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CONTENTS

The Concept and Measurement of Savings: The United States and Other Industrialized Countries

Derek W. Blades and Peter H. Sturm*

Introduction

1. It has long been recognized that conventionally measured saving ratios differ widely between countries, and that among the 24 member countries of the OECD the U.S. economy is the one with the lowest national saving ratio. It is also true—though probably less well publicized— that any definition of saving is to some extent arbitrary, and that given a specific definition, institutional differences between countries may result in differences in saving ratios between economies which otherwise display identical characteristics and behavior. The present paper analyzes the question of how important institutional differences are in explaining observed differences in official saving ratios between the United States and other industrialized countries, and how sensitive this difference is to alternative definitions of saving and income. This analysis will be carried out for both the aggregate national saving ratio and the household saving ratio. A separate treatment of the household sector seems justified, given the dominating share this sector contributes to total national savings in most countries, and the focus on household behavior in theoretical discussions of savings determinants.

2. The various possible modifications of the official definition of savings discussed here result in a large number of alternative savings concepts. Which of these alternatives is the "correct" one will of course depend on the question analyzed. Special attention will be given in this paper to the savings concept most relevant for the analysis of economic growth.

3. Part I of the paper discusses basic definitions and briefly presents the actual data on official national and household saving ratios, concentrating on long-term averages rather than year-to-year fluctuations in these variables. Part II explores how intercountry differences in (long-term average) saving ratios are affected by institutional differences between countries, both for the household sector and the nation as a whole, given a standardized definition of savings. In Part III, plausible alternatives to the standard definition of savings (and—where appropriate—income) are discussed, and their effect on intercountry differences in household and national saving ratios is explored quantitatively. A discussion of likely effects of further possible modifications to the standard definition of saving, which

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could not be carried out quantitatively in the present study due to data limitations, is presented in Part IV. The final section—Part V—attempts to answer the question of which savings concept is the most relevant in the analysis of economic growth and its determinants.

I. Definitions and Actual Data

4. The savings data in this paper have been compiled according to the *System of National Accounts* (SNA)[1]—the international system used by both the OECD and the United Nations for reporting comparable national accounts data. In the SNA, saving is the residual item in the income and outlay accounts where it is obtained by subtracting current disbursements from current receipts. Table 1 lists the transactions that enter into the SNA income and outlay accounts for the nation as a whole and for each sector of the economy.

5. In the United States National Income and Product Accounts (NIPA) saving is similarly defined as the balance between current receipts and disbursements. However, there is some disagreement between the SNA and the NIPA as to what constitutes current (as opposed to capital) transactions, and as a result the two systems generate somewhat different measures of saving. As regards *household* (or personal) saving the only difference concerns the treatment of estate and gift taxes, which are regarded as current outlays in the NIPA whereas the SNA treats them as capital outlays which are financed by running down assets. As a result, household saving according to the SNA is higher than on a NIPA basis by the value of such taxes.

6. As regards *national savings* there are a number of differences between the NIPA and SNA definitions, the most important of which is that in the NIPA all government purchases are treated as current consumption, whereas the SNA takes the more conventional view that government construction and purchases of equipment (excluding military hardware) constitute investment. As a result, national saving in the NIPA is substantially lower than according to the SNA. The resulting U.S. saving ratios compiled according to the NIPA and SNA rules are depicted in the top two lines in Table 2.

7. In the SNA, entrepreneurial incomes of unincorporated enterprises and operating surpluses of corporate enterprises are always calculated after deducting consumption of fixed capital. Consequently, saving is also shown net of capital consumption. The drawback of this approach is that calculating the consumption of fixed capital creates both practical and theoretical difficulties, which are particularly severe in periods of inflation. Since the procedures to compute capital consumption are not standardized across countries, net saving is usually considered a less reliable statistic in international comparison than gross saving, and so this latter concept is

[1]United Nations, *A System of National Accounts,* Series F, No. 2, Rev. 3 (New York: United Nation, 1968).

used throughout this paper. When reference is made below to saving and disposable income "on an SNA basis," it should be understood to mean gross rather than net saving as strictly required in the SNA.

8. Table 2 shows the extent to which national and household saving ratios differ internationally even after all country figures have been standardized to conform to the SNA definitions. Average net national saving ratios during the period 1970 to 1980 ranged from a high of 33 percent for Luxembourg to a low of 8 percent for the United States with an unweighted area mean of 16 percent and a coefficient of variation for the country averages of 32 percent. On a gross basis Luxembourg and the United States again represent the extremes—40½ percent and 18½ percent, respectively. The OECD average rises to 24 percent and the relative dispersion is reduced to 21 percent, although the coefficient of variation may exaggerate the resulting convergence.[2] As regards the household sector the United States has again a relatively low ratio on a net basis—8 percent compared to an average of 13 percent for the 18 countries covered. When capital consumption is added, the U.S. ratio increases to 12½ percent—the fourth lowest of the 11 countries included in Table 2.

9. *National* saving ratios are sometimes calculated with Gross Domestic Product at market prices (GDP) or Gross National Product (GNP) as the denominator. Here the economically more meaningful approach of using Gross National Disposable Income is preferred; this is the sum of gross saving plus private and government final consumption expenditure. It exceeds GNP by net receipts of current transfers from abroad (a relatively small negative number in most OECD countries), and exceeds GDP by these same transfers plus net receipts of property income and compensation of employees from abroad (again a relatively small number for most OECD countries). For *household* saving ratios the denominator used is gross disposable income, which in the SNA is defined as gross saving plus consumption expenditure.

[2]The coefficient of variation is the standard deviation of the saving ratios expressed as a percentage of their mean, and thus shows the intercountry variation of saving ratios relative to their average level. An adjustment (e.g., the transition from net to gross ratios) may result in greater *absolute* differences between the ratios while still reducing the *relative* standard deviation as measured by the coefficient of variation.

Table 1
Current Transactions Included in Income and Outlay Accounts According to the SNA

Current Receipts							Current Disbursements					
Nation	Nonfinancial enterprises	Financial institutions	General government	Private nonprofit institutions	Households (including unincorporated enterprises)	TRANSACTIONS	Nation	Nonfinancial enterprises	Financial institutions	General government	Private nonprofit institutions	Households (including unincorporated enterprises)
X					X	Compensation of employees						
X	X	X	X	X		Operating surplus of corporate enterprises						

X	X	X	X	X	X	Entrepreneurial income of unincorporated enterprises						
	X	X	X		X	Withdrawals from entrepreneurial income of quasi-corporate enterprise		X	X			
	X	X	X	X	X	Property income		X	X	X	X	X
	X	X	X	X	X	Casualty insurance claims			X			
		X				Net casualty insurance premiums		X	X	X	X	X
			X			Direct taxes		X	X		X	X
X			X			Indirect taxes						
						Subsidies	X			X		
			X			Compulsory fees, fines, penalties		X	X		X	X
			X			Social security contributions						X
					X	Social security benefits				X		
					X	Social assistance grants				X	X	
					X	Unfunded employee benefits		X	X	X	X	
	X	X	X	X	X	Unfunded employee welfare contributions imputed						X
						Final consumption expenditure	X			X	X	X
				X		Current transfers to private nonprofit institutions				X		X
			X		X	Current transfers n.e.c.—residents		X	X	X		X
X			X		X	Current transfers n.e.c.—rest of world	X	X	X	X		X

X Indicates transaction is included.

Table 2
Saving Ratios Averaged from 1970–1980, Compiled According to SNA

	National Saving Ratios		Household Saving Ratios	
	Net[a]	Gross[b]	Net[a]	Gross[b]
United States (NIPA)	6.7	16.0	7.2	12.1
United States (SNA)	7.8	18.6	7.7	12.6
Canada	12.3	22.1	9.5	13.8
Japan	25.1	35.0	20.7	25.0
Australia	18.1	22.3	14.1	16.8
New Zealand	16.7	22.5	—	—
Austria	18.4	27.9	9.9	—
Belgium	14.0	22.1	16.6	—
Denmark	13.2	20.3	—	—
Finland	13.1	25.9	6.3	11.9
France	15.0	24.1	13.4	16.7
Germany	15.5	25.1	14.7	—
Greece	19.3	24.7	19.2	—
Iceland	14.0	25.4	—	—
Ireland	14.1	21.3	19.7	21.7
Italy	11.6	22.3	21.5	25.1
Luxembourg	33.2	40.5	—	—
Netherlands	17.1	24.9	14.1	14.6
Norway	14.1	27.2	—	—
Portugal	15.7	19.1	14.7	—
Spain	15.1	22.5	10.2	—
Sweden	12.4	21.5	4.2	8.3
Switzerland	20.1	28.7	12.8	—
Turkey	14.1	18.2	—	—
United Kingdom	8.9	19.0	8.0	10.9
Arithmetic mean	15.8	24.2	13.2	16.1
Coefficient of variation	0.32	0.21	0.38	0.33

[a]Net saving as percent of net disposable income.
[b]Gross saving as percent of gross disposable income.

Country order: In this and subsequent tables, the non-European OECD countries appear first, followed by the European members of OECD in alphabetical order.

II. Intercountry Differences in Saving Ratios Due to Institutional Differences

10. Saving ratios may differ between countries for three main reasons:
(i) because different definitions have been used for income and saving;
(ii) because of differences in institutional arrangements; and
(iii) because social, economic, historical and cultural factors have combined to produce different underlying propensities to save.

