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Box 2125, Yale Station
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Willem Buiter and James Tobin

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Willem Buiter and James Tobin

Willem Buiter, Assistant Professor, Princeton University
James Tobin, Sterling Professor Economics, Yale University

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I. Historical Perspectives

The influence on the consumption-investment mix of alternative methods of financing a given volume of government spending has been a subject of debate since Adam Smith [1776] and David Ricardo [1817, 1820]. In recent years, under the rubrics of "debt neutrality" and "ultrarationality" the issues are restated as "Are government bonds net wealth?" and "Are future taxes anticipated by consumers?" (David and Scadding [1974], Kochin [1974], Carlson and Spencer [1975], Barro [1974, 1976, 1977], Buchanan [1976], Feldstein [1976], Buiter [1977]).

The "new classical macroeconomics" gives some dramatic answers to these questions. The effect of government, it says, is fully measured by the size and content of real government spending, regardless of how this spending is financed. Thus the Modigliani-Miller theorem for corporate finance is extended from the household sector vis-à-vis the corporate sector to the private sector as a whole vis-à-vis the public sector. (Modigliani and Miller [1950], Stiglitz [1969, 1974]). An important recent statement of this theorem for public sector financing is by Barro [1974]. Less formal statements can be found in the popular writings of Milton Friedman. "The total tax burden on the American people is what the government spends, not those receipts called "taxes." Any deficit is borne by the public in the form of hidden taxes--either inflation or the even more effectively hidden tax corresponding to borrowing from the public." (Friedman [1978]). James Buchanan [1976] has referred to the alleged neutrality of public sector financing as the "Ricardian Equivalence Theorem."

It is true that Ricardo stated the argument with characteristic clarity. He also added important qualifications, however, and concluded, almost passionately, that deferment of taxes by internal borrowing is bad fiscal policy. Ricardo, like Adam Smith before him, argued that given the volume and composition of what would today be called "exhaustive" public spending, taxes reduce mainly current consumption while internal borrowing results in reduced saving and private capital formation. He thus refuted rather than upheld the notion that the form of financing is irrelevant.[1/] In fact, after giving a clear statement in his Principles of the "Ricardian equivalence theorem," Ricardo proceeds to deny emphatically its validity. His grounds were partly what is now called "public debt illusion" (Vickrey [1961]), and partly his fear that expectations of future taxes would induce evasive behavior, even including emigration. Here are the master's own words, first stating the equivalence theorem:

> "When, for the expenses of a year's war, twenty millions are raised by means of a loan, it is the twenty millions which are withdrawn from the productive capital of the nation. The million per annum which is raised by taxes to pay the interest of this loan, is merely transferred from those who pay it to those who receive it, from the contributor to the tax, to the national creditor. The real expense is the twenty millions, and not the interest which must be paid for it. Whether the interest be or not be paid, the country will be neither richer nor poorer. Government might at once have required the twenty millions in shape of taxes, in which case it would not have been necessary to raise annual taxes to the amount of a million."[2/]

In "Funding System" Ricardo [1820] also makes the point, since reformulated by Barro [1974], that the intergenerational redistribution of income associated with a switch from tax financing to borrowing, could be neutralized by offsetting changes in voluntary intergenerational gifts and bequests (italics added):

> "It would be difficult to convince a man possessed of 20,000 £. or any other sum, that a perpetual payment of 50 £. per annum was equally burdensome with a single tax of 100 £. He would have some vague notion that the 50 £. per annum would be paid by posterity, and would not be paid by him; but if he leaves his fortune to his son, and leaves it charged with this perpetual tax, where is the difference whether he leaves him 20,000 £., with the tax, or 19,000 £. without it?"3/

Having thus stated the equivalence theorem, Ricardo quickly proceeds to deny its validity: "That an annual tax of 50 £. is not deemed the same in amount as 1,000 £. ready money, must have been observed by everybody."4/ One of the reasons given is public debt illusion,

> ". . . it must not be inferred that I consider the system of borrowing as the best calculated to defray the extraordinary expenses of the state. It is a system which tends to make us less thrifty--to blind us to our real situation. If the expenses of a war be 40 millions per annum, and the share which a man would have to contribute towards that annual expense were 100 pounds, he would endeavor, on being at once called upon for this portion, to save speedily the 100 pounds from his income. By the system of loans, he is called upon to pay only the interest of this 100 pounds, or 5 pounds per annum, and considers that he does enough by saving this 5 pounds from his expenditure, and then deludes himself with the belief that he is as rich as before. The whole nation, by reasoning and acting in this manner, save only the interest of 40 millions, or two millions,"5/

Evasive behavior, to the point of emigrating in order to avoid the continuing stream of taxes is given as another argument against borrowing:"

> ". . . it becomes the interest of every contributor to withdraw his shoulder from the burthen and to shift this payment from himself to another; and the temptation to remove himself and his capital to another country, where he will exempted from such burthens, becomes at last irresistible, and overcomes the natural reluctance which every man feels to quit the place of his birth, and the scene of his early associations."6/

Finally, to leave no room for any doubt about his feelings on the subject, he concludes:

> "It must, however, be admitted, that during peace, our unceasing efforts should be directed towards paying off that part of the debt which has been contracted during war; and that no temptation of relief, no desire of escape from present, and I hope temporary distresses, should induce us to relax in our attention to that great object."7/

This excursion into the early history of economic thought leads us to conclude that the "Neo-Ricardian Equivalence Theorem" should be re-labeled the "Non-Ricardian Equivalence Theorem" and Ricardo's doctrine relabelled the "Ricardian Non-Equivalence Theorem."

