

CONTROVERSY OVER THE FEDERAL BUDGET DEFICIT: A THEORETICAL PERSPECTIVE

Michael Dotsey

I. INTRODUCTION

Currently there is a great deal of controversy surrounding the federal budget deficit. Claims have been made that the deficit is a burden on future generations and that it crowds out private investment and reduces the capital stock. For example, in testimony before the Senate Budget Committee, Rudolph Penner, director of the Congressional Budget Office testified "Certainly one consequence of persistent deficits about which there seems little disagreement is their adverse effect on future generations Slower growth of the private capital stock would result in lower productivity than would occur with smaller deficits and the income of future generations would be lower." This crowding-out of investment is alleged to occur because budget deficits supposedly raise real rates of interest. The same theme is also present in the Congressional testimony of Federal Reserve Board Chairman Paul Volcker as well as in other public statements. "In essence, the demands of the Federal Government limit the rate of growth of other credit-absorbing sectors of the economy. The rationing device is interest rates held higher than would otherwise be the case."¹ The basic evils of budget deficits and the benefits of cutting the deficit are echoed in numerous market newsletters and by many private economists. For instance, Martin Feldstein in testimony before the Senate Finance Committee states "The short term effect of enacting a deficit reduction program of that magnitude would be a substantial decline in medium term and long term real interest rates"

There is a minority view that budget deficits do not have much consequence for aggregate economic activity. A major proponent of this line of argument

* I would like to thank Marvin Goodfriend, Thomas Humphrey, and Roy Webb for their valuable comments and suggestions.

¹ Remarks given at the Broyhill Executive Lecture Series, March 22, 1984.

is the University of Rochester's Professor Robert J. Barro, who has resurrected the notion of Ricardian equivalence or neutrality of budget deficits. In a recent *Wall Street Journal* article, Barro states "There is no evidence that shifts in deficits lead to higher rates, especially to higher real rates that would deter investment Basically, this crowding-out view of deficits is a myth, which is reinforced mainly by repetition."

These opposing viewpoints are irreconcilable and yet each finds its adherents among respected economists. This article attempts to place these viewpoints in the context of the economic models from which they are derived. This procedure focuses attention on the assumptions that underlie the various conclusions concerning the effects of budget deficits and helps appraise the realism or degree of confidence that should be placed in these various views.

In addition, the article will investigate a fairly recent area of research concerning optimal deficits. This literature concludes that the optimal level of government debt and budget deficits is not generally zero. The implication is that given an exogenous time path for government spending, a policy of balancing the government budget in each and every period is costly in terms of social welfare. Further the less stringent requirement of the Balance Budget Amendment that passed the Senate on October 1, 1982 does not generally represent a policy that is consistent with the literature on optimal deficits.²

² The optimal deficits literature does not consider the potential relationship between taxing and government spending. Some proponents of the Balanced Budget Amendment (see Friedman and Friedman [13]), feel that there exists a link between the level of government spending and the constraint of paying for spending as you go. However, I am unaware of any systematic discussion concerning this issue. More importantly, there are specific portions of the Balanced Budget Amendment that deal with the level of government spending directly by attempting to remove certain features of the current budgetary process that are likely to produce a nonoptimal level of government spending. These direct limitations on spending could be enacted independently of the requirement that the expected budget deficit be zero.

The organization of the article follows a historical approach to the theory of budget deficits. The departure point is the standard Keynesian model which is discussed in Section II. Section III analyzes some shortcomings of this model and the conclusions drawn from it. Section IV moves on to the notion of Ricardian equivalence, while Section V discusses criticisms concerning this theory. Section VI examines the notion of optimal budget deficits, while Section VII contains a brief summary and conclusions.

II.

THE EFFECTS OF BUDGET DEFICITS IN A STANDARD KEYNESIAN MODEL

The initial analysis of the effects of budget deficits will be carried out within the framework of a standard Keynesian model. Starting the analysis in this manner will provide the theoretical background necessary for evaluating much of the current discussion involving deficits. It will also serve as a useful point of departure for examining the more recent rediscovery of Ricardian equivalence.

The Goods Market

The analysis begins with the closed economy accounting identity of equation (1) that aggregate output (Y) is equal to the sum of aggregate consumption (C), aggregate investment (I), and government spending (G).

$$(1) \quad Y \equiv C + I + G$$

In order to give this identity economic content, the behavior of consumption, investment, and government spending must be examined. Typically, in these models consumption is hypothesized to depend positively on disposable income Y_d , which is merely income net of taxes (T). That is, $Y_d = Y - T$ and consumption is given by an equation such as (2).

$$(2) \quad C = c_0 + c_1 Y_d \quad c_0 > 0 \quad 0 < c_1 < 1$$

The coefficient c_1 is greater than zero and less than one implying that only a portion of an extra dollar of disposable income will be spent. It will be shown that the nature of the consumption function is crucial in determining the effects of a budget deficit.

For simplicity, let investment be written as a negative function of the real rate of interest. At higher real interest rates fewer projects are profitable, since the opportunity cost of funding a project is higher. Therefore, at higher real rates of interest there will be less investment. This is depicted by equation (3)

$$(3) \quad I = I_0 - i_1 r$$

where r is the real rate of interest.

Finally, let government spending be exogenously given at the level G_1 . The analysis concentrates on the consequences of changes in financing a given level of government expenditure and not on the effects of government expenditure itself. Holding government spending fixed at a predetermined level will allow the analysis to focus on the financing decision without introducing the complicating effects of government spending. Also, taxes are initially assumed to be lump sum in nature at the level T_1 . That is, the level of taxes an individual pays is independent of his income. Within the context of the model currently under consideration, this assumption is of little consequence. However, as the analysis proceeds to examine the nature of budget deficits in more detail the distinction between lump sum taxes and proportional taxes will be important.

The income levels and interest rates consistent with clearing of the goods market can be derived from equations (1), (2), and (3). This is expressed as equation (4), and shows the negative relationship between income levels and interest rates that are needed to clear the goods market.

$$(4) \quad r = \frac{C_0 + I_0 + G_1 - c_1 T_1}{i_1} - \frac{(1 - c_1) Y}{i_1}$$

To understand this negative relationship, perform the following thought experiment. Suppose that at an income level of Y_0 and a real interest rate r_0 that income equaled consumption plus investment plus government spending. Now suppose that income increased to Y_1 . Since consumption only increases by a fraction of the rise in income, it is easy to see that the goods market is no longer cleared. Output, Y_1 , is now greater than the sum of $C + I + G$. If the real rate of interest were to fall (to, say, r_1), so that investment rose, the goods market would once again clear. Therefore, the locus of points depicting market clearing in the goods market, commonly referred to as the IS curve, is downward sloping as indicated in Figure 1.

