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Intergenerational Linkages and Government Budget Policies

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Social security programs and deficit policies shift the burden of taxation across generations. In a social security program the working population is taxed with the proceeds being paid as benefits to the older and retired group. When the government runs a deficit it is choosing to borrow instead of taxing the current population. The debt may be rolled over for many years and eventually paid off by levying taxes on future generations.

An important issue in macroeconomics is whether and how such policies affect the private sector's saving behavior and hence the overall rate of capital accumulation and economic growth. Insight into this issue was provided by Barro (1974) who showed how these effects depend on the nature of *intergenerational linkages*, the financial connections between generations that can arise from altruistic motives. He considered the possibility that members of one generation may care about the welfare of another generation; parents may care for their children and choose to leave them bequests, or children may care for their parents by supporting them in retirement. He showed that if these links are sufficiently strong then a startling conclusion obtains: government budget policies may have no effects whatsoever on investment, growth, or the intergenerational distribution of wealth; that is, government policies may be *neutral*. Private saving behavior changes in such a way as to completely offset the intended effects of such policies. In the case of a social security program, children may simply reduce their support for parents dollar for dollar with the level of government support; in the case of a deficit, current generations may simply increase their saving and pass it on as bequests to future generations so they can afford to pay the higher taxes without suffering a loss in consumption.[1]

In this paper we will try to understand the economics of such offsetting private behavior. I first develop a simple model and analyze the effects of government policies in the absence of intergenerational linkages. Next I introduce such linkages and show how neutrality of government policies can obtain. Then I consider the relationship between neutrality and economic efficiency and show that there is no necessary connection between the two. That is, government policies may be neutral even when the economy is operating inefficiently, and they may not be neutral even when the economy is operating efficiently. After discussing some qualifications and extensions of the analysis, I conclude that considerations involving intergenerational linkages can serve to limit the potency of government policies but cannot eliminate the effects entirely.

A Model Without Intergenerational Linkages

We will begin by constructing a simple model so that we can carefully analyze the above issues. The most natural model to study is clearly an overlapping generations model—one in which generations come and go but the economy (and the government!) goes on forever. The simplest such model is one in which there are equal numbers of only two generations alive at any date, the working young (y) and the retired old (o).[2] Assume that they are endowed with w_y and w_o units respectively of a single good which may be consumed or invested and that if k units are invested at date t then $f(k)$ units will become available for consumption at date $t + 1$. The function $f(k)$ represents the investment technology and is assumed to be strictly increasing with diminishing marginal product. Further, $f(0) = 0$; that is, returns are zero if there is no investment. The investment technology is represented by the curve labeled $f(k)$ in Figure 1. The marginal product of investment is the additional output obtained due to an additional unit of investment and corresponds to the slope of the $f(k)$ curve. As drawn, this slope is diminishing with the level of investment.

Let $c_y(t)$ and $c_o(t)$ be consumptions of the young and the old, respectively, at date t and let $U\big(c_y(t),c_o(t+1)\big)$ be the utility function representing preferences over lifetime consumption for the young at t. Note that the above specification implies that we are considering a case where each generation is completely selfish and cares only about its own lifetime consumption and does not care about the welfare of any other generation.

Government policies are described as follows. A social security tax of γ_s is imposed every period on each young and the proceeds are distributed every period equally to each old. In addition, the government has outstanding debt obligations of face value d (measured in units of the good and per young person) which is constant over time. It follows that in every period additional taxes of $r(t)d/[1 + r(t)]$ per young person [where $r(t)$ is the real interest rate from t to $t + 1$] would have to be raised in order to make the interest payments on the debt.[3] We assume that a fraction θ of the needed taxes are levied on the young and the rest on the old. We denote by $\gamma_y(t)$ and $\gamma_o(t)$ the total taxes (less transfers) levied on the young and the old respectively, so that

$$\gamma_y(t) = \theta r(t)d/[1 + r(t)] + \gamma_s \tag{1}$$

$$\gamma_o(t) = (1-\theta)r(t)d/[1 + r(t)] - \gamma_s. \tag{2}$$

It is now possible to explain the working of the model as follows. Investment is undertaken at each date by firms which are jointly owned by the young at that date. The firms choose the level of investment to maximize profits which are then paid back next period to the (then old) owners. Suppose that the firms invest $k(t)$ (per young person) at date t which is financed by issuing bonds. In order to be competitive these bonds must pay the same interest rate $r(t)$ as government debt. It follows that each firm's profits at $t + 1$, denoted $\pi_o(t+1)$, are given by

$$\pi_o(t+1) = f\big(k(t)\big) - [1 + r(t)]k(t). \tag{3}$$

As shown in Figure 1, the profit-maximizing level of investment is that at which the marginal product of investment [which is the slope of the curve labeled $f(k)$] equals $[1 + r(t)]$. It can also be seen that the level of investment, as well as maximum profits, decreases as the interest rate goes up. This makes sense since the higher interest rate increases the cost to firms of financing investment. The profits, $\pi_o(t+1)$, are paid to the old at $t + 1$, who are the owners of the firms.

