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Ricardian Equivalence and National Saving in the United States

Prepared by Liam P. Ebrill and Owen Evans 1/

Authorized for Distribution by Yusuke Horiguchi

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Abstract

This paper examines the relative efficacy of cuts in government spending on goods and services and increases in taxation as tools for augmenting national saving--an issue related to Ricardian equivalence. The theoretical analysis shows little presumption in favor of spending cuts for this purpose and suggests that the issue is ultimately empirical. The empirical work for the United States suggests behavior close to zero Ricardian equivalence. Consequently, while there may be other reasons for favoring one approach or the other, cuts in government spending and increases in taxation appear broadly equivalent in terms of their impact on national saving.

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Summary

This paper is concerned with the impact of alternative fiscal measures on national saving. A recent research paper indicated that for each dollar of increase in tax revenue, national saving in the United States would increase by less than 25 cents, while a dollar of cuts in government purchases would have a positive national saving effect of nearly 70 cents. This result is close to Ricardian equivalence, which implies that the macro-economic impact of fiscal policy depends primarily on the magnitude of public spending on goods and services, while the choice between tax- and bond-financing matters little. Given the present concern with the low level of national savings in the United States, such a result suggests that fiscal deficit reductions should be in the form of expenditure curbs rather than tax increases.

The paper begins by presenting the available range of theoretical frameworks within which the impact of different fiscal measures can be analyzed. It notes that the assumptions needed to validate the Ricardian equivalence proposition are restrictive. The pure life-cycle model would appear to be a more appropriate vehicle for analysis, though in some cases it may be important to recognize the existence of binding liquidity constraints.

The empirical section of the paper commences by re-examining the previous empirical findings supporting the near-Ricardian equivalence proposition and, in essence, replicates the results of the source paper referred to above. Problems exist with the methodological underpinnings of that paper, however, indicating that any inferences may be suspect. An alternative empirical specification is then adopted so as to obtain more definitive results. The equations estimated suggest that the U.S. economy may in fact be closer to the polar alternative of zero Ricardian equivalence than to that of complete equivalence.

The issue is then re-examined within the context of a complete macro-economic model that exhibits short-run Keynesian behavior but retains long-run neoclassical properties. The results indicate that in a model of this kind, tax increases, cuts in transfer payments, and reductions in government expenditures are unlikely to have very different impacts on national saving. As a result, the choice of which measure or combination of measures to use would need to be made on other grounds.



I. Introduction

An important element in the discussion of the impact of alternative fiscal policies in recent years has been the question of whether and to what degree the magnitude of fiscal deficits matters given the level of government spending. According to one viewpoint--which might be termed the Keynesian/neoclassical synthesis--the financing of public spending is crucial to the macroeconomic impact of fiscal policy. Specifically, government spending financed by taxation may substitute for consumption, while spending financed by borrowing is likely to raise interest rates and crowd out investment expenditure, thus reducing long-run growth potential. According to an alternative view--typically associated with the Ricardian equivalence or debt neutrality propositions--the macroeconomic impact of fiscal policy depends primarily on the magnitude of public spending on goods and services, while the choice between tax-financing and bond-financing matters little.

Of course, these are polar alternatives, between which there is a spectrum of possibilities. For example, a recent paper (Darby, Gillingham, and Greenlees, 1987) indicated the possibility of 75 percent Ricardian equivalence--in the sense that a dollar of cuts in government spending on goods and services might yield a rise in national saving of nearly 70 cents, while a dollar of tax increases might yield a 25 cent increase in national saving, because of offsetting changes in private behavior.

The purpose of this paper is to consider both the theoretical and the empirical dimensions of this issue. On the theoretical side, it is noted that the type of framework needed to support the neutrality results associated with the Ricardian equivalence proposition represents a polar case whose underlying assumptions may not be plausible. When alternative theoretical frameworks are considered, not only does the choice between tax and bond finance matter but, in comparing the impact on national saving of either with that of changes in government expenditures, the choice of which government expenditure is to be altered is crucial. As regards empirical work, the results developed provide evidence for the Keynesian/neoclassical position and find little support for any degree of Ricardian equivalence.

Section II of this paper briefly reviews some relevant aggregate data, while section III discusses the theoretical framework underlying the issues. Section IV reviews existing empirical studies, and presents a review and evaluation of the paper by Darby, Gillingham, and Greenlees just cited. Section V presents additional empirical work, and Section VI provides the results of simulations with a full model of the U.S. economy. Section VII concludes.

II. Recent Trends in Public and Private Saving

Many commentators have viewed the sharp widening of the U.S. fiscal deficit in the 1980s as providing a test of the Ricardian doctrine. Under the equivalence proposition, such a widening--other things being equal--would have been expected to lead to offsetting movements in private saving, as the private sector anticipated the higher future tax burdens associated with larger fiscal deficits and increased its savings accordingly.

Savings Rates in the United States

(In percent of GNP)