The Money Market

As shown, the IS curve defines an infinite number of real interest rates and income pairs that are consistent with equilibrium in the goods market. In order to find the unique level of the real interest rate and income that will arise in our model economy, the money market must be analyzed. Equilibrium in the money market is given by values of income and

nominal interest rates that equate the demand for money with the supply of money. For simplicity, the analysis assumes that inflation is zero and therefore that nominal and real interest are equivalent. This locus of points, commonly called the LM curve, is upward sloping and is drawn in Figure 1. An intuitive explanation relies on the observation that the demand for money is positively related to income and negatively related to interest rates. Suppose that money demand were equal to money supply at r_1 and Y_1 . An increase in income to, say, Y_2 would increase the demand for money making it greater than a given money supply. Therefore, to return to equilibrium the interest rate would have to rise (to, say, r_2) lowering the demand for money so that it once again equals money supply.

Equilibrium and the Effects of Budget Deficits

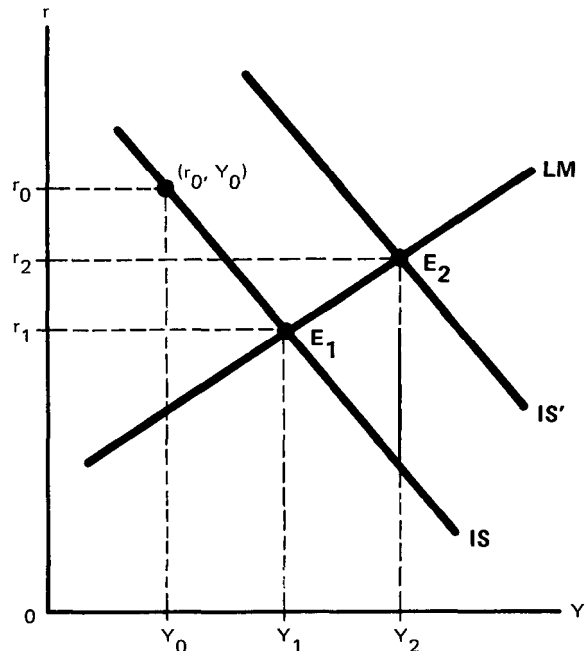
Equilibrium for the economy as a whole occurs when demand equals supply in both the money market and goods market simultaneously.³ This is depicted in Figure 1, and occurs at the point E_1 with an interest rate of r_1 and an income level of Y_1 . That is, the point E_1 is consistent with government spending of G_1 and taxes of T_1 . Now let the government decide to increase the deficit by lowering T_1 , while holding government spending fixed. This has no initial effect on the money market since taxes do not directly affect the demand or supply of money. Therefore, the LM curve does not shift. However, a decrease in taxes increases disposable income for any given level of income and therefore raises desired consumption. This means that aggregate demand is now greater than income at Y_1 and that a higher rate of interest, which lowers investment must now be associated with Y in order to return to equilibrium. The result is that the IS curve will shift upward and to the right (to IS'). The economy wide equilibrium is now given by E_2 with both income and interest rates higher than at E_1 . In the Keynesian system budget deficits are seen to be expansionary raising the level of both output and interest rates.

The increased budget deficit also changes the composition of output. Since the interest rate has risen, investment will have fallen. This interest reduced decline in investment is commonly called the crowding-out effect of a budget deficit. Also, since govern-

³ For this statement to be totally accurate it must be assumed that the aggregate supply curve is horizontal and that output is demand determined. This assumption is unimportant for the basic issues discussed in this paper.

Figure 1

THE EFFECT OF AN INCREASE IN GOVERNMENT DEBT IN A SIMPLE KEYNESIAN MODEL



ment spending has not changed, consumption must have risen substantially in order for output to rise on net. Therefore, an increase in government deficits causes the proportion of output comprised by consumption to rise while the ratio of investment to output falls. With lower investment, the future capital stock and productivity of the economy will fall. The opinions of many of the economists quoted in the introduction therefore seem to be based on the Keynesian model of the economy.

III.

SHORTCOMINGS OF THE KEYNESIAN ANALYSIS

A major problem with the Keynesian analysis presented in Section II is the myopic nature of individual behavior embodied in the consumption function (2). Specifically, individuals are assumed to consume a constant proportion of current disposable income regardless of the future time path of income or taxes. An individual with \$20,000 of disposable income in each period of his life would consume exactly the same amount as an individual whose disposable income alternated between \$20,000 and \$0 over his lifetime, with his current disposable income

being \$20,000. The permanent income hypothesis serves as an alternative way of modelling consumption. According to this theory consumption depends on the present value of lifetime disposable income or wealth.⁴ Making this one modification essentially negates the entire effects of a budget deficit that was presented in Section II.

To show this, assume that the world is two periods long (a period being of indeterminate length) and that current consumption depends on the present value of lifetime disposable income, W , where

$$(5) \quad W = Y_1 - T_1 + \frac{Y_2 - T_2}{1 + r}$$

and where the subscripts 1 and 2 denote time periods one and two. Equation (2) is then modified to read

$$(2') \quad C_1 = aW. \quad 5$$

Since the model has taken on dynamic considerations that were not present in Section II, government behavior must be analyzed in more detail. Specifically, a constraint requiring the government to balance its budget on average is imposed. That is, the present value of government spending must equal the present value of tax receipts, but the government budget need not balance in any particular period. Specifically,

$$(6) \quad G_1 + \frac{G_2}{1 + r} = T_1 + \frac{T_2}{1 + r}.$$

This constraint is reasonable since no one would lend to the government without the promise of being paid back. Suppose that the government ran a deficit of D_1 in period one (i.e., $G_1 - T_1 = D_1$). If the government doesn't raise enough revenue in period two to cover its spending plus the repayment of its debt and interest on the debt, no one would lend to the government in period one. Basically, in order to borrow the government must promise to repay or no one will lend to it in the first place. Extending the model to include more than two periods does not change the underlying justification for imposing a government budget constraint.⁶

⁴This analysis neglects the potential effects of liquidity constraints which will be dealt with in more detail in Section IV.

⁵The parameter a will depend on the individual's rate of time preference and perhaps other attributes of his utility function. For the case where the rate of time preference is equal to $(1/(1 + r))$, $a = \frac{1}{2}$.