Consumption and saving decisions are made by the young at each date t so as to maximize their utility $U(\cdot,\cdot)$ subject to the budget constraints

$$c_y(t) + s(t) = w_y - \gamma_y(t) \tag{4}$$

$$c_o(t+1) = w_o + [1 + r(t)]s(t) - \gamma_o(t+1) + \pi_o(t+1) \tag{5}$$

where $s(t)$ is saving by the young. The young use their saving to acquire government debt and bonds issued by firms. They are indifferent between the two since both bear the same interest rate. The old in the initial period (that is, at date 1) simply consume whatever they have, which is

$$(6) \qquad c_o(1) = w_o + [1 + r(0)]s(0) - \gamma_o(1) + \pi_o(1).$$

The budget constraints (4) and (5) can be combined into a single wealth constraint by dividing (5) by $[1 + r(t)]$ and adding to (4). This yields

$$\begin{aligned}(7) \qquad & c_y(t) + c_o(t+1)/[1 + r(t)] \\ &= [w_y - \gamma_y(t)] \\ &\quad + [w_o - \gamma_o(t+1) + \pi_o(t+1)]/[1 + r(t)].\end{aligned}$$

The right-hand side of this equation is the present discounted value of a young person's lifetime disposable income, or *wealth*. The individual chooses consumption in each period of life given the interest rate and wealth. The choice of consumptions is depicted in Figure 2 as resulting from utility maximization subject to the above budget constraint. Saving may then be found from (4).

We will assume that a rise in the interest rate reduces current consumption; or equivalently, increases saving. We also assume that an increase in wealth increases current consumption but by a smaller amount than the increase in wealth. This is captured by letting α denote the marginal propensity to consume out of wealth [that is, the change in $c_y(t)$ due to a dollar's change in wealth] and assuming that α is positive but less than one. It follows from this that the effect of an increase in wealth on saving depends on whether the increase in wealth is due to an increase in *current* disposable income or due to an increase in *future* disposable income. If it is entirely due to the former, saving must rise; whereas if it is entirely due to the latter, saving must fall.

The model specification is completed by imposing the equilibrium condition that

$$(8) \qquad s(t) = d/[1 + r(t)] + k(t).$$

This condition simply states that total saving by the young must equal the sum of government debt and the bonds that firms issue to finance their investment.[4]

From equation (8) and Figure 2 we can now see why the response of private saving behavior to government policies is so important. If a change in the social security program (which changes the relative disposable incomes between the young and the old) affects private saving then it will also affect investment and hence the interest rate and the consumption allocation between the young and the old. Similarly, if an increase in government debt is not offset by a corresponding increase in private saving, then again investment, interest rates, and consumption allocations would be affected. Thus the response of private saving is the crux of the whole matter.

Using the budget constraints (4) and (5), the equation for firm profits (3), and the equilibrium condition (8), we can develop the national income identity for this simple model economy as follows:

$$\begin{aligned}(9) \qquad c_y(t) + c_o(t) &= w_y + w_o - [\gamma_y(t) + \gamma_o(t)] - s(t) \\ &\quad + [1 + r(t-1)]s(t-1) + \pi_o(t) \\ &= w_y + w_o - r(t)d/[1 + r(t)] \\ &\quad - \{k(t) + d/[1 + r(t)]\} \\ &\quad + [1 + r(t-1)] \\ &\quad \times \{k(t-1) + d/[1 + r(t-1)]\} \\ &\quad + f\big(k(t-1)\big) \\ &\quad - [1 + r(t-1)]k(t-1) \\ &= w_y + w_o - k(t) + f\big(k(t-1)\big).\end{aligned}$$

Therefore, we have

$$(10) \qquad c_y(t) + c_o(t) + k(t) = w_y + w_o + f\big(k(t-1)\big)$$

which states that total consumption plus investment equals total output, consisting of total endowment plus the returns on past investment. Alternatively, we can interpret (10) as the equilibrium condition in the goods market: total demand consisting of consumption demand and investment demand must equal the total supply of goods consisting of total endowment and current production. If we impose (10) and work backwards using (3)–(5), we can derive (8) as an implication. Thus, conditions (8) and (10) are equivalent.

Policy Effects

We can now describe the effects of the two types of government policies we are considering.

☐ *An Increase in Social Security*

We interpret an increase in the social security program to mean an increase in social security taxes γ_s on the young with a matching increase in payments to the old. At date 1 it is clear that the old will consume all of the increase in the payments they receive. From the national income identity (10) either the young will have to reduce their consumption or firms will have to reduce investment, or both. From the point of view of the young this program represents a reduction in current disposable income and an increase in future disposable income of the same magnitude. Assuming a positive interest rate, wealth will fall but by less than the fall in current disposable income. Therefore, current consumption will fall by less than the reduction in wealth and hence by less than the reduction in current disposable income; consequently saving will fall, too.[5] It follows from (8) that investment will fall. From Figure 1 it can be seen that the interest rate will have to rise in order to induce firms to reduce investment. There is a reduction in wealth for all future generations; the increase in current taxes is larger (in present-value terms) than the equal increase in future social security benefits. Of course, the initial old are the beneficiaries of the increase in the program.

