GOVERNMENT DEBT, REDISTRIBUTIVE FISCAL POLICIES, AND THE INTERACTION BETWEEN BORROWING CONSTRAINTS AND INTERGENERATIONAL ALTRUISM*

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We show how borrowing constraints, intergenerational altruism, and their interaction shape the aggregate savings response to government debt and fiscal policies that redistribute resources between living generations. We also characterize the conditions under which borrowing constraints bind and the altruistic transfer motive operates in terms of the strength of the altruism motive, the shape of the lifetime productivity profile, the willingness to substitute consumption intertemporally, and other factors. Finally, we characterize the dynamic response of aggregate savings to nonneutral government debt policies in economies with binding borrowing constraints.

1. Introduction

Economists and policymakers have a longstanding and keen interest in questions about the interest rate, savings, and welfare effects of government debt policies and fiscal policies that redistribute resources between living generations. Two critical determinants of these effects are borrowing constraints and intergenerational altruism. While many economists consider separately the implications of borrowing constraints and intergenerational altruism, we embed them within a single model and analyze their interaction. We extend Barro's (1974) overlapping generations production economy to consider three-period lived individuals and, hence, a potentially active consumption-loans market. Our model also accommodates arbitrary shapes for individuals' lifetime productivity profiles, a feature that proves to be essential for addressing the issue of whether transfer motives operate.

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The introduction of borrowing constraints into an overlapping generations environment breaks the analogy emphasized by Barro (1974, pp. 1106–1107) and Miller and Upton (1974, pp. 182–184) between government debt policies and tax/transfer policies that redistribute resources between living generations. We show that, when altruistic transfer motives operate, an important class of redistributive fiscal policies is neutral irrespective of whether borrowing constraints bind. This class encompasses redistributive policies that act entirely through the budget constraints of the young and middle-aged. We also show that, by weakening the conditions under which transfer motives operate, borrowing constraints extend the applicability of the neutrality theorem that applies to this class of redistributive fiscal policies. In sharp contrast, borrowing constraints imply the nonneutrality of government debt irrespective of whether transfer motives operate. This sharp difference between the effects of debt and redistributive fiscal policies arises despite altruistic intergenerational transfers, because the timing of government tax collections matters in an economy with imperfect capital markets.

Our analysis confirms the view that borrowing restrictions imply large effects of government debt policies. At the same time, our analysis contradicts what we perceive to be widely held views about the implications of intergenerational altruism, and its interaction with borrowing constraints, for the effects of government debt policies. Specifically, we simulate the dynamic response of the no-loan economy to a one-time subsidy of the (borrowing-constrained) young, financed by a permanent increase in per capita government debt. We measure the magnitude of the dynamic response by the ratio of physical capital crowded out to new government debt issued. The comparative dynamic implications of intergenerational altruism for this debt-financed tax cut are surprising in several respects: (1) When interest payments on the debt are financed by taxes on the middle-aged, an operative transfer motive causes a greater relative and absolute dampening of the short-run than the long-run crowding-out ratio. (2) Quantitatively, the effects of intergenerational altruism on the crowding-out ratio in the no-loan economy are large. When interest payments on the debt are financed by taxes on the middle-aged, the contemporaneous crowding-out ratio is about twenty-five percent smaller in economies with an operative transfer motive than in economies with an inoperative transfer motive. When interest payments on the debt are financed by taxes on the young, the long-run crowding-out ratio increases by more than fifty percent as the transfer motive becomes operative. (3) Provided that borrowing constraints bind and the altruistic transfer motive operates along an economy’s entire time path, increases in the degree of altruism increase the short-run and long-run crowding-out ratio.

These simulation results suggest to us that, in non-Ricardian as well as Ricardian environments, the extent of altruistic transfer motives is a key
determinant of the long-run and short-run savings response to government deficits. The potentially important role of intergenerational linkages in our model with borrowing constraints arises even if finite lifetime effects alone imply a small short-run response of aggregate savings to government deficits. [See Hubbard and Judd (1986a, b) and Poterba and Summers (1987).] Thus, whether borrowing constraints bind and whether the transfer motive operates are, separately and jointly, key determinants of the effects of government debt and redistributive fiscal policies. Hence, we also address questions about the conditions under which borrowing constraints bind and transfer motives operate.

Hall (1986, pp. 51–53) expresses skepticism that oversaving by the young, induced by borrowing constraints, represents a serious problem. He argues that, since many or most families have the capability to overcome suboptimal consumption by the young, but apparently few families do so, ‘it raises the question of whether the problem exists.’ Mariger (1986) carefully, but separately, considers the implications of borrowing constraints and altruistically motivated intergenerational transfers for consumption behavior in theoretical and empirical models. He excludes from consideration the case in which, simultaneously, borrowing constraints bind and transfer motives operate, arguing that (pp. 30, 133) borrowing constraints are unlikely to bind when altruistic transfer motives operate. Similarly, in their empirical studies of the connection between borrowing constraints and intergenerational transfers, Cox (1987) and Cox and Jappelli (1987) restrict attention to the case in which operative altruistic transfer motives fully overcome borrowing constraints. In contrast to these views, we show that if the young choose to borrow against future income in the economy with a consumption-loans market, then the borrowing constraint always binds in the corresponding no-loan economy. Alternatively stated, if altruism is strong enough to overcome borrowing constraints, then a consumption-loans market would be redundant.

Weil (1987) and Abel (1987) address questions about the operativeness of an altruistic transfer motive in overlapping generations economies. Weil’s numerical analysis of a parametric version of his model indicates that parents must ‘love their children’ very much for the transfer motive to operate. For some apparently reasonable parameter configurations, he finds that it is impossible for parents to love their children enough for transfer motives to operate. We consider parametric versions of our closely related model and arrive at a strikingly different conclusion: for reasonable lifetime productivity profiles and a modest desire to smooth consumption intertemporally, parents need love their children only a little bit for the transfer motive to operate in the loan economy. For some parameter configurations, we show that the slightest degree of parental love for children implies positive intergenerational transfers. The much greater scope for altruistic transfers in our consumption-loans
economy reflects the effects of the intertemporal elasticity of substitution in consumption and the shape of the lifetime productivity profile on life-cycle savings.

Throughout the paper, we interpret consumption-loans and *inter vivos* transfers as alternative consumption-smoothing devices governed by different tradeoffs. As we show in section 4, the consumption-smoothing role of intrafamily transfers can complement and coexist with the smoothing that occurs through consumption loans at market interest rates. If the market mechanism for smoothing consumption becomes less attractive due to transaction costs in the loan market, or if prohibitive transaction costs preclude a consumption-loans market, the incentive to use intergenerational transfers as a consumption-smoothing device increases. In this way, borrowing constraints further increase the scope for an operative transfer motive.

The remaining sections of the paper are organized as follows. Section 2 describes the overlapping generations environment that serves as the framework for our analysis. In section 3 we compare steady-state equilibrium behavior across the consumption-loans and no-loan economies, and we characterize some qualitative features of the interaction between borrowing constraints and intergenerational altruism. Section 4 addresses, in a quantitative way, questions about the conditions under which the altruistic transfer motive operates. Section 5 shows that certain redistributive fiscal policies are neutral and government debt nonneutral in environments with binding borrowing constraints and an operative transfer motive. Section 6 investigates the implications of altruism for the dynamic response of the no-loan economy to nonneutral government debt actions. Section 7 offers concluding remarks on directions for future research.