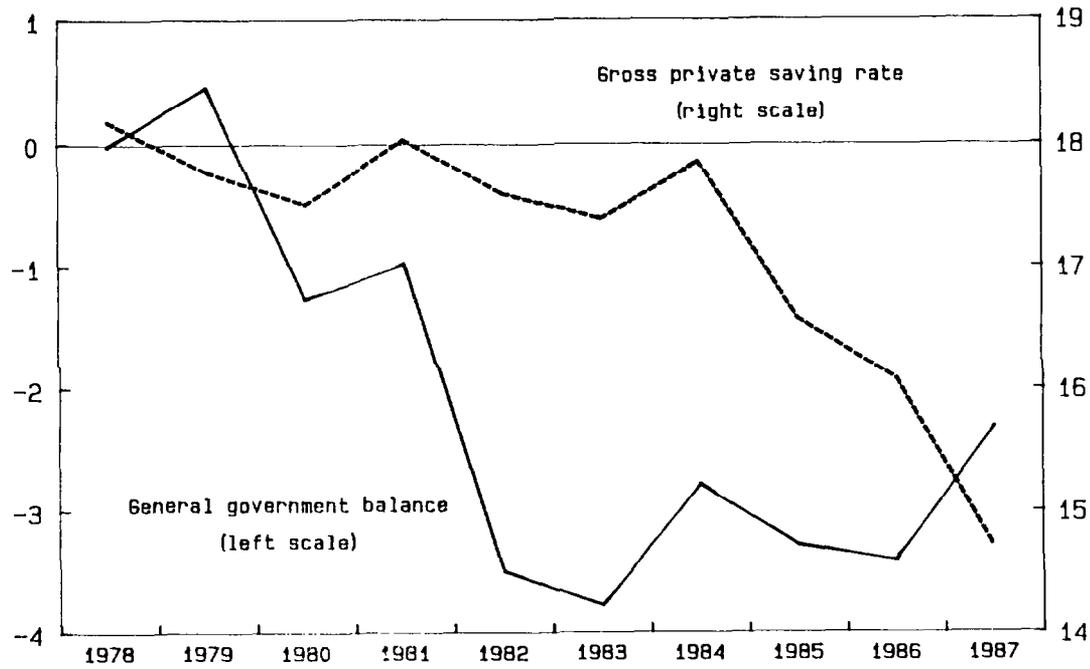
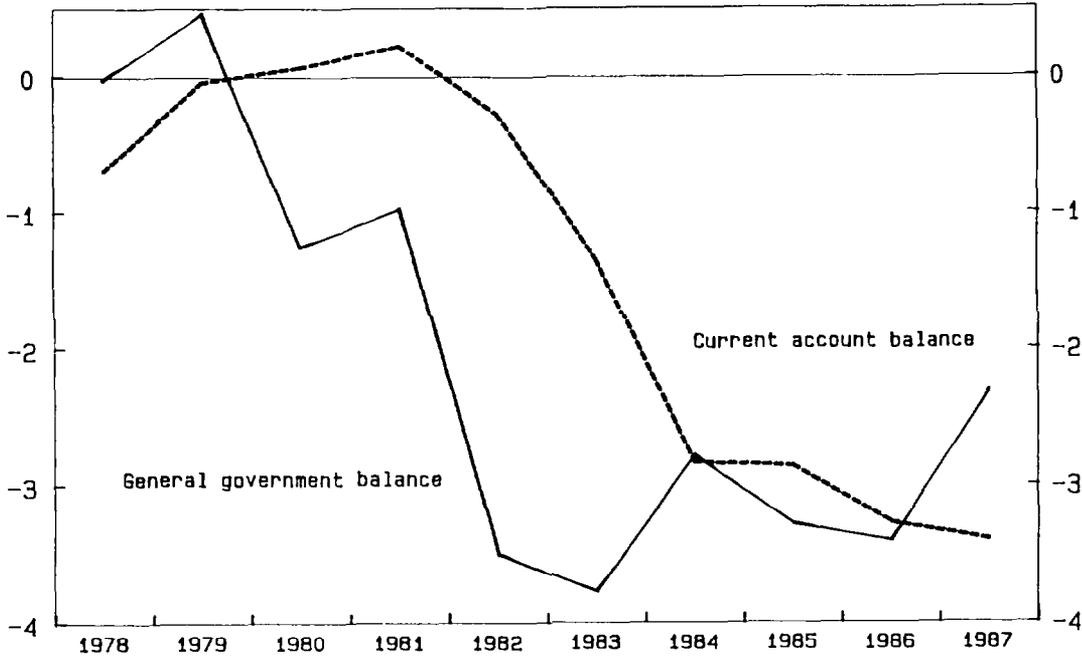
	Averages					
	<u>1960s</u>	<u>1970s</u>	<u>1980-87</u>	<u>1985</u>	<u>1986</u>	<u>1987</u>
Current account balance	0.5	--	-1.7	-2.9	-3.3	-3.4
General government balance	-0.3	-1.0	-2.7	-3.3	-3.4	-2.3
Private saving	16.6	17.6	17.0	16.6	16.1	14.7
National saving	16.3	16.7	14.3	13.3	12.7	12.4

As the tabulation above illustrates, however, the shift in the 1980s to substantial public dissaving has not been accompanied by a corresponding rise in private savings (panel 2, Chart 1). On the contrary, the private saving rate has also fallen. As a result, the national savings rate has declined from an average of 16 1/2 percent of GNP in the 1960s and 1970s to 12 1/2 percent of GNP in 1986 and 1987. Of course, proponents of Ricardian equivalence could argue that, in the absence of the rising fiscal deficits of recent years, the private saving rate would have declined by even more.

A further implication of Ricardian equivalence--if it is also assumed that the ratio of investment to GNP is relatively stable--is that there should be no link between fiscal and current account balances. However, the substantial fiscal deficits of the last several years have also been associated with a marked widening in the external current account deficit. As illustrated in panel 1 of Chart 1, the movements in the general government deficit and the current account deficit relative to GNP have been similar over time. Proponents of Ricardian equivalence would presumably dismiss this apparent linkage as an accidental correlation, attributing the movement in the current account deficit to the decline in private sector savings relative to investment.

CHART 1
UNITED STATES
PUBLIC AND PRIVATE SAVINGS

(In percent of GNP)





III. Theoretical Background

Underlying the Ricardian equivalence issue is the more general question of the differential impact on national saving not only of tax and bond finance but also of the full range of government expenditures. To analyze these issues, a theoretical framework is needed. This section considers the choice of economic model, and concludes that the question of the differential impact of various fiscal measures cannot be definitively resolved on a priori grounds. For that reason, it is important to evaluate the issue empirically.

Before proceeding, a distinction is needed between the nature of taxes and transfers and the nature of government spending on goods and services. Taxes and transfers affect economic activity primarily by changing individual budget constraints. In contrast, changes in the level of government expenditures on goods and services tend to influence individual behavior directly through utility functions.

1. Taxation

A useful first case to consider is lump-sum taxation, with all other aspects of government policy unchanged. In particular, the anticipated (and actual) path of government expenditure will be taken as invariant to the change in tax policy, permitting a focus on the pure income effects. The case is also a useful vehicle for presenting the range of alternative theoretical frameworks.

The framework suggested by Barro--associated with the concept of Ricardian equivalence--provides one important benchmark against which to evaluate the impact of lump-sum taxes (Barro, 1974). In addition to the assumption of rational expectations and the existence of well-developed capital markets, intergenerational altruism is assumed in the sense that the current generation is concerned about the welfare of future generations. ^{1/} When some additional (though nontrivial) technical assumptions are made, an increase in lump-sum taxation will not influence consumption and savings plans. Alternatively, individuals will be indifferent between tax and debt finance since, for a given path of government expenditures, the timing of the flow of tax payments is irrelevant.

To the extent that (lump-sum) taxes are increased and the Government therefore reduces its borrowing, individuals would appreciate that this shift will imply a reduced level of taxation on a future generation and they would offset the implied intergenerational redistribution by altering planned bequests. The increase in government saving resulting from the increase in lump-sum taxation would be offset by a decline in private saving leaving national saving unchanged.

^{1/} Technically, each individual incorporates the utility of successor generations as arguments in his utility function so that in effect each individual can be viewed as infinitely lived.

Critics of this theory have focussed on the assumptions needed for effective intergenerational altruism. For example, Buiters and Tobin (1979) note that some households are childless and others selfish, while others might be planning zero bequests, which could not then easily be reduced in response to a decline in public debt.

A related issue has been that large intergenerational transfers--the magnitude of which has been a subject of dispute 1/--do not imply that intergenerational altruism is the motivating force, as they could be the unintended consequences of risk aversion in the context of uncertainty about length of life and incomplete annuities markets. 2/ Alternatively, such transfers might reflect implicit contracts within families. 3/

An additional criticism has focussed on the treatment of family behavior in Barro's model. For example, Pollak (1988) notes that intergenerational transfers are frequently tied--that is, that the transfer is conditional on how it is used. Such behavior is only explicable if parents evaluate children's behavior according to their own preferences, which may conflict with those of their children. In such circumstances, effective intergenerational linking of preferences--needed for the Ricardian equivalence result--breaks down.

Further, Bernheim and Bagwell (1988) develop a model with greater realism in the biological structure of families, resulting in a proliferation of linkages between related families. In such a model, not only does Ricardian equivalence hold, but also government transfers have no real effects and distortionary taxation and changes in relative prices play no role in resource allocation. The authors conclude that such extreme and implausible results indicate that the underlying assumptions may not be appropriate, in turn calling into question the Ricardian equivalence result. Finally, the neutrality results depend on a number of technical assumptions, including the requirement that public and private discount rates be identical. In effect this means that private discount rates should not reflect an adjustment for anticipated mortality.