☐ *An Increase in Government Debt*

We interpret an increase in government debt in the following way. Assume that at date 1 the government increases the level of debt from d to d' and then maintains it at the new higher level forever. The increased borrowing at the initial date makes it possible to reduce taxes at that date. Assume that all of the reduction is passed on to

the old at date 1. This corresponds to an increase in the deficit at date 1 financed by additional borrowing. Again it is clear that the initial old will consume all of the resulting increase in their disposable income. Therefore, from the national income identity (10), either investment or consumption by the young (or both) will have to fall. For the young at date 1, we can see that there is no change in current taxes (since the entire tax reduction is given to the old) but that there is an increase in future taxes. Hence current disposable income is the same but future disposable income is reduced. Consequently, their wealth falls, which reduces their current consumption and hence increases saving. The crucial question is whether current consumption by the young falls dollar for dollar with the increase in debt, or equivalently, whether saving rises dollar for dollar with the rise in debt. As can be seen from the national income identity (10) or the equilibrium condition for saving (8), in such a case there will be no effect on investment and hence interest rates. Since this is an important point we will consider it in some detail.

Suppose that at date 1 the market value of debt issued by the government goes up by one dollar. If interest rates do not change, then the face value of the debt must go up by $[1 + r(1)]$ dollars. Therefore, future taxes on the current young will go up by $(1-\theta)r(1)(d'-d)/[1 + r(1)]$, which equals $(1-\theta)r(1)$ dollars. Hence lifetime wealth of the young is reduced by $(1-\theta)r(1)/[1 + r(1)]$ dollars, and consequently current consumption will be reduced by $\alpha(1-\theta)r(1)/[1 + r(1)]$ dollars. It follows that the reduction in current consumption will be less than one dollar, or equivalently, saving will go up by less than one dollar. Therefore, the interest rate must rise in order to induce the young to increase their saving and cut their consumption by one dollar to match the corresponding increase in consumption by the old. It follows that investment must fall.[6]

As for future generations, assuming that the interest rate is positive, the increase in the level of debt implies an increase in their taxes (in both periods of life) and hence a reduction in wealth and consumption possibilities. It is not too difficult to argue that the interest rates faced by future generations must also be higher than before. If the interest rates remain the same, then it can be seen from (8) that savings must go up by $(d'-d)/[1 + r(t)]$. The maximum increase in saving occurs when θ is zero. In that case, future disposable income decreases the most, causing saving to go up. The reduction in future disposable income is $r(t)(d'-d)/[1 + r(t)]$, which reduces wealth by $r(t)(d'-d)/[1 + r(t)]^2$ and hence reduces current consumption by $\alpha r(t)(d'-d)/[1 + r(t)]^2$. It follows that saving goes up by the same amount as the reduction in current consumption. This increase in saving, however, is still short of the required increase of $(d'-d)/[1 + r(t)]$ because $\alpha r(t)/[1 + r(t)]$ is less than one. In terms of (8), even in the most favorable case, saving will fall short of the increase in debt. Therefore, interest rates must rise to induce the young to save more on the one hand while inducing firms to invest less so that the equilibrium condition (8) can be met. The higher interest rate reduces investment permanently and thereby reduces the total availability of goods in the future.

Adding Intergenerational Linkages

Here we will consider how the conclusions of the previous section are affected by the introduction of intergenerational linkages. These linkages may take several forms: parents caring for the welfare of their children, children caring for their parents' welfare, or possibly both simultaneously. In addition, such caring may be *paternalistic* or *nonpaternalistic*. In the former, one generation cares not just about another generation's welfare but also about the levels of consumption of various goods. For example, parents may disapprove of their child's preference for beer instead of milk, or a child may disapprove of a parent's smoking or playing bingo. In nonpaternalistic caring, one generation cares only about the welfare of another and evaluates it the same way as the other does. In addition, there is no utility attached to the act of giving in and of itself separate from its effects on the recipient; there is no glow from being generous. We will mostly be concerned with nonpaternalistic caring though we will make some comments on what is likely to happen with other forms of caring. We will also restrict attention to the simple case where each member of a generation cares only about one other person in the next generation (descendant) or the previous one (single parent). The situation could get more complicated if we considered marriage between unrelated adults or grandparents caring directly about grandchildren (in addition to the indirect caring through their children).