2. The overlapping generations framework

2.1. *A consumption-loans and a no-loan economy*

The overlapping generations production economies we consider have a simple structure. The economies are populated by persons who live three periods. Each person inelastically supplies homogeneous labor services according to a lifetime productivity profile, \((\alpha_1, \alpha_2, \alpha_3)\), and output is produced from capital and labor inputs according to a neoclassical production function. When middle-aged, persons can transfer income to their \((1 + n)\) newly-born offspring. Persons maximize discounted lifetime utility, a function of own

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1 The analysis in section 4 is usefully read in conjunction with Weil (1987), Abel's (1987) extension of Weil's analysis to the case of two-way altruism, and Drazen (1978). Drazen develops the steady-state implications of altruistically motivated intergenerational transfers and borrowing restrictions for the effects of government debt on human capital accumulation. For an extensive review of the theoretical and empirical literature on intergenerational linkages and their implications for the effects of government debt policies, we refer the reader to Bernheim (1987).
consumption and the maximum attainable utility of their immediate descendants.

Depending on their lifetime income profiles, gross of intergenerational transfers, persons desire to borrow against future income to finance current consumption. An operating consumption-loans market requires some enforcement mechanism that insures loan repayment. We consider a consumption-loans economy that contains a costless enforcement mechanism and a borrowing-constrained economy that contains no viable enforcement mechanism. We take the absence of a viable enforcement mechanism to reflect the high costs of enforcing loan repayment, due partly to bankruptcy laws and other legal protections afforded debtors.2

The transfer mechanism we consider differs from the usual analysis that limits intergenerational transfers to bequests that pass to children upon the death of the parent. In the absence of strategic behavior, inter vivos transfers during a child’s borrowing-constrained period of life dominate bequests. Altig and Davis (1989) provide a formal demonstration of this claim; see, also, Ishikawa (1974). The available empirical evidence indicates that inter vivos transfers are the predominant form of familial transfers among adults [see Cox and Raines (1985)]. Furthermore, the observed pattern of inter vivos transfers indicates that transfers are disproportionately directed toward constrained households [see Cox (1987) and Cox and Jappelli (1987)].

In the consumption-loans economy a representative member of generation $t$ chooses $(C_{1t}, C_{2t}, C_{3t}, x_{1t}, x_{2t}, b_{t+1})$ to maximize

$$U_t = \sum_{i=1}^{3} \beta^{i-1} u(C_{it}) + \beta^{T} U_{t+1}^*,$$

subject to

$$C_{1t} + x_{1t} = \alpha_1 W_t + b_t,$$

$$C_{2t} + (1 + \eta) b_{t+1} + x_{2t} = (1 + r_{t+1}) x_{1t} + \alpha_2 W_{t+1},$$

$$C_{3t} = (1 + r_{t+2}) x_{2t} + \alpha_3 W_{t+2},$$

$$C_{1t}, C_{2t}, C_{3t}, b_{t+1} \geq 0,$$

2Hayashi (1987) and Yotsuzuka (1987) show that the Ricardian equivalence theorem holds in some environments with borrowing constraints that stem from adverse selection effects. In their analyses, lenders’ willingness to extend credit depends on borrowers’ implied future tax obligations, a feature that leads to debt neutrality under some information structures. If adverse selection effects are severe enough to push (some) potential borrowers out of the consumption-loans market, then the private-sector offset mechanism cannot (fully) operate. In this case, borrowing constraints induced by adverse selection carry the same implications for the effects of government debt as borrowing constraints induced by high enforcement costs. We believe this case to be the relevant one for an analysis of consumption-smoothing behavior over broad epochs of life, although available consumer credit mechanisms are often used for short-term consumption-smoothing purposes.
where

\[ C_{1t} = \text{consumption by generation } t \text{ when young}, \]
\[ C_{2t} = \text{consumption by generation } t \text{ when middle-aged}, \]
\[ C_{3t} = \text{consumption by generation } t \text{ when old}, \]
\[ x_{1t} = \text{capital purchases (i.e., savings) by generation } t \text{ when young}, \]
\[ x_{2t} = \text{capital purchases by generation } t \text{ when middle-aged}, \]
\[ b_{t+1} = \text{transfer made by a generation-}t \text{ parent at } t+1 \text{ to each } (1+n) \text{ offspring}, \]
\[ \beta = \text{intertemporal discount factor, } 0 < \beta < 1, \]
\[ \gamma = \text{interpersonal discount factor, } 0 < \gamma < (1+n)/\beta, \text{ which insures a positive steady-state interest rate when the transfer motive operates in the loans economy}, \]
\[ u(\cdot) = \text{period utility function, satisfying } u'(\cdot) > 0, u''(\cdot) < 0, \lim_{C \to 0} u'(C) = \infty, \text{ and } \lim_{C \to \infty} u'(C) = 0, \]
\[ U_{t+1}^* = \text{maximum utility attainable by a generation } t+1 \text{ individual}, \]
\[ n = \text{population growth rate}, \]
\[ W_t = \text{period-}t \text{ wage in units of the good, and} \]
\[ r_{t+1} = \text{the rate of return on capital (or consumption loans) held from } t \text{ to } t+1. \]

The absence of nonnegativity constraints on savings for the young and middle-aged reflects the availability of a costless consumption-loans market.

In the no-loan economy a representative consumer of generation \( t \) maximizes (1) subject to (2) thru (5) and

\[ x_{1t}, x_{2t} \geq 0. \] (6)

This additional constraint reflects the absence of a viable enforcement mechanism to support the operation of a consumption-loans market.

Turning to the production side of the two economies and normalizing so that generation \( 0 \) has one member, the aggregate period-\( t \) labor supply is

\[ L_t = \alpha_1 + \frac{\alpha_2}{1+n} + \frac{\alpha_3}{(1+n)^2} (1+n)' = \alpha(1+n)'. \] (7)

where \( \alpha \) is per capita labor supply. Defining \( k = K/L \) as the capital–labor ratio, we write the aggregate production function as

\[ Y_t = \alpha(1+n)'f(k_t). \] (8)

where \( f'(\cdot) > 0, f''(\cdot) < 0, \lim_{k \to 0} f'(k) = \infty, \text{ and } \lim_{k \to \infty} f'(k) = 0. \text{ The rep-}
representative firm's competitive profit maximization conditions are
\[ W_t = f(k_t) - k_t f'(k_t), \]  
\[ r_t = f'(k_t). \]  

The market-clearing conditions complete the specification of the two models. We obtain the goods market-clearing condition:

\[ K_{t+1} - K_t + (1 + n)^t \left[ C_{1t} + \frac{C_{2t-1}}{1 + n} + \frac{C_{3t-2}}{(1 + n)^2} \right] = \alpha (1 + n)^t f(k_t) \]
\[ \Rightarrow \alpha (1 + n) k_{t+1} - \alpha k_t + C_{1t} + \frac{C_{2t-1}}{1 + n} + \frac{C_{3t-2}}{(1 + n)^2} = \alpha f(k_t), \]  

and the capital market-clearing condition:

\[ K_t = (1 + n)^t \left[ \frac{x_{1t-1}}{1 + n} + \frac{x_{2t-2}}{(1 + n)^2} \right] \]
\[ \Rightarrow k_t = \frac{(1 + n) x_{1t-1} + x_{2t-2}}{(1 + n)^2 \alpha}. \]  

