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ABSTRACT

Persistent budget deficits have increased economists' interest in theories and evidence about fiscal policy. This paper develops the Ricardian approach and contrasts it with standard models. The discussion considers from major theoretical objections to Ricardian equivalence—finite lifetimes, imperfect capital markets, uncertainty about future taxes and incomes, and the distorting effects of taxation. Then the paper considers empirical evidence on interest rates, consumption and saving, and current-account deficits. The conclusion is that the Ricardian approach is a useful first-order approximation, and that this approach will probably become the benchmark model for assessing fiscal policy.

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In recent years there has been a lot of discussion about U.S. budget deficits. Many economists and other observers have viewed these deficits as harmful to the U.S. and world economies. The supposed harmful effects, predicted by theories of the life-cycle type, include high real interest rates, low saving, low rates of economic growth, large current-account deficits in the United States and other countries with large budget deficits, and either a high or low dollar (depending apparently on the time period). On the other hand, this crisis scenario has been hard to maintain along with the robust performance of the U.S. economy since late 1982. This performance features high average growth rates of real GNP, declining unemployment, much lower inflation than before, a sharp decrease in nominal interest rates and some decline in expected real interest rates, high values of real investment expenditures, and (until October 1987) a dramatic boom in the stock market.

Persistent budget deficits have increased economists' interest in theories and evidence about fiscal policy. At the same time, the conflict between standard predictions and actual outcomes in the U.S. economy has, I think, increased economists' willingness to consider approaches that depart from the standard paradigm. In this paper I will focus on the alternative theory that is associated with the name of David Ricardo.

### 1. The Standard Model of Budget Deficits

Before developing the Ricardian approach, I will sketch the standard model. The starting point is the assumption that the substitution of a

budget deficit for current taxation leads to an expansion of aggregate consumer demand. In other words, desired private saving rises by less than the tax cut, so that desired national saving declines. It follows for a closed economy that the expected real interest rate would have to rise to restore equality between desired national saving and investment demand. The higher real interest rate crowds out investment, which shows up in the long run as a smaller stock of productive capital. Thereby, in the language of Franco Modigliani (1961), the public debt is an intergenerational burden in that it leads to a smaller stock of capital for future generations. Similar reasoning applies to pay-as-you-go social security programs, as has been stressed by Martin Feldstein (1974). An increase in the scope of these programs raises the aggregate demand for goods, and thereby leads to a higher real interest rate and a smaller stock of productive capital.

In an open economy, a small country's budget deficits or social security programs would have negligible effects on the real interest rate on international capital markets. Therefore, in the standard analysis, the home country's decision to substitute a budget deficit for current taxes leads mainly to increased borrowing from abroad, rather than to a higher real interest rate. That is, budget deficits lead to current-account deficits. Expected real interest rates rise for the home country only if it is large enough to influence world markets, or if the increased national debt induces foreign lenders to demand higher expected returns on this country's obligations. In any event, there is a weaker tendency for a country's budget deficits to crowd out its domestic investment in the short run and its stock

of capital in the long run. However, the current-account deficits show up in the long run as a lower stock of national wealth—and a correspondingly higher amount of claims by foreigners.

If the whole world runs budget deficits or expands the scale of its social insurance programs, real interest rates rise on international capital markets, and crowding-out of investment occurs in each country. Correspondingly, the world's stock of capital is lower in the long run. These effects for the world parallel those for a single closed economy, as discussed before.

## 2. The Ricardian Alternative

The Ricardian modification to the standard analysis begins with the observation that, for a given path of government spending, a deficit-financed cut in current taxes leads to higher future taxes that have the same present value as the initial cut. This result follows from the government's budget constraint, which equates total expenditures for each period (including interest payments) to revenues from taxation or other sources and the net issue of interest-bearing public debt. Abstracting from chain-letter cases where the public debt can grow forever at the rate of interest or higher, the present value of taxes (and other revenues) cannot change unless the government changes the present value of its expenditures. This point amounts to economists' standard notion of the absence of a free lunch—government spending must be paid for now or later, with the total present value of receipts fixed by the total present value of spending. Hence, holding fixed

the path of government expenditures and non-tax revenues, a cut in today's taxes must be matched by a corresponding increase in the present value of future taxes.<sup>1</sup>

Suppose now that households' demands for goods depend on the expected present value of taxes—that is, each household subtracts its share of this present value from the expected present value of income to determine a net wealth position. Then fiscal policy would affect aggregate consumer demand only if it altered the expected present value of taxes. But the preceding argument was that the present value of taxes would not change as long as the present value of spending did not change. Therefore, the substitution of a budget deficit for current taxes (or any other rearrangement of the timing of taxes) has no impact on the aggregate demand for goods. In this sense, budget deficits and taxation have equivalent effects on the economy—hence, the term, "Ricardian equivalence theorem."<sup>2</sup> To put the equivalence result another way, a decrease in the government's saving (that is, a current budget deficit) leads to an offsetting increase in desired private saving, and hence to no change in desired national saving.

Since desired national saving does not change, the real interest rate does not have to rise in a closed economy to maintain balance between desired national saving and investment demand. Hence, there is no effect on investment, and no burden of the public debt or social security in the sense of Modigliani (1961) and Feldstein (1974). In a setting of an open economy there would also be no effect on the current-account balance because desired private saving rises by enough to avoid having to borrow from abroad. Therefore, budget deficits would not cause current-account deficits.