In the last thirty years, the issue of the differential incidence of tax financing and borrowing has resurfaced a number of times. Until the burden-of-the-debt controversy which followed the publication of James Buchanan's Public Principles of Public Debt in 1958, post-World War II economists generally agreed with the "equivalence theorem." At least they agreed to it as applied to fully employed economies. A country fights and pays for a war with current resources. This burden cannot be postponed by borrowing internally. This went along with a clear distinction between internal debt--"we owe it to ourselves"--and external debt.

There never has been any serious argument about the burden of the external debt in an economy with full employment. In the short run, the ability to borrow abroad, i.e. to run a current account deficit, enables a country to absorb more resources than it currently produces. Such borrowed real resources can be used to boost current consumption, public or private, or can be devoted to public or private capital formation. In the case of a consumption loan a real burden is placed on the future, when current account surpluses will have to be generated in order to service and repay the overseas debt. If the current account deficit is devoted to domestic capital formation, future generations will be better off if the social rate return on the additional domestic investment exceeds the marginal cost of foreign borrowing, worse off if the opposite

holds. To the extent that, in long-run equilibrium, rates of return are equalized between countries joined by well-functioning financial markets, foreign borrowing cannot enhance future consumption possibilities.

But as regards internally held debt, popular concern about the debt burden on future generations was considered a naive fallacy. This classical doctrine was conveniently married to Keynesianism. The "functional finance" doctrine associated with Abba Lerner [1943, 1946] downgraded the debt burden. The only purpose of taxation--and one which it was deemed capable of achieving--was to control private spending, mainly consumption spending, so as to achieve the right amount of aggregate demand and avoid inflation at full employment. The marriage produced somewhat inconsistent views of the long-run and the short-run effects of borrowing. Lerner et al. seemed to say that the debt stock did not substitute for the capital stock in the long run, but that saving was absorbed in the short run by public sector deficits financed by bond issue.

Also during the 1940's a debate began about the proper base for the real balance effect proposed by Gottfried Haberler [1941] and Arthur C. Pigou [1943, 1947] and elaborated by James Tobin [1947, 1952], Don Patinkin [1948, 1955] and John G. Gurley and Edward S. Shaw [1960]. Exactly the same issue was involved as in the debt neutrality debate: Does the base for the wealth effect include only base money? all nominal public debt? any nominal debt? nothing? In his 1948 paper, Don Patinkin argues that (the base) ". . . clearly consists of the net obligation of the government to the private sector economy. That is, it consists primarily of the total interest--and non-interest-bearing government debt held outside the treasury and the central bank, plus the net amount owed by the central bank, plus the net amount owed by the central bank to member banks."[8/] Shortly afterwards, in a discussion of the wealth effect in private con-

sumption, Tobin questioned the full inclusion of interest-bearing public debt in net private wealth (Tobin [1952]).

> "How is it possible that society merely by the device of incurring a debt to itself can deceive itself into believing that it is wealthier? Do not the additional taxes which are necessary to carry the interest charges reduce the value of other components of private wealth? There certainly must be effects in this direction."9/

Reasons mentioned for the incompleteness of the offset included: the government's option of paying the interest on its debt not by taxes but by incurring further debt and the effect of the creation of public debt on the distribution and composition of private wealth, especially with regard to liquidity.

The "burden of the debt" controversy of the late 1950's and 1960's concerned the long-run effects of substitution of borrowing for tax financing, the same issue that Ricardo had addressed: Does public debt diminish private demand for private financial claims and for stocks of real reproducible capital? Can the burden of current exhaustive government spending be shifted to future generations? The major protagonists were Buchanan [1958, 1964], Meade [1958], Bowen, Davis and Kopf [1960], Vickrey [1961], Modigliani [1961], Mishan [1963], Ferguson [1964] and Thompson [1967]. In this debate Buchanan and some others objected both to classical neutrality doctrine and to functional finance in any form. But they seemed to define burden as compulsory payment--debt purchases are voluntary, tax payments are not--and thus their claim that the burden was postponable was almost tautological. The main area of controversy was clarified by the "neoclassical synthesis" (see e.g. Samuelson [1951, 1955]), applied to the debt controversy most notably by Modigliani [1961]. It focussed attention on the central issue, whether and how public debt absorbs saving permanently and thus reduces the long-run capital stock.

In 1965 Diamond [1965] first applied the overlapping generations model developed by Samuelson [1958] to the analysis of the longer-run effects of public debt on capital formation. He also considered the consequences of overseas borrowing by the public sector. His model did not permit private domestic agents access to international capital markets. This part of his analysis therefore has limited applicability to developed market economies integrated into an international financial system. Less developed countries where the government is the sole agent with international credit-worthiness are more closely approximated by the open economy Diamond model. This is an area that deserves further research.

A considerable amount of further theoretical work has built on the closed overlapping generations growth model (e.g. Cass and Yaari [1967], Feldstein [1974, 1976a, 1976b], Barro [1974, 1976], Buiter and Tobin [1978a]).

Empirical work on debt neutrality has been scant; some recent contributions are reviewed in the next section. One area that has long attracted interest and continues to be investigated in depth is the effect of social security on private and national saving. (Feldstein [1974], Munnell [1974, 1976], Barro [1977]). An unfunded, "pay-as-you-go" social security scheme is a tax-transfer scheme that redistributes income between working and retired people. Its effect on saving and the long-run capital stock is governed by the same considerations as the effect of a change in the government's borrowing-taxation mix. On these issues the new classical macroeconomics, as exemplified by Barro [1974] and by Miller and Upton [1974], has a striking and extreme view: Voluntary private intergenerational transfers can and will offset the involuntary public intergenerational transfers associated with public

borrowing and social security. The private transfers negate any effects of public debt and social security on aggregate saving and the long-run capital stock. The most vocal opponent of this view is again James Buchanan (Buchanan and Wagner [1977]). Unfortunately their sweeping condemnation of deficit finance--which they represent as the major source of most our current economic ills--is not complemented by a tightly reasoned economic analysis of the sources of non-equivalence.