As already noted the savings data used here have been compiled according to standard definitions so that the first possible cause of intercountry differences has been eliminated. It is attempted here to identify institutional differences between countries that may affect saving ratios and provide adjusted saving ratios that are institutionally neutral. Remaining intercountry differences in these adjusted ratios must then be due to differences in the underlying savings propensities with respect to the common definition of savings adopted.

11. The institutional factors considered in this section are:
(i) the relative size of the unincorporated enterprise (small business) sector;
(ii) the relative importance of social security pensions versus private pension and life insurance schemes;
(iii) the relative importance of health and education services provided by government; and
(iv) the relative importance of taxes on consumption expenditure as compared with taxes on income.

12. All four of these institutional factors may affect *household* saving ratios which are therefore considered first; only the last one has any impact on *national* saving ratios. The analysis to follow includes saving ratios for the United States, Canada, Japan, Australia, Finland, France, Italy, Sweden, and the United Kingdom. While the choice of countries was limited by data availability, the economies included in the analysis are believed to constitute a representative sample of the more industrialized OECD countries.

(a) Household Saving Ratios

Relative size of unincorporated business

13. In the SNA the household sector as defined for the income and outlay accounts contains some unincorporated enterprises in addition to households. The enterprises concerned are those for which the owners do not keep a *complete* set of accounts, covering financial and capital transactions in addition to production operations. The reason why such companies are grouped together with households is that the lack of a complete set of business accounts indicates that the owners will usually be unable to distinguish between receipts and outlays arising from business operations and from household transactions. Unincorporated enterprises that keep com-

plete sets of accounts are termed "quasi-corporate" in the SNA and are, in principle, included in the corporate enterprise sector.

14. There are sound practical reasons for including unincorporated businesses in the household sector, and the SNA approach is in fact common to most national accounting systems. There are, however, several differences between countries as regards both the relative importance of unincorporated enterprises and the way national accountants interpret the SNA guidelines for distinguishing quasi-corporate from other unincorporated enterprises. Clearly, these differences make international comparisons difficult, and it seems, therefore, worthwhile to attempt estimating saving ratios for "pure" household sectors.

15. The entries in the income and outlay accounts which cannot readily be split between households and unincorporated enterprises include *entrepreneurial income,* which is partly wage income and therefore a household receipt, and partly operating surplus which is a business receipt, *income taxes* which should similarly be divided between taxes on employment income and business profits, and *property income receipts* earned on assets that may be held by either the household or the business. Even if these flows could be correctly divided it would still be necessary to calculate how much of the operating surplus is withdrawn by households as a form of property income, and how much is retained in the business. Several different, equally plausible assumptions could be made to solve these various allocation problems, and the meaning of the resulting "pure" household savings figure would be quite arbitrary.

16. Instead of trying to allocate each individual flow between businesses and households, a single "global" assumption can be made about the savings of unincorporated business included in the household sector. This has the advantage that the results have an unambiguous interpretation. This is the approach used here, where it is assumed that unincorporated businesses save enough each year to maintain their stock of fixed assets. In other words, their gross saving is exactly equal to consumption of fixed capital; net saving is zero and any additions to their fixed assets are financed by borrowing from either the owners themselves or from financial institutions.

17. "Pure household" saving ratios, obtained by applying this adjustment, are shown in column 2 of Table 3. These are the average ratios calculated as the arithmetic means of the ratios for each year 1970 to 1980. Table 3 shows that the effect of the adjustment is to reduce the SNA gross ratios by between 3 to 5 percentage points. Judging by the coefficient of variation for the nine country ratios, this adjustment tends to widen differences between countries. In most cases the adjusted ratios tend to rise more slowly than the SNA ratios and for the United States the atypical decline in the SNA household saving ratio is even more marked after the adjustment.

18. An alternative way of dealing with the problems of unincorporated business included in the household sector is to treat the whole operating surplus of the enterprise sector (rather than only the distributed or withdrawn part of it) as income of the household sector. Admittedly, this is cir-

Table 3
Average Household Saving Ratios ($\bar{x}$) and Linear Trends (T) for the Period 1970–1980: SNA basis and standardized for institutional differences

	(1)		(2)		(3)		(4)		(5)		(6)		(7)		(8)		(9)	
	SNA gross saving ratio		Excluding saving of unincorporated enterprises		Including net saving of corporate enterprises		Excluding net equity in pension and life insurance funds		Including saving of social security funds		Adjusted for government health and education services		Adjusted for taxes on expenditure		Totally (*) standardized method A		Totally (*) standardized method B	
	$\bar{x}$	T	$\bar{x}$	T	$\bar{x}$	T	$\bar{x}$	T	$\bar{x}$	T	$\bar{x}$	T	$\bar{x}$	T	$\bar{x}$	T	$\bar{x}$	T
United States	12.6	−0.22	7.7	−0.35	15.0	−0.14	9.6	−0.41	13.7	−0.29	11.9	−0.21	13.4	−0.25	4.5	−0.56	15.8	−0.22
Canada	13.8	0.38	9.5	0.46	20.0	0.68	9.4	0.06	15.3	0.39	—	—	16.0	0.39	5.4	0.11	24.3	0.63
Japan	25.0	0.28	20.7	0.16	27.8	−0.36	22.8	0.29	27.6	0.25	23.7	0.25	26.3	0.33	18.4	0.25	30.4	−0.42
Australia	16.8	−0.10	14.1	0.10	20.0	−0.15	—	—	—	—	15.3	−0.18	18.7	−0.08	—	—	—	—
Finland	11.9	0.07	6.3	0.15	16.4	0.06	11.7	−0.19	12.4	0.08	10.6	0.03	15.2	0.12	6.3	—	18.0	0.11
France	16.7	−0.16	13.4	−0.15	18.1	−0.44	16.3	−0.19	17.6	−0.15	—	—	20.2	−0.23	15.6	−0.27	22.6	−0.55
Italy	25.1	0.22	21.5	0.10	25.2	0.20	24.1	0.52	24.8	0.15	23.0	0.16	28.1	0.19	21.2	0.30	25.4	0.06
Sweden	8.3	0.12	4.2	0.08	12.5	−0.01	7.3	0.16	14.4	−0.03	6.8	0.00	10.4	0.15	2.8	0.02	17.8	−0.46
United Kingdom	10.9	0.62	8.0	0.57	13.5	0.57	4.6	0.41	11.4	0.67	9.0	0.37	12.5	0.70	1.1	0.21	13.4	0.57
Coefficient of variation	0.36	—	0.50	—	0.26	—	0.51	—	0.32	—	0.43	—	0.32	—	0.77	—	0.25	—

The *coefficient of variation* is the ratio of the standard deviation to the mean. It shows whether the adjustments made have increased or reduced intercountry differences in average saving ratios.

(*) See text (para. 33) for explanation of methods A and B.

cumventing rather than solving the disaggregation problems, but as it is arguable that the level of household saving is not independent of the wealth formation in the enterprise sector, this approach can certainly be justified.[3]

19. Because it seems unlikely that households' spending behavior will be affected by the level of consumption of fixed capital in the corporate sector, the adjusted saving ratios in column 3 of Table 3 include only the *net* operating surplus of (financial and nonfinancial) corporate enterprises. As is to be expected, the combined sector saving ratios are generally significantly higher than those for the household sector alone, except for Italy where during the 1970s the corporate sector recorded on average net operating deficits. Otherwise, the average increase varies between 1.4 percentage points for France and 6.2 points for Canada with the coefficient of variation dropping from 36 to 26 percent. For the United States this adjustment results in an increase of 2.4 percentage points in the average saving ratio—after Italy and France the lowest increase among the countries included in the sample.

20. The marked reduction in intercountry variability when saving ratios are adjusted in this way could be interpreted as supporting the hypothesis that, in making their decisions about savings, households take account of earnings retained by companies in which they have an equity holding. An alternative explanation for the sharp reduction in intercountry variability is that households may have a higher propensity to save dividend income than other current receipts. If so, in countries where a high proportion of profits are distributed, household saving ratios will tend to be high and enterprise savings low; the reverse would be true where most profits are retained within the enterprise sector. Combining the two sectors will obviously produce more equal saving ratios across countries.

Relative importance of social security pensions

21. Households may provide for pensions and other retirement benefits either by contributing to a government social security system, or by participating in a private pension or life insurance scheme. While both kinds of schemes serve the same purpose from the household's point of view, the SNA (and most national systems of accounts) considers that transactions between households and social security schemes are *current* in nature, while those with private schemes are mainly *capital* transactions. This implies major differences in the way these transactions are treated in the income and outlay account of households, and hence their impact on household saving. As a result SNA data are difficult to use for comparisons between countries that differ in the relative importance of social security versus private schemes.

[3]Several theoretical and empirical studies argue indeed that household and business savings are close substitutes, cf. Paul A. David and John Scadding, "Private Savings: Ultra-rationality, Aggregation and 'Denison's Law'," *Journal of Political Economy,* 82 (March/April 1974), 225–49 and several empirical studies quoted therein.

22. Treating households' transactions with private schemes in the same way as their transactions with social security schemes involves the following adjustments:

(i) Adjust current receipts (R) by adding pension receipts (P_p), and by deducting (imputed) receipts of interest and other property income earned on pension and life insurance funds (I_p).

(ii) Adjust current disbursements (D) by adding contributions (C_p) and by subtracting service charges (A_p).