### 3. Theoretical Objections to Ricardian Equivalence

I shall discuss four major theoretical objections that have been raised against the Ricardian conclusions. The first is that people do not live forever, and hence do not care about taxes that are levied after their death. The second is that private capital markets are "imperfect," with the typical person's real discount rate exceeding that of the government. The third is that future taxes and incomes are uncertain. The fourth is that taxes are not lump sum, since they depend typically on income, spending, wealth, and so on. I assume throughout that the path of government spending is given. The Ricardian analysis applies to shifts in budget deficits and taxes for a given pattern of government expenditures; in particular, the approach is consistent with real effects from changes in the level or timing of government purchases and public services.

It turns out that each of the four issues implies that budget deficits matter, and are in that sense non-Ricardian. It is important, however, to consider not only whether the Ricardian view remains intact, but also what alternative conclusions emerge. Many economists raise points that invalidate strict Ricardian equivalence, and then simply assume that the points support a specific alternative; usually the standard view that a budget deficit lowers desired national saving and thereby drives up real interest rates or leads to a current-account deficit. Many criticisms of the Ricardian position are also inconsistent with this standard view.

### A. Finite Horizons and Related Issues

The idea of finite horizons, motivated by the finiteness of life, is central to life-cycle models—see, for example, Franco Modigliani and Richard Brumberg (1954) and Albert Ando and Franco Modigliani (1963). In these models individuals capitalize only the taxes that they expect to face before dying. Consider a deficit-financed tax cut, and assume that the higher future taxes occur partly during the typical person's expected lifetime and partly thereafter. Then the present value of the first portion must fall short of the initial tax cut, since a full balance results only if the second portion is included. Hence the net wealth of persons currently alive rises, and households react by increasing consumption demand. The rise in consumer demand means that desired private saving does not rise by enough to offset fully the decline in government saving; hence desired national saving falls. It follows in a closed economy that the current real interest rate increases: thereby investment demand falls in the short run and the stock of capital declines in the long run. For an open economy, the short-run response is a current-account deficit, which leads in the long run to a smaller stock of national wealth.

A finite horizon seems to generate the standard result that a budget deficit reduces desired national saving. The argument works, however, only if the typical person feels better off when the government shifts a tax burden to his or her descendants. The argument fails if the typical person is already giving to his or her children out of altruism. In this case people react to the government's imposed intergenerational transfers, which



are implied by budget deficits or social security, with a compensating increase in voluntary transfers (see Robert Barro, 1974). For example, parents adjust their bequests or the amounts given to children while the parents are still living (or, equivalently, children raise their transfers to aged parents).

The main point is that a network of intergenerational transfers makes the typical person a part of an extended family that goes on indefinitely. In this setting, households capitalize the entire array of expected future taxes, and thereby plan effectively with an infinite horizon. In other words, the Ricardian results, which seemed to depend on infinite horizons, can remain valid in a model with finite lifetimes.

Two important points should be stressed. First, intergenerational transfers do not have to be "large"; what is necessary is that transfers based on altruism be operative at the margin for most people.<sup>3</sup> Specifically, most people must be away from the corner solution of zero transfers, where they would, if permitted, opt for negative payments to their children. (However, the results also go through if children typically support their aged parents.) Second, the transfers do not have to show up as bequests at death. Other forms of intergenerational transfers work in a similar manner.

One objection to Ricardian equivalence is that some persons, such as those without children, are not connected to future generations (see James Tobin and Willem Buiter, 1980, pp. 86ff.). Persons in this situation tend to be made wealthier when the government substitutes a budget deficit for taxes. At least this conclusion obtains to the extent that the interest and

principal payments on the extra public debt are not financed by higher taxes during the remaining lifetimes of people currently alive. However, the quantitative effects on consumption tend to be small. For example, for someone with 30 years of remaining life who consumes at a constant rate, a one-time budget deficit of \$1 would increase real consumption demand by 1.4 cents per year if the annual real interest rate is 5%, and by 2.1 cents per year if the real interest rate is 3%.<sup>4</sup>

The aggregate effect from the existence of childless persons is even smaller because people with more than the average number of descendants experience a decrease in wealth when taxes are replaced by budget deficits. (In effect, although some people have no children, all children must have parents.) The presumption for a net effect on aggregate consumer demand depends on different propensities to consume out of wealth for people with and without children. Since the propensity for those without children tends to be larger (because of the shorter horizon), a positive net effect on aggregate consumer demand would be predicted. However, the quantitative effect is likely to be trivial. Making the same assumptions as in the previous example, a budget deficit of \$1 would raise aggregate real consumption demand by 0.3 cents per year if the real interest rate is 5%, and by 0.9 cents if the real interest rate is 3%.

Michael Darby (1979, Ch. 3) and Laurence Kotlikoff and Lawrence Summers (1981) calculate that the accumulation of households' assets in the United States for the purpose of intergenerational transfers is far more important than that associated with the life cycle. This observation suggests that

intergenerational transfers would be operative for most people, a conclusion that supports the Ricardian position.

Douglas Bernheim, Andrei Shleifer and Lawrence Summers (1985) note that the motivation behind intergenerational transfers matters for the results. These authors consider the possibility that bequests, instead of being driven by altruism, are a strategic device whereby parents induce their children to behave properly. Some imaginative evidence is presented (involving how often children visit and communicate with their parents) to document the importance of strategic bequests.