⁶This line of argument does not exactly hold when the number of periods is infinite. However, if the economy grows at rate $n < r$, then the present value of the future taxes that must be levied to finance the interest on the

Using (5) and (6) it is straightforward to show that an increase in the current budget deficit will have no effect on the economy. Government spending is given and invariant and hence so is the present value of taxes. Therefore, wealth will not be changed by a change in the timing of taxes so long as the present value of taxes remains unchanged. Therefore, consumption will not be changed and the initial level of output and interest rates will be consistent with equilibrium. In essence, the decrease in taxes in period 1 will be used by consumers to purchase the additional bonds sold by the government to finance its unchanged level of spending G_1 . These bonds will then be sold to pay for the increase in taxes that must occur in period 2. As a result, consumption is unchanged and the effect of the government deficit is nil.⁷The basic thrust of this analysis underlies the Ricardian equivalence proposition, which is discussed in more detail in the next section.

IV. RICARDIAN EQUIVALENCE

The model presented in Section III still has a number of unrealistic features. However, it should be noted that the results of Section II rest on a consumption function that has very little analytical appeal. First and foremost is the assumption that individuals and the government have the same life span or time horizon. One could alternatively view the government as having an infinite time horizon, with individuals being finite lived. In that case the government need not raise taxes in period 2 to offset the decline in taxes in period 1, but could wait to some point in the distant future before bringing its budget into balance. The absence of offsetting taxes would imply a rise in current individual wealth and an increase in current consumption. Consequently, the results of Section II would obtain.

Barro's [2] contribution has led to the reemergence of the notion of Ricardian equivalence, or that pure government financing decisions do not matter even in the case of finite lived individuals. He

debt net of debt finance is exactly equal to the original debt issuance (see Barro [3]). McCallum [15] shows that in an economy with a fixed factor (such as land) that inefficient capital accumulation does not occur and that $n < r$. This inequality holds (without land) if both agents and the government are infinitely lived. Barro [3, p. 345] conjectures that it holds in an overlapping generations model in which bequests are operational.

⁷This analysis would carry over to proportional income taxes, since in the current setting the supply of labor is fixed.

employs the reasonable assumption that members of a family care about each others welfare. This assumption ties one generation to another and makes the problem equivalent to analyzing individuals as if they were infinitely lived. Since individuals effectively have the same time horizon as the government, any restructuring of debt and taxes does not alter individual wealth. Therefore, there are no changes in behavior due to an increase in government debt.

The nature of Ricardian equivalence can be illustrated by the following simple overlapping generations model. In this model, an individual is assumed to live for two periods. Further, he is assumed to care about his own consumption and the attainable utility or welfare of his heir.⁸ For simplicity, the analysis considers an economy with a constant population, that is, one in which there is one child per parent. An individual maximizes his lifetime utility subject to a lifetime budget constraint. His earnings include wages when young and generally a bequest from his parent that he receives in the second period of his life. Formally, an individual of generation i maximizes $U_i(c_i^y, c_i^o, U_{i+1}^*)$ subject to a first period budget constraint of

$$(7a) \quad w - T_i = c_i^y + A_i^y$$

and a second period budget constraint of

$$(7b) \quad A_i^y(1+r) + A_{i-1}^o(1+r) = c_i^o + A_i^o$$

where U_i is the utility of generation i , c_i is consumption of generation i , T_i are taxes levied, and A_i are assets of generation i . The superscripts y and o refer to the periods when the individual is young and old. Therefore, A_i^y refers to assets accumulated while a member of generation i is young and A_i^o are the assets accumulated by agent i when old that will serve as a bequest to his heir who is a member of generation $i+1$. Wage earnings are denoted by w , while the real rate of interest is given by r .

In this framework, the consumption and asset demands of the old and young can be written as functions of their net-of-tax bequests, wages, and interest rates. This is most easily seen by combining the budget constraints of an agent when young and old (7(a) and 7(b)) into a total lifetime budget constraint given by

$$(8) \quad w(1+r) + A_{i-1}^o(1+r) - T_i(1+r) = c_i^y(1+r) + c_i^o + A_i^o$$

This implies that the maximum utility level of an individual is indirectly determined by his wages, his bequest from his parent, and the interest rate.

Suppose that the government engages in deficit financing by lowering the taxes paid by generation i and raising the taxes of generation $i+1$ by enough to pay off the deficit plus accumulated interest on the additional debt. Within the framework of the previous section, since the i^{th} generation is paying less taxes over its lifetime, members would feel wealthier and increase their consumption in period i . The deficit would be expansionary. However, that need not be the case when generation i is concerned about the welfare of generation $i+1$ as they are currently assumed to be. If generation i is sufficiently concerned to leave positive bequests to generation $i+1$,⁹ then there will be no wealth effect of the government deficit in period i .

To see this update and reexamine (8), and recall that the attainable utility of a member of generation $i+1$, U_{i+1}^* , depends on his bequest net of taxes. The government deficit in period i is financed by an increase in generation $i+1$'s taxes. Essentially, this financing is equivalent to the government taking away money from generation $i+1$ and giving it to generation i . However, since generation i had decided to give their descendants a bequest, this option was already available to them in terms of lowering their bequests. That generation i did not do this means that they did not find the lower bequests optimal in terms of maximizing their own level of utility. Hence, in order to undo what the government has done, members of generation i will increase their bequests by the amount of the deficit. Essentially, the government deficit forced individuals in generation i away from an optimal allocation of resources between generations by taking away income from generation $i+1$ and giving it to generation i . Generation i can easily offset the actions of the government by increasing its bequests leaving the net bequest to its heirs unchanged. In doing so the entire profile of market equilibria is unchanged and the government deficit is neutral. The same results occur if the analysis is extended to having taxes being paid by generations further in the future.

⁸ The initial analysis abstracts from the possibility of transfers from the younger generation to the older generation.

⁹ For necessary conditions on the utility function see Drazen [11].

V.
CRITICISMS OF RICARDIAN EQUIVALENCE

The Existence of Bequests

The first and perhaps most obvious criticism of Ricardian equivalence is the assumption of a bequest motive. As shown in Section IV, a necessary condition for the neutrality of government deficits is the existence of operational intergenerational transfers. If bequests between generations are not often observed, then the argument presented above is merely a theoretical exercise with little policy content. However, it is more difficult to dismiss the bequest motive than is often realized. For example, bequests can be of a very general form, such as money spent on a child's education, and need not only represent money left in a will. In fact, any intergenerational transfer of resources will do. Casual empiricism seems to indicate that there does indeed exist some form of intergenerational transfers in most families. If so, deficits will have an expansionary effect only to the extent that some members of the older generation do not want to leave a bequest, and one would probably expect this effect to be small.

Also, operational intergenerational transfers need not only flow from the old to the young to derive the neutrality results of Section IV. Transfers of gifts from the young to the old would lead to the same sort of conclusions. Therefore, in a situation where wages were growing at a relatively fast rate (in excess, say, of the real rate of interest), making bequests from old to young less likely, the existence of gifts from young to old would serve to preserve Ricardian equivalence.