The simplest way to specify utility when a parent cares about a child is as follows. Let $V(t)$ be the welfare of a member of generation t and let β be the discount factor, between zero and one. Then write

$$(11) \qquad V(t) = U\big(c_y(t),c_o(t+1)\big) + \beta V(t+1) \qquad t = 0, 1, 2, \ldots .$$

Note that by repeatedly substituting for $V(t+1)$, $V(t+2)$, . . . , and so forth, we can rewrite (11) as

$$(12) \qquad V(t) = U\big(c_y(t),c_o(t+1)\big) + \beta U\big(c_y(t+1),c_o(t+2)\big) + \ldots .$$

The case where a child cares about the welfare of the parent may be specified as

$$(13) \qquad V(t) = U\big(c_y(t),c_o(t+1)\big) + \beta V(t-1) \qquad t = 1, 2, 3, \ldots$$

$$(14) \qquad V(0) = U\big(c_y(0),c_o(1)\big).$$

Again it follows that by repeated substitution we can write the welfare of a member of generation t as

$$(15) \qquad V(t) = U\big(c_y(t),c_o(t+1)\big) + \beta U\big(c_y(t-1),c_o(t)\big) + \ldots .$$

It is, of course, possible to have both of these types of linkages occurring simultaneously. We will, however, analyze them one at a time. The discount factor indicates that (since it is less than one) even though one generation may care about another's welfare, it attaches a smaller weight to the other's welfare than to its own. In this sense generations are still somewhat selfish.[7]

Parent to Child

How do members of one generation express their concern for the welfare of another? In the case where parents care about children we assume that they may leave a bequest which the children can either consume or save. Let $b(t)$ denote the bequest received by a generation t person from its $t - 1$ parent. The budget constraints of such a person would have to be modified to reflect bequests as follows:

$$(16) \quad c_y(t) + s(t) = w_y + b(t) - \gamma_y(t)$$

$$(17) \quad c_o(t+1) = w_o + [1 + r(t)]s(t) - \gamma_o(t+1) + \pi_o(t+1) - b(t+1).$$

We assume that the generation t person takes $b(t)$ as given (since it is chosen by the parent) and chooses $b(t+1)$ in addition to consumption and saving. We also require that bequests be nonnegative; that is, a parent may give to but not take away from the next generation. It is now easy to describe the choice of bequests. A generation t person would find it optimal to make an additional dollar's worth of bequest so long as the loss in its own utility (due to the reduction in own second-period consumption) is outweighed by the gain in the next generation's utility (due to the increase in wealth) discounted by β. This leads to the condition

$$(18) \quad MU_2\big(c_y(t),c_o(t+1)\big) \geq \beta MU_1\big(c_y(t+1),c_o(t+2)\big) \quad \text{with equality if } b(t+1) > 0.$$

In (18), MU_2 and MU_1 stand for the marginal utility of consumption in the second and the first period of life, respectively.[8] The left-hand side of (18) measures the loss in utility to the old at $t + 1$ due to an additional dollar's bequest made to the young at $t + 1$ since this (potentially) reduces the old's consumption by a dollar. The right side of (18) is the discounted gain in utility to the young due to the corresponding increase in their consumption. From (12) we see that so long as the loss in utility to the old is less than the discounted gain in utility to the young, the old will benefit by increasing their bequest. On the other hand, if the loss in utility to the parent exceeds the discounted gain to the child, then the parent would not be willing to make any bequest; that is, the bequest will be zero. This corresponds to having a strict inequality in (18). However, if the bequest is positive, then it must be that the loss and the gain must offset each other exactly at the margin. This corresponds to having an equality in (18). When there is strict inequality in (18), the bequest motive is termed *nonoperative;* otherwise it is termed *operative.*

We will first analyze the effects of government policies under the provisional assumption that bequests are operative in every period. Next we will consider what happens when bequests are never operative. Finally we will explore the conditions under which bequests might or might not be operative.

Consider what happens when the government increases the level of social security taxes and benefits by, say, a dollar. This raises the utility of the parent but lowers the marginal utility. Correspondingly, it lowers the child's utility but raises its marginal utility. Therefore, from every parent's perspective, the loss in utility from making a bequest has been reduced and the gain in utility to the child has been increased. It follows that it would be advantageous to increase the level of the bequest. By how much? Exactly one dollar because that restores the balance between the parent's and the child's marginal utilities that prevailed before the increase in social security levels. We thus come to the startling conclusion that consumption levels, saving, and hence investment and interest rates are all completely unaffected: the increase in social security benefits to the old is totally offset by a matching increase in bequests from the old to the young.

What about an increase in the level of government debt by one dollar? (Recall that the government's additional borrowing results in a tax cut for the initial old.) As one can guess, the old at date 1 will pass on their tax reduction of one dollar to the generation 1 young. The young will save the entire amount earning $[1 + r(1)]$ in their second period. They will use a part $(1-\theta)r(2)[1 + r(1)]/[1 + r(2)]$ to pay the higher taxes in their second period and pass on the rest $[1 + r(1)][1 + \theta r(2)]/[1 + r(2)]$ as bequests to their children. They, in turn, will use a part $\theta r(2)[1 + r(1)]/[1 + r(2)]$ to pay the higher taxes on them in their first period and save the remaining $[1 + r(1)]/[1 + r(2)]$ dollars earning $[1 + r(1)]$ in their second period (that is, at date 3). From here on the story just repeats. It follows that the saving by the young in each generation will have gone up by exactly the increase in the market value of government debt and hence that investment and therefore interest rates will have remained the same. Similarly, everyone's consumption pattern remains the same. Private saving goes up dollar for dollar with reductions in government saving (increases in the deficit) so that economy-wide saving (which equals investment) is unaffected. We thus come to the conclusion that deficits (due to tax cuts) financed by borrowing have no effects on the economy so long as every generation is linked to the next one by operative bequests.