2.2. Necessary conditions for the consumer's optimization problems

Combining the period budget constraints (2)–(4) yields an expression for \( b_{t+1} \) in terms of \( C_{1t}, C_{2t}, \) and \( C_{3t}: \)

\[ b_{t+1} = \left( \frac{1}{1 + n} \right) \left[ \frac{\alpha_2 W_{t+1}}{1 + r_{t+1}} + (1 + r_{t+1}) (\alpha_1 W_t + b_t - C_{1t}) \right. \]
\[ \left. - C_{2t} + \frac{\alpha_2 W_{t+2}}{1 + r_{t+2}} - \frac{C_{3t}}{1 + r_{t+2}} \right]. \]  

Using (1), (5), (13), and the restrictions on the utility function, we obtain the remaining first-order conditions for the consumer's problem in the consumption-loans economy:

\[ u'(C_{2t}) \geq \frac{\gamma}{1 + n} u'(C_{1t+1}), \text{ with equality if } b_{t+1} > 0, \]  
\[ u'(C_{1t}) = \beta (1 + r_{t+1}) u'(C_{2t}), \]  
\[ u'(C_{2t}) = \beta (1 + r_{t+2}) u'(C_{3t}). \]
where the envelope theorem is used to calculate $\partial U_t^{x+1}/\partial b_t^{x+1}$. These first-order conditions have familiar interpretations. Eq. (14) states that, at an interior solution for intergenerational transfers, the marginal rate of substitution between consumption by the middle-aged at time $t + 1$ and consumption by the young at time $t + 1$ equals the (population-growth) deflated interpersonal discount factor. Eq. (15) states that the marginal rate of substitution between generation $t$'s consumption when young and their consumption when middle-aged equals the time-discounted gross rate of return to savings at time $t$. Eq. (16) has a similar interpretation.

If the constraints (6) are nonbinding in the no-loan economy, the consumer's optimization problem continues to be characterized by (13)–(16). For simplicity, and without losing anything essential, we restrict our attention to lifetime productivity profiles that lead to positive savings by the middle-aged at all dates. Hence, eqs. (14) and (16) hold for the no-loan economy, while the first-order condition characterizing the relation between consumption in the first and second periods of life is

$$u'(C_{1t}) \geq \beta(1 + r_{t+1})u'(C_{2t}), \text{ with equality if } x_{1t} > 0. \quad (15')$$

2.3. Equilibrium

An equilibrium in the consumption-loans economy is a sequence $\{C_{1t}, C_{2,t-1}, C_{3,t-2}, x_{1t}, x_{2,t-1}, b_t, W_t, r_{t+1}, k_t, Y_t\}_{t=0}^{\infty}$ that satisfies eqs. (1)–(5) and (7)–(16) for all $t$, given the initial conditions $(x_{1,-1}, x_{2,-2}, k_0)$. Likewise, an equilibrium in the no-loan economy is a sequence that satisfies (1)–(14), (15'), and (16) for all $t$, given the initial conditions.

Some of our results in section 3 require that the steady-state equilibrium in the consumption-loans economy be unique. Thus, we shall occasionally require:

Assumption U. $(1 + n)x_1[w(k), r(k)] + x_2[w(k), r(k)] = a(1 + n)^{2}k$ has a unique solution, $\tilde{k}$, where $\tilde{k}$ denotes the steady-state equilibrium capital stock in the consumption-loans economy.

When the transfer motive operates, the uniqueness of $\tilde{k}$ follows from the first-order conditions in the consumers' problem. At an interior solution for transfers, (14) and (15) imply that the steady-state interest rate is $(1 + n)/(1 - \beta) - 1$. The strict concavity of $f(\cdot)$ then implies a unique solution to

$$f'(k) = \frac{1 + n}{\gamma \beta} - 1 \equiv r^* \geq n \geq 0.$$ 

When the transfer motive does not operate, we rely on Assumption U to rule
out a multiplicity of steady-state equilibria. Diamond (1965) and Weil (1987) make similar assumptions in overlapping generations models with two-period lived persons. For the case of a Cobb–Douglas production function and an isoelastic utility function, we have used root-bracketing techniques to search over a grid on the model's parameter space and failed to find multiple equilibria.

3. Steady-state equilibrium comparisons: The interaction between borrowing constraints and intergenerational altruism

In this section we derive basic relationships between the steady-state equilibrium in the consumption-loans economy and the steady-state equilibrium in the no-loan economy. We use overlines and tildes to designate steady-state equilibrium values in the consumption-loans and no-loan economies, respectively.

We first address the issue of whether borrowing constraints bind when the altruistic transfer motive operates. We prove the following: if the young choose to borrow against future income in the consumption-loans economy, then borrowing constraints always bind in the corresponding no-loan economy. In this sense, altruistically motivated transfers are never large enough to overcome a suboptimal consumption problem facing the young. The proof is straightforward and by contradiction: suppose that $\bar{x}_1 < 0$ and that $u'(\bar{C}_1) = \beta(1 + \bar{r})u'(\bar{C}_2)$. Then there exists a steady-state equilibrium in the loan economy with dissavings by the young and another equilibrium with nonnegative savings by the young, violating the uniqueness assumption. Note that this proof holds regardless of whether the transfer motive operates. Thus, we have:

Proposition 1. If the consumption-loans market is active in the loan economy, borrowing constraints bind in the corresponding no-loan economy.

The reader might ask whether the result in Proposition 1 reflects a failure to account for transfers that connect the old to the middle-aged. By allowing for intergenerational transfers from the old to the middle-aged, we could exploit the resulting indeterminacy in the timing of the transfers in the loan economy to construct a trivial counterexample to Proposition 1. The following restatement of Proposition 1 is immune to this counterexample: If altruism is strong enough to overcome borrowing constraints, then the loan and no-loan economies exhibit identical equilibrium capital stock and consumption profiles.

The next proposition characterizes the relationship between the steady-state interest rates in the two economies under the operative and inoperative transfer-motive regimes.
Proposition 2

(i) If the transfer motive is operative in the loan economy but the consumption-loans market is inactive, then \( \hat{r} = r^* = \hat{r} \).

(ii) If the transfer motive is operative in the loan economy and the consumption-loans market is active, then \( \hat{r} = r^* > \hat{r} \).

(iii) If the transfer motive is inoperative in the loan economy and the consumption-loans market is active, then \( r^* > \hat{r} > r^* \).

(iv) If the transfer motive is inoperative in the loan economy and the consumption-loans market is inactive, then \( r^* > \hat{r} = F \).

Proof. Follows directly from (14), (15), (15'), and Proposition 1.

Recalling that \( r^* \leq n \), Proposition 2 yields Weil’s fundamental result on the connection between dynamic inefficiency and the operativeness of the altruistic transfer motive: Since \( \hat{r} = r^* \) when the transfer motive operates and dynamic inefficiency arises when \( \hat{r} < n \), dynamic inefficiency implies an inoperative transfer motive.