The life-cycle model provides another important alternative. 4/ In the pure version of the life-cycle model, in which there is no bequest motive, the relevant budget constraint can be expressed in terms of the present value of the individual's lifetime earnings. The impact of an increase in lump sum taxation depends on how that increase is interpreted. If that increase is expected to be reversed in present value terms within its lifetime, then the current generation will not alter

1/ Kotlikoff and Summers (1981), Kotlikoff (1988), and Modigliani (1984 and 1988).

2/ See for example Davies (1981), and Evans (1983a).

3/ Kotlikoff and Spivak (1981).

4/ Modigliani and Brumberg (1955), and Ando and Modigliani (1963).

consumption behavior and a result analogous to the Barro result would emerge. If, however, the increase in taxation is to be reversed in the lifespan of some future generation, then the current generation's lifetime or permanent income has been reduced and consumption will be reduced accordingly. Given the consumption-smoothing associated with the life-cycle model, the decline in consumption will only be some proportion of the increase in lump-sum taxation. The smaller this proportion, the smaller the increase in national saving. The crucial feature driving this result is the absence of bequests which implies that changes in lump-sum taxes can effect transfers across generations.

Keynesian models which incorporate liquidity constraints provide a further framework for analyzing the effects of tax/transfer policies. These models are exemplified by a recent paper by Hubbard and Judd (1986) in which the constraint is imposed that the net worth of individuals must always be non-negative--that is, that consumers be prohibited from borrowing against future income. This restriction is intended to capture the fact that capital markets are not as complete as is implicitly assumed in both the life-cycle and the intergenerational frameworks. Instead, this model implies "liquidity constraints" since the non-negativity restriction requires consumption to be limited to current resources. Those consumers who cannot finance their desired level of consumption with current wealth will find their consumption levels responding even to anticipated changes in disposable income. In particular, consumers in such a situation would be forced to reduce their consumption in parallel with any increase in lump-sum taxation, implying a dollar-for-dollar increase in national saving, in contrast to the results derived in the life-cycle framework discussed above.

A range of models exist, therefore, where the implications of changes in lump-sum taxation for consumption behavior run the gamut from no change (in the Barro framework) to a potentially fully offsetting change (in the liquidity-constrained framework). Which framework is the most appropriate representation of consumer behavior is essentially an empirical question. 1/

1/ In reality, lump-sum taxation does not exist. The question therefore arises as to whether the results just stated would be substantially altered by recognizing the distortionary effects of taxation. The impact of distortionary taxation on aggregate saving would depend on how that taxation affected the rate of return to saving--i.e., the (net of tax) real rate of interest--and, to the extent that the rate of return is affected, on how aggregate saving responds to such changes. Concentrating on the latter factor--the former factor concerns the incidence of taxation--the consensus seems to be that the interest elasticity of aggregate savings is quite low. In reality also, changes in taxation have effects on labor supply which could have consequences for private saving. For prime age males at least, the effects of tax changes on labor supply are typically judged to be small.

2. Transfer payments

The analysis of changes in transfers in many respects is similar to that of changes in taxation. When analyzing the case of changes in (lump-sum) taxation, a given path of expenditures was assumed--as a result, changes in (lump sum) taxation could be associated with changes in government debt of an equal but opposite magnitude. Changes in transfers, however, can be financed by changes in taxation or bond finance. It is assumed here that changes in transfer payments would be associated with offsetting changes in borrowing and, therefore, in future tax liabilities. ^{1/} Thus, much of the analysis that was used in evaluating the impact of (lump-sum) taxation also applies to the case of transfers.

Some transfer programs are established with the explicit intent of effecting income transfers within generations. In contrast, the analysis of (lump-sum) taxation above abstracted from the possibility of intragenerational income transfers by implicitly assuming identical individuals. When it is recognized that some transfer programs are tilted toward the lower income segments of society, then the income-constrained framework discussed above might well be relevant--the marginal propensity to consume out of transfer income could be high, even approaching unity. As a result, reductions in expenditures of this type might be expected, everything else being equal, to have a relatively significant depressing impact on consumption.

Other transfer programs are notable for their intertemporal implications. For example, in the case of social security, a reduction in benefits in the form of an "adverse" change in the rules determining social security payments could affect the savings behavior of all individuals through the impact of that change on expectations, since, in a life-cycle framework, such a reduction would create an incentive for the current working generation to increase its savings. Therefore, in such circumstances, a change in transfer payments could be expected to have an appreciable positive impact on private savings. ^{2/} In particular, the tendency for a reduction in social security benefits to induce an increase in national saving might well be greater than the corresponding tendency of an increase in taxation to do so, everything else being held equal. ^{3/}

^{1/} The largest transfer program, social security, has its own dedicated source of finance in the form of social security taxes. However, this does not affect the analysis since it is clearly possible to alter benefits without altering taxes.

^{2/} See also Feldstein (1974).

^{3/} It is conceivable that, when the expectational effects have worked through, savings could increase by more than the reduction in benefits implying that national savings could increase by significantly more than the reduction in the deficit.

As with taxation, transfer payments are generally the source of distortions. This is most obviously the case with price subsidies and price supports where the explicit intent is to interfere with market behavior. However, these distortions, while they may have a significant impact in the markets for the commodities involved, are unlikely qualitatively to alter conclusions concerning the impact of changes in the relevant transfer programs on aggregate consumption and saving.

The last two subsections have considered the case of tax/transfer changes with a view both to evaluating a range of alternative frameworks for analyzing the impact of fiscal changes and to assessing the potential impact of that type of fiscal change on national saving. Some tentative observations can be made at this stage. First the assumptions needed in order for the Barro framework to be valid are stringent and, at least in some respects, seem implausible. Second, the choice of which model is most appropriate may well depend on the circumstances. For example, the income constrained framework may be most relevant when analyzing the impact of changes in income maintenance programs whereas the life-cycle model might be most appropriate when evaluating changes in social security.

3. Expenditure on goods and services

To analyze the impact of changes in expenditures on goods and services, it is assumed that any reduction in government expenditures on goods and services is associated with a corresponding decrease in borrowing. Thus, the impact of such a decrease in borrowing on consumption and saving will be a function of how the path of future tax payments is anticipated to change. This aspect of the analysis parallels that presented immediately above in the case of changes in lump-sum taxation.

However, changes in government expenditures influence economic activity through a number of additional channels. First, in providing goods and services, the Government lays claim to a proportion of the productive resources of the economy. One could assume that these resources would otherwise have been unemployed. However, given the relatively high level of resource utilization currently in the United States, it is instead assumed that the resources used in the process of

producing the goods and services supplied by the government would have been otherwise productively employed. 1/

The issue is how changes in the supply of these goods and services affect the balance between consumption and saving. The impact will depend on the degree of substitutability or complementarity between those expenditures and aggregate private expenditures. The determining factors include both the nature of individual preferences and the technology for organizing the distribution of goods production. The latter is important since the ease with which private producers can substitute their production of a given good for government provision of that good will often depend primarily on the way the market is organized.