The Difference between Investment in Education and Bequests

As mentioned, intergenerational transfers are a necessary condition for deriving the Ricardian equivalence proposition. Also, no distinction is made between investment in an heir's education or human capital and a monetary bequest. However, Drazen [11] points out that there may be important differences between these two types of bequests. Specifically, under the condition of unidirectional bequests from old to young that are primarily in the form of investments in human capital, he finds that government deficits may imply a change in net wealth, and therefore have real effects.

His argument is based on the potential difference between the return to human capital, r^e , and the real rate of interest, r . Suppose it is reasonably assumed

that the return on human capital is positively related to the amount invested in education, but that each additional dollar of investment yields a slightly lower return than the previous dollar invested. That is, there are diminishing marginal returns to investment.

Under these assumptions, and since people do indeed invest in education, the first dollar so invested yields a return greater than the real rate of interest. Indeed, one may suppose that the return on education is greater than the return on capital up to some critical value of educational investment, denoted by \bar{e} . In this setting the optimal method of bequests would be for parents to first make investments in their child's education up to an amount \bar{e} , and if further bequests are desired to leave them in the form of a monetary transfer. In the case where the optimal level of bequests was less than \bar{e} , the return on human capital would be greater than the real rate of interest. In this setting, government debt issuance can have a real effect. This real rate of government debt results from a failure of private markets to equalize rates of return among various investments. Alternatively, the outcome in which $e < \bar{e}$ represents a situation of underinvestment in human capital.

It is this existence of a private market failure that creates the possibility for government debt to have real effects. This can be seen by reexamining the analysis of Section IV for the case where $e < \bar{e}$. Suppose the government decreases the taxes of the parents (generation i) when they are young and finances some government spending through the creation of debt. It then raises the taxes of the young (generation $i+1$) to pay off the debt as well as the interest on the debt. In Section IV, it was shown that a dollar for dollar change in bequests entirely offsets the government financing decision. However, since the return on human capital is greater than the real rate of interest, parents do not have to invest all of the tax cut in their child's education to leave their child's attainable utility level unaffected. The parent only has to invest a portion of the tax cut in his child's education, and could spend the rest. A more likely occurrence would be for the parent to invest enough in the child's education to make the child slightly better off and to spend the rest making the parent slightly better off. As long as human capital possesses a greater return than the real rate of interest both generations can be made better off by an increase in government debt, even though the increase in debt will raise the real rate of interest. In this case it is inappropriate to refer to debt as a burden on future generations.

Again it should be stressed that Drazen's results occur because of a market failure. This market failure arises for three basic reasons. One is the reasonable assumption that there is no market in human capital. That is, one can not generally enter into a contract with his son saying that I will invest so much in your education and force the son to repay the loan at an interest rate equivalent to the return on human capital. Another is that the son can not invest in his own human capital. This seems less reasonable, since educational loans (at the post-high-school level) are readily available, and it would not be optimal to forego investing in one's own education so long as the rate of return was greater than the real rate. Allowing for own investment would tend to equalize the real rate of interest and the return on human capital, making changes in government financing neutral.

The third reason is the omission of a gift motive from son to father. If one also allows the son to care about his father, then it seems that in the presence of operational transfers in both directions the situation in which $r^c > r$ would not represent an equilibrium. For instance, suppose that intergenerational transfers are operative in both directions and that $r^c > r$. The father will be investing in his son's human capital because the return to the son is greater than the cost to the father. Further, the son gives gifts to his father because the return on his education may make him better off in real terms than his father. Now with $r^c > r$, the father could invest an additional dollar in his son's education making his son's attainable utility higher while decreasing his own utility. However, we have assumed that the son cares about the father and that he gives gifts. That is, with bidirectional transfers operational, a gift of a dollar from the father (at the margin) will be returned by the son leaving the proposed equilibrium unchanged. But, because the return on the investment made in his education is sufficient to both fully reimburse his father and still leave enough to make himself better off the situation with $r^c > r$ is not optimal. That is, it pays for the father to invest in the son up to the point where $r^c = r$.

Alternatively, suppose that the only form of bequest is investment in education (i.e., the case where $e < \bar{e}$), and that the bequests motive is operational in both directions. Suppose the government takes a dollar from the father (when young) and gives it with interest to the son. Since the son was already giving a gift to his father, he could have consumed more if he desired. That he did not implies that he

will give the dollar plus interest back to his father. The father, therefore, knows that an additional bequest to the son will be returned with interest. However, since $e < \bar{e}$, a dollar invested in education will yield the son more than the real rate of return. This means that the son will return at least a dollar plus interest to the father, while still having more for himself. Both will be better off, and the situation with $r^c < r$ is inefficient. That is the combined budget sets of both the son and the father will be maximized when investment in education is made up to the point where $r^c = r$. Having transfers operate in both directions essentially opens up a market in human capital between the father and son, driving the return on human capital down to r . In this situation there are no longer any real effects of government debt.

Liquidity Constraints

The situation in which some consumers are liquidity constrained also opens up an avenue that allows government debt to have real consequences. It is sometimes assumed that individuals can not always borrow to the extent that they desire, since capital markets may not lend money based on future risky income streams.¹⁰ Or, perhaps, individuals knowing themselves better than a lending officer discount their risky income at a lower rate. In any event, if individuals are constrained to some extent from borrowing against risky future income streams, budget deficits will have real effects. The size of the effects will depend on the proportion of income earned by those who are constrained.

The effect originates because some portion of the society would like to consume more of their wealth but are constrained from doing so. A cut in taxes today coupled with an appropriate increase in taxes tomorrow is equivalent to making a loan to constrained individuals at the rate r . Since these individuals were constrained they will increase their consumption by at least some portion of the tax cut. This will cause the real rate of interest to rise. However, the effect on social welfare of the government debt is unclear. If the government is providing an intermediation service that was not available due to some private market failure then social welfare could be enhanced. However, the loan to constrained individuals is made at the government's borrowing rate, which may not be the appropriate rate. This implies that some subsidization is occurring between con-

¹⁰ For more detail see Zeldes [21], [22].

strained and unconstrained individuals making the net effect on social welfare ambiguous.

Further, the apparent credit rationing may not be due to any private market failure, but could result as a consequence of optimal lending arrangements in private markets.¹¹ In that case the intermediation process provided by the government may be non-optimal.

Related to this issue is the question regarding the relative efficiency of the government in providing intermediation services. If the government is more efficient than the private sector, then social welfare would be increased and the economic effects associated with a positive wealth effect of government debt would occur.¹² The postulated relative efficiency of the government may be important in developing countries with unsophisticated financial sectors but is unlikely to be relevant for the U. S. economy. Also, in the case where the government does have a relative advantage in performing financial intermediation it is inappropriate to speak of the burden of public debt since social welfare is enhanced.