Elsewhere in these volumes we seek to make clear again what seemed obvious to Ricardo 150 years ago (Buiter [1978], Tobin-Buiter [1978]). Here we turn to empirical findings adduced by proponents of "Ricardian" equivalence. We find that empirical evidence better supports Ricardo's final judgment.

II. Empirical Findings Relevant to the Debt-Neutrality Issue

Very little empirical research has been addressed directly to the debt-neutrality issue. In a paper by Kochin [1974] some simple consumption functions are estimated that include the Federal budget deficit as one of the explanatory variables. A paper by David and Scadding [1974] analyzes "Denison's Law" [1958], the proposition that the gross private savings ratio (GPSR) for the U.S.A. has been very stable. While this phenomenon is different from debt-neutrality, the authors' interpretation of GPSR stability as reflecting "ultra-rational" behavior is germane to the debt-neutrality issue.

Finally, a fairly sizeable volume of research, while not addressed directly to the debt-neutrality issue, nevertheless has important implications for it. Recent work by Feldstein [1974, 1976b], Munnell [1974] and Barro [1977] on the relation between social security and private saving extends earlier research in this area by Katona [1960, 1965], Cagan [1965], Taylor [1971] and Juster and Wachtel [1972]. These three bodies of empirical research will be discussed in turn.

Are Government Deficits Equivalent to Current Taxes?

To test the hypothesis that government deficits are equivalent to explicit current taxes, Kochin [1974, p. 391] estimated the equations given below:

$$\underset{}{CND} = \underset{(1.81)}{5.56} + \underset{(3.79)}{0.283}\,YD - \underset{(2.56)}{0.224}\,FDEF + \underset{(5.12)}{0.643}\,CND_{-1} \qquad (1)$$

$R^2 = 0.9989$; SE = 2.23; DW = 0.680; Annual data 1952-1971.

$$\Delta CND = \underset{(3.44)}{2.88} + \underset{(7.86)}{0.392}\ \Delta YD - \underset{(2.95)}{0.109}\ \Delta FDEF + \underset{(2.42)}{0.218}\ \Delta CND_{-1} \qquad (2)$$

$R^2 = 0.892$; SE = 1.26; DW = 1.79; Annual data 1952-1971.

CND denotes consumer expenditures on non-durables and services. YD is personal disposable income and FDEF the Federal deficit. Each variable is deflated by the implicit price index for consumption expenditures.

Kochin finds that the significant negative coefficient of FDEF supports the debt-neutrality thesis. However, they do not support its strict and strong form, because they are smaller in absolute value than the coefficient of YD (markedly so in the second equation). In any case, a number of econometric and economic objections can be made to Kochin's regressions.

1. First, there are familiar problems of simultaneity and identification. In cyclical fluctuations, consumer spending, disposable income and the federal surplus all move together. The critical experiment of substituting disposable income for federal surplus is seldom performed. So it is difficult to estimate the separate YD and FDEF effects. Moreover, a high propensity to spend means a buoyant economy and a low deficit, reverse causation which Kochin's regressions do not screen out. Kochin attempts to solve this problem by using the full-employment deficit, in equations not reported here. But this is for other reasons quite inappropriate. Except at full employment, the full employment deficit does not provide a measure of the present value of the future taxes required to service the debt issued.

2. Why is only the Federal deficit considered equivalent to current taxes? The claim that households internalize public debts is surely more credible for state and local governments. They are subject to legal and economic debt limits; they cannot print money; there are

fairly direct links between their outlays, including debt service, and their tax levies.

3. If the household sector subsumes the public sector under its own behavior, we can surely expect it to do the same for the corporate sector. Private disposable income, inclusive of corporate retained earnings, rather than personal disposable income should be entered as an argument in (1) and (2).

4. Kochin apparently views spending on consumer durables as a form of saving; this accounts for his choice of CND rather than personal consumption expenditures as the dependent variables in his regressions. Conceptually the proper dependent variable is consumption, including imputed services from durables. The excess of the value of these services over depreciation of the stock should be imputed as income and added to the National Income Accounts calculation of disposable income.

5. It is probably better to specify the consumption function in per capita terms.

6. The two regressions differ in economic substance as well as in their assumptions about the serial dependence of errors. The second implies a time trend in CND, absent in the first.

Kochin's investigation was motivated by his observation that unusually high saving rates occurred in the late 1960's and early 1970's when the Federal deficit was high. His results, whatever their econometric merits, are dramatically altered when the years 1972-76 are added to the sample. Personal saving definitely did not adjust to offset the Federal budget deficits run in 1975 and 1976.

Probably owing to data revisions for his sample period, we were unable to duplicate exactly the results obtained by Kochin. Our equations (1a) and (2a) are Kochin's specifications using the data provided in the 1978 Economic Report of the President.[10/]

$$CND = \underset{(1.26)}{4.504} + \underset{(3.45)}{0.2498}\ YD - \underset{(2.43)}{0.1781}\ FDEF + \underset{(6.94)}{0.6981}\ CND_{-1} \qquad (1a)$$

$R^2 = 0.999$; $\bar{R}^2 = 0.999$; SE = 2.66; DW = 1.21; Annual data 1952-1971.

$$\Delta CND = \underset{(2.55)}{4.069} + \underset{(5.20)}{0.355}\ \Delta YD - \underset{(1.85)}{0.086}\ \Delta FDEF + \underset{(2.10)}{0.268}\ \Delta CND_{-1} \qquad (2a)$$

$R^2 = 0.823$; $\bar{R}^2 = 0.790$; SE = 2.28; DW = 2.17; Annual data 1952-1971.