This enforcement theory of giving may have different implications for the effects of budget deficits and social security. If the government redistributes income from young to old (by running a deficit or raising social security benefits), the old have no reason in this model to raise transfers to offset fully the government's actions. Instead, the old end up better off at the expense of the young, and aggregate consumer demand rises. Then, as in the standard approach, real interest rates increase or domestic residents borrow more from abroad.

One shortcoming of this approach is that it treats the interaction between parents and children as equivalent to the purchases of services on markets. In this setting parents would tend to pay wages to children, rather than using bequests or other forms of intergenerational transfers. These features—as well as the observation that most parents seem to care about their children's welfare—can be better explained by introducing altruism along with a desire to influence children's behavior. In this case Ricardian

equivalence may or may not obtain. Consider the utility that a parent would allocate to his or her child if there were no difficulty in motivating the child to perform properly. Suppose that the parent can design a credible threat involving bequests that entails the loss of some part of this utility for the child. (Note that if no threats are credible, the whole basis for strategic bequests disappears.) If the threat is large enough to induce the behavior that the parent desires, Ricardian equivalence still holds. For example, if the government runs a budget deficit, the parent increases transfers to the child, and thereby preserves the child's level of utility, as well as the behavior sought by the parent. On the other hand, the parent may have to allow excess utility to the child to secure a better threat against bad performance. Then a budget deficit enables the parent to reduce the child's utility (as desired), while maintaining or even enhancing the threat that influences behavior. In this case Ricardian equivalence does not hold.

### B. Imperfect Loan Markets

Many economists argue that the imperfection of private credit markets is central to an analysis of the public debt; see, for example, Robert Mundell (1971). To incorporate this element, assume that a closed economy consists of two types of infinite-lived economic agents; those of group A who have the same discount rate,  $r$ , as the government (and are therefore willing to hold the government's debt), and those of group B who have the higher discount rate,  $\bar{r} > r$ . The constituents of group A would include many large businesses

and some individuals. The members of group B, such as small businesses and many households, possess poor collateral; therefore, loans to these people imply large costs of evaluation and enforcement. It follows that the members of group B face higher borrowing rates (even after an allowance for default risk) than the government.

Suppose that the government cuts current taxes and runs a budget deficit. Further, assume that the division of the tax cut between groups A and B—say fifty-fifty—is the same as the division of the higher future taxes needed to service the extra debt. Then, as in the Ricardian setting, those from group A experience no net change in wealth. But, since  $\bar{r} > r$ , the present value of group B's extra future taxes falls short of that group's share of the tax cut. Therefore, those from group B react to their increased wealth by raising consumption demand. Moreover, as current consumption increases, the fall in the discount rate  $\bar{r}$  motivates an increase in investment demand. For example, if a small business uses its tax cut to raise current investment, the fall in  $\bar{r}$  reflects the diminishing marginal return to investment.

In the aggregate a budget deficit now raises aggregate demand, or equivalently, the aggregate of desired private saving increases by less than one-to-one with the government's deficit. It follows that the real interest rate  $r$ , which applies to group A and the government, rises to induce people to hold the extra public debt. Hence there is crowding out of consumption and investment by members of group A. However, since the discount rate  $\bar{r}$  for group B declines on net, the expenditures of this group are encouraged. The main result is a diversion of expenditures from group A to group B, and a

corresponding narrowing of the spread between the two discount rates,  $r$  and  $\bar{r}$ . In the aggregate investment may either rise or fall, and the long-term effect on the capital stock is uncertain. The major change, however, is a better channeling of resources to their ultimate uses. Namely the persons from group B—who have relatively high values for rates of time preference and for marginal returns to investment—command a greater share of current output. In any event the outcomes are non-neutral, and in that sense non-Ricardian.

The important finding from the inclusion of imperfect loan markets is that the government's issue of public debt can amount to a useful form of financial intermediation. The government induces people with good access to credit markets (group A) to hold more than their share of the extra public debt. Those with poor access (group B) hold less than their share, and thereby effectively receive loans from the first group. This process works because the government implicitly guarantees the repayment of loans through its tax collections and debt payments. Thus loans between A and B take place even though such loans were not viable (because of "transaction costs") on the imperfect private credit market.

This much of the argument may be valid, although it credits the government with a lot of skill in the collection of taxes from people with poor collateral (which is the underlying source of the problem for private lenders). Even if the government possesses this skill, the conclusions do not resemble those from the standard analysis. As discussed before, budget deficits can amount to more financial intermediation, and are in that sense

equivalent to a technological advance that improves the functioning of loan markets. From this perspective it is reasonable to find a reduced spread between various discount rates and an improvement in the allocation of resources. If the government really is better at the process of intermediating, then more of this activity—that is, more public debt—raises perceived wealth because it actually improves the workings of the economy.

Instead of introducing costs of enforcing the collection of loans, Toshiki Yotsuzuka (1987) extends the analysis of Mervyn King (1984) and Fumio Hayashi (1985) by allowing for adverse selection among borrowers with different risk characteristics. Individuals know their probabilities of default, but the lenders' only possibility for learning these probabilities comes from observing the chosen levels of borrowing at going interest rates. In this setting the government's borrowing amounts to a loan to a group that pools the various risk classes. Such borrowing matters if the private equilibrium does not involve similar pooling. However, by considering the incentives of lenders to exchange or not exchange information about their customers, Yotsuzuka argues that the private equilibrium typically involves a pooled loan of limited quantity at a relatively low interest rate. Then the high-risk types may borrow additional amounts at a high interest rate. In this case the government's borrowing replaces the private pooled lending, and leads to no real effects. That is, Ricardian equivalence holds despite the imperfect private loan market where high-risk people face high marginal borrowing rates. The general lesson again is that Ricardian equivalence fails because of imperfect credit markets only if the government does things

in the loan market that are different from, and perhaps better than, those carried out privately.