While it is easy to visualize a range of aggregate substitutability/complementarity possibilities, it would be difficult to assign a given good definitively to a point within that range and thus it would not be possible to determine a priori the impact of a reduction in government expenditures on private consumption expenditures. On this last point, consider the polar case which occurs when the relevant government expenditures are perfect substitutes for private expenditures. That case parallels the lump sum taxation case considered earlier. The crucial feature is the reduction in borrowing consequent upon a reduction in government expenditures; how that reduction influences consumer behavior depends both on how individuals perceive the time path of future tax payments to be altered and on the type of budget constraint which is relevant.

In the Barro world discussed earlier, the reduction in government spending will be associated with an equal reduction (in present value terms) in taxation at some point in the future and individuals will therefore react by substituting privately provided goods precisely to offset the reduced public provision. By so doing, they will reduce bequests by an amount equal in present value terms to the increase in income the future generation will experience as a result of reduced taxation. National saving would be unaffected. In contrast, in the pure life-cycle model, to the extent that the associated tax reduction will benefit a future generation, the current generation will experience

1/ In fact, it has been implicitly assumed throughout the analysis to this point that none of the fiscal measures would result in aggregate demand effects. To use the language of public finance, the analysis here is in the spirit of a budget incidence approach in that it is being assumed that the fiscal measures result in movements along the production possibility frontier rather than in shifts of that frontier, or in deviations of actual production away from that frontier. For a further elaboration, see Musgrave and Musgrave (1976). Note that by taking this approach, the paper abstracts from balanced-budget multipliers (a traditional form of analysis of the differential impact of tax and expenditure changes) in examining the response of private consumption and saving to government fiscal measures.

a correspondingly smaller increase in life-cycle income and will adjust consumption accordingly. National saving will increase by some proportion of the increase in government saving.

Alternatively, consider what would happen if the expenditure reductions involved goods which are complementary to private consumption. Then, as well as the effects outlined in the perfect substitutes case, there will be an additional positive impact on private saving, the precise magnitude of which it would be difficult to quantify.

In sum, it would be difficult on a priori grounds to determine the differential impact of tax increases and expenditure reductions on national saving. The outcome depends on the interaction of a number of factors, including the nature of the relevant budget constraints, the distributional impact of the measures under consideration, the effect of changes in fiscal policies on expectations, and the degree of substitutability/complementarity with private consumption. Subsequent sections will consider the empirical evidence.

IV. Review of Empirical Literature

1. General review

Empirical studies relating to Ricardian equivalence have focussed on several features of household behavior. First, if households face binding liquidity constraints preventing them from smoothing income over the life cycle, then intergenerational smoothing seems implausible. While the debate continues, the broad conclusion from this research appears to be that a significant proportion of consumers is in fact income constrained. For example, Hall and Mishkin (1982) found that roughly 20 percent of consumers appeared to be income-constrained and Hayashi (1982) developed similar results. In a related vein, Flavin (1981) found strong sensitivity of consumption to current income, beyond that predicted by her version of the life cycle model, indicating the existence of binding liquidity constraints. Mariger (1986) estimated structural consumption functions on cross-section data from Federal Reserve surveys, and found substantial evidence for the existence of liquidity constraints.

A second area of research examines the implications of the social security system for household saving and capital formation. Ricardian equivalence predicts that the existence of an unfunded social security system would have no implications for capital formation, because private intergenerational transfers would offset the intergenerational transfers resulting from the social security system.

Most of the articles in the empirical literature on this issue tested the significance of social security by adding a "social security wealth" variable to a conventional consumption function. In a series of articles, Feldstein (1974, 1977, 1982a) argued that empirical results using this approach supported the view that social security reduced household saving and capital formation--even after discovery of a major computational error in his early results (Leimer and Lesnoy, 1982). Barro (1978), among others, argued the opposite. Evans (1983b) suggested that the significance of social security could be tested more simply by examining whether the marginal propensity to consume was higher for transfer income--including social security payments--than other forms of disposable income; he found tentative evidence that social security did depress household saving and capital formation, arguing against Ricardian equivalence. Auerbach and Kotlikoff (1983), using an overlapping generations life cycle model with assumed parameters, constructed pseudo time series data, for which it was known in advance--by construction--that social security depressed household saving. When conventional time series regression tests were run on the pseudo-data, however, the hypothesis that social security depressed saving was sometimes accepted and sometimes rejected depending in particular on the precise specification and the length of the sample. On this basis, they concluded that time series tests of the significance of social security were inherently biased against finding a significant effect of social security on saving. Mariger (1986) on the basis of

econometric analysis of cross-section data--an analysis largely free of the problems, outlined above, that have plagued empirical analyses on time series data in this area--found evidence for a significant and substantial depressing effect of the social security system on saving and capital formation.

A fourth element of the empirical literature relating to Ricardian equivalence focuses on testing the impact of the age distribution of income and wealth on consumption. Under Ricardian equivalence, consumption by particular members of an extended family or dynasty depends on the resources of other family members, which implies that consumption should be invariant to shifts in the age distribution of income and wealth. After conducting careful tests, Boskin and Kotlikoff (1985) found that in fact the age distribution made a significant contribution to the explanation of consumption.

Another relevant area of research relates to the significance of intergenerational transfers for capital accumulation. If these transfers are relatively small, it would seem unlikely that the bulk of households are acting in the way proposed by Barro. The empirical evidence on the significance of bequests is unclear. Kotlikoff and Summers (1981) initially argued that bequests accounted for roughly 80 percent of capital accumulation in the United States, but Modigliani (1984 and 1988) after finding an error in their computations, suggested that the fraction was much lower. If the latter were correct, this would be further indirect evidence against Ricardian equivalence. Moreover, even if intergenerational transfers were established as accounting for the bulk of U.S. capital formation, several plausible behavioral formulations exist--as noted earlier--which would be consistent with this outcome and yet would not entail Ricardian equivalence.

The most substantial strand of empirical work dealing with Ricardian equivalence has related a measure of private consumption to government spending, taxation, transfer and government debt variables, as well as income and wealth. The basic equation is typically a variation on that outlined below:

$$C = a_0 + a_1Y + a_2W_{-1} + a_3G + a_4T + a_5TR + a_6 D_{-1} \quad (1)$$

where

- C = private consumption ^{1/}
- Y = a measure of income (typically national income or net national product)
- W = household wealth, excluding government debt
- G = government purchases of goods and services
- T = tax revenue
- TR = government transfers to persons
- D = government debt,

and all variables are measured in real terms. ^{2/}

Under Ricardian equivalence, changes in taxation do not affect consumption when government spending is constant ($a_4 = 0$); changes in transfer payments do not influence consumer spending, for a given level of income ($a_5 = 0$); and the private sector does not view government debt as net wealth ($a_6 = 0$). The appropriate sign and magnitude of the coefficient on government spending on goods and services is ambiguous, depending on the degree of substitutability/complementarity of such spending with private consumption.