Adding the years 1972-1976 to the sample has the result, hardly surprising in the light of the high spending propensities and deficits of recent years, of depriving the Federal deficit of all explanatory power, as shown in equations (1b) and (2b).

$$CND = \underset{(1.97)}{7.503} + \underset{(5.41)}{0.381}\ YD + \underset{(0.26)}{0.018}\ FDEF + \underset{(5.25)}{0.516}\ CND_{-1} \qquad (1b)$$

$R^2 = 0.999$; $\bar{R}^2 = 0.999$; SE = 3.97; DW = 1.41; Annual data 1949-1976.

$$\Delta CND = \underset{(2.13)}{4.639} + \underset{(5.98)}{0.406}\ \Delta YD - \underset{(0.60)}{0.035}\ \Delta FDEF + \underset{(1.54)}{0.195}\ \Delta CND_{-1} \qquad (2b)$$

$R^2 = 0.697$; $\bar{R}^2 = 0.657$; SE = 4.18; DW = 1.83; Annual data 1950-1976.

To correct the specifications and statistical procedures, we modified Kochin's original equation in three ways. First, the equation was

specified in per capita terms.[12/] Second, the total public sector deficit rather than just the Federal deficit was used. Third, the business sector was subsumed under the household sector. Let y denote per capita real national income, g per capita purchases of goods and services by governments (Federal, state and local), gdef the real per capita public sector deficit and t real per capita taxes net of transfers. (gdef ≡ g - t). The appropriate per capita real income concept is y - t - gdef = y - g, if, from the point of view of the private sector, public sector deficits are equivalent to current taxes. We test the hypothesis that y, t and gdef have the same coefficients. Both real per capita consumption spending on non-durables and services, cnd, and total real per capita consumer expenditures, c, are used as dependent variables. The results are presented in equations (3) through (8), using annual data for 1949 through 1976.

$$\underset{\quad(1.57)}{\text{cnd} = -133.139} + \underset{(4.43)}{0.224\ y} - \underset{(1.30)}{0.337\ t} - \underset{(1.04)}{0.254\ \text{gdef}} + \underset{(13.46)}{0.798\ \text{cnd}_{-1}} \qquad (3)$$

$R^2 = 0.998$; $\bar{R}^2 = 0.998$; SE = 19.34; SSR = 8604.21; DW - 1.73.

$$\underset{\quad(1.38)}{\text{cnd} = -114.730} + \underset{(4.64)}{0.192\ y} - \underset{(0.98)}{0.239\ g} + \underset{(14.81)}{0.821\ \text{cnd}_{-1}} \qquad (4)$$

$R^2 = 0.998$; $\bar{R}^2 = 0.998$; SE = 19.42; SSR = 9050.40; DW = 1.78

$$\underset{\quad(4.48)}{\text{cnd} = -97.002} + \underset{(6.11)}{0.186\ (y-g)} + \underset{(20.68)}{0.813\ \text{cnd}_{-1}} \qquad (5)$$

$R^2 = 0.998$; $\bar{R}^2 = 0.998$; SE = 19.05; SSR = 9068.78; DW = 1.75.

$$c = -218.806 + 0.424\ y - 0.682\ t - 0.496\ gdef + 0.652\ c_{-1} \qquad (6)$$
$$\quad\ (1.26)\ \ (4.05)\ \ \ (1.26)\ \ \ (0.99)\ \ \ \ (6.24)$$
$$R^2 = 0.995;\ \bar{R}^2 = 0.994;\ SE = 40.23;\ SSR = 37218.90;\ DW = 1.44$$

$$c = -156.242 + 0.352\ y - 0.408\ g + 0.682\ c_{-1} \qquad (7)$$
$$\quad\ (0.932)\ (4.03)\ \ \ (0.82)\ \ \ (6.63)$$
$$R^2 = 0.995;\ \bar{R}^2 = 0.994;\ SE = 40.63;\ SSR = 39621.50;\ DW = 1.51$$

$$c = -135.697 + 0.345\ (y-g) + 0.673\ c_{-1} \qquad (8)$$
$$\quad\ (2.97)\ \ (5.08)\ \ \ \ \ \ (9.04)$$
$$R^2 = 0.995;\ \bar{R}^2 = 0.994;\ SE = 39.82;\ SSR = 39648.50;\ DW = 1.50$$

Equations (3) - (8) indicate that the debt-neutrality hypothesis is not supported for either consumption spending on non-durables and services or total consumer spending. In equations (4) and (7), the coefficient on g has the "right" sign but is insignificantly different from zero. In equations (3) and (6) both t and gdef have the right signs but are statistically insignificant. Accurate estimation of the coefficients on y, t, gdef and g is complicated by considerable collinearity among these variables as shown by the matrix of partial correlation coefficients below:

Correlation matrix for y, t, gdef and g;

	y	t	gdef	g
y	1.00			
t	0.91	1.00		
gdef	0.38	-0.03	1.00	
g	0.99	0.88	0.44	1.00

Annual data, 1948-1976.