By using Propositions 1 and 2, we can characterize the effects of borrowing constraints on steady-state welfare and consumption behavior. Proposition 1 states that closure of an active consumption-loans market always leads to a suboptimal consumption problem confronting the young: the marginal rate of substitution between consumption in the second and first periods of life exceeds the gross rate of return to saving. But, when the transfer motive operates in the consumption-loans economy, Proposition 2 implies that \( \hat{C}_1 \) typically exceeds \( C_1 \). That is, although the young wish to consume more at equilibrium prices in the no-loan economy, if they can borrow against future income they actually consume less at the new (steady-state) equilibrium prices. This general equilibrium result is driven by a combination of wealth and substitution effects. Proposition 2 implies a smaller capital stock and, hence, smaller aggregate consumption in the consumption-loans economy than in the no-loan economy. Further, the higher interest rate in the consumption-loans economy provides a greater incentive to forego consumption early in life.

Proposition 3. Consider a consumption-loans economy with an operative transfer motive and an active loan market. If aggregate consumption in the corre-

\(^3\)Greater production obviously implies greater aggregate consumption when \( n = 0 \). For sufficiently large \( n \), greater production need not lead to greater aggregate consumption because of the greater investment requirements. But increasing \( n \) drives up the interest rate (\( \hat{r} > n \) when the transfer motive is operative), reducing the young’s incentive to dissave. Hence, as \( n \) increases the two economies converge. We suspect, but have not proved, that an active consumption-loans market guarantees higher aggregate consumption in the no-loan economy. Certainly, this outcome is the nonpervasive one; it holds in all of the numerical examples we have calculated with isoelastic utility and Cobb-Douglas production.
sponding no-loan economy exceeds aggregate consumption in the consumption-loans economy \((n = 0\) is a sufficient condition), then \(\tilde{C}_1 > \tilde{C}_0\).

Proof. Suppose \(\tilde{C}_1 \leq \tilde{C}_0\). Then, by the hypothesis and the definition of aggregate consumption, \(\tilde{C}_2 > \tilde{C}_0\) or \(\tilde{C}_3 > \tilde{C}_0\). But \(\tilde{C}_3 > \tilde{C}_0\), \(\tilde{r} < \tilde{r}\), and the first-order conditions

\[
u'\left(\tilde{c}_2\right) = \beta(1 + \tilde{r})u'(\tilde{c}_2), \quad u'\left(\tilde{c}_3\right) = \beta(1 + \tilde{r})u'(\tilde{c}_3)
\]

imply \(\tilde{C}_2 > \tilde{C}_0\). So,

\[\tilde{C}_1 \leq \tilde{C}_0 \Rightarrow \tilde{C}_2 > \tilde{C}_0 \Rightarrow u'\left(\tilde{c}_2\right) < u'\left(\tilde{c}_3\right) = \frac{\gamma}{1 + n}u'\left(\tilde{c}_3\right) < \gamma u'\left(\tilde{c}_1\right)/(1 + n).
\]

But \(u'(\tilde{c}_2) < (\gamma/(1 + n))u'(\tilde{c}_1)\) contradicts (14). Thus, the supposition is false, and the proposition is proved.

By applying the transfer-motive first-order condition, we obtain as a corollary to Proposition 3 that \(\tilde{C}_2 > \tilde{C}_0\). Since \(\tilde{r} < \tilde{r}\), the relationship between \(\tilde{C}_3\) and \(\tilde{C}_0\) does not follow as directly, but \(\tilde{C}_3\) exceeds \(\tilde{C}_0\) in all of the numerical experiments we performed. Hence, steady-state utility in no-loan economies typically exceeds steady-state utility in corresponding loan economies with an operative transfer motive. The intuition behind this result is simple. Forced savings today increases the future productive potential of the economy, raising welfare in the long run. We do not view this result as a compelling normative argument for restrictions on consumption loans, since the transition path from the loan to the no-loan steady state does not represent a Pareto improvement. Rather, the result illustrates the potentially misleading nature of normative arguments for policy interventions that are based solely on steady-state welfare comparisons.

Finally, consider the effect of borrowing constraints on the operativeness of the transfer motive. Define \(\bar{\gamma}\) as the infimum value of the interpersonal discount factor for which \(\delta > 0\), where \(\bar{\gamma}\) is a function of \(\beta\), \(n\), the lifetime productivity profile, and the shapes of the utility and production functions. Define \(\tilde{\gamma}\) analogously. Since consumption loans and intergenerational transfers represent alternative consumption-smoothing mechanisms, it is natural to expect that \(\gamma \leq \tilde{\gamma}\), with a strict inequality for some parameter configurations.

\(^4\)We conducted extensive numerical experiments using Cobb–Douglas production and isoelastic utility functions. We also conducted many experiments with utility functions of the form \(U(C) = a_1 \log(C) + a_2 \log(C - b_2) + a_3 \log(C - b_3)\).
Indeed, all of our numerical experiments satisfy this inequality. We present examples that exhibit a strict inequality in section 4.\textsuperscript{5}

4. 'Love thy children' a little bit

In this section we adopt parametric specifications for the utility and production functions and further explore the conditions under which altruistic transfer motives operate. We consider the implications of the lifetime productivity profile, the interpersonal discount factor, the willingness to substitute consumption intertemporally, borrowing constraints, and other factors for the existence of altruistically motivated transfers. We concentrate on the question: 'How much must parents love their children for the altruistic transfer motive to operate?'

Let $u(C) = C^{\lambda}/\lambda$, where $\lambda = 0$ corresponds to log utility, and let $f(k) = k^\theta$. An appendix – available upon request from the authors – displays steady-state equilibrium solutions for the consumption-loans and no-loan economies under these parametric specifications. The appendix also contains derivations of the $b = 0$, $\bar{x}_1 = 0$, and $\bar{y} = 0$ boundary loci in $\beta - \gamma$ space. Note that the $b = 0$ ($\bar{y} = 0$) boundary locus depicts the $\gamma$ ($\bar{\gamma}$) function. We plot the boundary loci to investigate the effects of altruism and other factors on intergenerational transfers and consumption loans.

4.1. The effects of the lifetime productivity profile

For the consumption-loans economy, fig. 1 displays in $\beta - \gamma$ space the $\bar{b} = 0$, $\bar{x}_1 = 0$, and admissibility boundaries. The parameter specification entails zero population growth, capital's output share equal to 25%, a $(0, 1, 0)$ productivity profile, and either log utility (solid lines) or $\lambda = -0.5$ (dashed lines). The admissibility boundary reflects the restrictions $\beta < 1$ and $\gamma < (1 + n)/\beta$. Only $\beta - \gamma$ combinations that lie below both solid lines are admissible. The upward-sloping lines depict the zero-transfer boundary; $\beta - \gamma$ combinations to the right of this locus correspond to positive transfers in the consumption-loans economy steady-state equilibrium. The downward-sloping lines depict the zero-savings boundary for the young; points to the left of this locus correspond to an active consumption-loans market. For $\beta - \gamma$ combinations between the $b = 0$ and $\bar{x}_1 = 0$ boundaries, the transfer motive is operative and the consumption-loans market is active.