What happens if the bequest motive is not operative? For simplicity, assume that it is never operative. Then the initial old will not pass on their extra wealth (whether due to an increase in social security benefits or due to a tax cut financed by more borrowing) to the young and neither will the initial young make any bequest to their young the period after, and so on. It is as if every generation behaves in a strictly selfish fashion, and the effects are the same as if there were no intergenerational linkages. If the bequest motive were operative for some generations but not all, then the effects would be somewhat less than when no linkages exist, but policies would still not be neutral.

It is interesting and useful to understand when the bequest motive might or might not be operative. As condition (18) states, the bequest motive will not be operative if the marginal utility of consumption for the old exceeds the discounted marginal utility of consumption for the young. In view of diminishing marginal utility it follows that this will happen when consumption of the old is much smaller than consumption of the young. This is likely to be the case when the endowment of the old is much smaller than that of the young and when the investment technology is not too productive. This makes sense because then the old do not have much wealth to pass on and further, they value their low second-period consumption much more highly than the relatively larger consump-

tion of the young. This consideration suggests the following. Suppose that initially the bequest motive is not operative. As the size of the social security transfers to the old or their debt-financed tax cuts increase, their wealth and second-period endowment increase, thereby making it more and more likely that the bequest motive will become operative. At that point any further increases in these policies will be neutral.

Child to Parent

We now consider what happens if the linkage runs from children to parents. We denote by $g(t)$ the gift given by a generation t young to its parent. The budget constraints of a generation t person become

$$(19) \quad c_y(t) + s(t) = w_y - g(t) - \gamma_y(t)$$

$$(20) \quad c_o(t+1) = w_o + [1 + r(t)]s(t) + g(t+1) - \gamma_o(t+1) + \pi_o(t+1).$$

This individual takes $g(t+1)$ as given (since that is chosen by the next generation) and chooses $g(t)$ in addition to consumption and saving. As is natural we restrict $g(t)$ to be nonnegative; a child may give to but not take from its parent. Analogous to (18) the condition for gifts to be made is

$$(21) \quad MU_1\big(c_y(t),c_o(t+1)\big) \geq \beta MU_2\big(c_y(t-1),c_o(t)\big) \quad \text{with equality if } g(t) > 0.$$

The interpretation of this condition is also similar to (18). If the loss in utility to generation t (which is MU_1) from making an additional unit of gift to the parent exceeds the discounted gain in utility (βMU_2) to the parent, then a gift would not be made. If a gift is being made, then at the margin the loss and the gain must exactly offset each other. As with the bequest motive, the gift motive is said to be operative if there is an equality of marginal utilities in (21); otherwise it is termed nonoperative.

It is also easy to see the mechanism by which government policies might be neutralized under this type of linkage. Suppose that the gift motive is operative in every period. Then an increase in the level of social security payments to the old will lead to a reduction by the same amount of the gifts being passed on from child to parent—assuming that the increase in payments is not larger than the initial level of gifts so that the gift motive remains operative. Similarly, a tax cut given to the old and financed by additional borrowing will cause a matching reduction in gifts from young to old with the reduction being saved to make up for the difference in future taxes. Thus, private saving rises dollar for dollar with the deficit so that investment, interest rates, and consumption allocations remain unaffected. The same proviso about the bequest motive remaining operative applies to the gift motive as well. If the gift motive is never operative, then the effects are the same as if there were no such intergenerational linkage. If the motive is operative at some dates but not all, then the effects will be somewhat moderated.

It is also easy to understand when the gift motive is likely to be operative. As condition (21) indicates, if the consumption of the young is relatively small compared to the old, then MU_1 is likely to be larger than MU_2 so that gifts will not be made. This is likely to happen when the young are relatively poorly endowed compared to the old. Debt-financed tax cuts to the old and increases in social security, both of which transfer wealth towards the old, obviously make it less likely that the gift motive will operate.

Other Considerations

So far, we have considered a model in which all the individuals in any generation were identical with regard to their lifetime endowments and utility functions. It would be more realistic to allow for some heterogeneity among members of each generation. This will lead to the possibility that bequests or gifts may be operative across some members of the old and young generations while for others, neither is operative. So long as there are some people in some generations who are not linked via operative bequests (gifts) to the next (previous) generation, government policies will not be neutral. However, the larger the fraction of each generation that is linked via operative bequests or gifts, the smaller will be the impact of government policies.