The lack of statistical significance of the variables that should reflect the presence or absence of debt neutrality [g and gdef] is reflected in our inability to reject the hypothesis that the coefficients on y, -t and -gdef are the same, at the 5% or 1% level of significance. This holds both when cnd is the dependent variable [equation (3) vs. (5)] and when c is the dependent variable [equation (6) vs. (8)]. The hypotheses that t and gdef have the same coefficients [equation (3) vs. (4) or equation (6) vs. (7)] and that y and g have the same coefficients [equation (4) vs. (5) or equation (7) vs. (8)] similarly cannot be rejected. This gives scant comfort to proponents of debt neutrality, however; the coefficients of g and gdef are statistically insignificantly different from zero, and therefore also differ insignificantly from values close to zero.

Success, as measured by high R^2, significant t-statistics, and an acceptable Durbin-Watson statistic, is cheap in aggregage time series analysis. This should be kept in mind when evaluating the significance of the "successful" equations (5) and (8). The simplest Keynesian consumption function is estimated in (9), in which yd denotes real per capita personal disposable income.

$$c = \underset{(4.53)}{123.431} + \underset{(100.44)}{0.875}\ yd \qquad (9)$$

$R^2 = 0.997$; $\bar{R}^2 = 0.997$; SE = 27.01; SSR = 18970.00; DW = 1.47;[13/]
Annual data 1949-1976.

In terms of conventional statistical criteria, (9) (and its first-order autocorrelation-corrected version) is preferable to (8). For nondurables and services, permanent disposable income[14/] in equation (10) also performs as well as the corresponding debt-neutral specification (5).

$$cnd = \underset{(1.28)}{31.747} + \underset{(6.39)}{0.369}\ yd + \underset{(6.46)}{0.528}\ cnd_{-1} \qquad (10)$$

$R^2 = 0.998$; $\bar{R}^2 = 0.998$; SE = 18.52; SSR = 8577.87; DW = 1.51;
Annual data 1949-1976

The Stability of the Private Savings Rate

David and Scadding [1974] draw attention to the historical stability in the U.S. of the ratio, GPSR, of gross private saving to GNP. The explanation, they say, is what they call "ultra-rationality." However, their "ultra-rationality" is by no means the same rationality invoked by proponents of public debt neutrality. The debt-neutrality proposition relates to the stability of social saving (private + public) as a function of social wealth or permanent social real income. A stable private savings ratio, in conjunction with significant variation in the public savings ratio, is inconsistent with the debt-neutrality proposition. David and Scadding impute to private savers quite a different interpretation of the meaning of shifts between taxes and debt in the financing of public expenditure. They say:

> "(The) regularity in the GPSR . . . is not the result of constant sectoral savings propensities, of a stable distribution of output between the public and the private sectors, and, within the latter, of a stable division of income between the corporate and household sectors. . . . First there has been a shift in the composition of private saving away from personal saving to corporate saving and expenditure on consumer durables. Second, the total of private saving has been almost totally insensitive to the share of output absorbed by the public sector, given the level of output. . . . [The second point] implies a high degree of substitutability. . . . between private consumption and taxes and between private investment and government dissaving." (David and Scadding [1974], p. 236).

This reasoning is an exercise in arithmetic dressed up as theory. Assume, for the sake of argument, that personal saving, corporate saving and the

accumulation of consumer durables are perfect substitutes. Let S denote gross private saving, C private consumption, T taxes net of transfers, Y gross national product, I gross domestic capital formation, G government spending on goods and services and X the international current account surplus. From the national income accounting identities we have

$$\frac{S}{Y} \equiv \frac{Y-(C+T)}{Y} \equiv \frac{I+X+G-T}{Y} \tag{11}$$

Constancy of $\frac{S}{Y}$ means that for given Y, C and T are perfect substitutes and also that I+X and G-T are perfect substitutes. Going straight from these ex post accounting identities to ex ante structural behavioral relationships, David and Scadding [1974, p. 243] come up with a startling proposition: ". . . . an extra dollar of government deficit will displace a dollar of private investment expenditure because households autonomously treat deficits as public investment and regard the public and private sector's investment projects as interchangeable." Applied literally to year-to-year variations in budget outcomes, this would impute to private savers belief that the public sector increased its investment between 1974 and 1975 by $60 billion and cut it the next year by $30 billion! This could only be described as ultra-irrationality. Some of the evidence presented by David and Scadding [1973, pp. 236-238] can be interpreted as suggesting that their proposition does not apply to short-run cyclical variations of public sector deficits and surpluses, which result from fluctuations in the tax base and from discretionary countercyclical fiscal policies; instead they intend it, like the "Denison's Law" which inspired their article, to apply only to longer-run variations as reflected in deficits averaged across business cycles. This restriction would deprive their "ultra-rationality" of its most striking policy implications; their proposition could not be used to argue that

deficit spending is ineffective for short-run stabilization because it displaces private investment. The policy conclusions drawn by David and Scadding, however, are that "fiscal policy would be useless for stabilization purposes" (David and Scadding [1974, p. 245]). This requires their form of ultra-rationality to be operative in the short run and not merely "on average" over the cycle. While this interpretation of David and Scadding's findings is in agreement with their emphasis on the smallness of the year-to-year variability in the GPSR (in addition to the absence of a trend in this ratio), it requires the rather unusual view of public sector deficits and public sector investment referred to earlier.