Adjusted saving (S') is therefore equal to:

$$S' = (R + P_p - I_p) - (D + C_p - A_p) \qquad (1)$$

which can be rearranged to yield:

$$S' = (R - D) - [(I_p + C_p) - (P_p + A_p)] \qquad (2)$$

From (2) it is clear that saving on an SNA basis ($R - D$) is to be adjusted by subtracting the difference between the receipts ($I_p + C_p$) and the outlays ($P_p + A_p$) of private pension and life insurance funds. This difference is the surplus available to the fund for investments, and is referred to in the SNA as the increase in the "net equity of households in pension and life insurance funds."

23. Gross disposable income—the denominator in the saving ratio—consists of gross saving plus final consumption expenditure of households. The latter should be adjusted by deducting service charges (A_p) for administering private pension schemes. Unfortunately, SNA statistics do not show this item separately, and this adjustment is therefore not made to the saving ratios shown below. However, data for the United Kingdom suggest that these service charges amount to less than 1 percent of household consumption expenditure, and so the omission of this adjustment is unlikely to cause serious distortions.

24. The adjusted ratios in column 4 of Table 3 are lower than the SNA ratios by between 0.2 and 6.3 percentage points. The adjustments tend to be particularly large for countries with low SNA household saving ratios (e.g., the United Kingdom and Sweden) and relatively unimportant for countries with high SNA ratios (e.g., Italy and Japan), indicating that private life insurance and pension schemes tend to accumulate assets more rapidly in low- than in high-saving countries. As a result the adjustment increases the intercountry disparity in saving ratios. As regards changes over time, the effect of the adjustment is generally to reduce the rate of increase, and in the United States the removal of household saving in private pension and insurance funds nearly doubles the rate of decline, while reducing the average ratio by 3 percentage points.

25. An alternative approach to standardizing the treatment of pensions is to treat social security pension fund transactions in the same way as transactions with private pension and life insurance funds. This involves the following adjustments:

(i) Adjust current receipts (R) by deducting pensions received (P_s) and by adding interest and other property income earned on the social security pension fund assets (I_s).

(ii) Adjust current disbursements (D) by deducting pension contributions (C_s), and by adding service charges (A_s).

Adjusted household savings therefore becomes:

$$S' = (R - P_s + I_s) - (D - C_s + A_s) \tag{3}$$

which can be rearranged to yield:

$$S' = (R - D) + [(C_s + I_s) - (P_s + A_s)] \tag{4}$$

This adjustment consists of the addition of savings of pension funds managed by the social security administration to savings on an SNA basis $(R - D)$.

26. Disposable income should also be adjusted by adding the service charges for administering social security pension schemes. Unfortunately, in the SNA statistics no distinction is made between the administrative costs of pension schemes and for other social security branches and in the table below no adjustment is therefore made to disposable income. This will tend to overstate the adjusted saving ratios, but the error is not likely to be very large.

27. The adjusted saving ratios in column 5 of Table 3 are higher in all countries except Italy, where social security pension funds generated negative savings in 6 of the 11 years covered. Otherwise the adjustment increases saving ratios by between 0.5 (United Kingdom) and 6.7 (Sweden) percentage points, and tends to slightly reduce intercountry differences. For the United States the adjustment results in an increase in the household saving ratio by 1.1 percentage points.

Relative importance of public health and education expenditures

28. In all OECD countries health and education services are paid for partly by private households and partly by government. In the national accounts only private purchases of these services are included in household consumption expenditures and the value of government health and education services that households "purchase" indirectly through taxation are included in government consumption expenditure. As there are marked differences between countries in the extent of government involvement in these activities, it seems worthwhile to consider the effect on household saving ratios of transferring government expenditures on health and education services to household consumption.

29. Such a transfer will increase household current disbursements by the amount of government expenditure on health and education. How this affects household saving depends on how the government finances such ex-

penditure and how government revenues would respond to the transfer. It has been assumed here that the expenditure is financed by direct taxes on households, and that these taxes are reduced by an identical amount when the expenditure is transferred to the household sector, increasing its disposable income by the same amount. Thus, household saving is not changed. Saving ratios on the other hand will fall because of the rise in disposable income, the denominator of the saving ratio.

30. The adjusted saving ratios in column 6 of Table 3 show the percentages saved out of household disposable income grossed up to include the tax reduction entailed by transferring government expenditure to the household sector. The differences between the adjusted and SNA ratios reflect the relative importance of government outlays in the fields of health and education. The differences between the two ratios range from less than 1 percentage point (United States) to just over 2 points (Italy). The adjustment reduces the trend growth of saving ratios in all countries except the United States, indicating that government health and education expenditures were rising more rapidly over the period than household disposable income.

Tax structure

31. Governments may raise revenue from households either by direct taxation—income taxes and social security contributions—or by taxes on consumption—value-added taxes, import duties, sales taxes, etc. Household *saving* is not affected by the choice of tax used since both kinds enter into current disbursements, but saving *ratios* are reduced by the imposition of consumption taxes because total consumption expenditure is part of disposable income, which appears in the denominator. Since the relative importance of direct versus consumption taxes varies between countries, it is interesting to see what saving ratios would look like if all countries adopted the same system of taxation. The adjusted ratios in column 7 of Table 3 are obtained by deducting all consumption taxes from the denominator. They thus show how saving ratios would change if consumption taxes were replaced by direct taxes.[4]

32. The adjusted ratios are mostly between 2 to 3 percentage points higher than the SNA ratios. The differences are rather larger in France and Finland where consumption taxes are relatively more important than in, for example, the United States and Japan. The 1970–1980 growth rates are virtually unchanged, and the coefficient of variation indicates that this adjustment brings only a small reduction in intercountry differences in saving ratios.

[4]The tax data used for this adjustment are taken from *Revenue Statistics of OECD Countries,* an annual OECD publication prepared by the Directorate for Financial and Fiscal Affairs. They are described as "taxes on production, sale, transfer, leasing and delivery of goods and rendering of services." They consist mainly of value-added taxes, sales taxes, excises, and customs and import duties, but they also include some export and investment taxes which should properly be taken out. The amounts involved, however, are insignificant for the nine countries considered here.

Combined adjustments

33. The last two columns of Table 3 bring together the various adjustments described above and show what happens to household saving ratios when all the adjustments are made simultaneously. Alternative procedures were discussed above both for adjusting saving ratios for the relative importance of unincorporated enterprises, and for the adjustment with regard to social security versus private pension and life insurance schemes. As a result there are four possible methods of calculating "totally standardized" saving ratios, and two of these—the lowest and the highest—are shown in Table 3 as Methods A and B respectively.

34. Method A gives what may be termed "pure household" saving ratios, obtained by deducting both savings of unincorporated enterprises and net equity in private pension and life insurance funds from SNA household savings. This implies that households take a myopic view of what constitutes their saving, and are skeptical about their claims on retained business profits and supposed rights in pension and life insurance funds. Ratios resulting from Method B, on the other hand, are obtained by adding in both corporate savings and savings of social security pension funds, and thus come close to national saving ratios. This Method B implies that households have a more sophisticated ("rational") attitude, and adjust their consumption behavior in the light of the savings accumulated on their behalf by the business sector and the social security system.

35. The choice of method not only produces drastically different saving ratios, but also affects the country ranking except for the United Kingdom which remains the lowest saver whichever method is used. The coefficient of variation increases (is reduced) significantly if Method A(B) is used, but the absolute difference between the highest and the lowest household saving ratio increases in either case compared to SNA ratios. Neither adjustment method seems to improve the relative position of the United States in the ranking order. A feature common to both methods A and B is that in most cases they tend to reduce the trend growth, or accentuate the trend decline, observed in SNA household saving ratios over the period 1970–1980.

(b) National Saving Ratios

36. Of the four institutional factors listed in paragraph 11 above, the first three involve only the allocation of income and saving between sectors, and therefore cancel out at the national level. However, since national disposable income includes consumption taxes, the tax adjustment is also relevant for national saving ratios. Column 2 of Table 4 shows national saving ratios adjusted for a standard treatment of expenditure taxes. Compared with the SNA ratios in Column 1 the standardized ratios are between 1 (United States) and 4 (Finland) percentage points higher. In all countries except Australia the standardized ratios were falling more rapidly over the period 1970 to 1980 indicating the decreasing relative importance of consumption taxes during that period. In contrast with the household ratios,

Table 4
Average National Saving Ratios ($\bar{x}$) and Linear Trends (T) for the Period 1970–1980: SNA basis and standardized for institutional differences

	(1)		(2)	
	SNA gross saving ratios		Adjusted for taxes on expenditure	
	$\bar{x}$	T	$\bar{x}$	T
United States	18.6	0.01	19.6	0.00
Canada	22.1	−0.04	24.3	−0.08
Japan	35.0	−0.93	36.7	−1.10
Australia	22.3	−0.97	25.8	−0.67
Finland	25.9	−0.37	29.9	−0.38
France	24.1	−0.48	27.6	−0.59
Italy	22.3	−0.05	24.4	−0.09
Sweden	21.5	−0.82	24.3	−0.93
United Kingdom	19.0	−0.11	20.9	−0.14
Coefficient of variation*	0.20	—	0.19	—

*See note to Table 3.

standardizing national saving ratios has virtually no effect on intercountry differences as measured by the coefficient of variation of the sample, though the saving ratios of individual countries may be affected noticeably by the adjustment.