### C. Uncertainty about Future Taxes and Incomes

Some economists argue that the uncertainty about individuals' future taxes—or the complexity in estimating them—implies a high rate of discount in capitalizing these future liabilities (see Martin Bailey, 1971, pp. 157-58; James Buchanan and Richard Wagner, 1977, pp. 17, 101, 130; and Martin Feldstein, 1976, p. 335). In this case, a substitution of a budget deficit for current taxes raises net wealth because the present value of the higher expected future taxes falls short of the current tax cut. It then follows that budget deficits raise aggregate consumer demand and lower desired national saving.

A proper treatment of uncertainty leads to different conclusions. Louis Chan (1983) first considers the case of lump-sum taxes that have a known distribution across households. However, the aggregate of future taxes and the real value of future payments on public debt are subject to uncertainty. In this case a deficit-financed tax cut has no real effects. Individuals hold their share of the extra debt because the debt is a perfect hedge against the uncertainty of the future taxes. (This analysis assumes that private credit markets have no "imperfections" of the sort discussed earlier.)

Suppose now that future taxes are still lump sum but have an uncertain incidence across individuals. Furthermore, assume that there are no



insurance markets for relative tax risks. Then a budget deficit tends to increase the uncertainty about each individual's future disposable income. Chan (1983, p. 363) shows for the "usual case" (of non-increasing absolute risk aversion) that people react by reducing current consumption and hence, by raising current private saving by more than the tax cut. Consequently, the effects on real interest rates, investment, the current account, and so on are the opposites of the standard ones.

The results are different for an income tax (Chan, 1983, pp. 364-366, and Robert Barsky, Gregory Mankiw and Stephen Zeldes, 1986). Suppose that each person pays the tax  $\tau y_i$ , where  $y_i$  is the person's uncertain future income. Suppose that there are no insurance markets for individual income risks, and that  $\tau$  is known. (The analysis thus abstracts from uncertainties in relative tax rates across individuals.) In this case a budget deficit raises the future value of  $\tau$  and thereby reduces the uncertainty about each individual's future disposable income. In effect, the government shares the risks about individual disposable income to a greater extent. It follows that the results are opposite to those found before; namely, a budget deficit tends to raise current consumption and hence, to raise private saving by less than the tax cut.

Overall, the conclusions depend on the net effect of higher mean future tax collections on the uncertainty associated with individuals' future disposable incomes. Desired national saving tends to rise with a budget deficit if this uncertainty increases, and vice versa.

#### D. The Timing of Taxes

Departures from Ricardian equivalence arise also if taxes are not lump sum; for example, with an income tax. In this situation budget deficits change the timing of income taxes, and thereby affect people's incentives to work and produce in different periods. It follows that variations in deficits are non-neutral, although the results tend also to be inconsistent with the standard view.

Suppose, for example, that the current income-tax rate,  $\tau_1$ , declines, and the expected rate for the next period,  $\tau_2$ , rises. To simplify matters, assume that today's budget deficit is matched by enough of a surplus next period so that the public debt does not change in later periods. Because the tax rate applies to income, people are motivated to work and produce more than usual in period 1 and less than usual in period 2. Since the tax rate does not apply to expenditures (and since wealth effects are negligible here), it follows that desired national saving rises in period 1 and falls in period 2. Therefore, in a closed economy, after-tax real interest rates tend to be relatively low in period 1—along with the budget deficit—and relatively high in period 2—along with the surplus. In an open economy, a current-account surplus accompanies the budget deficit, and vice versa.<sup>5</sup> Hence the results are non-Ricardian, but also counter to the standard view. (Temporary variations in consumption taxes tend to generate the standard pattern where real interest rates, current-account deficits, and budget deficits are positively correlated.)

Unlike in the Ricardian case where debt and deficits do not matter, it is possible in a world of distorting taxes to determine the optimal path of the

budget deficit, which corresponds to the optimal time pattern of taxes. In effect, the theory of debt management becomes a branch of public finance; specifically, an application of the theory of optimal taxation.

One result is that budget deficits can be used to smooth tax rates over time, despite fluctuations in government expenditures and the tax base. For example, if time periods are identical except for the quantity of government purchases—which are assumed not to interact directly with labor supply decisions—then optimality dictates uniform taxation of labor income over time. This constancy of tax rates requires budget deficits when government spending is unusually high, such as in wartime, and surpluses when spending is unusually low.

Constant tax rates over time will not be optimal in general;<sup>6</sup> for example, optimal tax rates on labor income may vary over the business cycle. To the extent that some smoothing is called for, budget deficits would occur in recessions, and surpluses in booms. If optimal tax rates are lower than normal in recessions and higher than normal in booms, the countercyclical pattern of budget deficits is even more vigorous. The well-known concept of the full-employment deficit, as discussed in E. Cary Brown (1956) and Council of Economic Advisers (1962, pp. 78-82), adjusts for this cyclical behavior of budget deficits.