Uncertainty over Income Streams

To this point, the analysis of the paper has dealt with lump sum taxes rather than taxes that are related to income. Doing so has been of little consequence, since income is exogenously given and an individual's income stream has been certain. (To see that this is true the reader need only replace T by tY in the preceding discussion, where t is the proportional tax rate.) However, in an analysis that considers uncertain future income streams and risk averse individuals, a distinction exists between lump sum taxes and proportional income taxes, even if income is taken to be exogenous.

The reason for this is straightforward.¹³ Risk averse agents do not like risk. Therefore, the usual effect of a reduction in risk is to make agents feel wealthier implying that they will consume more. Consider an agent who lives two periods earning a known and therefore certain amount of income, Y_1 , in period 1 and an uncertain amount of income, Y_2 , in period 2. The variance of an individual's after-tax income in period 1 is zero, since he knows Y_1 with certainty, while the variance of his period 2 after-tax

income is $(1-t)^2$ times the variance of Y_2 . Reducing this after-tax variability will make individuals better off and generally increase period 1 consumption.

The government can accomplish this by lowering the first period tax rate and increasing period 2's tax rate by enough to cover the resulting increase in the deficit. Increasing t will lower the $(1-t)^2$ component of the variance of after-tax income. Thus, individuals will be better off and will wish to consume more. This will cause the real rate of interest to rise.

In essence, individuals are better off because the government is operating an income insurance scheme. This improvement in welfare can be seen by more closely examining the taxes levied on a particular agent in period 2, $T_2 = tY_2$, which can be rewritten as

$$\tau Y_2 = \tau \bar{Y} + \tau(Y_2 - \bar{Y})$$

where \bar{Y} is the known average income level for individuals in period 2. If our agent has a lower than average income level he receives an insurance payment, while if his income is relatively high he pays what amounts to an insurance premium. By changing t , the government can affect the degree of after-tax income risk. Also, if \bar{Y} were uncertain, meaning that aggregate income was uncertain, then an increase in t would lower aggregate uncertainty about after-tax income, resulting in a welfare gain.

The provision of this insurance policy by the government improves welfare. If the market were able to fully insure individuals against income risk there would be no room for government financing decisions to affect the economy. As in the previous discussion, it is the presence of a market failure that allows government financing decisions to be nonneutral. Therefore, the existence of an economic effect caused by government debt in the presence of uncertain income presumes that the government has a relative advantage in providing insurance.

Uncertainty over the Incidence of Future Taxes

If future tax rates are uncertain, perhaps because aggregate income is uncertain—therefore implying that the government is unsure about the income tax rate needed to raise necessary revenue—the wealth effects of government debt could be negative. This is because the variance of future after-tax income may now be higher.

¹¹ A discussion of credit rationing in perfectly competitive markets is given in Stiglitz and Weiss [18].

¹² For a more thorough discussion see Barro [2] and Chan [9].

¹³ See Chan [9] and Barsky, Mankiw, and Zeldes [7].

To isolate the effect of future income tax uncertainty, consider the case where taxes are lump sum and the i^{th} individual pays taxes equal to $T+ke_i$, where e_i is a random number and k represents the uncertain portion of tax payments faced by individual i . The sum of all random taxes is equal to zero. This means that some individuals pay more than average while some pay less. Now suppose that an increase in future taxes is associated with an increase in the uncertainty regarding the incidence of future taxes (i.e., an increase in k). That is, the more revenue the government needs to raise the greater is the uncertainty concerning who will have to pay. In this case, the increased uncertainty caused by an increase in debt makes agents worse off, and they therefore reduce consumption demand in period 1, resulting in a fall in interest rates. Combining both income and tax rate uncertainty into the analysis will make the net effect of government debt ambiguous.

Summary of Ricardian Equivalence

In Sections IV and V, an analysis of Ricardian equivalence has been presented along with a number of the major criticisms that have been raised against this theory. The major criticisms involve the absence of a bequest motive, and the existence of various market failures. On net these criticisms do not seem to be capable of generating any large wealth effects of government debt. The proportion of society that does not exhibit any intergenerational altruism does not seem to be very large. Also, in a country like the United States with sophisticated financial markets, the importance of liquidity constraints resulting from private market failures may not be very great. Further, it is hard to believe that the government is more efficient at providing intermediation services. Finally, the combined effects of income uncertainty and tax incidence uncertainty are ambiguous. Therefore, when income is exogenous, the Ricardian theory of government debt appears to hold up fairly well and one would expect the wealth effects of government debt to at best be fairly small.

However, the exogeneity of income is a questionable assumption. Under this assumption the amount that individuals work is independent of their tax rate. This means that no consideration is given to substitution between labor and leisure, and that when no wealth effects result from purely government financing decisions there are no social losses imposed by

the tax system. The implication is that for a given path of government spending one amount of debt is as good as another. If so, then the intensity of the current debate over the size of the deficit is hard to understand. However, it could also be that the assumption of income exogeneity is inappropriate and that relaxing this assumption will provide some useful insights into the importance of deficits. This step is taken in the next section. The importance of the Ricardian equivalence theory is that it has forced one to take this step, since it suggests that wealth effects are not a major factor in understanding the effects of government debt.

VI.

THE OPTIMAL LEVEL OF GOVERNMENT DEBT

In this section the assumption regarding the exogeneity of income is dropped. Individuals can use their time to either work or take leisure. The decision on how to spend their time will generally depend on their after-tax wage rate. Therefore, tax rates will affect the amount of labor supplied and will create distortions in the economy. The job of the government will be to choose tax rates that minimize the amount of distortions subject to a future path of government spending and an inherited amount of debt. Choosing a path of tax rates for a given path of government spending amounts to choosing a path for government debt. This path is chosen to maximize social welfare and usually involves both positive and negative deficits. Hence a balanced budget is not generally optimal.

It is important to note that the literature on optimal government deficits assumes that government spending is exogenous. This is a fairly extreme assumption, since government spending should more appropriately be viewed as a choice variable. However, treating government spending as a choice variable with respect to some specific objective function is unlikely to change the qualitative results presented below. This is due to the reasonable belief that the ratio of government spending to income will vary optimally over time. For example, a state of war would cause this ratio to temporarily rise. Also, (with the exception of wartime spending) individuals would probably prefer a relatively smooth path of government spending for the same reasons that they

prefer a smooth consumption stream. This permanent income analogy between consumption of publicly and privately produced goods implies that the ratio of government spending to income should move countercyclically.¹⁴ Although a complete analysis that jointly determines the optimal levels of government spending and tax rates would be valuable, the article follows the treatment of the current literature by assuming that government spending is exogenous.