There have been many studies involving variations on this theme, the bulk of which conclude that deficits do affect consumer spending, and that Ricardian equivalence does not hold. ^{3/} Interpretation of these studies is complicated by a variety of difficulties including simultaneous equations bias; spurious correlations induced by cyclical comovements between variables that are unrelated on a cyclically adjusted basis; flaws in methods used to deflate nominal variables; multicollinearity; difficulties in disentangling the contemporaneous effects of changes in fiscal variables from signalling effects that may

^{1/} Depending on the particular study, C may be defined as total consumer expenditure or as pure consumption. The latter comprises expenditures on nondurable goods and services plus the estimated service stream on the stock of consumer durables.

^{2/} Depending on the particular study, they may or may not be deflated by population.

^{3/} Among the influential studies failing to find support for Ricardian equivalence are the following: Feldstein (1982b); Barth, Iden, and Russek (1984-85); Hernández-Catá (1982); Modigliani and Sterling (1986). Empirical studies in this vein lending support to Ricardian equivalence include those of Seater and Mariano (1985), Kormendi (1983), and Kormendi and Meguire (1986).

be taking place with regard to their own future values; 1/ and disagreements as to appropriate sample period--including in particular whether data covering war years should be included. 2/

The more interesting--albeit less frequently addressed--issue concerns magnitudes. If the polar proposition of Ricardian equivalence does not hold, to what extent are changes in taxation offset by private behavioral responses? Bernheim (1987) addresses this issue, concluding that most studies indicate that reducing taxes with government spending held constant is likely to raise consumption by 40-50 percent of the magnitude of the tax cut. Boskin (1988) suggests a consensus of a net deficit for tax substitution effect on consumption of between 20 and 40 cents per dollar. Another paper directly discussing the magnitude of deviations from Ricardian equivalence is that of Darby, Gillingham and Greenlees discussed in detail in the next subsection.

2. The Darby, Gillingham, Greenlees paper

The work of Darby on the consumer expenditure function, which has been recently updated and extended by Darby, Gillingham, and Greenlees (DGG) in a U.S. Treasury research paper 3/ is examined in some detail here, because it attempts a quantitative assessment of the extent of deviations from Ricardian equivalence. Although the DGG paper does not attempt to present an official view, it may nevertheless have been influential in policy discussions.

The specification adopted by DDG was as follows: 4/

$$C = a_0 + a_1 YP + a_2 YT + a_3 CD_{-1} + a_4 M_1 + a_5 (P_d/P_{nd}) + a_6 r + a_7 GD \quad (2)$$

where all nominal quantities are deflated by the deflator for consumer spending.

1/ See the discussion in Leiderman and Blejer (1988).

2/ An exhaustive assessment of the empirical studies is provided in Bernheim (1987).

3/ The original references were Darby (1975 and 1978). The most recent paper was by Darby, Gillingham, and Greenlees (1987).

4/ Notation is as follows: C = consumer spending; YP = permanent income; YT = transitory income; CD = the stock of consumer durables; M1 = the M1 definition of the money supply; P_D = the implicit deflator for consumer durable goods; P_{ND} = the implicit deflator for other consumer goods; r = the AAA corporate bond rate; GD = the general government deficit, with a distributed lag over four periods.

The time series data for permanent income, with income defined alternatively in "traditional" and Ricardian terms, are calculated based on a procedure outlined in DGG. 1/ This procedure (based on the so-called Holt-Winters forecasting model 2/) calculated the logarithm of permanent income as a weighted average of the logarithms of actual income and permanent income the previous period, together with a growth rate term. The growth rate term in turn is defined as a weighted average of the growth rate in the previous period and the change in the logarithm of permanent income. The parameters in these two equations for the derivation of permanent income are generated so as to maximize the goodness of fit in the estimated equations for consumer expenditure. The parameter values which result imply very slow adjustment of perceived permanent income to changes in actual income. Thus the estimated equations are able to "explain"--in a statistical sense--the rapid growth of consumer spending (and the associated decline in the household savings rate) in the last few years as stemming from the "fact" that permanent income is judged to be substantially above actual income. 3/ The idea that consumers may believe actual income to be substantially below permanent income has intuitive appeal for times of cyclical downturn, but it is not clear why this should be the case in the fourth year of an economic expansion, as was the case in 1986 in the United States. 4/

Moreover, the behavior of consumers in this model when the Ricardian income measure is adopted is particularly puzzling. On the one hand, these consumers are highly rational and forward looking; they foresee and offset the increased future tax burden stemming from a higher government deficit in the present. On the other hand, these consumers are highly myopic in the sense that they initially perceive all shocks as temporary, and adjust their estimate of permanent income only very slowly to changes in actual data.

Other features of the specification include the use of the real money supply (M1) as an indicator of wealth instead of a broader mea-

1/ The "traditional" income variable (Y1 in Table 1) is defined to be net national product, plus general government spending (excluding that on goods and services) less general government revenue. The Ricardian income measure (Y2 in Table 1) is defined to be net national product less general government spending on goods and services. Each is then separated into permanent and transitory components.

2/ See Harvey (1981).

3/ In 1986, the traditional permanent income measure was 3 percent higher than the corresponding actual income, while the Ricardian measure of permanent income was 7 percent above actual income.

4/ In a sense, the argument that household consumption was high relative to income (and saving rates correspondingly were low) because permanent income was substantially in excess of actual income is close to being a tautology when the data for permanent income are generated to maximize the fit of a consumption equation.

sure; the use of a relative price term (durables versus the remainder), even while both durable and other consumer goods are included in the dependent variable; the inclusion of a nominal rather than a real interest rate, and the imposition of a lag structure on the government deficit variable which is distributed over four periods for both the annual and the quarterly equations--that is, for four years in the annual equation and for four quarters in the quarterly equations.

According to DGG, the interpretation of their results is relatively straightforward. ^{1/} By their interpretation, the empirical results suggest that, under the traditional model, a dollar increase in taxation would lower consumer spending by 83 cents and household saving by 17 cents in the long run; thus national saving would rise by 83 cents. A dollar cut in government purchases would raise consumer spending and lower household saving by 15 cents in the long run; national saving would rise by 85 cents.

Under the Ricardian model, a dollar increase in taxes would reduce consumer spending by 24 cents and household saving by 76 cents in the long run; thus national saving would increase by only 24 cents. However, a dollar cut in government purchases would increase consumer spending by 67 cents in the long run and thus reduce household saving by 33 cents; national saving would increase by 67 cents.

The results under the Ricardian specification have been cited in support of the proposition that spending cuts are a more effective way to raise national saving than tax increases. However, the results under the traditional specification indicate that spending cuts and tax increases would essentially be equally effective in terms of raising national saving. Since DGG note that the data seem unable to discriminate between the two specifications, the more circumspect interpretation may be that--even abstracting from a number of reservations about the estimated equations discussed above--it is not clear whether cuts in

^{1/} If equation (2) is estimated with the "traditional" income variable, then a \$1 reduction in government spending will in the long run increase consumer spending and lower household savings by a_7 dollars where a_7 is the sum of the coefficients on the government deficit terms--expected to be negative. An increase in taxation by a dollar, however, will reduce consumer spending in the long run by $(a_1 + a_7)$ dollars--that is, the sum of the coefficients on permanent income and the government deficit. Household saving will then be reduced by $1 - (a_1 + a_7)$ dollars. When the equation is estimated with the Ricardian income variable, DGG suggest that a reduction in government spending will raise that measure of income while lowering the deficit, with a long-run impact on consumer spending of $(a_1 - a_7)$ dollars per dollar of cuts; household saving is thus changed by $(1 - a_1 + a_7)$ dollars. An increase in taxation by a dollar has no effect on Ricardian income, and eventually reduces consumer spending by a_7 dollars, and household saving by $1 - a_7$ dollars.

government spending are or are not more effective instruments for raising long-run national saving than increases in taxation.