The tax-smoothing view has implications for the interaction between inflation and budget deficits if the public debt is denominated in nominal terms. Basically, the fiscal authority's objective involves the path of tax rates and other real variables. Therefore, other things equal, a higher rate

of expected inflation (presumably reflecting a higher rate of monetary growth) motivates a correspondingly higher growth rate of the nominal, interest-bearing debt. This response keeps the planned path of the real public debt invariant with expected inflation. This behavior means that differences in expected rates of inflation can account for substantial variations in budget deficits if deficits are measured in the conventional way to correspond to the change in the government's nominal liabilities. However, this element is less important for an inflation-adjusted budget deficit, which corresponds to the change in the government's real obligations (see Jeremy Siegel, 1979).

With perfect foresight, the strict tax-smoothing model implies constant tax rates. More realistically, new information about the path of government spending, national income, and so on, would lead to revisions of tax rates. However, the sign of these revisions would not be predictable. Thus, in the presence of uncertainty, tax smoothing implies that tax rates would behave roughly like random walks.

It is possible to use the tax-smoothing approach as a positive theory of how the government operates, rather than as a normative model of how it should act.<sup>7</sup> Barro (1979, 1986) shows that this framework explains much of the behavior of U.S. federal deficits from 1916 to 1983, although the deficits since 1984 turn out to be substantially higher than predicted. Over the full sample, the major departures from the theory are an excessive reaction of budget deficits to the business cycle (so that tax rates fall below "normal" during recessions) and an insufficient reaction to temporary

military spending (so that tax rates rise above normal during wars). These departures are found also by Chaipat Sahasakul (1986), who looks directly at the behavior of average marginal tax rates. Barro (1987, Section 3) finds for the British data from the early 1700s through 1918 that temporary military spending is the major determinant of budget deficits. Also, unlike the U.S. case, the results indicate a one-to-one response of budget deficits to temporary spending.

Gregory Mankiw (1987) used the tax-smoothing model for a joint analysis of the inflation tax and other taxes. This perspective can explain why short-term nominal interest rates, which are the tax rate associated with money, have been close to a random walk since the founding of the Federal Reserve System in 1914 (see N. Gregory Mankiw and Jeffrey Miron, 1986). Moreover, Mankiw (1987) finds for the United States from 1952 to 1985 that changes in nominal interest rates are positively associated with changes in the ratio of federal tax receipts to GNP or with changes in average marginal tax rates. These results accord with a model where nominal interest rates and other tax rates are jointly determined from an optimal-tax perspective.

#### 4. Empirical Evidence on the Economic Effects of Budget Deficits

It is easy on theoretical grounds to raise points that invalidate strict Ricardian equivalence. Nevertheless, it may still be that the Ricardian view provides a useful framework for assessing the first-order effects of fiscal policy. Furthermore, it is unclear theoretically that the standard analysis offers a more accurate guide. For these reasons it is especially important to examine empirical evidence.

The Ricardian and standard views have different predictions about the effects of fiscal policy on a number of economic variables. The next two sections summarize the empirical evidence on interest rates and saving. Although these variables have received considerable attention, the theories also have divergent implications for other variables, such as the current-account balance and exchange rates. However, because less empirical work has been done, even less is known about these variables than about interest rates and saving.

#### A. Interest Rates

The Ricardian view predicts no effect of budget deficits on real interest rates, whereas the standard view predicts a positive effect, at least in the context of a closed economy. Many economists have tested these propositions empirically (for a summary, see U.S. Treasury Department, 1984). Typical results show little relationship between budget deficits and interest rates. For example, Charles Plosser (1982, p. 339) finds for quarterly U.S. data from 1954 to 1978 that unexpected movements in privately-held federal debt do not raise the nominal yield on government securities of various maturities. In fact, there is a weak tendency for yields to decline with innovations in federal debt. Plosser's (1987, tables VIII and XI) later study, which includes data through 1985, reaches similar conclusions for nominal and expected real yields. Paul Evans (1987b) obtains similar results for nominal yields with quarterly data from 1974 to 1985 for Canada, France, Germany, Japan, the United Kingdom, and the United States.

Evans (1987a, Tables 4-6) finds for annual U.S. data from 1931 to 1979 that current and past real federal deficits have no significant association with nominal interest rates on commercial paper or corporate bonds, or with realized real interest rates on commercial paper. Over the longer period from 1908 to 1984, using monthly data, there is some indication of a negative relation between deficits and nominal or real interest rates (Evans, 1987a, Tables 1-3). Evans also explores the effects of expected future budget deficits or surpluses. He assumes that people would have expected future deficits in advance of tax cuts, such as in 1981, and future surpluses in advance of tax hikes. But interest rates turn out typically not to rise in advance of tax cuts and not to fall in advance of tax hikes. If anything, interest rates tended to move with the opposite pattern. Mankiw's (1987) analysis, which views the nominal interest rate as a form of tax rate, is consistent with these findings.

Overall, the empirical results on interest rates support the Ricardian view. Given these findings it is remarkable that most macroeconomists remain confident that budget deficits raise interest rates.

#### B. Consumption and Saving

Most empirical results on the interplay between budget deficits and saving come from the estimated coefficients of fiscal variables in consumption or saving functions. Examples of this work are Levis Kochin (1974), J. Ernest Tanner (1979), Martin Feldstein (1982), Roger Kormendi (1983), John Seater and Robert Mariano (1985), and Franco Modigliani and

Arlie Sterling (1986). The majority of these (selected) studies finds that fiscal policy has little effect on consumer demand, but Feldstein and Modigliani/Sterling reach opposite conclusions.