In analyzing the optimal level of government debt, the economy examined will be fairly simple. Individuals are assumed to live for two periods as does the government.¹⁵ Also, the production process involves only labor thereby omitting a discussion of capital.¹⁶ The relevant points concerning debt optimality can be made without considering capital.

The Model without Taxes

The representative consumer maximizes his utility by choosing consumption, c , and leisure, l , in each period of his life subject to a lifetime budget constraint. Specifically, he maximizes

$$(9) \quad U = c_1 - \frac{1}{2}c_1^2 + l_1 - \frac{1}{2}l_1^2 + \beta[c_2 - \frac{1}{2}c_2^2 + l_2 - \frac{1}{2}l_2^2]$$

subject to

$$(10) \quad c_1 + \frac{c_2}{1+r} = 1 - l_1 + \frac{1-l_2}{1+r}$$

For simplicity, a time separable quadratic utility function is used and it is assumed that one unit of labor yields one unit of output. This means that the real wage rate is normalized to one. Using a time separable quadratic utility function allows for easy numerical calculations that illustrate the nature of optimal taxation and budget deficits. In this case the marginal utility of consumption and leisure are $1-c$ and $1-l$. This can be seen by taking the derivative of U with respect to c and l . For the long-run

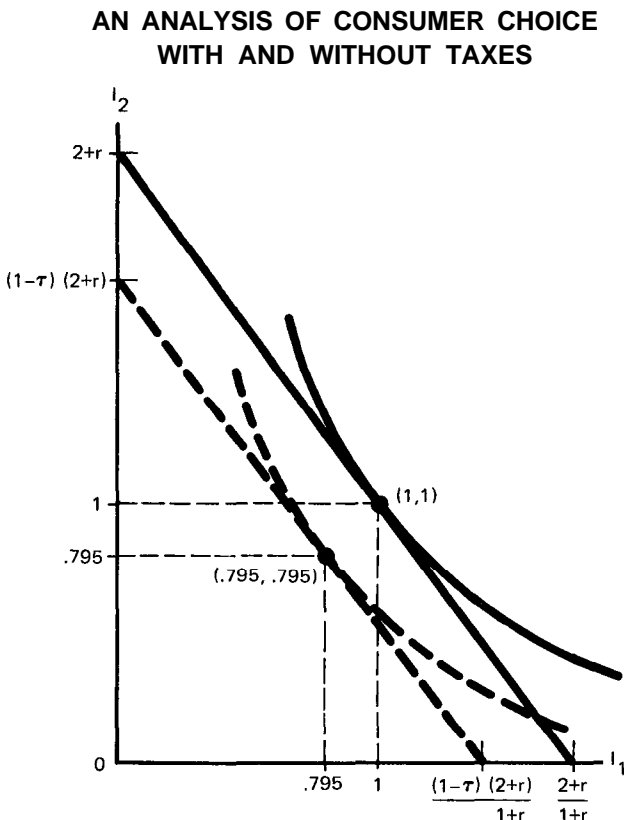
steady state case of $\beta = 1/(1+r)$ individuals spend equal amounts on consumption and leisure in each period implying that $c_1 = c_2 = l_1 = l_2 = 1/2$.

These values are consistent with economy-wide market clearing in each period since $c_1 = 1 - l_1 = 1/2$ and $c_2 = 1 - l_2 = 1/2$. That is, aggregate demand equals supply. (Since c and l are consumption and leisure choices of the representative individual, it is permissible to equate individual and aggregate values without affecting the results of the analysis.) The solution to the individual's choice problem can be depicted graphically by defining $I = c + l$. The budget line has a slope of $(1+r)$ and for the case where $\beta = 1/(1+r)$, the individual will choose $I_1 = I_2 = 1.0$. This is depicted by the solid line in Figure 2.

The Model with Government Spending and Taxation

The analysis now turns to the problem when there is a government that spends and raises revenue through distortionary taxes. Taxes are levied against labor income and government spending is not valued

Figure 2



¹⁴ Additional complications would arise from considering the investment type qualities of government spending and the role of government spending as an input in the production process. There is also the question concerning the extent that agency type problems make the optimization of social welfare an unrealistic characterization of government objectives.

¹⁵ The analysis abstracts from the complicated issue of the time inconsistency of optimal tax policies. However, many of the essential features corresponding to an optimal level of debt are still illustrated without introducing the time consistency problem.

¹⁶ For a discussion of taxes on capital in a similar setting see Aschauer and Greenwood [1].

by consumers or producers.¹⁷ The introduction of a government alters the individual's budget constraint as well as the market clearing conditions. The individual's budget constraint is now

$$(10') \quad c_1 + \frac{c_2}{1+r} = (1-\tau_1)(1-l_1) + (1-\tau_2)\frac{1-l_2}{1+r}.$$

The individual now maximizes his utility (9) subject to the constraint that the present value of consumption is equal to the present value of after-tax income. In this case one would not longer expect consumption and leisure to be equal since the relative price of leisure has fallen. Prior to the introduction of a government that raises revenue by taxing wages the foregone income resulting from additional leisure was one, while now it is $1-\tau$. With leisure being cheaper, people will work less and produce less. This is the distorting nature of taxes.

The economy-wide market clearing conditions are also altered to take into account the presence of the government. In each period the amount of goods produced must equal consumption plus government spending. Specifically,

$$(11) \quad c + g = 1 - l,$$

where g is government spending.

The government is also required to satisfy a budget constraint given by

$$(12) \quad g_1 + \frac{g_2}{1+r} = \tau_1(1-l_1) + \tau_2 \frac{1-l_2}{1+r}$$

which indicates that the present value of government spending equals the present value of government revenue. This condition requires the government to pay off any debt acquired in period 1 by raising revenue in period 2. Without this requirement it would be unreasonable for anyone to hold government debt and there would be no government debt issue to consider.

Given the model economy described by equations (9) (10') (11) and (12), the government chooses tax rates τ_1 and τ_2 to maximize the utility of its citizens, given an exogenous time path of government spending. To gain some insight into the nature of optimal deficits two simple cases are analyzed below.

Case 1. Optimal deficit with equal government spending, $g_1 = g_2$.

The first case examines the situation when government spending is constant over time. Intuitively, one would expect the government to equalize the level of distortions in each period and that $\tau_1 = \tau_2$. This implies that the government budget will be balanced in each period.

In particular let $g_1 = g_2 = .10$. In this case the government chooses tax rates $\tau_1 = \tau_2 = .2053$. Individuals therefore choose $c_1 = c_2 = .3870$, and $1-l_1 = 1-l_2 = .4870$. Also the government consumes a little over twenty percent of output. And, as conjectured, the government balances its budget in each period.