Another point that should be kept in mind is that even if initially the bequest or the gift motive is operative, a sufficiently large change in government policy may lead to the motive becoming nonoperative and hence the policy change will be nonneutral. If initially the gift motive is operative, a sufficiently large increase in the social security program can make it nonoperative. Similarly, if the bequest motive is operative initially, a tax increase on the initial old with a corresponding reduction in the deficit and government debt may make it nonoperative. The neutrality result that we have demonstrated is true only for those changes in government policy such that the bequest (or the gift) motive is operative before as well as after the policy change.

Neutrality and Economic Efficiency

If government policies are neutral, then is the economy operating as efficiently as possible? Conversely, if the economy is operating efficiently will government policies be neutral? The concept of *efficiency* we will use is the following: the economy is operating efficiently if it is not possible to increase total consumption at some date without reducing total consumption at some other date.

That the answer to the first question is negative can be seen from a more detailed analysis of the gift motive. Suppose that the economy is in a steady state so that consumption allocations, investment, interest rates, and gifts (assumed operative) are constant over time. Individuals will choose consumptions over the two periods of their life such that

$$(22) \quad MU_1(c_y,c_o)/MU_2(c_y,c_o) = 1 + r.$$

This can be seen from Figure 2. The left side of (22) is the marginal rate of substitution between first- and second-period consumption (the slope of the indifference curve) and the right side of (22) is the slope of the budget line. From condition (21) we then have that

$$(23) \quad 1 + r = \beta < 1$$

so that the interest rate must be negative so long as the gift motive is operative. The steady-state version of the national income identity (10) yields

$$(24) \quad c_y + c_o = w_y + w_o + rk$$

which indicates that the total availability of goods can be *increased in every period by permanently reducing investment*. Consequently, so long as the gift motive is operative and investment is positive, the economy is operating inefficiently. It is not difficult to construct examples that exhibit these features.

However, if the interest rate is positive then it would not be possible to increase the supply of goods in every period. If investment at date 1 is increased then the supply of goods in that period must be less, whereas if investment is permanently decreased then the supply of goods in the future must be less. Thus an investment program will be efficient if the interest rate is positive.[9] It does not follow, however, that if the economy is operating efficiently then government policies will be ineffective! For example, we can construct situations such that the interest rate satisfies

$$(25) \quad 1 < 1 + r < 1/\beta.$$

In such a case the bequest motive cannot be operative [see conditions (18) and (22)] and neither can the gift motive. Therefore, policies will not be neutral and yet the economy is efficient since the interest rate is positive. This discussion also reveals that when the bequest motive is operative (in every period) so that $1 + r$ equals $1/\beta$, we have a situation in which the economy is efficient and policies are neutral.

Some Qualifications and Extensions

Here we will discuss some qualifications for the bequest or the gift motive to be operative and for government policies to be neutral. We have already seen that the bequest or the gift motive has to be operative in order for government policies of the type considered to be neutral. We have also discussed the conditions on endowment patterns that lead to one or the other motive being operative. It should also be emphasized that the *same* motive has to be operative both before and after the policy change for it to be neutral. This should be clear from the previous discussion on neutrality and efficiency. When the bequest motive is operative $1 + r$ equals $1/\beta$ (in the steady state), whereas when the gift motive is operative $1 + r$ equals β. It follows that the interest rate cannot be the same if different motives are operative before and after the policy change and hence neither can investment be the same.

Another qualification is that there be no impediments to the smooth operation of credit markets (Drazen 1978). An easy way to see why this is important is to consider a model with three generations alive at each date (old, middle aged, and young). Suppose that people receive endowments only in the middle period. Young individuals will then borrow to provide for consumption. In the next period they will receive a bequest from the old and use the bequest plus the endowment to repay the previous loan and make additional loans to the new generation of young. In their last period, the receipts from loans made previously will be used partly for consumption with the rest being passed on as bequests to the middle aged. The role of credit markets can be seen to be crucial because without them the old cannot acquire assets (by lending in the previous period) in order to finance consumption and bequests. If credit markets are perfect and bequests are operative, then a social security program that taxes the middle aged with the proceeds going to the old may be neutralized by bequests in the reverse direction. On the other hand, if there are no credit markets, then such a policy cannot be neutralized because the bequest motive will not be operative initially.

Another qualification concerns the nature of taxes imposed. The previous analysis assumed that all taxes were lump sum, that is, unrelated to the economic decisions being made by agents. On the other hand, if the government were to levy taxes on consumption or on income (defined to include interest income), then the consumption/saving decisions of agents (as well as their labor/leisure decisions, if the labor supply were elastic) may get distorted in spite of there being operative bequests or gifts. This conclusion, however, depends on the assumption that bequests (or gifts) continue to be made in a lump-sum fashion. There is no reason why this should be so when taxes are distortionary. Bequests and gifts may themselves be conditioned on behavior in a way that neutralizes "distortionary" taxes (Bagwell and Bernheim 1986).

It was mentioned previously that intergenerational linkages may exhibit either paternalistic or nonpaternalistic caring. The neutrality results depend crucially on the linkage being nonpaternalistic. If, for instance, people derive pleasure from the act of giving per se, which is unrelated to the effects of the bequest or the gift on the receiver, then changes in government policies will not be neutralized by compensating changes in private bequests or gifts.