The consumption-function approach has also been used to assess the effect of retirement programs under social security. When funded on a pay-as-you-go basis, such programs are similar to budget deficits in terms of their theoretical effects on national saving. Feldstein (1974, 1977) initially concluded that more generous social security programs depressed national saving. This finding was contested in subsequent research—see, for example, Barro (1978), Darby (1979), Louis Esposito (1978), Sterling (1977), Barro and Glenn MacDonald (1979), and Dean Leimer and Selig Lesnoy (1982). Overall, the evidence from the U.S. time series and from a cross-section of countries fails to demonstrate a clear link between social security and national saving.

The empirical studies mentioned above rely on estimates of consumption functions; an approach that involves well-known identification problems. For example, the analysis does not deal satisfactorily with the simultaneity among consumption, income, and real interest rates. Another difficulty concerns the definitions of wealth and income; the inclusion of capital gains has dramatic effects on measures of U.S. saving (see James Poterba and Lawrence Summers, 1986, Appendix Table A-2). Other problems concern the fiscal variables that enter as regressors. These variables can play a signaling role for future income or government expenditure, and this role affects the interpretation of estimated coefficients. For example, if the



government adjusts its budget deficits to smooth out tax rates, as suggested before, then the current tax rate proxies for the expected long-run ratio of government expenditure to income, which influences current consumption demand (see Levis Kochin, Daniel Benjamin, and Mark Meador, 1985). Similarly, the correlation of the deficit with recessions, wars, etc., affects the analysis.

Chris Carroll and Lawrence Summers (1987) compare private saving in the United States and Canada. They note that the private saving rates were similar in the two countries until the early 1970s, but have since diverged; for 1983-85 the Canadian rate was higher by about 6 percentage points. After holding fixed some macroeconomic variables and aspects of the tax systems that influence saving, the authors isolate a roughly one-to-one, positive effect of government budget deficits on private saving. That is, as implied by the Ricardian view, the relative values of net national saving in the United States and Canada appeared to be invariant with the relative values of the budget deficits. These results are particularly interesting because the focus on relative performance in the United States and Canada holds constant the many forces that have common influences on the two countries. It may be that this procedure lessens the problems of identification that hamper most studies of consumption functions.

Recent fiscal policy in Israel comes close to a natural experiment for studying the interplay between budget deficits and saving.<sup>8</sup> Figure 1 shows the values from 1974 to 1987 for the gross national saving rate, the gross private saving rate, and the gross public saving rate. (The underlying variables were converted at effective exchange rates into U.S. dollars.)

Note that in 1983 the gross national saving rate of 13% corresponded to a private saving rate of 17% and a public saving rate of -4%. In 1984 the dramatic rise in the budget deficit led to a public saving rate of -11%. (A principal reason for the deficit was the adverse effect of the increase in the inflation rate on the collection of real tax revenues.) For present purposes, the interesting observation is that the private saving rate rose from 17% to 26%, so that the national saving rate changed little; actually rising from 13% to 15%. Then the stabilization program in 1985 eliminated the budget deficit, along with most of the inflation, so that the public saving rate increased from -11% in 1984 to 0 in 1985-86 and -2% in 1987. The private saving rate decreased dramatically at the same time—from 26% in 1984 to 19% in 1985 and 14% in 1986-87. Therefore, the national saving rates were relatively stable, going from 15% in 1984 to 18% in 1985, 14% in 1986, and 12% in 1987.

One episode cannot be decisive in verifying or refuting a theory. But the recent Israeli experience on fiscal policy—driven mainly by exogenous changes in policy, rather than as reactions to the economy—reveals the roughly one-to-one offset between public and private saving that the Ricardian view predicts. For detailed analysis of the longer time series evidence for Israel see Leiderman and Razin (1988) and Meridor (1988).

### C. Current-Account Deficits

Popular opinion attributes the large current-account deficits in the United States since 1983 to the effects of budget deficits. There has not been much careful analysis of this relationship, but the data reveal a

positive association between the two deficits only if the experience since 1983 is included.

Figure 2 shows the values since 1948 of the ratio of the total government budget surplus (national accounts' version) to GNP (solid line) and the ratio of net foreign investment to GNP (dotted line).<sup>9</sup> Through 1982 there is no association between these two variables (correlation =  $-.02$ ). However, including the data since 1983 raises the correlation to  $.37$ . In effect, the U.S. data since World War II reveal a single incident—the period since 1983—when budget and current-account deficits have been high at the same time. While this recent co-movement is interesting, it does not provide strong support for the view that budget deficits cause current-account deficits. It would be useful to investigate this relationship further, possibly with data from other countries.

##### 5. Concluding Observations

The Ricardian approach to budget deficits amounts to the statement that the government's fiscal impact is summarized by the present value of its expenditures. Given this present value, rearrangements of the timing of taxes—as implied by budget deficits—have no first-order effect on the economy. Second-order effects arise for various reasons, which include the distorting effects of taxes, the uncertainties about individual incomes and tax obligations, the imperfections of credit markets, and the finiteness of life. To say that these effects are second order is not to say that they are uninteresting; in fact, the analysis of differential taxation in the theory

of public finance is second order in the same sense. However, careful analysis of these effects tends to deliver predictions about budget deficits that differ from those of standard macroeconomic models.