The GPSR is quite stable, as shown in Table 1, which presents summary statistics for it and eight other saving ratios. The most important features of Table 1 are the following: First, the gross private saving ratio is much more stable (as measured by range, standard deviation or coefficient of variation) than either the personal saving ratio (PSR) or the gross social saving ratio (GSSR).[15/] Second, the net saving ratios, whether private or public, are much less stable than the gross saving ratios. The reasons for this disquieting result are not clear.[16/] In principle, rational or ultra-rational behavior should lead to greater stability in net saving ratios.[17/]

Further investigating the phenomena reported in Table 1, we estimated a large number of simple saving functions with alternative dependent and independent variables. The measure of saving used as dependent variable included all combinations of net and gross, private and social, and saving with and without purchases of consumer durables. Explanatory variables were appropriately matched to the saving concept. They included GNP, NNP, GNP or NNP minus public sector purchases of goods and services, and personal income. Some regressions also included lagged dependent

TABLE 1

STABILITY OF SAVINGS RATES, 1948-1976

	Mean	Range	Standard Deviation	Coefficient of Variation
GPSR	.167	.147-.179	.006	.036
GPSR'	.256	.238-.274	.009	.035
NPSR	.084	.064-.100	.010	.119
NPSR'	.182	.160-.208	.012	.066
GSSR	.163	.137-.202	.015	.092
GSSR'	.252	.224-.302	.018	.071
NSSR	.080	.034-.134	.021	.263
NSSR'	.178	.132-.239	.024	.135
PSR	.082	.048-.102	.012	.146

Annual data 1948-1976; Source: Economic Report of the President 1978. GPSR = Gross private saving ratio; GPSR' = (gross private saving + gross purchases of consumer durables)/GNP; NPSR = net private saving ratio; NPSR' = (net private saving + gross purchases of consumer durables)/NNP; GSSR = gross social saving (private + public)/GNP; NSSR = net social saving/NNP; NSSR' = (net social saving + gross purchases of consumer durables)/NNP; PSR = personal saving/personal disposable income.

variables. None of these equations performed as well as the simple traditional consumption functions given in (9) and (10), or as the restricted debt-neutrality equations (5) and (8). The saving functions that incorporated the debt-neutrality assumption, i.e. those with social saving as the dependent variable, were dominated by those that had private saving as the dependent variable.[18/]

The stability of the GPSR is an interesting phenomenon deserving a credible explanation. Perhaps the answer should be sought on the right-hand side of equation (11) as well as on the left-hand side, in the offsets to private saving as well as in private saving behavior. In cyclical fluctuations, I/Y tends to be positively correlated with Y, while endogenous components of X/Y and (G-T)/Y are negatively correlated. If fluctuations in Y are driven by autonomous variations of I, X and G-T, including those engineered by deliberate compensatory policy, the sum of the ratios could be fairly stable. In the longer run, the explanation of Denison's Law may be different before and after the Depression and Second World War. In the earlier period, there were strong economic and political constraints holding $\frac{X}{Y}$ and $\frac{G-T}{Y}$ constant and close to zero. As Kuznetz [1952, 1961a, 1961b] observed, gross domestic private investment was a fairly constant share of national product over the decades since the Civil War. This stylized fact of economic growth can be attributed to technology and to the long-term stability of the real interest rate. Since the Second World War the constraints on X/Y and (G-T)/Y have been relaxed. But the national commitment to full employment and the "fiscal revolution" have meant that, secularly as well as cyclically, $\frac{G-T}{Y}$ bends to adapt in compensation for variation in I/Y and X/Y.

None of these suggestions is inconsistent with one of the implications of David-Scadding "ultra-rationality." This is that, in the long

run anyway, households pay attention to the increments of wealth they acquire via equity appreciation reflecting the retention and reinvestment of corporate profits. Non-human wealth, in one form or another, is a significant variable in most modern empirical consumption functions. (e.g. Arena [1964, 1965], Bosworth [1975], Mishkin [1977]). These equations generally imply that retained earnings fully reflected in stock values will eventually increase consumption and displace other forms of wealth accumulation. They also imply that the effects of retained earnings on consumption and personal saving are much slower than those of dividend distributions. But for the long run, this component of "ultra-rationality" is much more credible, and much more consistent with evidence, than the second component, the notion that private savers regard a public deficit as the counter-part of public investment equivalent to private capital formation.

Saving Out of Different Types of Income

Social insurance and other public and private programs compelling saving for retirement and other contingencies have grown spectacularly since the Second World War. What effect has their growth had on other, discretionary private saving? What is the net effect on funds available for capital formation?

Recently a number of observers have sounded the alarm that social insurance (OASDHI) and other government pension plans are significantly diminishing national saving and investment. Feldstein [1974] estimates that social security depresses personal saving by as much as 30 to 50 percent. Munnell [1976] concludes that personal saving has been reduced by private pension plans. The negative effects alleged by these critics arise from the unfunded "pay-as-you-go" nature of these programs. For example, the social security taxes or contributions paid by or for workers are not invested to provide for the benefits to which these workers

will be entitled on retirement. They do not suffice for that. They are used to pay contemporary beneficiaries. In effect the government is engaging in deficit finance. The debt is not explicitly evidenced by bills, notes, or bonds; it is the implicit commitment to pay benefits to current participants when they later become eligible. In other words, the taxes (or contributions) to pay these commitments have been postponed; they will be levied on the generation at work when current contributing participants have retired. In the view of Feldstein and other critics, participants reduce their discretionary saving because their compulsory saving and the associated prospect of benefits fulfill the same purpose.

Clearly those who worry about unfunded retirement plans are not believers in the neo- (or non-) Ricardian equivalence theorem.[19/] They do not regard the net debt to future beneficiaries as innocuous. If they are analytically and empirically correct, then the protagonists of debt neutrality are wrong. Barro [1974, 1976, 1977] says that Feldstein et al. forgot that the public, knowing full well that future social security taxes will have to be higher to pay for benefits already committed, will save enough to pay the extra future taxes. This additional saving may be done by the future beneficiaries themselves, to make up by gifts or bequests the taxes the younger generation will have to pay. Or it may be done by the future taxpayers themselves. The critics of unfunded pension plans tend to use the life-cycle model of saving behavior, or at any rate a model that imputes finite horizons to savers. The advocates of debt neutrality assume infinite horizons, or the equivalent obtained via endless linkage of generations through operative bequest or gift motives.