A final qualification that we have omitted throughout our discussion is that of uncertain lifetimes and imperfect annuities markets (Eckstein, Eichenbaum, and Peled 1982). These can result in involuntary bequests and a beneficial role for compulsory social security programs. The latter can arise because in the absence of government intervention, individuals dealing in imperfect or nonexistent annuities markets may be unable to properly share the risks of inopportune death.

An extension of the setup in this paper would be to modify the implicit assumption that the family tree originating from one initial old does not overlap with that of any other initial old. This is clearly unrealistic considering the predominance of reproduction by marriage among previously unrelated persons. The nature of linkages within the same generation and across members of different generations can get quite complex under this system with overlapping family trees. This leads to a situation in which different members of the older generation may care about the same members of the younger generation or indirectly about the same members of the next-to-next generation and so on.[10] This results in horizontal linkages among members of the same generation and in bequest externalities in which one set of parents may reduce their bequest given that the child is also receiving a bequest from another set of parents.

Under this extended setup, the proliferation of linkages *widens* the scope for neutrality of government policies. As

an example, government transfers from one set of parents-in-law to the other set can be neutralized by the first reducing their bequest to their son (or daughter) and the second increasing their bequest to their daughter (or son). Thus, not only intergenerational transfers but within-generation transfers may also turn out to be neutral. This, together with the neutrality of "distortionary" taxes discussed previously, suggests that the scope of neutrality results is uncomfortably wider than that of the Ricardian doctrine (Bagwell and Bernheim 1986).[11] While a significant number of economists may be willing to accept the latter, very few would go along with the much wider neutrality results. This suggests that some important considerations are being overlooked in the present framework of intergenerational linkages. Alternatively, one could argue that the framework of linkages is not a good approximation to reality and that the Ricardian doctrine is (approximately) valid for reasons entirely different from the effects of intergenerational linkages.

Conclusion

It seems clear that the presence of intergenerational linkages limits the potency of government budget policies. Whether or not this limitation is strong enough so that policies of realistic magnitudes are best approximated as being neutral can only be judged by detailed empirical investigation. If government policies are judged to be approximately neutral, then we need not worry about the effects on private saving, investment, or the intergenerational distribution of wealth. If they are not, then there are legitimate grounds for being concerned about the burden of taxation that is being passed on to future generations and the crowding out effects of government debt on capital accumulation.

[1]The idea that government deficit policies may be neutral, first formulated by the English economist David Ricardo (1772–1823), is known as the *Ricardian doctrine.*

[2]While this simplification makes it easier to understand the issues, it is not very useful for empirical applications because it requires that each period in the model be thought of as corresponding roughly to 35 years.

[3]This follows because the government budget constraint in each period is

Face Value of Debt Outstanding = Taxes + Market Value of New Debt.

Since the face value of debt outstanding is constant at d, the market value of new debt at date t must be $d/[1 + r(t)]$.

[4]Since firms finance all of their investment by issuing bonds, the value of bonds issued equals their investment.

[5]Note that this conclusion follows even if the interest rate is negative. In this case, wealth and current consumption rise and hence saving falls.

[6]In macroeconomics this is known as *crowding out,* or the displacement of private investment by increased government borrowing. Rising interest rates are what accomplish this: higher rates induce private savers to channel their saving toward government bonds instead of real capital.

[7]Our specifications of intergenerational linkages follow those of Carmichael (1982).

[8]*Marginal utility of consumption* is the extra utility obtained by increasing consumption by one unit. The *law of diminishing marginal utility* states that marginal utility decreases as consumption levels increase. In contrast, *total utility,* measured by $U(\cdot,\cdot)$, always increases when consumption levels increase.

[9]The interest rate condition takes this form because we are assuming a *stationary economy,* one with no growth. In a growing economy the corresponding condition for efficiency is that the interest rate must exceed the growth rate.

[10]Suppose we interpret each person to be a couple. Then a male child of one couple and a female child of another couple form a person in the next generation. Clearly, this person may receive bequests from both sets of parents. Two persons in the older generation may also be linked by marriage in the next-to-next generation, and so on.

[11]As discussed before, this need not imply that the resulting allocations are efficient.