In order to pursue the line of research advocated by DGG somewhat further, additional empirical work was performed in a similar vein. Equations were estimated for consumer expenditure with income, wealth, and government deficit terms as explanatory variables. The results are presented in Table 1. The main changes from the original specification are the exclusion of the permanent income variable; the use of broader measures of household wealth--rather than the money supply--disaggregated between government debt and the remainder to permit a test of the significance of the former; and the exclusion of the interest rate and relative price terms.

Equations (1) - (3) in Table 1 follow the traditional specification, differing only in the precise definition of the income terms. ^{1/} According to equation (2)--and using the method of interpretation proposed by DGG (outlined in the footnote on the previous page)--an increase in personal taxation would reduce consumer spending by 136 percent of the increase in taxes so that household saving would be raised by 36 percent, and national saving by 136 percent of the tax change. By contrast, a cut in government spending on goods and services would reduce consumer spending by 64 percent of the spending cut, augmenting national saving by 164 percent of the cut. Equation (3) also indicates more pronounced effects on national savings from cutting spending than from raising taxes, though the differences are quite small.

Equations (4) and (5) in Table 1 adopt a Ricardian specification with the income variable taken as net national product less government spending on goods and services. Reflecting the constraints of the specification, cuts in government spending are estimated to be roughly twice as effective as tax increases in augmenting national savings. Thus, as was the case with the DGG results, a traditional specification generated results consistent with that specification while a Ricardian specification generated results closer to the Ricardian end of the spectrum.

^{1/} Equation (1) includes only current and lagged household disposable income, while equation (2) includes net national product less net taxes, and equation (3) enters separately disposable income and the difference between net national product less net taxes, and disposable income.

Table 1. United States: Equations for Consumer Spending ^{1/}

Equation Number	YD	YD ₋₁	Y1	Y1 ₋₁	Y2	Y2 ₋₁	Y1-YD	Y1 ₋₁ -YD ₋₁	Y2-YD	Y2 ₋₁ -YD ₋₁	$\frac{W_{-1}-D_{-1}}{CE_{-1}}$	D ₋₁	CE ₋₁	DEF	DEF ₋₁	DEF ₋₂	R ²	SEE	DW
1.	0.76 (9.6)	0.04 (0.4)	--	--	--	--	--	--	--	--	0.021 (2.5)	0.180 (3.4)	0.001 (0.1)	-0.12 (1.3)	0.24 (2.9)	0.19 (2.2)	0.999	0.052	1.88
2.	--	--	0.49 (8.4)	0.23 (3.3)	--	--	--	--	--	--	0.038 (4.8)	0.090 (2.0)	0.019 (2.0)	0.11 (1.2)	0.24 (2.7)	0.29 (3.9)	0.999	0.055	1.64
3.	0.63 (6.7)	0.14 (1.4)	--	--	--	--	0.25 (1.5)	0.06 (0.4)	--	--	0.026 (3.3)	0.143 (3.4)	0.008 (0.8)	-0.03 (0.3)	0.23 (3.0)	0.25 (3.0)	0.999	0.048	1.99
4.	--	--	--	--	0.49 (8.4)	0.23 (3.3)	--	--	--	--	0.038 (4.8)	0.090 (2.0)	0.019 (2.0)	0.60 (5.8)	0.46 (3.6)	0.29 (3.9)	0.999	0.055	1.64
5.	0.63 (6.7)	0.14 (1.4)	--	--	--	--	--	--	0.25 (1.5)	0.06 (0.4)	0.026 (3.3)	0.143 (3.4)	0.008 (0.8)	0.22 (1.1)	0.29 (1.5)	0.25 (3.0)	0.999	0.048	1.99

^{1/} All variables were deflated by the implicit deflator for consumer spending, and population, with lags as appropriate. The dependent variable was real per capita consumer spending. Notation as follows: YD = disposable income; Y1 = net national product, plus general government spending (excluding that on goods and services) less general government revenue; Y2 = net national product less general government spending on goods and services; W = household net worth; D = household holdings of government securities (federal, state and local); CE = household holdings of corporate equities; DEF = the general government deficit (that is, federal plus state and local). Data were annual from 1958 to 1987, with estimation by OLS, using version 1.11 of the AREMOS package supplied by Wharton Econometrics. The data were the most up-to-date U.S. national accounts and wealth data available, as of September 1988. A data appendix is available from the authors on request. Constants are not reported.

Another observation to be made on all the estimated equations presented in Table 1--including those with a Ricardian specification--is that in every case, the coefficient on government debt was statistically significant and exceeded that on the remainder of household net worth by a wide margin, providing evidence against the belief that government debt is not viewed as wealth by households.

A more detailed look at the results presented in Table 1 indicates a basic pitfall in the overall approach adopted by DGG. Equations (2) and (4) purport to be fundamentally different specifications--the first traditional and the second Ricardian--leading to different results and interpretations. However, closer inspection reveals that equation (4) is in fact a linear transformation of equation (2) and similarly that equation (5) is a linear transformation of equation (3).^{1/} Thus the statistical information contained in equations (2) and (4) is identical and one cannot therefore draw distinct inferences from them.

Returning to the equations presented in the DGG paper, the equations estimated with the alternative income variables--traditional and Ricardian--are not exact linear transformations of each other, because the parameters used to generate the data for permanent income differ somewhat. However, the two equations are close to being precise linear transforms of each other, which makes the drawing of very different inferences about the effects of alternative fiscal measures on national saving suspect at best--since the equations contain essentially the same information.

^{1/} An examination of the definitions of Y_1 (traditional income) and Y_2 (Ricardian income) reveals that $Y_2 = Y_1 - DEF$, where DEF is the general government deficit. Consequently an equation

$$C = a_1 Y_2 + a_2 DEF + a_3 Z,$$

where Z is a vector of other explanatory variables, is a simple linear transformation of the equation

$$C = b_1 Y_1 + b_2 DEF + b_3 Z.$$

With regard to the estimated coefficients, it will be the case that

$$b_1 = a_1; \quad b_2 = a_2 - a_1 \quad \text{and} \quad b_3 = a_3.$$

V. Additional Empirical Work

In this section, results are presented based on specification which allows a better discrimination between alternative models of consumer behavior. These are the key empirical results among those presented in this paper. As before, the focus is the impact on national savings of alternative types of fiscal actions. The basic equation is that of Section IV, in which 1/:

$$C = a_0 + a_1Y + a_2W_{-1} + a_3G + a_4T + a_5TF + a_6D_{-1} \quad (3)$$

As noted earlier, under full Ricardian equivalence, changes in taxation do not affect consumption for a given level of government spending ($a_4 = 0$) while the pure life cycle hypothesis would imply that the coefficient on taxation be equal in magnitude and opposite in sign to that on income ($a_4 = -a_1$) 2/. Complete Ricardian equivalence would suggest that transfer payments do not influence consumption, for a given level of government spending ($a_5 = 0$). While the pure life cycle model might suggest $a_5 = a_1$, since transfers are essentially negative taxes, a version of the life cycle model incorporating short-run liquidity constraints on the part of recipients of government transfers would indicate that a_5 might be greater than a_1 . Alternatively a_5 could exceed a_1 because of the influence of the social security system, a result which would be consistent with the life cycle model. Finally, under Ricardian equivalence, households do not view government debt as wealth, ($a_6 = 0$), whereas the pure life cycle hypothesis would imply that the coefficient on wealth held in the form of government debt be similar in magnitude to that on other forms of wealth.