From this perspective we can review some of the evidence on the substitutability between compulsory or contractual saving and discretionary

saving.

Taylor [1971] concludes from his time series analysis of personal saving that households consider contributions to social insurance a form of saving. He finds a very large (-2) negative marginal propensity to save in other forms with respect to social security. This estimate is consistent with one form of "ultra-rationality": worker-consumers appear to take into account their employers' contributions as well as their own. His basic equation is [1971, p. 391]

$$S_t = \underset{(43.79)}{0.955}\ S_{t-1} + \underset{(4.21)}{0.449}\ \Delta L - \underset{(0.86)}{0.277}\ \Delta p + \underset{(2.86)}{0.893}\ \Delta TR - \underset{(3.30)}{2.16}\ \Delta SI \qquad (12)$$

$$\underset{(4.87)}{-0.901}\ \Delta T + \underset{(2.08)}{3.65}\ \Delta r$$

$R^2 = 0.899$; SE = 2.01; DW: missing; Data: 1953 I - 1969 IV.

S denotes saving, ΔL the change in labor income, Δp the change in income from property, ΔTR the change in transfer income, ΔSI the change in personal contributions to social security, ΔT the change in personal tax payments and Δr the change in the nominal yield on Baa bonds. All variables except the interest rate are in billions of current dollars.

The interpretation of these coefficients is not straightforward. The several income components differ in their positions in the transitory-permanent spectrum; they differ in distribution among households of total income, wealth, and age; they are imperfect substitutes because of differences in the liquidity and marketability of the assets that yield the incomes or taxes. The high marginal propensity to save out of transfer payments is undoubtedly due partly to the liquidity and wealth positions

of the recipients and partly to the transitory, cyclical nature of some transfer increases and reductions. On the whole, the Taylor study provides strong though indirect evidence against the behavioral hypotheses underlying the debt neutrality thesis and provides moderate support for the worries of the critics of unfunded pensions and retirement insurance, by concluding that the various components, positive and negative, of personal disposable income are not perfect dollar-for-dollar substitutes for each other.

A similar conclusion was reached by Juster and Wachtel [1972]. When they re-estimated equation (12) for the period 1954 I - 1972 III, the only significant change was a reduction in the numerical value of the coefficient on the change in personal social security contributions (ΔSI) from -2.16 to -1.55 (From the debt neutrality point of view this would indicate a decline in the "degree of ultra-rationality" of worker-consumers with respect to employers' contributions to only 50%).

Earlier studies by Cagan [1965] and Katona [1960, 1965] found that households do not curtail discretionary saving when they are covered by compulsory retirement plans. The studies of Taylor, Katona and Cagan unfortunately are not comparable. Taylor uses aggregate time series data, Katona a cross-section sample of households, and Cagan both types of data.[20/] Cagan, like Taylor, found an almost dollar-for-dollar offset of discretionary saving for contractual saving when he analyzed aggregate time series. In the decade and a half before 1963, the "aggregate personal saving-income ratio declines slightly while group pension funds (including government plans but excluding social security) have increased dramatically, indicating a full offset to pension growth by reductions in other forms of saving." [1965, p. 43].

A closer look by Cagan at household saving behavior after a household has come under a pension plan, however, yields results that are the opposite of those suggested by the aggregate savings ratio: the net addition to aggregate personal saving apparently equals the full amount of employees' and employers' contributions. Katona, in his analyses of sample survey data, found that discretionary saving, if anything, increases. In another contribution he argues (Katona [1960, p. 98]) that the reason for the complementarity observed, in cross-section data, between discretionary private saving and 'collective security plans,' could be a major shift in the ways financial provision is made for old age. ". . . . in former generations financial protection for old age was not generally achieved by individual saving efforts. In many socio-economic groups this type of aid was provided by relatives, particularly grown children. Also, at the present time and probably for years to come, there is a considerable gap between the standard of living to which an employed family is accustomed and the standard of living provided by social security benefits and private pension plans. It is conceivable, therefore, that the minimal protection afforded by collective insurance plans may even stimulate people to save in order to achieve more adequate protection. Without these plans, economic insecurity would be inescapable for many lower- and middle-income families. With these plans people may be feeling closer to their goal and highly motivated to attain it."

While the attitude toward risk attributed, in this quote, to a representative household may be somewhat perplexing, the point about the "major shift in the ways financial provision is made for old age" is important. It is consistent with the view that in Western society

a combination of factors--affluence, mobility and independence, lengthened life--has weakened the lineal and extended family and the responsibility felt by and expected of children for taking care of aged parents. Social security and the proliferation of private pension plans are a collective response to this phenomenon. During the transition to the new system, these institutions brought financial independence in old age within reach for the first time for many people, and consequently did not lead them to reduce other provisions but perhaps even encouraged them. After the transition, however, substitution--though not necessarily perfect substitution--between one form of saving and the other would become the likely pattern.