\textsuperscript{5}Despite some effort, we have failed to prove that $\bar{\gamma} \leq \gamma$ holds in general or to find a counterexample. The difficulty in proving a general result stems from the increase in the young's wage income induced by the closure of an active consumption-loans market. Closure of an active loan market increases the capital stock which, in turn, leads to a higher wage. Using this observation, it is straightforward to argue that either a sufficiently small savings elasticity of the wage or a sufficiently steep slope to the lifetime productivity profile over the first two periods of life guarantees $\bar{\gamma} \leq \gamma$. 
Fig. 1. Loan economy: $\Lambda = 0$ or $-0.5$, $\theta = 0.25$, $\alpha = (0,1,0)$, $n = 0$. The solid lines (dashed) lines depict the $x_1 = 0$ and $b = 0$ boundary loci corresponding to $\Lambda = 0$ ($\Lambda = -0.5$).
Table 1

<table>
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<th>Profile</th>
<th>$1^\gamma$</th>
<th>$3^\gamma$</th>
<th>$5^\gamma$</th>
<th>$7^\gamma$</th>
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</thead>
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<td>0.403</td>
<td>0.415</td>
<td>0.422</td>
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</tr>
<tr>
<td>$(1, 0, 0)$</td>
<td>1.108</td>
<td>1.443</td>
<td>1.76</td>
<td>2.028</td>
</tr>
</tbody>
</table>

*Table entries are the minimum values of $\gamma$ for which the transfer motive operates, given the indicated annual population growth rate, $n^\prime$, and productivity profile. All calculations assume log utility, $\theta = 0.25$, and $\beta = 0.99$.*

Fig. 1 indicates that the transfer motive operates when parents place a modest weight on their children's welfare. For example, interpreting a period as twenty-five years and focusing on the log utility case, an annual time discount factor of 0.99 implies that the transfer motive operates for interpersonal discount factors above 0.36. If the interpersonal discount factor is also less than 0.63, then the young dissave. Smaller time discount factors increase the range of $\gamma$ values over which transfers operate and the loans market is active.

Fig. 1 can be compared to the numerical results in Weil (1987, table 1). In Weil’s model agents live two periods and their lifetime productivity profile is $(1, 0)$. In other respects, Weil’s numerical examples are very similar to our log utility example in fig. 1.⁶ Even for low time-discount factors, Weil finds that parents must love their children very much for the transfer motive to operate. For annual time discount factors on the order of 0.99, parents must weight their children’s utility more heavily than their own for the transfer motive to operate in his examples. For some apparently reasonable parameter configurations, Weil shows that altruism is always too weak to generate transfers. He proves that this outcome occurs whenever the corresponding Diamond (1965) economy (having no transfer motive) is dynamically inefficient – that is, whenever nonphysical assets are useful for reducing oversavings.

In the third row of table 1, we repeat the exercise that Weil performs in his table 1. Row three displays $\gamma^\prime$, assuming log utility, capital’s share equal to 0.25, an annual time discount factor of 0.99, and a $(1, 0, 0)$ lifetime productivity profile. As in Weil’s example, an operative transfer motive requires implausibly large interpersonal discount factors. But, as the first two rows of our

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⁶That is, Weil assumes a log utility function and a Cobb–Douglas production function with capital’s share equal to 0.25. Weil also considers nonzero population growth rates; we consider the effects of population growth below. Note that Weil's $\gamma$ symbol refers to the product of the time discount factor and the interpersonal discount factor. Hence, to directly compare the entries in Weil's table to our results, it is necessary to divide his table entries by the time discount factor.
Weil’s dramatic result is reversed when the productivity (earnings) profile slopes up over the first two periods of life.

Table 1 shows that the contrast between Weil’s result and fig. 1 stems from the differing shapes of the lifetime earnings profiles. With a downward-sloping profile, steady-state transfers serve only to pass the economy’s capital stock from generation to generation. If the economy exhibits large savings anyway – too much savings in the dynamically inefficient case – transfers are not useful and, hence, the altruism motive fails to operate. When lifetime earnings profiles contain an upward-sloping segment, life-cycle considerations are less likely to generate oversavings, and the between-person consumption-smoothing motive (intergenerational transfers) has more room to operate.

The intuition behind the results in table 1 becomes apparent by recognizing the following isomorphism. In our simple model with inelastic labor supply, the comparative steady-state effects of $\alpha$-compensated changes in the shape of the lifetime productivity profile are identical to the effects of intergenerational redistributions of income imposed by the government via lump-sum taxes and transfers. For instance, a government-imposed transfer from the middle-aged to the young narrows the scope for an operative altruistic transfer motive in exactly the same way as an $\alpha$-compensated decrease in the slope of the lifetime productivity profile (over the first two periods of life). With elastic labor supply the exact isomorphism would break down, but there would continue to be a close parallel between these two experiments.

4.2. The effects of consumption-smoothing incentives

We turn now to the role of consumption-smoothing incentives. Consumption smoothing in our model often occurs simultaneously through consumption loans and through interpersonal transfers. To understand why consumption smoothing can simultaneously occur through both mechanisms, note that intrafamily consumption smoothing is determined by the rate at which parents are willing to trade off their current consumption for their children’s current consumption, whereas marketplace consumption smoothing is determined by the rate at which children are willing to trade off current for future consumption. Only marketplace consumption smoothing involves an intertemporal tradeoff.

This consumption-smoothing perspective on intergenerational transfers suggests that a decrease in the willingness to substitute consumption intertemporally leads to a greater reliance on both market and family consumption-smoothing mechanisms and, hence, unambiguously increases the interest rate and reduces $\bar{\gamma}$. To gauge the impact of greater utility function curvature, fig. 1 also displays the $b = 0$ and $\bar{\alpha}_1 = 0$ loci for the case of $\lambda = -0.5$. As a comparison of the two $b = 0$ loci in fig. 1 illustrates, small increases in curvature dramatically increase the scope for an operative transfer motive. For
degrees of curvature slightly greater than the $\lambda = -0.5$ case in fig. 1, the transfer motive operates for any positive interpersonal discount factor, independent of the time discount factor.

4.3. The effects of borrowing constraints

The consumption-smoothing perspective also highlights the economic logic behind the claim that borrowing constraints increase the scope for an operative transfer motive: the consumption-smoothing motivation for transfers looms larger in the absence of market mechanisms that facilitate consumption smoothing. With a $(0,1,0)$ profile and borrowing constraints, consumption-smoothing incentives imply $\tilde{\gamma} = 0$. In other words, the $\tilde{b} = 0$ boundary in fig. 1 coincides with the vertical axis.

As fig. 2 illustrates, the closure of an active consumption-loans market more generally enlarges the $\beta - \gamma$ region over which the transfer motive operates. The solid lines in fig. 2 depict $\gamma$ and $\tilde{\gamma}$ as functions of $\beta$ for a reasonable benchmark parametric specification of the model. In the benchmark specification, we interpret a period as twenty-five years, and we assume $\theta = 0.25$, $(1 + n)^{25} = (1 + 0.01)^{25}$, $\gamma = -0.5$, and $(\alpha_1, \alpha_2, \alpha_3) = (1.5, 6.0, 2.5)$. For comparison, the dashed lines in fig. 2 depict the $\tilde{\gamma}$ and $\tilde{\gamma}$ functions when $\lambda = -1$. Fig. 2 indicates that the altruistic transfer motive operates when parents love their children a little bit. For example, in the no-loan (consumption-loans) economy with $\lambda = -1$, if parents weight their children's utility at least 15% (22%) as heavily as their own utility, the transfer motive operates for any admissible time discount factor.