The empirical results are presented in Table 2. In all equations, household net worth is disaggregated into three components--corporate

1/ The dependent variable C is pure consumption (consumer expenditures on nondurable goods and services, plus the imputed income on and service stream from the stock of household consumer durables), as defined in the Federal Reserve MPS econometric model. All variables other than government spending are deflated by the deflator for pure consumption and by population; the deflation of G--a subject of controversy in this literature--is dealt with in the footnotes to the table presenting results. Notation is as follows: C = pure consumption; Y = net national product; W = household wealth, excluding government debt; G = government spending on goods and services; T = government revenues; TF = government transfers to persons; D = government debt to households.

2/ Assuming that tax changes are viewed as permanent, in the sense that they are not expected to be reversed within the current generation's lifetime.

Table 2. United States: Additional Consumption Equations 1/ 2/

Equation Number	$W_{-1}-D_{-1}$															R ⁻²	SEE	DW
	NNP	NNP ₋₁	T	T ₋₁	TF	TF ₋₁	-CE ₋₁	CE ₋₁	D ₋₁	G	G ₋₁	GNM	GNM ₋₁	GMIL	GMIL ₋₁			
1.	0.38 (7.2)	0.15 (1.7)	-0.42 (2.9)	-0.09 (0.6)	0.96 (3.2)	0.25 (0.8)	0.042 (4.8)	0.032 (3.1)	0.38 (9.3)	-0.041 (0.2)	0.31 (1.6)	--	--	--	--	0.999	0.038	2.94
2.	0.38 (7.4)	0.18 (2.0)	-0.40 (2.8)	-0.13 (0.8)	1.01 (4.0)	0.31 (0.9)	0.040 (4.6)	0.032 (3.1)	0.38 (9.3)	-0.12 (0.8)	0.28 (1.8)	--	--	--	--	0.999	0.037	2.95
3.	0.38 (5.9)	0.15 (1.6)	-0.42 (2.7)	-0.09 (0.5)	0.98 (2.6)	0.24 (0.7)	0.042 (2.8)	0.032 (2.9)	0.37 (6.2)	--	--	-0.04 (0.1)	0.28 (0.7)	-0.05 (0.2)	0.32 (1.3)	0.999	0.040	2.95

1/ The dependent variable was real per capita pure consumption (consumer spending on nondurable goods and services, plus the estimated income on and service stream from the stock of household consumer durables) with data taken from the MPS model data bank. The independent variables were deflated by the implicit deflator for pure consumption and population, except for government spending variables (discussed in footnote 2). Data were annual from 1958-1987. Notation as follows: NNP = net national product; T = government revenue (federal, state and local); TF = government transfers to persons; W = household net worth; CE = the corporate equity component of W; D = the government debt component of W; G = government spending (federal, state and local) on goods and services; GNM = government spending on goods and services excluding military; GMIL = federal military spending. Constant not reported. Equations were estimated by OLS using version 1.11 of the AREMOS package supplied by Wharton Econometrics. Data were the latest available U.S. national accounts and wealth data as of September 1988. A data appendix is available from the authors on request.

2/ In equation 1, G is nominal government spending deflated by the pure consumption deflator and population; in equation 2, G is real government spending deflated by population. In equation 3, government spending variables are deflated by the pure consumption deflator and population.

equities, government debt and the remainder. 1/ The first and second equations differ only in the choice of deflator for government spending on goods and services while the third equation separates government spending on goods and services between military spending and the remainder. 2/

The results in Table 2 tend uniformly to reject Ricardian equivalence. First, the estimated coefficients on the tax variable are significantly different from zero in all three equations; in fact the sum of the current and lagged coefficients on the tax variables is insignificantly different in absolute value from the sum of the current and lagged income coefficients in all three equations--a result implied by the pure life cycle hypothesis. Second, the coefficients on transfer payments are positive and significant. Their magnitude may suggest the existence of Keynesian liquidity constraints, contrary to both pure Ricardian equivalence and the pure life cycle hypothesis, or could reflect an effect of the social security system, consistent with the life cycle hypothesis. Third, the coefficient on the government debt component of household wealth is positive and significant in all three equations, and in fact consistently exceeds the coefficients on other forms of wealth by a wide margin. Finally, the coefficients on government spending on goods and services are not particularly informative, as their sum is relatively small and not statistically significant at the 5 percent level, with current government spending exerting a negative effect and lagged spending a positive effect.

In sum, the results presented in Table 2 not only suggest that the polar proposition of pure Ricardian equivalence does not seem to hold, but also indicate that zero adherence to Ricardian equivalence may be the best working assumption. This result was achieved in a framework amenable to either polar result, or to an intermediate outcome. While empirical results are inevitably tentative and potentially subject to methodological criticism, the results just presented constitute relatively strong evidence against Ricardian equivalence.

1/ The separate treatment of corporate equities is a common feature of empirically estimated aggregate consumption functions. See for example Brayton and Mauskopf (1985) and Evans (1988).

2/ The appropriate sign of the coefficients on government spending is not clear, a priori, since it depends on whether that spending substitutes for or is complementary with private spending. Military spending was separated in equation (3) to test the validity of the view that its substitutability/complementarity characteristics might be distinct from those of non-military spending.

VI. Simulations with a Macro-Economic Model

As a final check on the empirical results presented in the previous section, simulations examining the effect of alternative fiscal measures on national saving were conducted, using a complete macro-econometric model of the U.S. economy. The framework employed has properties broadly consistent with the results developed in the previous section. The model--the Washington University Macromodel (WUMM) ^{2/}--is a quarterly econometric model of the U.S. economy, comprising 350 equations, and is explicitly designed to exhibit short-run Keynesian properties--so that short-term macro-economic fluctuations are driven by aggregate demand--while in the long run the model behaves like a neo-classical growth model. In particular, the model incorporates consumption equations based on the life cycle model.

In the equation for pure consumption--consumer spending on nondurables and services plus the estimated service stream on durable goods--the long-run propensity to consume out of disposable labor income is 0.65, while that out of transfer income is 0.86, reflecting income constraints on the part of transfer recipients. The estimated long-run consumption propensity out of household common stock holdings is 0.052, while the corresponding propensity for the remainder of household net worth is 0.097. The properties of the consumption sector of the model reflect its life cycle foundations, with a modification to allow for liquidity constraints on the part of transfer recipients. There is no allowance for Ricardian equivalence effects, as disposable income is taken as the income variable, with taxes subtracted directly from personal income, while household holdings of government securities are treated as part of net worth. The structure of the consumption sector of the WUMM model is consistent with the empirical results presented in the previous section, which indicated an absence of Ricardian effects and suggested an approach based on the life cycle model with an allowance for binding income or liquidity constraints.