I have argued that empirical findings tend mainly to support the Ricardian viewpoint. However, these findings deal primarily with interest rates and consumption/saving, and the results are sometimes inconclusive. It would be useful to assemble additional evidence, especially in an international context.

Although the majority of economists still lean toward standard macroeconomic models of fiscal policy, it is remarkable how respectable the Ricardian approach has become in the last decade. Most macroeconomists now feel obligated to state the Ricardian position, even if they then go on to argue that it is either theoretically or empirically in error. I predict that this trend will continue and that the Ricardian approach will become the benchmark model for assessing fiscal policy. This is not to say that most analysts will embrace Ricardian equivalence and therefore conclude that fiscal policy is irrelevant. But satisfactory analyses will feature explicit modeling of elements that lead to departures from Ricardian equivalence, and the predicted consequences of fiscal policies will flow directly from these elements.

### Footnotes

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<sup>1</sup>The calculations use the government's interest rate in each period to calculate present values, and assume perfect foresight with respect to future government expenditures and taxes. For further discussion see Ben McCallum (1984) and Robert Barro (1989).

<sup>2</sup>The term, Ricardian equivalence theorem, was introduced to macroeconomists by James Buchanan (1976). After Gerald O'Driscoll (1977) documented Ricardo's reservations about this result, some economists have referred to the equivalence finding as being non-Ricardian. But, as far as I have been able to discover, David Ricardo (1951) was the first to articulate this theory. Therefore, the attribution of the equivalence theorem to Ricardo is appropriate even if he had doubts about some of the theorem's assumptions. As to whether the presence of this idea in Ricardo's writings is important for scientific progress, I would refer to Nathan Rosenberg's (1976, p. 79) general views on innovations in the social sciences: "... what often happens in economics is that, as concern mounts over a particular problem ... an increasing number of professionals commit their time and energies to it. We then eventually realize that there were all sorts of treatments of the subject in the earlier literature. ... We then proceed to read much of our more sophisticated present-day understanding back into the

work of earlier writers whose analysis was inevitably more fragmentary and incomplete than the later achievement. It was this retrospective view which doubtless inspired Whitehead to say somewhere that everything of importance has been said before—but by someone who did not discover it."

<sup>3</sup>Philippe Weil (1987) and Miles Kimball (1987) analyze conditions that ensure an interior solution for intergenerational transfers. Douglas Bernheim and Kyle Bagwell (1988) argue that difficulties arise if altruistic transfers are pervasive. See Barro (1989) for a discussion of their analysis.

<sup>4</sup>The assumption is the the real debt remains permanently higher by \$1. For some related calculations, see Merton Miller and Charles Upton (1974, Chapter 8) and James Poterba and Lawrence Summers (1987, Section I).

<sup>5</sup>These results follow if the effects on investment demand are small. With adjustment costs, investment would tend to respond little to this kind of temporary change in income taxes.

<sup>6</sup>The conditions for optimality, based on results from optimal taxation theory, appear in David Aschauer and Jeremy Greenwood (1985). On the notion of tax smoothing, see A.C. Pigou (1928, Chapter 6), Robert Barro (1979, 1986), and Finn Kydland and Edward Prescott (1980).

<sup>7</sup>A colleague of mine argues that a "normative" model should be defined as a model that fits the data badly.

<sup>8</sup>I am grateful to Ed Offenbacher for calling my attention to the Israeli experience. Because of the magnitude of the variations, the Israeli case is more revealing than the "Reagan experiment" associated with the large U.S. budget deficits from 1984 to 1986. The effect of the Reagan deficits on

saving and investment is controversial.

<sup>9</sup>The data are quarterly, seasonally-adjusted values from Citibase. The results are similar if the federal surplus is used instead of the total government surplus.

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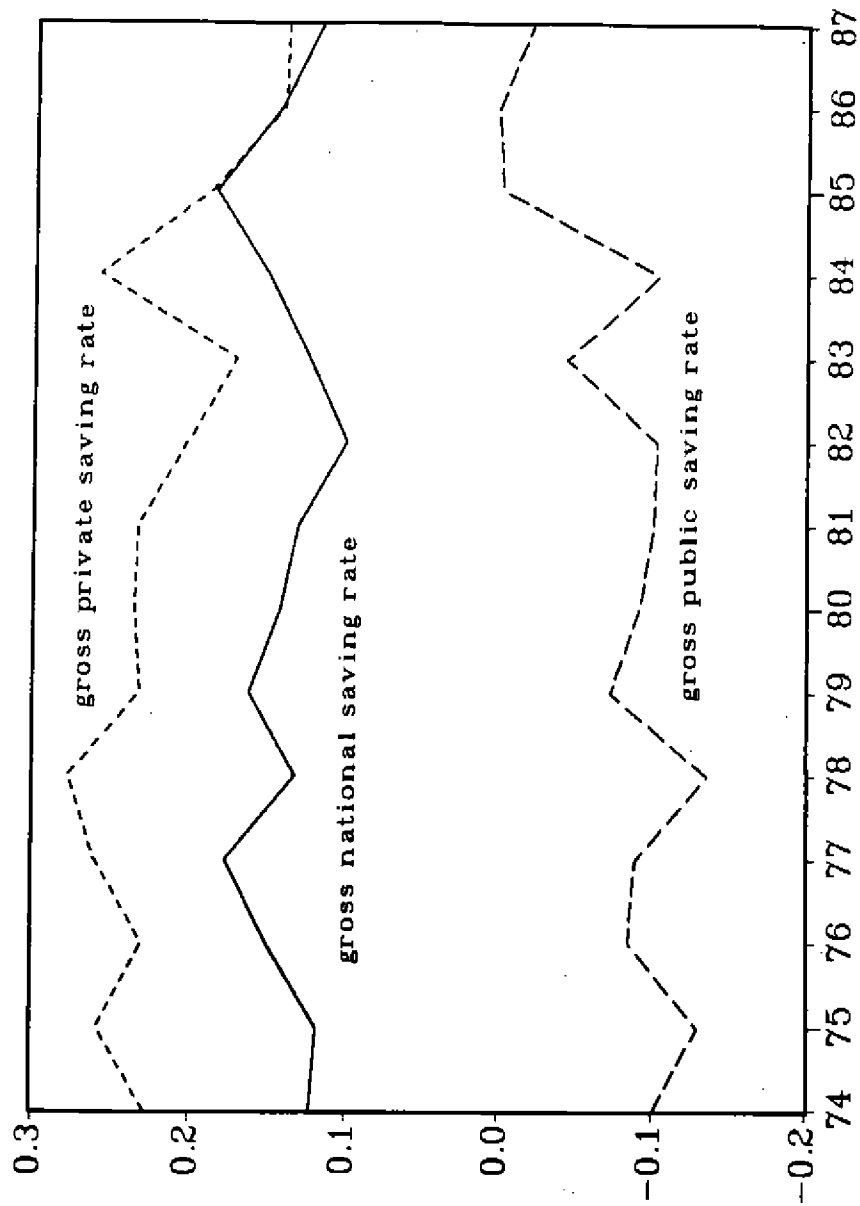