In a steady-state equilibrium of the loan economy with an operative transfer motive, the rate at which an individual trades off first- and second-period consumption equals the rate at which the family trades off first-period consumption by children for second-period consumption by parents. Thus, the effect of an increase in $\lambda$ on $\tilde{\gamma}$ is linked to the effect on the steady-state interest rate, which in turn reflects the smaller amount of life-cycle saving associated with greater utility function curvature. In the no-loan economy, the interaction between consumption-smoothing incentives and the transfer motive is more complicated, because no direct link exists between the steady-state interest rate and the degree of altruism.

We isolate the separate effects of consumption-smoothing incentives when borrowing constraints bind in table 2. The first row in table 2 reports $\gamma$ for the benchmark parameter specification and three values of the consumption-smoothing parameter. The next three rows treat the center column as a central case and vary one parameter at a time. The second row varies $h$, holding $r$ and $w$ fixed; while the third (fourth) row varies $r$ ($w$) as it varies in the first row, holding $\lambda$ and $w$ ($r$) fixed. The bottom row reports $\tilde{\gamma}$. 
Fig. 2. $b = 0$ boundary loci for the loan and no-loan economies: benchmark specification with $\lambda = -0.5$ or $-1$. The solid (dashed) lines depict the $b = 0$ boundary loci corresponding to $\lambda = -0.5$ ($\lambda = -1$).
The text contains a table and an explanation of its contents. Each value of \( \gamma \) is the infimum value for which the transfer motive operates for the given experiment. The superscripts indicate the experiment to which each row relates. Specifically:

- \( \tilde{\gamma} \) = general equilibrium infimum value of \( \gamma \) for no-loan economy.
- \( \tilde{\gamma}' \) = partial equilibrium value found by fixing \( r \) and \( w \) at the benchmark general equilibrium values and varying \( \lambda \).
- \( \tilde{\gamma}'' \) = fixing \( \lambda \) at the benchmark value (-0.5) and varying the interest rate as if \( \lambda \) had varied.
- \( \tilde{\gamma}''' \) = fixing \( \lambda \) at the benchmark value and varying wages as if \( \lambda \) had varied.
- \( \tilde{\gamma}'''' \) = general equilibrium infimum value of \( \gamma \) for loans economy.

See the text for further explanation.

In the no-loan economy, the interest-rate effect on the transfer motive is much smaller than in the loan economy and a small part of the total effect of consumption-smoothing incentives. The small interest-rate effect, shown in row three, reflects roughly offsetting wealth and substitution effects on savings by the middle-aged. (Moving from left to right across the third row, the interest rate falls.) The direct effect of consumption-smoothing incentives on the incidence of transfers, completely absent in the loan economy, accounts for almost the entire story in the no-loan economy. This direct effect is captured by the partial equilibrium experiment in row two. As noted, there is room for the direct effect to operate in the no-loan economy, because the interest rate no longer pins down the steady-state relationship between first- and second-period consumption.

4.4. Conclusions

In closing this section, we stress four points: (1) A positively sloped segment of the lifetime productivity profile dramatically increases the scope for operative transfer motives, relative to the case considered by Weil (1987). (2) As a related point, realistic lifetime productivity profiles diminish the scope for dynamically inefficient equilibria, because they imply much smaller life-cycle effects. We also calculated Slutsky-compensated versions of rows two through four to isolate substitution effects. The wealth-compensated versions of rows two through four exhibit a slight or slightly greater upward slope than the uncompensated versions in table 2. Hence, the separate wealth and substitution effects associated with the interest rate change are also small.
savings than the sharp downward-sloping profiles typically adopted in overlapping generations models. (3) Small decreases in the willingness to substitute consumption intertemporally (relative to the precision of estimates for this parameter) greatly increase the scope for operative transfer motives. The large effect of consumption-smoothing incentives on the incidence of transfers arises in both the loan and no-loan economies, though for different reasons. (4) Borrowing constraints increase the scope for operative transfer motives; the magnitude of this effect is sensitive to the shape of the lifetime productivity profile and the desire to smooth consumption intertemporally.

5. Borrowing constraints, intergenerational altruism, and neutrality theorems

At least since Barro (1974) and Miller and Upton (1974), economists have often stressed an analogy between redistributive fiscal actions and government debt actions. In a Ricardian environment neither type of action expands the opportunity set of private agents; hence, neither influences the determination of equilibrium outcomes. But the analogy between neutrality theorems that apply to these two classes of policy actions is imperfect, because the theorems rely on different types of interpersonal linkages. As stressed by Bernheim and Bagwell (1988), fiscal neutrality theorems depend critically on the nature and extent of interpersonal linkages. Neutrality theorems that apply to redistributive actions rely on linkages between different persons at a point in time, whereas debt neutrality theorems rely on linkages between different points in time for one or more persons. Since binding borrowing constraints destroy linkages involving different points in time, they vitiate debt neutrality theorems. Since binding borrowing constraints do not necessarily destroy linkages between persons at a point in time, they do not necessarily overturn the neutrality of redistributive actions.

Bearing these observations in mind, we now characterize classes of neutral and nonneutral fiscal interventions when borrowing constraints bind and transfer motives operate. We know from our earlier analysis that this case is nonvacuous. For example, fig. 2 informs us that the closure of a nonredundant consumption-loans market can lead to the coexistence of binding borrowing constraints and operative transfers, whether or not the transfer motive operates in the consumption-loans economy. For simplicity, we restrict attention in this section to an isoelastic utility function.

Assuming operative transfers and binding borrowing constraints, a generation- \( t \) member's budget equations become

\[
\begin{align*}
C_{1t} &= \alpha_1 W_t + b_t + s_{1t}, \\
C_{2t} &= (1 + n) b_{t+1} + d_{t+1} + x_{2t} = \alpha_2 W_{t+1} + s_{2t}, \\
C_{3t} &= \alpha_3 W_{t+2} + (1 + r_{t+2}) x_{2t} + (1 + r_{t+2}) d_{t+1} + s_{3t},
\end{align*}
\]
where
\[ s_{1t} = \text{net lump-sum subsidies granted to generation-}t \text{ members when young}, \]
\[ s_{2t} = \text{net lump-sum subsidies granted to generation-}t \text{ members when middle-aged}, \]
\[ s_{3t} = \text{net lump-sum subsidies granted to generation-}t \text{ members when old}, \]
\[ d_{t+1} = \text{government debt (per middle-aged person) issued at time } t+1. \]

The government budget constraint is
\[ d_{t+1} = (1 + n)s_{1t+1} + s_{2t} + \frac{s_{3,t-1}}{1+n} + \frac{(1 + r_{t+1})}{1+n} - d_t. \quad (17) \]