In the context of the theoretical framework presented earlier, the structure of the model assumes either that government spending on goods and services is not valued by households, or that such spending enters the utility function in such a way as to be separable from private consumption. Thus changes in government spending exert influence only through income effects. In the simulations discussed below, tax and transfer changes are assumed to be permanent, in the sense that a tax increase or transfer cut yields an income reduction which is not expected to be reversed within the lifetimes of the population currently alive.

The baseline projections, which cover the period from 1987 to 1996, are broadly consistent with the medium-term projections for the United

^{2/} Developed and maintained by Laurence H. Meyer and Associates. See Laurence H. Meyer and Associates (1988).

States prepared in the context of the summer 1988 IMF World Economic Outlook exercise (IMF, 1988) though the time horizon here is several years longer; real GNP grows by 2 1/2-2 3/4 percent annually in the baseline, while inflation remains moderate, and the economy remains close to full employment. In the three alternative scenarios, simulations are conducted examining the effects of three different sets of fiscal measures--relating to personal taxation, transfer payments, and government spending on goods and services. In each case, the simulated fiscal measure was in the direction of curbing the fiscal deficit, amounted to \$20 billion in 1988, and was maintained constant in real terms over the simulation period. ^{1/} The results are presented in Table 3.

In the short-run, the national saving effects of all three kinds of fiscal cuts are negative, reflecting the initial effects of the cuts on economic activity. Over the medium-term, the effects of the fiscal cuts on economic activity taper off and then reverse. The level of real GNP has rebounded to exceed its baseline level by 1991 in the cases of cuts in transfer payments and government spending on goods and services, and by 1992 in the case of tax increases. By 1993, the national savings effects of all three types of fiscal measures are essentially equivalent at just below 0.1 percent of baseline GNP, while by 1996 the national savings effects remain essentially equivalent, a little above 0.1 percent of GNP.

Given possible sensitivity of the results to the choice of model employed and to the specification of the baseline against which the shocks are calibrated, the simulations should be regarded as only illustrative. Nevertheless, they confirm that--in a model based on the Keynesian/neoclassical synthesis and not embodying Ricardian equivalence effects--the effects on national saving of alternative fiscal measures, such as tax increases versus cuts in spending, appear broadly equivalent over the medium-term. According to the empirical evidence presented in the previous section, just such a model seemed to be supported by the data.

^{1/} The ex ante fiscal cuts amounted to 0.42 percent of baseline GNP in 1988, declining to 0.34 percent of baseline GNP by 1996, the terminal year.

Table 3. Effects on Savings of Alternative Fiscal Measures 1/
(In percent of GNP, deviations from baseline)

	1988	1990	1993	1996
Personal saving				
Tax shock <u>2/</u>	-0.26	-0.26	-0.29	-0.30
Transfer shock <u>3/</u>	-0.15	-0.18	-0.19	-0.25
Spending shock <u>4/</u>	-0.12	-0.20	-0.19	-0.22
Private saving				
Tax shock <u>2/</u>	-0.34	-0.29	-0.32	-0.35
Transfer shock <u>3/</u>	-0.30	-0.23	-0.27	-0.34
Spending shock <u>4/</u>	-0.29	-0.25	-0.27	-0.32
General government balance				
Tax shock <u>2/</u>	0.27	0.30	0.40	0.48
Transfer shock <u>3/</u>	0.14	0.22	0.36	0.44
Spending shock <u>4/</u>	0.12	0.23	0.36	0.44
National saving				
Tax shock <u>2/</u>	-0.07	0.01	0.08	0.13
Transfer shock <u>3/</u>	-0.16	-0.01	0.09	0.11
Spending shock <u>4/</u>	-0.17	-0.02	0.09	0.12

1/ In each case, the fiscal shock amounted to 0.4 percent of GNP (revenue increase or spending cut) implemented in 1988 and maintained constant in real terms. The results are presented as deviations from baseline relative to baseline nominal GNP.

2/ A lump-sum increase in personal taxation equivalent to 0.4 percent of GNP in 1988 was implemented for purposes of simulation. This could be envisaged as a curbing of certain personal tax preferences.

3/ Transfer payments to persons were cut by 0.4 percent of GNP beginning in 1988.

4/ Government spending on goods and services was cut by 0.4 percent of GNP beginning in 1988.

VII. Conclusion

This paper has examined a variety of issues related to the potential differential effects of alternative fiscal measures on national saving in the United States. The examination was prompted by the suggestion that, although the polar proposition of Ricardian equivalence might not apply, the empirical realities of the U.S. economy might support a 75 percent version of Ricardian equivalence.

An extensive examination of alternative theoretical structures was presented, indicating inter alia that Ricardian equivalence appeared to depend on strict and perhaps overly simplistic assumptions and that the nature of the impact of alternative fiscal measures on national saving could vary substantially depending on the spending or revenue category under consideration and its relationship to private budget constraints and utility functions.

Empirical studies with a bearing on the Ricardian equivalence debate--including those related to the existence of liquidity constraints, the possible effects of the social security system, the magnitude of intergenerational transfers in the United States and direct tests of Ricardian equivalence through estimation of consumption equations--were then surveyed. The bulk of the evidence did not appear to support the polar proposition of Ricardian equivalence.

The earlier paper which had given rise to the 75 percent Ricardian equivalence proposition was then re-examined. That paper presented two alternative specifications--one based on Ricardian assumptions and the other on more traditional assumptions--and found that U.S. data was unable to discriminate between the alternatives. In particular, while the Ricardian specification supported 75 percent Ricardian equivalence, the results under the traditional specification found no support for the equivalence hypothesis. Consequently, little light was in fact shed on the issue at hand. When the approach employed in that paper was examined further, a problem was found in the methodology, undermining the usefulness of the approach adopted.

Subsequently, an alternative empirical specification was adopted with a view to obtaining a more definitive outcome. The results provide the key empirical evidence in this paper and suggest that the U.S. economy may be closer to the polar alternative of zero Ricardian equivalence than to that of complete equivalence. Specifically, they indicate that households regard increases in taxation as reductions in income while transfer payments are viewed as part of income. Moreover, government debt is viewed as a component of net worth.

In the final section of the paper, simulations were conducted based on a complete econometric model of the U.S. economy. The model exhibits short-run Keynesian behavior and long-run neoclassical properties, and incorporates household consumption behavior based on the life cycle model, and embodying zero Ricardian equivalence together with liquidity

constraints on the part of transfer recipients. While the simulation results were necessarily only illustrative, they indicated that in a model of this nature tax increases, cuts in transfer payments, and reductions in government spending on goods and services were likely to be broadly equivalent in terms of the effect on national saving.

In sum, there seems to be little theoretical presumption in favor of Ricardian equivalence and indeed empirical evidence on U.S. data appears consistent with zero Ricardian equivalence. Thus, while there may be other reasons for preferring one approach or the other in choosing ways to address the fiscal imbalance in the United States, the evidence suggests that tax increases, reductions in transfer payments, and cuts in government spending on goods and services would not be very different in terms of their effects on national saving.

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