Figure 1: Saving Rates in Israel, 1974-1987  
 Source: Bank of Israel, Annual Report, 1987

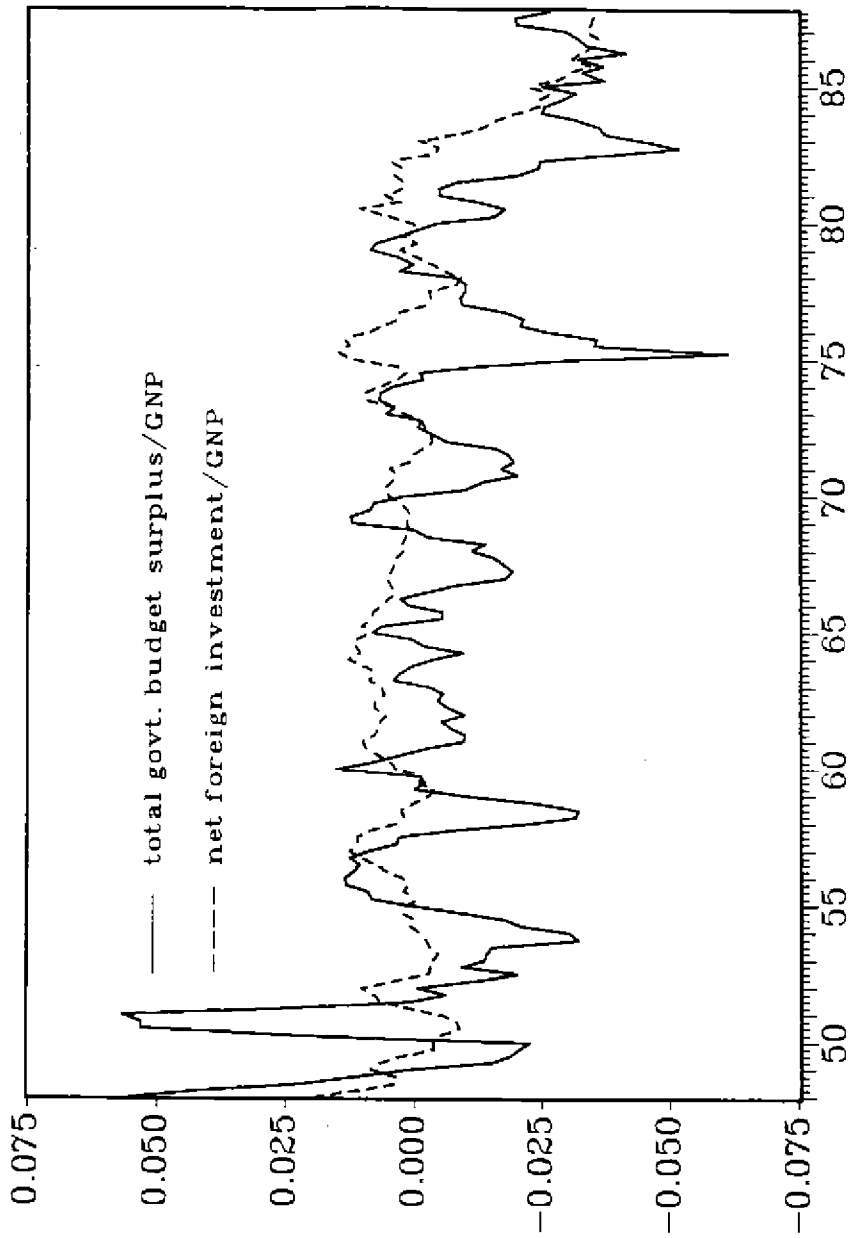


Figure 2: U.S. Budget and Current Account Surpluses, 1948-1987

Note: Data are seasonally-adjusted, quarterly values from Citibase.