Using the budget equations (2')-(4') and the first-order conditions (14) and (16), we obtain the following expressions for aggregate savings and transfers at time \( t \):
\[ s_{2,t-1} = \frac{1}{1 + \phi} \left[ s_{2,t-1} + (1 + n)s_{1t} - \phi \frac{s_{3,t-1}}{1 + r_{t+1}} \right] - d_t, \quad (18) \]
\[ b_t = \Gamma' + \frac{\phi'}{1 + \phi} \left[ s_{3,t-1} + (1 + r_{t+1})s_{2,t-1} + (1 + n)(1 + r_{t+1})s_{1t} \right] - (1 + n)s_{1t}, \quad (19) \]

where \( \Gamma, \Gamma', \phi, \) and \( \phi' \) are functions of \( W_{t+1}, W_t, \) and \( r_{t+1}. \)

Consider a specific redistributive fiscal action involving a subsidy of \( s_{2,t} \) to the middle-aged at time \( t \) financed by taxation of the young at time \( t. \) Inspection of (18) reveals that the redistributive action has no effect on aggregate savings, since the balanced-budget restriction on government behavior implies \( s_{2,t-1}/(1 + n) = -s_{1t}. \) Furthermore, eq. (19) indicates that private transfers increase by exactly \( s_{2,t-1} \) per middle-aged person. Thus, consumption and savings are unaffected by this redistributive action.

Now consider a government debt action involving a subsidy of \( s_{1t} \), financed by issuing debt at time \( t \) to be retired, with certainty, by taxation of generation \( t \) when middle-aged (at time \( t+1 \)). In contrast to the redistributive action, eq. (19) implies that the government debt action is nonneutral. Since \( s_{1t} = (1 + n)d_t \), the partial equilibrium effect of the debt action is to reduce aggregate savings by \([((1 + n)^2)/(1 + \phi) - 1]d_t \), and, from the capital market clearing condition, to reduce the capital stock carried into time \( t+1 \) by \([((1 + n)^2)/(1 + \phi) - 1]d_t/\alpha(1 + n)^2 \). The general equilibrium effects of the government debt action on savings and capital formation are dampened by rising interest rates, but the direction of change remains the same. Thus, an
increase in government debt crowds out (crowds in) private savings (consumption). Similar arguments apply to alternative redistributive and government debt actions that operate on the budget equations of the young and middle-aged. Thus, we have:

**Proposition 4.** In the no-loan economy with an operative transfer motive and binding borrowing constraints, government redistributive actions that operate on the budget equations of the young and middle-aged are neutral. Under the same circumstances, government debt actions that operate on the budget equations of the young and middle-aged are nonneutral.

While the debt-financed subsidy considered above reduces savings by substituting for the absent consumption-loans market, Proposition 4 implies that the government’s fiscal action need not have the appearance of a consumption-loans program: a debt-financed tax cut for the middle-aged and an equal-magnitude debt-financed tax cut for the young have identical effects, if the transfer motive operates. Proposition 4 also carries important implications for existing arguments about the aggregate effects of fiscal policy. To give one example, Hubbard and Judd (1986a, pp. 40–41) note that, historically, many government debt actions concentrate the effects of tax changes on high-income persons, who are presumably unconstrained. They argue that such debt actions have small effects on aggregate savings, even when a large fraction of the population faces binding borrowing constraints. Proposition 4 weakens the force of this argument, especially since, as we have seen in section 3, borrowing constraints tend to weaken the conditions under which the transfer motive operates.

Not all redistributive actions are neutral when borrowing constraints bind and transfer motives operate. (18) and (19) imply the nonneutrality of any redistributive action that operates on the budget equation of the old. As noted in section 2, the existence of binding borrowing restrictions in our model implies that linkages between parents and children are operative only between youth and middle-age. The old are at corners with respect to intergenerational transfers. Thus binding borrowing constraints imply the nonneutrality of unfunded social security programs regardless of whether transfer motives operate. [An extended discussion of social security in the presence of borrowing constraints and intergenerational altruism appears in Altig and Davis (1989).]

Finally, we note that a limited class of debt actions are neutral in the presence of binding borrowing constraints and operative transfers. Consider a debt-financed subsidy of the middle-aged at time \( t \), and suppose that the debt is fully retired by taxing the old at \( t + 1 \). In (18) \( s_{2,t-1} \) and \( d_t \) rise by the amount of the subsidy, and \( s_{3,t-1} \) declines by \( 1 + r_{t+1} \) times the amount of the subsidy. Substituting these values into (18) yields a zero net change in
aggregate savings and, from (19), no change in intergenerational transfers. Thus, the debt action is neutral. Applying Proposition 4, the debt action would also be neutral if the subsidy is provided to the young rather than the middle-aged. Neutrality holds for this class of debt actions because the middle-aged are connected at time $t$ (through the capital market) to their old age at $t+1$.

To summarize the main message of the analysis in this section, we stress that blanket statements concerning the neutrality or nonneutrality of fiscal policy cannot be made by simply appealing to capital market imperfections. Instead, neutrality arises whenever the intertemporal and interpersonal redistributions imposed by a fiscal action operate only along linkages that already operate in the existing pattern of intergenerational transfers and capital market participation.\(^8\)

6. Altruism and the dynamic response to government debt in the no-loan economy

In this section we investigate how the magnitude of the crowding-out response to nonneutral government debt depends on the strength and operativeness of the altruistic transfer motive. We consider a one-time debt-financed subsidy of the borrowing-constrained young while maintaining the following assumptions: (a) no debt and no taxes at the initial steady-state equilibrium; (b) the subsidy equals five percent of the young's initial steady-state consumption; and (c) isoelastic utility and Cobb-Douglas production with the benchmark parameter specification. In calculating the long-run crowding-out ratio, we also assume that (d) per capita government debt remains constant following the initial increase.

In our simple model, the short-run and long-run responses to the debt-financed subsidy of the young do not depend on whether the fiscal intervention is anticipated or unanticipated, provided that the borrowing constraint binds along the entire time path. Furthermore, the contemporaneous response does not depend on future government behavior with respect to debt retirement and taxation. These properties are special, and they would not survive natural extensions of our model to include elastic labor supply, distortionary taxation, or agents who live more than three periods. Nonetheless, these

\(^8\)The interaction between intergenerational transfers and intrafamilial incentive problems can also influence the pattern of intergenerational linkages [see Bruce and Waldman (1988)] and thereby affect the aggregate savings response to fiscal actions. We effectively sidestep issues related to strategic interaction among family members by assuming that parents and children can credibly precommit to efficient (from the point of view of the family) patterns of consumption and saving. We thank Doug Bernheim for bringing this point to our attention and for other comments that improved the analysis in this section.
Fig. 3. Contemporaneous and long-run response of aggregate savings to a permanent increase in per capita government debt: benchmark specification. The solid (dashed) line depicts the long-run (contemporaneous) crowding-out ratio as a function of \( \gamma \). The subsidy equals five percent of the young's initial steady-state consumption.
special properties make it easy to characterize the dynamic response to government debt actions.

Fig. 3 depicts the contemporaneous and long-run aggregate savings response to the debt issue as a function of the interpersonal discount factor. The numerator of the contemporaneous crowding-out ratio in fig. 3 equals the difference between per capita savings in the initial steady state and during the period of the subsidy, \((x_{2,0} - x_{2,1})\). The denominator equals the per capita debt issue, \([0.05(1 + n)C_{1,0}]\). In calculating the long-run crowding-out ratio, the final steady-state savings of the middle-aged replaces \(x_{2,1}\).