It is interesting to compare this case to the example of no government initially discussed in this section. Consumption and output have fallen, while leisure has risen. Because government spending is not valued by individuals, utility has also declined. In this case let $I = c + l(1-\tau)$. This implies that $I_1 = I_2 = .795$. This situation is depicted by the dotted lines in Figure 2.

Interestingly enough, because τ_1 and τ_2 are chosen as the solution to an optimization problem by the government, small changes in τ_1 and τ_2 will be neutral. That is, given that the government has chosen the level of public debt optimally, small movements in tax rates and the deficit will have no real consequences. If changes in tax rates are large, or if the political outcome is one that doesn't produce optimal taxation, then government financing decisions will have real consequences.

Case 2. The optimal deficit when government spending is unequal, $g_1 \neq g_2$.

This example investigates the optimal budget deficit when government spending is unequal across periods. For example, suppose that $g_1 > g_2$. This could occur if the government were financing a war or a temporary buildup in defense expenditures in period 1. Similarly, one might view period 1 as representing a cyclical downturn in which government transfer payments increase, while period 2 represents a cyclical upturn in which government transfer payments fall.

Intuitively one would no longer expect the government to balance its budget in both periods. Rather, the government would try to balance the distorting aspects of taxes over both periods, running a deficit in period 1 and a surplus in period 2.

¹⁷ For the more complicated case where government spending is productive and valued by consumers see Aschauer and Greenwood [1].

To highlight this behavior, consider the case where $g_1 = .20$ and $g_2 = 0$. Let $\beta = .75$. Under these conditions the tax rate in period 1 is .240, while the tax rate in period 2 is .282. Consumption in period 1 is .318 and consumption in period 2 is .418, while leisure in period 1 is .482 and leisure in period 2 is .582. The government runs a deficit in period 1 of $.20 - .24(1-.482) = .076$ and runs a surplus in period 2 equal to $.282(1-.582) = .118$ which has a present value of .076 given an equilibrium real rate of interest of .56.

Compare this to the nonoptimal behavior of balancing the budget period by period. In this case the first period tax rate is .67, consumption is .1, and leisure is .7. In the second period tax rates are zero, and consumption and leisure are .5. The equilibrium real rate is 1.40. Under an optimal budget deficit consumption and leisure are more effectively smoothed over time. This smoothing reflects the desire of individuals to have the burden of taxes appropriated over each period. Forcing the budget to balance in each period reduces the welfare of individuals.

Current Political Concerns

The material in this section has shown that under distorting taxes, individuals care about deficits in **the sense** that deficits help to allocate the burden of uneven levels of government spending optimally over time. The theory, therefore, implies that today's optimal deficit depends on the perceived future time path of government spending as well as the inherited existing debt structure of the current government. The question of whether or not to reduce the current deficit through increased taxes hinges upon beliefs of future government spending patterns relative to GNP. The Reagan administration's reluctance to increase taxes may rest largely on the expectation that government will consume lower fractions of output in the future. The reluctance to increase taxes and the inclination to reduce current taxes can be viewed as an optimal reaction to this expectation.

Proponents of tax increases must therefore feel that government spending will exhibit secular growth relative to GNP and that some of this future burden should be optimally allocated to the current period. The theoretical analysis presented in this section indicates that much of the argument concerning the size of the deficit is directly related to beliefs over the expected size of the government.

The Balanced Budget Amendment

This section discusses the relationship between the Balanced Budget Amendment (BBA) passed by the Senate on October 1, 1982 and the literature on optimal budget deficits. Of particular relevance is the material contained in section 1 of the amendment (see Friedman and Friedman [13; p. 56]), which requires that actual government spending be less than or equal to planned government spending which in turn must be less than or equal to planned receipts. A formal interpretation of this section is that $E_{t-1}g_t \leq E_{t-1}T_t$ where g_t is government spending, T_t is tax revenue, and E_{t-1} is the conditional expectation of the variable in question.

As shown in Case 2, it is not generally optimal for the government to balance its budget in each and every period. The wording of the Balanced Budget Amendment does not require the government budget to balance ex post, since tax revenues are generally uncertain and may deviate from their planned or expected value. However, the language of section 1 requires that the budget balance on average.

Even though the BBA does not require strict budget balance in each period it still may force tax policy to deviate from the optimal policies previously outlined. This can be shown by means of a simple example. Consider an economy that wasn't growing (growth could easily be incorporated into the analysis) and where government spending was fixed at \bar{g} in every period. Assume that taxes are income taxes and that income fluctuates in a predictable way around some average level \bar{Y} . An optimal policy under these circumstances would be to set taxes so that there was an anticipated surplus during relatively prosperous times and a deficit when income was depressed. On average the government's budget would balance. The BBA does not allow for this type of behavior which would characterize optimal tax policy over a business cycle. That is, the BBA only allows for deviations from budget balance when income movements are unanticipated, but does not allow for planned changes in the level of debt that would optimally accompany anticipated cyclical changes in economic activity. This lack of response to anticipated cyclical activity represents a welfare cost with regard to this amendment.

A similar example exhibiting the welfare costs of the proposed BBA, could be depicted for the case of temporary anticipated movements in government expenditure, such as short-term increases in defense spending. This is because the BBA does not gener-

ally allow for planned government budget deficits and surpluses that are necessary if taxes are to be optimally smoothed. However, the amendment does contain an important element which allows for departure from expected budget balance if three-fifths of the Congress approves it. Therefore, it is conceivable that optimal budget deficits and surpluses could be produced under the amendment if economic conditions clearly warrant a departure from expected budget balance.¹⁸ However, there is no guarantee that the provision of section 1 of this amendment will produce an optimal time path for taxes.

An Estimate of the Optimal Budget Deficit

In a recent *Wall Street Journal* article, Professor Robert Barro estimates \$165 billion as the optimal budget deficit for 1984. The actual deficit was approximately \$170 billion and very close to the optimum. Also, the size of the deficit which is in the range of 4-5 percent of GNP, is claimed to be in line with historical experience.

Barro's method of estimation is linked with the second example presented in this section. During recessions, or periods where government spending may be temporarily high relative to output, budget deficits rise. This is part of the tax smoothing role of deficits. According to Barro, the effect of the last recession, 1980-83, has contributed approximately \$60 billion to the 1984 deficit. This estimate is a result of the fact that output is still below its full employment level and therefore the business cycle is still contributing to a positive deficit.

Another major consideration is the extent to which interest on the debt should be financed by taxes. A financing of the expected inflation component of interest payments on the debt by the issue of new debt would leave the debt to GNP ratio unchanged, and place no further real burden on society. Barro estimated that \$70-\$75 billion of an optimal amount of debt arises from this component.