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Figure 1

The Investment Technology and the Maximization of Firm Profits

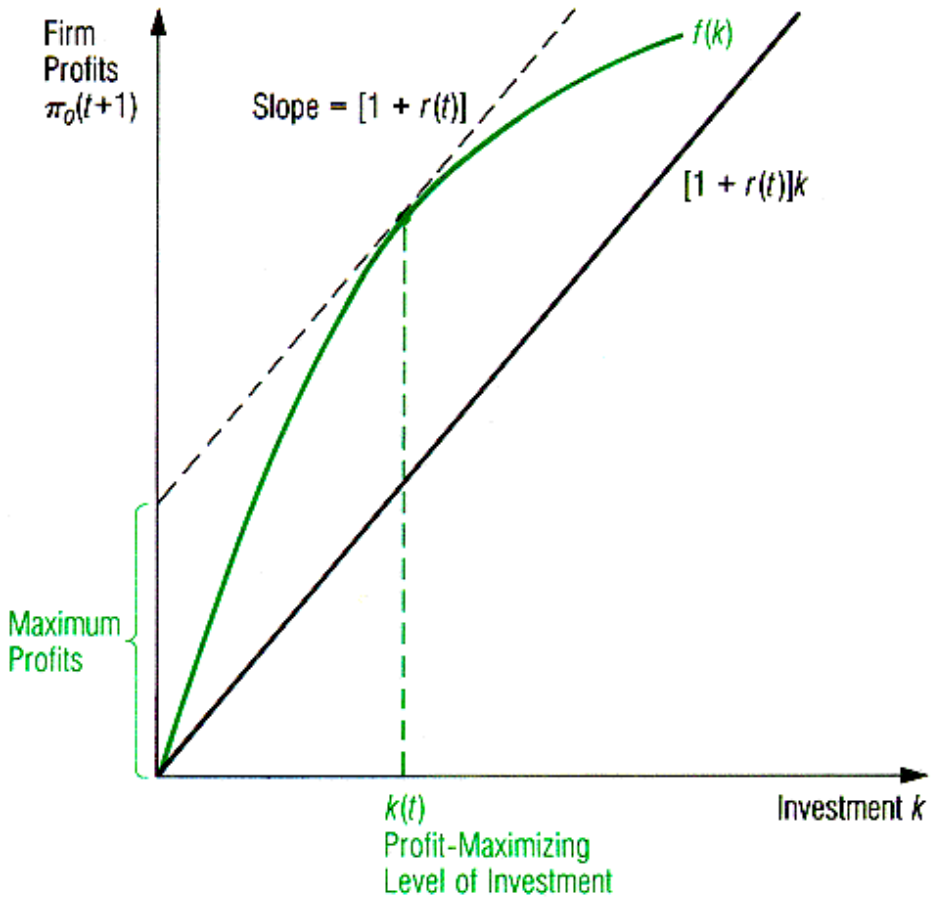
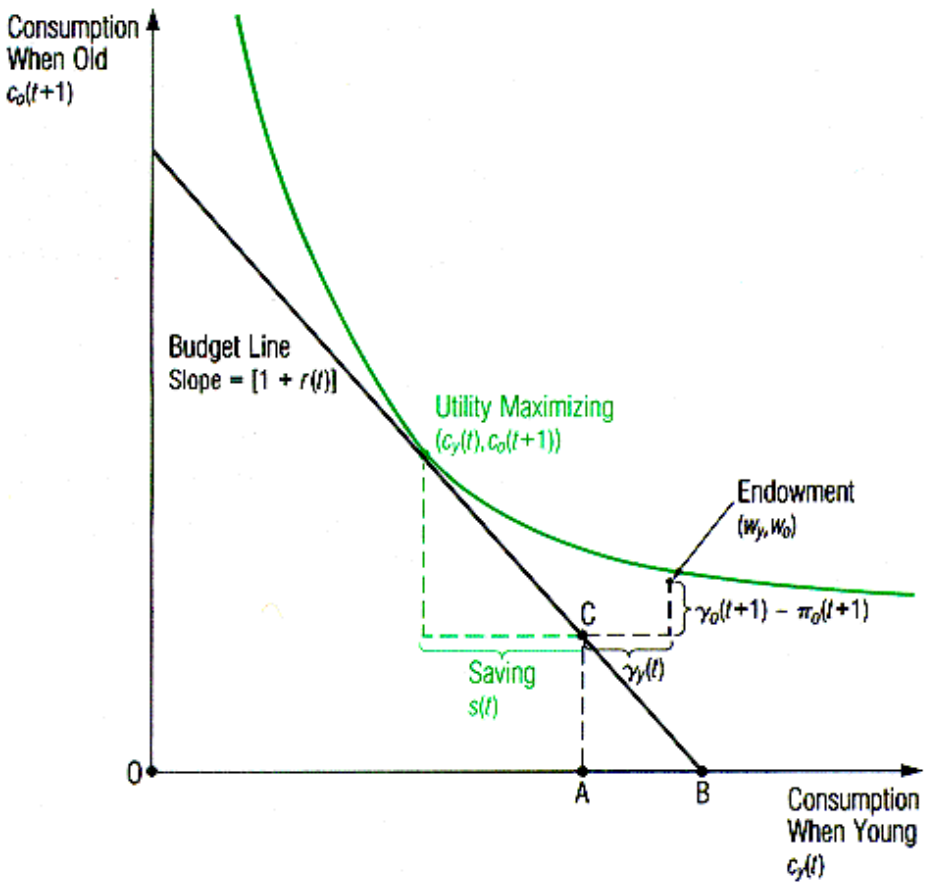


Figure 2

A Person's Lifetime Consumption Choices



OB = wealth when young
OA = disposable income when young
AC = disposable income when old