Each curve in fig. 3 contains three distinct segments: a flat segment over which the transfer motive is inoperative and consumption by the young increases dollar-for-dollar with the subsidy; a sharply-sloped middle segment in which the transfer motive switches from operative to inoperative or vice versa and a right-most segment along which the transfer motive operates before and after the subsidy.

These curves illustrate several interesting results that often run counter to the intuition suggested by models that fail to capture the interaction between borrowing constraints and intergenerational altruism. First, when taxes are levied on the middle-aged to finance interest payments on the debt, an operative transfer motive causes a much greater relative dampening of the short-run than the long-run crowding-out ratio. Even the absolute effect of operative transfers is slightly greater in the short run than in the long run.

Second, the effects of intergenerational altruism on the contemporaneous crowding-out ratio in the no-loan economy are quantitatively large. In fig. 3, the contemporaneous response of aggregate savings to the government debt issue is about twenty-five percent smaller in economies with an operative transfer motive in periods 0 and 1.

Third, an operative transfer motive leads to a large increase in the long-run crowding-out ratio, if the taxes used to finance interest payments on the debt are levied on the young. In this case, the long-run crowding-out ratio is well over fifty percent greater when the transfer motive operates at the initial and final steady states. This result arises because an operative transfer motive transforms an otherwise perverse fiscal policy (taxing the borrowing-constrained young) into a good substitute for the absent consumption-loans market. Thus, in this model altruistic linkages make it easier for the govern-

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9In line with Proposition 4, when the transfer motive operates at both steady states, the two curves depicting the long-run crowding-out response coincide. For sufficiently large \(\gamma\) values, the borrowing constraint fails to bind at the final or both steady states. This outcome occurs sooner when taxes are levied on the middle-aged. Of course, if the borrowing constraint is nonbinding and the transfer motive is operative along an economy's entire time path, the Ricardian equivalence theorem holds.
ment to increase welfare (of living persons) by using crude fiscal policy instruments.

Fourth, provided that borrowing constraints bind and the transfer motive operates before and after the debt issue, increases in the degree of altruism increase the contemporaneous and long-run crowding-out ratios. This surprising result reflects the effect of altruism on the shape of lifetime consumption profiles. When the transfer motive operates and borrowing constraints bind, a larger value of $\gamma$ corresponds to a flatter consumption profile over the first two periods of life; recall the first-order condition (14). Hence, a larger fraction of any income disturbance—such as a debt-financed transfer to the young or middle-aged—is consumed away by the young. (Our simulations confirm that consumption by the young is an increasing function of the interpersonal discount factor when the altruism motive operates.) The middle-aged spread the remaining fraction over two periods of life. This direct effect of altruism on the shape of the lifetime consumption profile causes the crowding-out ratio to rise as $\gamma$ rises.

A countervailing effect of altruism steepens the slope of the consumption profile over the second two periods of life. Looking across steady-state equilibria with binding borrowing constraints, a larger $\gamma$ corresponds to a larger interest rate and, hence, a greater incentive for the middle-aged to defer consumption. This indirect effect implies that, for larger values of $\gamma$, the middle-aged save a larger fraction of that part of the income shock not given to the young. On balance, the direct altruism effect dominates this indirect effect operating through the interest rate, producing the upward sloping segments in fig. 3. (We have redrawn fig. 3 for several alternative values of $\beta, \lambda, n$, and $\theta$. The same basic pattern always emerges. That is, the flattening of the consumption profile over the first two periods of life always outweighs the steepening of the consumption profile over the second two periods of life, in terms of the effect on the crowding-out ratio.)

Quantitatively, the results in fig. 3 are not very sensitive to changes in the size of the subsidy or changes in the time discount factor. The long-run crowding-out ratio is highly sensitive to changes in the curvature of the utility function. For example, for the benchmark specification with $\gamma = 0.25$, a decrease in $\lambda$ from 0 to $-1.2$ increases the long-run crowding-out ratio from 1.9 to 3.3, assuming that the middle-aged pay the taxes.

7. Concluding remarks

The main results of the paper are summarized in the introduction, and we do not repeat them here. Rather, we briefly describe some conclusions about fruitful avenues for future research suggested to us by the preceding analysis. In evaluating the short-run effects of fiscal actions on aggregate savings, many economists have argued explicitly, or implicitly by their choice of models, that
the extent and nature of capital market imperfections are far more important than the extent and nature of intergenerational linkages. We agree that issues associated with capital market imperfections merit attention, but our simulation results point to large effects of intergenerational transfers in non-Ricardian environments. Thus, we believe that analyses of the short-run, as well as the long-run, effects of fiscal actions on aggregate savings should consider the role of intergenerational linkages. This position is reinforced by the observation that borrowing constraints can weaken the conditions under which transfer motives operate and thereby induce additional intergenerational linkages. It seems likely that other types of capital market imperfections, such as incomplete annuities markets, also induce additional intergenerational linkages.

As a separate point, the simulation results in section 6 indicate that borrowing constraints and intergenerational altruism interact in surprising ways and lead to outcomes that are difficult to anticipate. As cases in point, we identified two distinct factors that imply a positive relationship between the strength of the altruism motive and the magnitude of the aggregate savings response to government debt. This positive relationship violates the simple intuition – derived from models that stress finite lifetime effects – that altruism mitigates the effects of government debt actions by extending agents’ planning horizons. Given the evidence that capital market imperfections and intergenerational linkages are widespread, a fuller examination of how their interaction influences the response to fiscal policy actions seems in order.

In this paper we restrict attention to the pure altruism motive for intergenerational linkages, but the economics literature contains several competing hypotheses. Bernheim (1987) provides an overview of and references to this literature. We believe it would be useful to investigate the interaction between borrowing constraints and other motives for intergenerational linkages and to incorporate a deeper explanation for borrowing constraints into the model.

One strong virtue of our treatment of borrowing constraints and intergenerational linkages is its relative tractability. Detailed policy analyses of the macroeconomic effects of fiscal actions call for a dynamic general equilibrium model that incorporates a variety of additional features in a tractable way, including elastic labor supply, human capital investment, government purchases, distortionary taxation, alternative tax bases, and nonlinearities in the tax system to name a few of the most obvious and important. We believe it is feasible to generalize our model to encompass – within a numerically tractable framework – the features listed above, individuals who live many periods, and costly consumption loans. The usefulness of tractable, dynamic general equilibrium models of the economy for the analysis of fiscal policy questions is exemplified by the recent work of Auerbach and Kotlikoff (1987).

Finally, our model is easily adapted to provide a framework for empirical work that investigates the interaction between borrowing constraints and intergenerational linkages. See the recent work by Cox (1987) and Cox and
Jappelli (1987). Our simulation analysis in section 6 also suggests that the magnitude of the savings response to nonneutral government debt actions depends primarily on the incidence of altruistic linkages and not on the strength of altruism, per se. From an empirical point of view, this result is encouraging, because estimating the incidence of altruistic linkages is likely to prove far easier than estimating the magnitude of an altruism parameter.

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