III. Effects of Alternative Definitions of Income and Saving

37. The SNA definitions of income and saving are uncontroversial in the sense that virtually all national systems of accounts use identical or very similar definitions. They are, however, in the nature of general-purpose definitions, and it may well be that somewhat different definitions are more appropriate for particular topics in economic analysis. Some alternative concepts are discussed below and their impact on saving ratios is shown. For the *household sector* the following changes are considered:

(i) treating expenditure on consumer durables as capital rather than current outlays;
(ii) treating private education expenditure as a capital outlay; and
(iii) including inflation-induced capital gains and losses on financial assets as a component of income.

For the *national saving ratios* the changes considered are:

(i) treating expenditures on consumer durables as capital outlays;
(ii) treating private and government expenditures on education as capital outlays; and
(iii) treating research and development expenditures by enterprises as capital outlays.

The inflation adjustment made to household saving ratios is less relevant at the *national* level because inflation gains and losses mainly affect the allo-

cation of saving between sectors and largely cancel out with respect to national savings.

(a) Household Saving Ratios

Classifying consumer durables as capital

38. In the SNA, final consumption expenditure of households includes outlays on consumer durable goods such as household appliances and motor vehicles. Since these goods provide services over a number of years it is frequently argued that they should be treated like producer durables and included in capital rather than current expenditure. Since the share of household expenditures devoted to consumer durables varies substantially between countries, it seems interesting for purposes of international comparison to examine the effect of the alternative classification on household saving ratios.

39. Treating purchases of consumer durables as capital rather than current expenditure means that households are regarded like unincorporated enterprises that produce "consumer durable services" for their own consumption. This is of course exactly the approach presently used with regard to owner-occupiers who are treated like enterprises producing, for their own use, "housing services" equal to the sum of consumption of fixed capital, net operating surplus, and intermediate consumption. Adopting the same approach for consumer durables involves the following changes to the SNA household income and outlay account:

(i) Adjust current receipts (R) by adding the (imputed) net operating surplus (O) generated by the production of "consumer durable services," and by adding consumption of fixed capital in respect of durable consumer goods (C).

(ii) Adjust current disbursements (D) by deducting purchases of consumer durables (P), by adding (imputed) consumption of the "consumer durable services" (V) that households are deemed to be providing to themselves, and by deducting intermediate consumption (I), involved in the production of these services. The latter, consisting of repairs and maintenance of consumer durables, is presently included in final consumption expenditure, but must now be treated as a business outlay (i.e., intermediate input).

40. Using the above notation gross saving (S') should now be calculated as:

$$S' = (R + O + C) - (D - P + V - I) \tag{5}$$

which can be rearranged to yield:

$$S' = (R - D) + (O + C + I - V + P) \tag{6}$$

The value of "consumer durable services" (V) is of course the sum of net operating surplus (O), consumption of fixed capital (C) and intermediate consumption (I), so that the second term in (6) reduces to (P). Saving on an

SNA basis is therefore to be increased by the value of purchases of consumer durables.

41. Gross household disposable income—the denominator in the saving ratio—consists of gross saving plus household consumption expenditure (X). The latter must be adjusted by deducting purchases of consumer durables (P), by adding (imputed) consumption of "consumer durable services" (V), and by deducting intermediate consumption (I). Gross household disposable income (YD') should therefore be calculated as:

$$YD' = (R - D + P) + (X - P + V - I) \tag{7}$$

Since V is equal to $O + C + I$, (7) can be written as:

$$YD' = (R - D) + (X + O + C) \tag{8}$$

42. As information is not available from the national accounts on the values of the net operating surplus or the consumption of capital for consumer durables, some simplifying assumptions are required. As regards *net operating surplus,* this could be taken as equal to the interest that could have been earned by investing in alternative assets (e.g., bonds) instead of purchasing consumer durable goods.[5] Although there is always some opportunity cost in the decision to invest in consumer durables, the simplifying assumption has been made here that opportunity costs, and therefore net operating surplus, is zero; in other words providing consumer durable services for own consumption generates no income above what is needed to replace the using up of the assets concerned.

43. Concerning the *consumption of fixed capital* another simplifying assumption has been made, namely that its value each year is equal to purchases of new consumer durables. This implies that the net stock of consumer durables is stable. If, as is generally thought to be the case, the net

[5]Ruggles and Ruggles argue that ideally the value of consumer durable services should be determined on the basis of equivalent rental values, but since these are not available for many consumer durables, it is necessary to approximate rental values by the sum of capital consumption and imputed interest on the capital value; cf. Richard Ruggles and Nancy Ruggles, *The Design of Economic Accounts* (New York: National Bureau of Economic Research, 1970). More recently the United States Bureau of Economic Analysis has published comprehensive estimates of the value of consumer durable services, obtained as the sum of imputed interest, capital consumption plus repairs and maintenance costs; cf. Arnold Katz and Janice Peskin, "The Volume of Services Provided by the Stock of Consumer Durables, 1947–77: An Opportunity Cost Measure," *Survey of Current Business*, Vol. 60, no. 7, (July 1980), 22–31.

stock is actually growing, the adjustment ratios given in column 2 of Table 5 are too low because the denominators are overstated. Data for the United States suggests, however, that the errors involved are not very large.[6]

44. Table 5 shows that the exclusion of consumer durable goods from household consumption expenditure has a marked impact on saving ratios; their period-averages increase by between 3 (Japan) and 10 (Canada) percentage points, and in some years the adjusted saving ratios are twice as high as the SNA ratios. In general the increases are most marked for countries with low SNA ratios, with the result that the adjustment tends to reduce intercountry differences significantly. For the United States the ad-

Table 5
Average Household Saving Ratios ($\bar{x}$) and Linear Trends (T) for the Period 1970–1980: SNA basis and adjusted for different concepts of saving and income

	(1)		(2)		(3)		(4)	
	SNA gross saving ratio		Including expenditure on consumer durables		Including private expenditure on education		Including inflation gains and losses	
	$\bar{x}$	T	$\bar{x}$	T	$\bar{x}$	T	$\bar{x}$	T
United States	12.6	−0.22	20.7	−0.15	14.4	−0.24	10.7	−0.40
Canada	13.8	0.38	23.8	0.32	16.3	0.36	12.0	0.33
Japan	25.0	0.28	28.2	0.18	26.2	0.30	21.1	0.44
Australia	16.8	−0.10	—	—	17.3	−0.15	—	—
Finland	11.9	0.07	19.2	0.10	—	—	—	—
France	16.7	−0.16	23.6	−0.17	17.0	−0.15	13.3	−0.22
Italy	25.1	0.22	28.6	0.58	25.4	0.21	—	—
Sweden	8.3	0.12	16.2	0.09	8.5	0.12	—	—
United Kingdom	10.9	0.62	17.9	0.60	12.7	0.60	4.0	0.55
Coefficient of variation*	0.36	—	0.19	—	0.33	—	—	—

*See note to Table 3.

[6]The United States is one of the few countries that publishes estimates of gross and net capital stock of consumer durable goods. A description of these data is given in John Musgrave, "Durable Goods Owned by Consumers in the United States, 1925–1977," *Survey of Current Business*, Vol. 59, no. 3, (March 1979). Using alternative denominators gives the following saving ratios:

	1970	1972	1974	1976
Using capital consumption	20.9	21.2	21.7	21.0
Using purchases of consumer durables	20.7	20.6	21.3	20.6

In countries where the replacement component of durable purchases is markedly smaller than in the United States the error will, however, be bigger.

justment considerably dampens the decline in the household saving ratio recorded between 1975 and 1978, suggesting a switch from financial savings to purchases of consumer durables during this period.

Classifying education expenditures as capital outlays

45. While education expenditures do not create physical assets they result in "major alterations" to an existing asset—the "stock of human capital"—which greatly enhance its productivity. Alterations of this kind are treated in the SNA as investments when they are made to physical capital goods, and here the effect on household saving ratios is examined if this treatment were extended to human capital.

46. Treating household expenditure on education as a capital outlay requires a similar kind of adjustment to the accounts as was made earlier for consumer durable goods. Households are treated as though they were unincorporated enterprises that purchase an intangible capital asset—education—which is then used to produce "human capital services." There is, however, an important difference between consumer durable and human capital services, in that the latter are not primarily for own consumption, but are sold to other households, enterprises, or government. This greatly simplifies matters since household disposable income already includes, as part of wages and entrepreneurial income, the gross operating surplus $(O + C)$ generated by "human capital services," while such income had to be separately imputed in the case of consumer durable services. As a result the only adjustment required is the addition of education expenditures to the numerator of the saving ratio.[7]

47. Column 3 of Table 5 shows that the adjustment raises household saving ratios by between 0.2 (Sweden) and 2.5 (Canada) percentage points. The increase for the United States amounts to 1.8 percentage points, reflecting the above-average importance of households' educational expenditure in this country. There is a small reduction in intercountry differences as measured by the coefficient of variation.

Inflation gains and losses

48. In the SNA, gains and losses on liabilities and assets are shown in the balance sheet accounts where they appear as a reconciliation item between the opening and closing stocks. Some of these gains and losses arise from exceptional events such as physical destruction of assets (i.e., natural disasters or business failures) but gains and losses arising from holding financial assets and liabilities during periods of persistent inflation are regular and predictable and there is a prima facie case for treating these particular gains and losses as current flows and including them in income and savings.

[7]By ignoring the opportunity cost of forgone earnings by students, this may considerably underestimate the actual investment in human capital taking place.