Another part of interest payments that should be financed through debt rather than taxes are those that are due to higher than average real interest rates. The reason for using debt to smooth these payments is analogous for using debt to smooth taxes over the business cycle. When real rates are higher than

¹⁸ The provisions of the amendment may also be waived in any fiscal year in which there exists a declaration of war. Since wars are one of the primary examples of temporary government spending that should not be totally financed over their duration, the amendment does take declared wars explicitly into consideration.

normal the debt will grow and when real rates are lower than normal the debt will fall. On average there would be no long-run change in government debt and therefore no reason to shift tax rates to finance this portion of interest payments. Since real rates appear to be abnormally high, Barro estimates that this factor has contributed roughly \$30 billion to the 1984 deficit. Adding up the three factors produces an optimal deficit of \$160-\$165 billion for 1984.

The prediction for future optimal deficits is much the same as the prediction for 1984. Basically, the optimal level of the deficit will change if there is rapid future economic growth relative to changes in government spending, or if inflation and real interest rates fall. Current forecasts of these variables over the near future do not point to any major changes in the optimal level of the budget deficit. Therefore it is only to the extent that proposed deficits differ from the optimum that the deficit should be a matter of concern.

It should be mentioned that Barro's estimates depend on assumptions regarding the normal level of the real interest rate, the extent to which the business cycle downturn of 1980-83 has contributed to the deficit, and forecasts of expected inflation. Differing views concerning these factors will produce different estimates of the optimal deficit. However, Barro's analysis is useful in providing a framework for examining the current deficit with respect to some desirable standard.

VII. SUMMARY

This article has examined the effects that government budget deficits have on the economy given a variety of assumptions regarding the actual workings of the economy. Although the survey presented is far from exhaustive, it does attempt to highlight the major issues associated with the economic consequences of budget deficits. In that regard, the article first focused on the expansionary effects as well as the economic burdens of government deficits that are derived in a simple Keynesian framework. Criticisms of that framework were then discussed in light of the Ricardian equivalence proposition. Features of that proposition were explored, with the conclusion that wealth effects are probably not an important channel for analyzing the effects of government deficits.

The article then focuses on the notion of optimal deficits in an economy with taxes on labor income. Because distortions are introduced into the economy through the tax system, the government has an in-

centive to minimize these distortions given a projected path of government spending and an inherited structure of public debt. It does so by smoothing taxes over time. This process leads to movements in debt that are associated with temporary changes in government spending relative to output. Wars and business cycle phenomena are therefore primary factors in causing the optimal level of debt to vary over time.

The paper concludes with a brief analysis of the political controversy surrounding the current budget deficit in relation to the ideas concerning the optimal debt. Perhaps much of the controversy is related to differing desires or forecasts over movements in the size of government. A rough estimate of \$165 billion as the optimal level of government debt is given as a yard stick on which to evaluate proposed budget deficits.

References

1. Aschauer, David, and Jeremy Greenwood. "Macroeconomic Effects of Fiscal Policy." Carnegie-Rochester Conference Series on Public Policy, vol. 23, ed. by K. Brunner and A. H. Meltzer. Amsterdam: North Holland, 1985, forthcoming.
2. Barro, Robert J. "Are Government Bonds Net Wealth?" *Journal of Political Economy* 82 (November/December 1974) : 1095-117.
3. ——— "Reply to Feldstein and Buchanan." *Journal of Political Economy* 84 (April 1976) : 343-49.
4. ——— "Public Debt and Taxes." In *Federal Tax Reform: Myths and Realities*, ed. by Michael J. Boskin. San Francisco: Institute for Contemporary Studies, 1978.
5. ——— "On the Determination of Public Debt." *Journal of Political Economy* 87 (October 1979) : 940-71.
6. ——— "A Deficit Nearly on Target." *Wall Street Journal*, January 29, 1985, p. 32.
7. Barsky, Robert N.; Gregory Mankiw; and Stephen P. Zeldes. "Ricardian Consumers with Keynesian Propensities." NBER Working Paper No. 1450, July 1984.
8. Bryant, John. "Government Irrelevance Results : A Simple Exposition." *American Economic Review* 83 (September 1983) : 758-61.
9. Chan, Louis Kuo Chi. "Uncertainty and the Neutrality of Government Financing Policy." *Journal of Monetary Economics* 11 (May 1983) : 351-72.
10. Dornbusch, Rudiger, and Stanley Fischer. *Macroeconomics*. New York: McGraw-Hill Book Company, 1978.
11. Drazen, Allan. "Government Debt, Human Capital, and Bequests in a Life-Cycle Model." *Journal of Political Economy* 86 (June 1978) : 505-16.
12. Feldstein, Martin. "Consequences of Lowering Future Budget Deficits," in *Economic Impact of Spending Reductions*. Hearing before the Committee on Finance, U. S. Senate, 98th Cong., 2d sess., January 2, 1985. Washington: Government Printing Office, 1985.
13. Friedman, Milton, and Rose Friedman. *Tyranny of the Status Quo*. New York: Harcourt, Brace, Jovanovich, 1984.
14. Lucas, Robert E., Jr., and Nancy L. Stokey. "Optimal Fiscal and Monetary Policy in an Economy without Capital." *Journal of Monetary Economics* 12 (July 1983) : 55-93.
15. McCallum, Bennett T. "The Optimal Inflation Rate in an Overlapping Generations Economy with Land." Carnegie-Mellon University, June 1985. (Processed.)
16. Penner, Rudolph G. Prepared Statement to Senate Budget Committee. Hearings before the Committee on the Budget, U. S. Senate, 99th Cong., 1st sess., February 6, 1985. Washington : Government Printing Office, 1985.
17. Persson, Torsten, and Lars E. O. Svensson. "Time-Consistent Fiscal Policy and Government Cash-Flow." *Journal of Monetary Economics* 14 (November 1984) : 365-74.
18. Stiglitz, Joseph E., and Andrew Weiss. "Credit Rationing in Markets with Imperfect Information." *American Economic Review* 71 (June 1981) : 393-410.
19. Tobin James. *Asset Accumulation and Economic Activity*. Chicago : University of Chicago Press, 1980.
20. Volcker, Paul A. "Opportunities and Dangers." Broyhill Executive Lecture Series. Babcock Graduate School of Management, Wake Forest University, March 23, 1984.
21. Zeldes, Stephen. "Optimal Consumption with Stochastic Income : Derivations from Certainty Equivalence." Massachusetts Institute of Technology, 1983. (Processed.)
22. ——— "Consumption and Liquidity Constraints: An Empirical Investigation." Wharton School of the University of Pennsylvania, November 1984. (Processed.)