The only conclusive evidence on the extent to which voluntary intra-family intergenerational transfers offset the effects of social security would be panel data on intra-family transfers combined with accurate measures of the social security wealth "owned" by each family member. Unfortunately it seems likely that some of the required data on intra-family transfers, especially the in-kind ones, will never be available. A recent attempt by Barro [1977] to evaluate the effect of social security on private saving therefore resorted to estimating the net response of aggregate private saving to social security using time series data. The specifications he considered were very similar to those adopted by Feldstein [1974]. A social security wealth variable is added as an argument to a (rather unconventional) permanent-income type consumption function which has as its arguments current and lagged personal disposable income, net corporate retained earnings, the total public sector surplus, the unemployment rate, a measure of non-human wealth and the stock of consumer durables. The social security wealth variable is supposed to measure the perceived net increase in permanent income--given current

disposable income and the other arguments--that is implied by the expected future benefit payments and the expected future social security taxes. The calculation of such a measure is a heroic task. In spite of the considerable care Feldstein [1974, pt. III] devoted to coverage, life expectancy and age structure, benefit and tax rates, growth of real per capita income and the discount rate, the final product retains many arbitrary features. Feldstein assumed e.g. that the anticipated ratio of benefits to disposable income since the beginnings of the social security system was constant at its average value over the period the program has been in existence. Barro retained this assumption in some of his regressions. In others he made the equally arbitrary assumption that anticipated future benefits and anticipated future coverage (both relative to disposable income) correspond to their current values. This is an area where the use of more sophisticated expectations mechanisms (including rational expectations) can be expected to yield interesting results. Feldstein's [1974] findings that social security depresses private saving are confirmed in two[21/] of Barro's regressions. In both of these the unemployment rate is omitted as an argument. The remaining regressions yield insignificant or even perverse coefficients for the social security wealth variable. In view of the shortcomings of the social security wealth variable and the rather ad hoc selection of other arguments for his consumption functions, Barro's results cannot be regarded as conclusive evidence either in favor or against the existence of a depressing effect of social security on private saving.

Conclusion

The debt-neutrality issue is important for a number of reasons. To the historian of economic thought it is of interest as one of the most

ancient areas of professional inquiry and argument, spanning the two centuries since the Wealth of Nations.

To the economic theorist debt neutrality raises fundamental issues about the interrelationship of private and public economic activity. The subjects of public finance, macroeconomics, monetary theory, corporate finance and international finance each contribute their varied perspectives to our understanding of the issues involved.

To the applied economist and the economic policy maker, the debt neutrality debate is of the utmost importance. From a long-run perspective, it concerns the consequences of alternative public sector financing rules for the growth of the domestic capital stock. From a short and medium term point of view, the usefulness of deficit financing as a stabilization instrument is at stake.

On the basis of currently available theoretical models and empirical evidence our provisional conclusion is that the case for debt neutrality is not well established. Further empirical work is urgently required, however, before any conclusion can be more than tentative.

FOOTNOTES

[1]Both Smith and Ricardo were, of course, assuming a fully employed economy.

[2]Ricardo [1817] in McCullock [1871, pp. 146-147].

[3]Ricardo [1820] in Sraffa [1951, p. 187].

[4]Ricardo [1820] in Sraffa [1951, p. 187].

[5]Ricardo [1817] in McCullock [1871, p. 148].

[6]Ricardo [1817] in McCullock [1871, p. 148].

[7]Ricardo [1817] in McCullock [1871, p. 148].

[8]Patinkin [1948] reprinted in Patinkin [1972], p. 16. Patinkin's later views on this subject were less sanguine. A compromise solution adopted by him was to define $\frac{M_o}{p} + k\frac{V_o}{rp}$ as the proper base for the operation of the real balance effect. [M_o is the initial stock of government money, V_o the number of government bonds, where each bond is a perpetuity with a coupon of \$1., r is the nominal rate of interest and p the price level]. k is a constant between zero and one, measuring the degree to which individuals do not discount the future tax liabilities connected with government bonds. Patinkin [1965, p. 289]. The debate about the proper base for the real balance effect has been continued in the inside money-outside money controversy (Pesek and Saving [1967], Saving [1970, 1971], Patinkin [1969, 1971], Johnson [1969]) about the role of private bank money as a component of net (private) wealth.

[9]Tobin [1952], reprinted in Tobin [1971, p. 91].

[10]As it was not clear from Kochin's paper whether data points had been lost because of the lagged dependent variable in (1) and the difference operator in (2), we also estimated (1a) for the period 1953-1971 and (2a) for the period 1954-71. The discrepancies were greater in each case.

[11]We start our sample in 1948, but the results for the period 1952-1976 are not significantly different from those reported here.

[12]The population series is from the Economic Report of the Presidents, 1978, Table B.22.

[13]Correcting for first order autocorrelation yielded the following equation:

$$c = \underset{(4.04)}{122.91} + \underset{(89.99)}{0.876}\ yd$$

$R^2 = 0.997$; $\bar{R}^2 = 0.997$; SE = 26.90; SSR = 18809.40; DW = 1.59; $\rho = .121$

[14]Permanent disposable income is defined here as the infinite sum of current and past values of disposable income, with declining geometric weights.

[15]GPSR', NPSR', GSSR' and NSSR' include gross purchases of consumer durables in the numerator but do not include the imputed rental income from the ownership of durables in the denominator. No guess was ventured as to the magnitude of depreciation of consumer durables.

[16]The unreliability of the capital consumption data may be part of the explanation.

[17]Some of the same points are made by Boskin [1978].

[18]These results can be obtained from the authors on request.

[19]Since the way in which the social security benefit formula is designed penalizes late retirement, individuals may choose to shorten their working life. This distortionary effect of social security would be a source of concern even to those who accept all other propositions required for debt-neutrality.

[20]Katona's definition of saving is very narrow and amounts to the change in net liquid assets, disregarding non-liquid assets (such as houses, equity in life insurance and pension funds) and liabilities.

[21]If we are willing to accept a t-statistic of 1.8, one more equation shows a significant positive effect of one of the social security wealth variables on consumption.

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