49. Households hold durable goods—notably dwellings—equities, and other financial assets, and they incur nonequity liabilities. Holding gains and losses may arise with respect to any of these assets and liabilities, but for reasons of data availability it is only possible to consider inflation gains and losses on nonequity assets and liabilities, i.e., basically assets and liabilities denominated in money terms such as bank deposits, mortgages, and bonds, but excluding shares. Jack Hibbert[8] has recently prepared for five OECD countries estimates of the gains and losses in terms of current-year purchasing power during the period 1970–1979.

50. For the household sector, nonequity financial assets tend to exceed liabilities so that net capital gains due to inflation are negative, i.e., capital losses, in the case of households. As a result, household saving and disposable income are both reduced by inflation losses in calculating the adjusted saving ratios shown in the fourth column of Table 5. The saving ratios fall by between 6.9 (United Kingdom) and 1.8 (Canada) percentage points. In all countries except Japan the inflation adjustment reduces the growth or accentuates the decline of saving ratios over the period, with a particularly marked fall in the case of the United States.[9]

(b) National Saving Ratios

Classifying consumer durables as capital

51. The rationale behind the classification of expenditure on consumer durables as a capital outlay was discussed above. Column 2 of Table 6 shows that when this adjustment is followed through to the national saving ratios, there is a marked reduction in the difference between countries with the coefficient of variation falling from 20 to 15 percent. The 3.7 percentage point increase in the United States is the second highest (after Canada) in the sample, compared with only a 2.0 percentage point increase for Japan.

Classifying education expenditures as capital outlays

52. This is a similar adjustment to that made above to household saving ratios, except that for the national saving ratio both government and private education expenditures are included in the numerator. Column 3 of Table 6 shows that the adjustment substantially increases the national saving ratios and increases their growth (or reduces their decline) during the 1970s. The increase is the highest for the United States (6.1 percentage points) thus reducing the "savings gap" generally diagnosed for this country.

[8]Jack Hibbert, *Measuring the Effects of Inflation on Income, Saving, and Wealth,* forthcoming publication of the OECD and the Statistical Office of the European Communities.

[9]In these countries inflation-induced holding losses have apparently not been neutralized by reinvestment of inflated nominal interest earnings. In fact, if inflation is not anticipated, the increase in nominal returns will not occur and the holding loss will correspond to a real loss.

Table 6
Average National Saving Ratios ($\bar{x}$) and Linear Trends (T) for the Period 1970–1980: SNA basis, and adjusted for different concepts of income and saving

	(1)		(2)		(3)		(4)	
	SNA gross saving ratio		Including expenditure on consumer durables		Including expenditure on education		Including expenditure on research and development[a]	
	$\bar{x}$	T	$\bar{x}$	T	$\bar{x}$	T	$\bar{x}$	T
United States	18.6	0.01	24.3	0.05	24.7	0.11	19.5	0.02
Canada	22.1	−0.04	28.4	−0.03	—	—	22.3	−0.03
Japan	35.0	−0.93	37.0	−0.93	39.4	−0.79	36.1	−1.00
Australia	22.3	−0.97	—	—	26.2	0.28	—	—
Finland	25.9	−0.37	29.8	−0.33	—	—	26.3	−0.37
France	24.1	−0.48	28.9	−0.41	—	—	24.6	−0.49
Italy	22.3	−0.05	25.5	−0.28	26.7	−0.03	22.6	−0.05
Sweden	21.5	−0.82	25.6	−0.79	27.1	−0.73	22.1	—
United Kingdom	19.0	−0.11	23.4	−0.12	24.5	−0.08	19.3	0.08
Coefficient of variation*	0.20	—	0.15	—	0.18	—	0.21	—

*See note to Table 3.
[a]By enterprise sector only.

Treating R&D expenditures as capital outlays

53. Research and development (R&D) expenditures are treated in the national accounts as current outlays—either as intermediate consumption if they are made by enterprise, or as final consumption if made by government or nonprofit organizations. However, it can be argued that they should properly be regarded as capital outlays, since people who finance R&D probably think of themselves as making an "investment" in some sense, and expect the outlays to produce a return over a period of years. On the other hand, while R&D may be undertaken in the expectation of future benefits, that expectation is qualitatively different from the kind of reasonable certainty that motivates the acquisition of financial or tangible assets. In what follows a compromise position has been taken, and only R&D that is both carried out and funded by enterprises (i.e., excluding government- and university-funded R&D) will be considered as a capital outlay. This kind of research and development will presumably have been subjected to some form of cost/benefit analysis so that the future returns must be both quantifiable, and likely to accrue within a reasonable time-span.

54. The data used for the R&D adjustment are collected through regular surveys by the OECD Directorate for Science and Technology. They

are compiled according to the definitions and classifications of the "Frascati Manual" [10] and, at the aggregation level used here, they are both reasonably consistent over time and comparable between countries. The main problem for present purposes is that they exclude outlays on mineral prospecting; these are obviously important outlays in several OECD countries and if they were also treated as capital outlays, the adjusted ratios of Table 6 would be substantially higher for Canada, the United States, Australia and the United Kingdom—particularly towards the end of the period.

55. Treating enterprises' R&D expenditures as capital outlays increases the gross operating surplus because R&D outlays which were formerly included in intermediate consumption are now treated as self-financed capital formation, which is part of final output. Both gross national savings and gross national disposable income—the denominator in the national saving ratio—are therefore increased by the value of enterprise expenditure on R&D. The results of the adjustment are shown in the last column of Table 6. The adjusted ratios exceed the SNA ratios by between 0.2 (Canada) and 1.1 percentage points (Japan). Within countries the differences were remarkably stable during the 1970s, and so have a negligible effect on the growth rates over the period.

IV. Further Considerations (items not quantified)

56. The modifications of the savings definition considered in the preceding section by no means exhaust all possible changes in the definition of savings which might appear desirable for particular topics in economic analysis. In this section additional modifications of the savings concept will be explored, though a quantification of their effects on the saving ratio has not been possible for the present study due to the lack of comparable data for a sufficiently large group of countries. Still in many cases available qualitative information permits educated guesses on how the relative position of the United States in the international savings league would be affected by the adjustment discussed. Several of the adjustments considered here are controversial and the discussion only scratches the surface of problem areas which have been analyzed more intensively elsewhere, though not necessarily in the context of saving ratios.

Military Hardware

57. The SNA treats government expenditure on military construction and equipment as public consumption. It can be argued that such purchases represent investment and add to the stock of "defense capital" which will produce "defense services" in future periods. To maintain consistency, such a reclassification would require the national income concept to be supplemented by an estimate of the imputed return to the properly computed stock of defense capital. In principle, such treatment should be

[10]OECD, *The Measurement of Scientific and Technical Activities* (Paris: OECD, 1980).

analogous to that of investment in other tangible assets which produce non-marketed output for final consumption, like owner-occupied dwellings.[11] Since the United States has the largest expenditure on military hardware (both absolute and in terms of GNP) in the OECD area, such an adjustment would increase the U.S. national saving ratio relative to other OECD countries.[12]

Production Excluded from National Accounts

58. The SNA definition of output does not include all production activities in the economy. Production may be excluded deliberately (e.g., productive activity of housewives) because of inherent difficulties of measurement, or because it is (illegally) concealed from the authorities for reasons of tax evasion (i.e., the "underground" or "black" economy).[13] Enlarging the concept of production (and thus income) to include activities hitherto not included—if it could be done—would also affect saving ratios. How big and in what direction such a change would be obviously depends on the volume of the added production, and on which part represents consumption (e.g., self-supplied domestic services) and investment (e.g., black market construction) respectively. It thus seems impossible to predict in what direction—let alone by how much—international differences in saving ratios would be affected by such an adjustment without a detailed empirical study. As to the relative size of unrecorded production activities, a recent OECD study[14] suggests that the volume of the "black" or "underground" economy excluded from the national accounts is much smaller than the volume of activities concealed from tax collectors. This is because national accountants use a variety of sources and methods to cross-check their estimates for activities where "black" transactions are likely to be important.[15] However, the relative size of domestic production activities deliberately excluded from the production and income accounts is likely to be quite large and thus their inclusion may conceivably affect intercountry differences in saving ratios significantly if the relative size of such production differs between countries. Assuming that all these activities are directed to the out-

[11]Nonmilitary government investment not considered as producer durables should in principle also be treated in this fashion.

[12]A major reason why military hardware is classified as consumption in the SNA is that great uncertainty attaches to the length of its service life. Under normal peace-time conditions, however, it appears legitimate to argue that its destruction in the relatively rare armed conflicts that do occur should be treated as capital losses, in line with the treatment of civilian capital assets lost in floods and earthquakes.

[13]A third category of transactions excluded from the National Accounts consists of illegal activities like gambling and drug trade; these items are ignored in this paper.

[14]Cf. Derek Blades, "The Hidden Economy and the National Accounts," *OECD Economic Outlook, Occasional Studies,* (June 1982), pp. 28–45.

[15]Recent studies in the United States and the United Kingdom suggest that the value added by "black" activities omitted from the national accounts might amount to *at most* 3 percent of GDP, cf. Blades, ibid.

put of consumption goods and services (which seems questionable), their inclusion should ceteris paribus lower the saving ratios most in those countries where the labor participation rate of married women is relatively low.

Use of Nonrenewable Resources

59. Many production processes require (directly or indirectly) inputs of raw materials. Where these raw materials are taken from a limited (though unknown) stock of nonrenewable resources, it can be argued that the value-added share corresponding to this input (i.e., the rents received by the resource owner) do not represent net output but should be treated as negative investment (and savings) much like the running down of conventional inventories. A corresponding adjustment to the income and product statistics would imply a relatively larger downward adjustment of the saving ratio in those countries where the share of rental income from the use of nonrenewable resources is relatively large, e.g., Norway, Canada, and the United States. In quantitative terms the adjustment would, however, be likely to be small because—contrary to moderately widespread opinion—the share of pure rental income from the use of depletable national resources in total income is minute in most OECD countries, or at least has been prior to the oil price shocks in the seventies.[16]

60. Analogous reductions in official income measures may be appropriate with respect to the declining quality of agricultural land due to (over-) use and more generally with respect to deterioration in quality of the environment (e.g., air pollution) caused by various production activities. In the latter case quantification is particularly difficult because due to undefined property rights, no rental income identifiable with the resource use (e.g., clean air, water, etc.) accrues, but rather the benefits are widely dispersed through suboptimal product prices not reflecting total (social) cost of production. Apart from the difficulties of measurement, the appropriate adjustment to the income and product accounts can have quite different implications for the saving ratio: where the environmental externalities represent a permanent damage (the stock of resources is permanently decreased, as in land erosion) income and *savings* should be lowered by identical amounts, entailing a *decline* in the saving ratio. Where the environmental damage is transitory (e.g., most types of air pollution) resources are not depleted and income and *consumption* (i.e., of clean air) should be lowered by identical amounts, leading to an *increase* in the saving ratio.

[16]Estimates by E. Denison for the share of total land rents in national income are 2.6 and 3.6 percent for the United States and Northwest Europe, respectively, in the early sixties. Only a fraction of this would correspond to the use of nonrenewable resources; cf. E. Denison, *Why Growth Rates Differ* (Washington, D.C.: The Brookings Institution, 1967), Table 4–2.

Learning-by-Doing

61. It has been argued in part III above that educational expenditure can justifiably be redefined as gross savings to the extent that it maintains or increases the stock of human capital, and thus adds to productive capacity. Formal education is, however, not the only activity generating human capital. Many skills are accumulated through learning-by-doing and on the job training. If these activities do, therefore, increase the stock of human capital (defined as increased capacity to produce in the future), the question arises how this phenomenon can be adequately recognized in an economically more meaningful definition of savings. For jobs which effectively entail human capital formation (in this wider sense), total labor and capital cost represent only a part of total value-added. Additional income is distributed "in kind" to the employee in whom the newly created human capital is embodied and thus saved, and total income estimates should be supplemented by the amount of human capital thus created.[17] Doing so would obviously increase the gross saving ratio by increasing the adjusted income and gross savings measures by identical amounts. In international comparison such an adjustment would raise the saving ratio most for those countries which have been most successful in integrating additional members of society into the labor force. A casual look at international employment statistics suggests that on this basis the U.S. and Canadian saving ratios would probably improve significantly relative to most European economies where employment stagnated or even declined during the last decade.

Rearing Costs and Health Expenditures

62. An even more drastic extension of the human capital concept has been suggested by J. Kendrick.[18] He includes under the definition of "tangible human capital," the cumulated rearing and maintenance cost of individuals, roughly identifying these items with "necessary" consumption and health care expenditures respectively. As a consequence, these expenditures would have to be reclassified as investment rather than consumption which would, of course, increase the saving ratio. In production analysis, tangible human capital and intangible human capital embodied in the former would replace labor as a production factor, and gross returns on these types of capital correspond to labor income in conventional analysis. The Kendrick methodology produces an adjusted national saving ratio for the United States which increases gradually from 43 percent in 1929 to 50 percent in 1969. No comparable studies are available for other countries but given the more rapid population growth in the United States than in most

[17]The time profile of income during a (professional) life might be interpreted as prima facie evidence of the amount of human capital formation specific to a job: a flat (steeply increasing) time profile would suggest no (large) human capital formation.

[18]John Kendrick, *Formation and Stocks of Total Capital* (New York: Columbia University Press, 1976).

other OECD countries, such an adjustment is likely to favor the relative position of the United States in an ordering of countries according to the size of the national saving ratio.

Different Relative Prices of Investment Goods

63. All the previous adjustments discussed referred to changes in the definition of savings and/or income. The reasoning that follows is qualitatively different in that it considers the effect of relative prices on savings ratios. In countries where the relative price of investment and consumption goods differs significantly, identical physical amounts of investment and consumption would imply different investment ratios, the latter being ratios of value aggregates rather than of quantities. Since empirically investment ratios and saving ratios in most OECD countries are close to identical in the medium run,[19] this implies that saving ratios may differ considerably between countries with an identical composition of physical output allocated to consumption and investment.[20] The assumption of perfectly competitive world markets would weaken but not completely eliminate this possible source of differences in saving ratios. As long as production factors are immobile internationally and there are nontradeable goods and/or differential transportation costs, the relative price of investment goods may still differ between countries.

64. It seems difficult to say a priori whether such a relative price effect plays a significant role in observed intercountry saving ratio differences and—if so—in which direction it influences these differences. A recent careful international comparison of relative prices of major GNP components shows, however, that intercountry relative price differentials are substantial and that the relative price of investment goods is lower in the United States than in most other OECD countries.[21] This implies that the low U.S. saving ratio can be interpreted simply as a reflection of the fact that "investment comes cheap" in the United States rather than entailing low investment (relative to consumption) in physical terms. The policy implications of this finding would appear to be that the saving ratio may indeed be low, but that this is nothing to worry about as far as the *volume* of investment is concerned.

[19]Cf. M. Feldstein, and C. Horioka, "Domestic Saving and International Capital Flows," *The Economic Journal,* 90 (June 1980), 314–329.

[20]This phenomenon has been implicitly recognized in discussions of the high Japanese household saving ratio, where the latter is partially explained by the high relative price of housing in Japan; cf. J. Shiba, "The Personal Savings Function of Urban Worker Households in Japan," *Review of Economics and Statistics,* 161 (May 1979), 200–213.

[21]Cf. Irving Kravis, Alan Heston, and Robert Summers, *World Product and Income* (Baltimore: John Hopkins University Press, 1982), p. 20.

V. Savings Concept Relevant for Economic Growth

65. Applying different combinations of the various adjustments to the SNA saving definition discussed earlier, results in a large number of alternative savings concepts differing considerably in size as well as the speed and even direction of change over time. For the economic policymaker it is important to know which of these alternative concepts is the most relevant with respect to the policy targets he pursues.[22] This section discusses the question of which definition of the national saving ratio is the most appropriate to use in the analysis of economic growth and its determinants.[23] While this relationship seems to be of primary concern in the United States, it is by no means the only important policy aspect of savings: in many LDCs, and recently also in several industrialized European countries, policies aiming to increase savings are primarily motivated—at least according to explicit statements by politicians—by the desire to create employment opportunities through capital-widening investment. Though closely related, output and employment growth targets need not have a one-to-one correspondence and would indeed imply different definitions of savings as the relevant concept for policy analysis.

66. Limitation of the discussion to the national saving ratio makes it unnecessary to review those adjustments discussed above which only affect the sectoral composition of total savings, while leaving the overall saving ratio unaffected. These adjustments include the adjustment for inflation-induced capital gains and losses on financial assets, and all adjustments for differences in institutional arrangements except for the method of raising tax revenue (i.e., direct vs. consumption taxes). The latter entails differences in national saving ratios only if disposable national income is measured at market prices rather than at factor cost, and this suggests that international comparisons of national saving ratios should be based on the latter concept rather than on income measures including indirect taxation.

[22]While this study is limited to the discussion of saving *ratios,* it may be useful to remind the reader that annual changes in total national savings due to variation in the saving ratio usually do not exceed changes accounted for by variations in the level of income. Thus, policies to achieve full capacity utilization would appear equally relevant if the policy objective is an increase in total savings. Of course, full capacity utilization and high saving ratios are not mutually exclusive policy objectives. In fact, there seems to be an empirically robust positive correlation between the two variables over the business cycles.

[23]Notwithstanding the concentration on total (or national) savings, it is recognized that with imperfect capital markets the sectoral distribution of savings will affect the composition of capital formation and probably the speed of income growth associated with a given overall saving and investment ratio. The sectoral distribution of a given amount of savings may thus itself become a legitimate policy concern.

67. In neoclassical growth models it is normally the *net saving ratio* which codetermines the absolute growth of the capital stock, given the growth rates of population and technical progress. There are at least two problems with such a paradigm:[24]

— It is the increase in the gross rather than the net capital stock which codetermines the growth in productive capacity.[25] Whenever scrapping differs from depreciation (the normal case in a growing economy), net savings will not be equal to the increase in the gross capital stock and thus fail to be a proper indicator of capacity growth.[26]

— If embodied technical progress is important and the official measure of investment fails to take full account of the increased productivity of new investment, the capital stock (measured in efficiency units) may rise even if net savings is zero. In this case a vintage capital model may be the appropriate tool for analyzing growth, in which case gross savings (and investment) becomes a relevant variable.[27]

These examples suggest that both the gross and the net saving ratio may be relevant in a realistic and detailed analysis of growth, rather than one or the other.

68. In standard neoclassical growth theory, the rate of output growth is in the long run independent of the saving ratio. Changes in the latter exert an influence on output growth only during the transition period from one steady state to another. To avoid getting unduly involved in a discussion of the policy relevance of such models, it thus appears useful to replace the question of which savings concept is relevant for growth analysis by the related (but not identical) question of which wealth concept is relevant for the determination of income levels.[28] Once the appropriate wealth concept is determined, the relevant savings concept is likewise determined as its derivative with respect to time. Inspection of the various adjustments

[24]In the real world further complications arise from the openness of the economy (which may entail discrepancies between national savings and domestic investment) and ex ante disequilibrium in the goods market, entailing unintended increases in inventories, i.e., investment which does not increase productive capacity. Implications of these complications are not pursued here.

[25]If fixed capital loses part of its productive capacity already during its lifetime (i.e., before final scrapping), the relationship becomes even more complicated but the arguments to follow still hold.

[26]Along a steady-state growth path the *relative* growth of the net and the gross capital stock will, however, be the same.

[27]Putty-clay technology equally requires the use of vintage models and thus of gross savings for growth analysis.

[28]In said neoclassical growth models, the saving ratio in the long run determines the *level* of (per capita) wealth which in turn determines the *level* rather than the growth of (per capita) income.

to the definition of savings discussed above shows that in some cases these changes would require concommitant changes in the concept of income (or output) to maintain consistency in the national accounts. In these instances the question of which is the relevant savings or wealth concept translates directly into the question of what is the relevant income concept. Thus, if services provided by consumer durables are deemed to be a legitimate part of a "comprehensive" or "correct" measure of income, then the "relevant" wealth concept must include the stock of consumer durables, and savings should be redefined to include consumer durable purchases. An analogous argument applies to the savings adjustment on account of government purchases of military hardware.[29]

69. Little discussion is required with respect to the "black economy" adjustment: it attempts to reduce measurement errors, and the smaller these errors are kept the better.[30] Whether production activities presently deliberately excluded from the SNA (e.g., housewives' services and do-it-yourself activities) should be included in the income definition, thus lowering (raising) the saving ratio in the case where these activities represent consumption (investment), depends on what the income concept is supposed to measure. Where income is used as a proxy variable for welfare, inclusion would seem desirable.[31] If, however, the aggregate output measure is used as an indicator determining demand pressure in the labor market or the size of the tax base, to mention a few examples, inclusion would not be justified. Since welfare considerations are the primary objective in promoting growth, it follows that the saving and income concepts chosen should be rather more comprehensive than the concepts presently used. The inclusion of hitherto ignored production activities which qualify as investment would for consistency require the computation of a corresponding capital stock whose (imputed) rate of return would, of course, add to current income appropriately redefined whenever this capital renders consumption services.[32]

[29]Note, however, that as these changes are implemented, the resulting savings concept becomes rather uninteresting for analysts concentrating on the supply of loanable funds by the household sector: financial planners may find little comfort in being told that the household saving ratio is unchanged, if households have switched from investing in financial assets (e.g., stocks and bonds) to buying consumer durables.

[30]All adjustments are discussed here with respect to their economic justification, ignoring statistical difficulties of implementing any suggested adjustment. In that respect the present study differs from the rationale underlying the SNA which attempts to strike a balance between what is conceptually desirable and practically feasible.

[31]The resulting concept would still be a rather imperfect indicator of welfare, ignoring important aspects of welfare such as leisure time, income distribution, and relevant social indicators like crime rates, incidence of sickness, etc.

[32]In the United States this is presently done only with respect to owner-built houses. Where the capital renders production services (e.g., human capital), the returns are reflected in higher productivity (as conventionally measured) and no imputed return should be added to income.

70. Generalizing this type of reasoning, it seems difficult to escape the conclusion that the part of education and R&D which permanently increases the productivity of labor and/or capital should be reclassified as investment and thus saving for the purpose of growth analysis. Cumulating these intangible investments would generate an intangible capital stock partly embodied in human beings (skills) and partly embodied in a stock of known production technologies and products. It has been shown that imputing market returns to these types of intangible capital goes a considerable way in explaining labor income differentials and the residual factor in economic growth.[33] The part of education which does not lead to an increase in factor productivity should be treated analogously to investment in consumer durables, where it leads to a permanent increase in knowledge and understanding or as consumption (as is presently done for all education) if no such lasting effects are produced. Human capital formation originating from learning by doing should similarly add to the stock of intangible human capital, implying an equal (imputed) increase in income and savings.[34]

71. The last item to be considered is whether the value of nonrenewable resources used in current production should be deducted from current income on the grounds that it is equivalent to running down inventories.[35] The diversification efforts of economies heavily based on the exploitation of nonrenewable resources (e.g., Nigeria, Venezuela) implicitly recognize the dissaving character of nonrenewable resource use. By saving a substantial part (the rental income equivalent?) of their revenues from these activities and reinvesting it into alternative income-producing assets, they attempt to avoid the erosion of net national wealth defined in a broader way to include the stock of nonrenewable resources.[36] Recognizing the same principle explicitly in the national accounts would imply the deduction of rental income from nonrenewable resource use from national income and savings. Doing so would seem in line with economic logic.

[33]For a detailed discussion of this topic see John W. Kendrick, *Formation and Stocks.*

[34]It may well be that the amount of human capital formation foregone due to (youth) unemployment during a prolonged recession matches or even exceeds the output losses conventionally measured, the topic seems certainly worth further investigation.

[35]Contrary to other stocks of capital which contribute to current output by rendering a production or consumption service in which economic depreciation is an unavoidable fact, a stock of natural resources "only" contributes to output by being used up. There is thus no imputed net return to stocks of natural resources, only cost of depreciation equal to the rental income of the resource owner.

[36]The asset value of natural resources relative to current income may, in some cases, be so large as to make it economically efficient to lower the wealth income ratio by consuming part of the rental income from resource exploitation—this may presently be the case in countries like Kuwait and Saudi Arabia.

Discussion

Paul A. Wachtel*

That saving rates for the major industrialized countries differ enormously is a well-known puzzle. The careful analysis of the OECD's uniform National Income Accounts by Blades and Sturm suggests that the puzzle will continue to defy solution. This is not to fault their analysis; instead I am inclined to conclude that a full understanding of international differences in saving behavior may not be obtainable from the available data. In this discussion I would like to suggest an alternative framework for analysis of the available data which I think would provide a fuller understanding of the puzzle. Nevertheless, it is clear that answers to all the issues will be very difficult to obtain.

To begin, we can summarize the methodological approach used by Blades and Sturm. Their point of departure is the uniform accounting scheme prepared by the OECD. They note that the conceptual definition of saving in those accounts can be criticized for a number of reasons. For each of these they make adjustments to the data and note that with conceptually improved definitions of saving, the intercountry variation in average saving rates for the 1970s is reduced slightly.

Although the adjustments to the data that they suggest are always reasonable, the corrections made do not go very far towards solving the puzzle. For example, Table 3 in Blades and Sturm shows that with the SNA definition of gross household saving rates, Italy and Japan have the highest saving rates and Sweden and the United Kingdom have the lowest. Some six adjustments later, we find that the same rankings hold (totally standardized saving rate, method A). The rank correlations for all nine countries in the sample of the SNA average saving rates with the two alternative totally standardized measures are .90 and .85. Although the adjustments affect different nations differently, the overall picture is invariant. In a few countries a fifth or more of disposable income is saved, while in some the rates are only a fraction of that amount.

The emphasis in the paper is on the appropriate definition of the aggregate saving ratio, whether it is national saving or household saving. This, I think, is the major failing of the study. It compares the overall picture—the forest for each country. Instead, I suggest more emphasis on individual trees from each nation's forest. The puzzle of international differences in saving rates is not solved by comparing the vast forest of savings in each country. However, within each forest there are individual trees which are similar to or different from the corresponding trees in other forests. Per-

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haps more can be learned from a comparative study of different types of saving activity and motivations for saving.

Blades and Sturm present aggregate saving ratios after various adjustments are made. My contention is that the adjustments themselves merit more attention. They typically represent specific types of saving behavior and the extent to which countries differ with respect to these activities may shed light on the differences in the standard or common core definitions of saving. It is difficult to examine the magnitudes of the saving components used for the adjustments with the data in their tables which include adjustments to both the numerators and denominators in saving rates.

The emphasis on household saving here and in the Blades and Sturm paper needs to be justified. Saving by households is of particular interest because the household sector is generally a surplus sector. That is, its net financial investment represents resources available to other sectors for capital formation. The extent to which the household sector is releasing resources to the rest of the economy can be measured even with SNA data on personal saving. That is, simply subtract net housing investment from personal saving. I think that this calculation would provide a valuable addition to the material presented in the article.

Using the household saving data in Table 3 as an example, the interrelationship between SNA saving and the saving of unincorporated enterprises, corporate enterprises, pension funds, social security funds and government expenditures on human capital should be of interest. Thus, some simple questions could be addressed like: Do countries with high public pension saving have low private pension saving? Do countries with a lot of saving by unincorporated enterprises have less household saving? The emphasis on a comprehensive saving ratio obscures such questions. It is important to know whether differences in standard saving rates are due to particular components or to similar variation in all the components.

A decomposition of household saving cannot be done easily with NIPA data, but for the United States at least there is an alternative data source which is particularly useful, the Flow of Funds data. A breakdown of the Flow of Funds data on household saving which would be useful for the type of analysis that I am proposing is found in Table 1. Average ratios to disposable personal income for 1970–81 are shown, along with the slope coefficient from a trend equation.

Table 1
Composition of Household Saving, United States 1970–81

	Average Ratio to Disposable Income[a]	Trend[b]
Net acquisition of financial assets	14.3	.41*
Deposits and credit market instruments	11.7	.31*
Life insurance and pension fund reserves	4.1	.14*
Net investment in noncorp. business	−1.4	−.05
Miscellaneous	−.1	−.01
Net increase in liabilities	7.5	.29
Home mortgages	4.9	.27*
Other	2.6	.03
Net physical investment	6.1	−.06
Residential construction	3.0	.05
expenditures	5.0	.12
capital consumption	2.0	.06*
Consumer durables	3.1	−.12
expenditures	12.6	−.07
capital consumption	9.4	.05*
Net financial investment	6.8	.11
Net saving	13.0	.05
Personal saving (NIPA)	7.0	−.23*
Personal saving (FOF)	9.8	.17*

[a]Following FOF convention, capital gains dividends and credits from government insurance are added to the NIPA definition of DPI.
[b]Slope coefficient of regression of saving rate on a time trend; t-statistics greater than two are indicated by an asterisk.

The importance of the disaggregation is clear from Table 1. Any measure of household aggregate saving is composed of a diverse set of activities which exhibit very different trends over the decade of the 1970s. The major changes seem to be due to increases in the acquisitions of money market instruments and of mortgage liabilities. It is also interesting to note that the FOF aggregate measures exhibit positive trends over the decade while the trend in the personal saving rate using the NIPA is negative.

It would be logical to assume that a similar variety of behavior would be found with data for other countries. Although, to my knowledge, there is no comparable standard set of FOF accounts, I imagine that entries for all or some of the items in the Table could be found for many of the industrialized countries. At the very least, it may be possible to isolate the residential construction sector and its associated items, capital consumption and mortgages. The U.K. National Accounts include some FOF data. The following breakdown for the United Kingdom is readily available; it is shown with the average percentages of net income for 1970–75:[1]

[1]These data are taken from "Private Saving in the Provision of Social Security in Britain" by David Burros in George von Furstenberg, ed., *Social Security versus Private Saving,* (Cambridge, Mass.: Ballinger, 1979). This volume also includes essays on the relationship between social security and saving in Canada, Sweden, France, W. Germany and the United States. See also K. Cuthbertson, "The Measurement and Behavior of the U.K. Saving Ratio in the 1970s," *National Institute Economic Review,* February 1982.

Personal Saving	11.2
Gross physical investment	6.1
Net financial investment	5.1
contractual assets	5.6
other financial assets	6.0
net increase in liabilities	6.5

However, we should not underestimate the task of constructing comparable tables of the components of saving. The U.K. data shown are similar to the breakdown suggested for the United States, but not necessarily comparable.

Analysis of saving behavior of individuals in different countries usually centers around institutional differences. Particularly, the public and private ways of providing retirement income are considered very important. Blades and Sturm address this issue in part by adjusting the saving ratios to either exclude the surplus of private pension funds or to include the surplus of social security funds. However, neither of these surpluses is relevant for analyzing the effect of pension saving on individual saving behavior. The surpluses of pension funds are their contribution to national saving or the extent to which resources are set aside for capital formation. Individuals' saving will be affected by the extent to which pension funds accumulate expected future liabilities. Since both private and public pension funds are rarely fully funded, the surpluses may not correspond with the accumulation of implicit or explicit pension promises. It is these promises of future pensions that may substitute for individuals' saving rather than the extent to which the pension funds run a current surplus.

Thus, the relevant measure of saving by pension funds depends on the question at hand. The surplus represents their contribution to national saving or capital formation. If, however, we are interested in the role of pension funds as a creator of pension wealth which substitutes for individuals' saving, a different measure is needed. A calculation of the unfunded liabilities must be added to the assets of the pension funds or a calculation can be made of pension wealth along the lines used in the United States to estimate social security wealth. It would be interesting to know whether those countries with low asset accumulation by households have high levels of private or public implicit pension promises. Although there have been calculations of implicit pension wealth in the United States, I do not know whether similar data are available for other countries.

A large part of the saving behavior of individuals is related in one way or another to the provision of housing. The housing sector affects financial asset accumulation (for downpayments), liabilities (mortgages), and capital expenditure (construction). Countries differ enormously in the institutional structures that determine saving for these purposes. Furthermore, there are differences in the extent to which housing services are provided by the public sector, the business sector, and by owner-occupiers. The institutional structure of the housing sector will affect the level of net financial investment and resources available for capital formation elsewhere. Thus, an analysis of the housing sector could help answer many important questions.

For example, could low productivity growth in the United States be due to a large allocation of saving to housing rather than other capital formation?

The overall conclusion to be drawn from these comments about personal saving behavior is that it is not informative to make international comparisons of personal saving rates. For the analysis of national saving, an aggregate saving rate may be of greater interest. An overall measure of the propensity of various countries to set aside resources for capital formation is an important determinant of future growth. It is interesting to observe (Blades and Sturm Table 2) that the coefficient of variation in gross national saving (.21) is only two-thirds as large as the coefficient of variation for gross household saving (.33). (Gross saving is preferred to net because of the differences in depreciation calculations.) The remaining intercountry differences are large and some disaggregation would still provide a useful framework.

Disaggregation of the national saving data provides important information about which sectors are providing the resources for capital formation and which are using them. For example, government deficits absorb the savings of other sectors. Generally, the household surplus is absorbed by business needs to finance its investment. It is also useful to measure the extent to which the housing sector absorbs savings and whether the foreign sector is an absorber or supplier of resources. The FOF scheme in the United States provides savings tables for each of the major sectors in the economy which can be used to analyze patterns of capital formation and savings flows.[2]

A useful breakdown of gross saving and investment in the United States can be found in the NIPA as shown in Table 2. The U.S. data indicate that the government sector absorbs saving while the foreign sector provides resources. However, the behavior of the important sectors is very variable although there is no apparent trend.

[2]See for example the author's "Financial Prerequisites for Economic Growth" in M. Polakoff and T. Durkin, eds., *Financial Institutions and Markets* (Boston: Houghton-Mifflin, 1981).

Table 2
Composition of National Saving, United States, 1970–81

	Average Ratio to GNP	Trend[a]
Gross Saving	15.9	.10
Gross Private	16.9	.07
Personal saving	4.9	−.16*
Undistributed profits	2.0	.00
Capital consumption	9.9	.23*
Government Surplus	−1.0	.03
Gross Investment	16.0	.08
Gross Private Domestic Investment	16.0	.10
Residential construction	4.4	−.03
Nonresidential fixed and inventories	11.5	.14
Net Foreign Investment & Capital Grants	.1	−.02

[a]Slope coefficient of regression of saving rate on a time trend; t-statistics greater than two are indicated by an asterisk.

Data to fill out such a scheme should be obtainable for most countries and the contrasts among the entries seems more interesting to me than just concentrating on the first entry. In addition, data are often available to make some logical additions to this scheme. For example, consumer durables can be added to personal saving and a government capital account can be added to the scheme (as is done in Canada). There are also probably large differences among countries in the proportion of GNP devoted to household physical investment (housing and consumer durables) and to government capital formation (military capital, research and development, public enterprises and social infrastructure).

Also of interest in this context are differences in the size of capital consumption allowances. These are in part due to variation in the accounting procedures used by national income statisticians which would probably be very difficult to evaluate. More importantly differences in the age and composition of the capital stock would also affect the size of depreciation allowances. An understanding of this issue would help explain why in certain countries (with a small or young stock of capital) a given amount of nonconsumption (gross investment) makes a larger contribution to the growth potential of the economy.

An advantage of looking at capital formation (investment) by type of activity is that we can take a look at items which may or may not be classified as investment expenditure. Saving may be low in those countries which have large expenditures on near-investments (research and development, education and health). It is not always clear that such expenditures should be added to the saving rate (Blades and Sturm hesitate to do so) and disaggregation keeps the analysts' options open.

Although saving is one of the most important elements of any national accounting scheme, it is also the most problematic because saving is usually measured as the residual entry in the accounts. Thus any measure of saving is subject to large errors of measurement. Differences among countries in

the size of such errors may make comparison of saving levels and trends very inaccurate. However, it would be very difficult to pinpoint exactly the type or direction of errors that may appear in the accounts.

An example of a data error which affects the international comparison of saving rates is the size of the underground economy. If nations differ in the size of the underground economy as they probably do, then the comparison of saving rates can be very inaccurate. Of the countries in the sample, I guess that the severest underestimation of income occurs for Italy. But Italy already has a high personal saving rate and if income is underestimated and consumption accurately measured, then the saving rate is even higher.

An indication of the size of the errors that creep into saving data are the discrepancies that appear in the accounts. A glaring example is the difference between U.S. personal saving calculated from the NIPA and from the FOF accounts (using financial data). Using a September 1982 FOF table we find that the average absolute discrepancy was $5.7 billion for 1970–75 and $39.8 billion for 1976–81. In recent years the FOF indicates substantially more saving; the FOF personal rate is 2.3 percentage points higher than the NIPA calculation for 1976–81.

A related problem that is more tractable is the revision of data. Since saving is a residual measurement it can change substantially when data revisions are made. I do not know how revisions have affected the accounts of other countries, but recent data revisions have all but wiped out the capital shortages that seemed to appear in the United States in the 1970s. For example the revision to the accounts published at the end of 1980 increased the average personal saving rate for 1968–79 to 7.1 percent from 6.4 percent.[3] The revisions released this summer (July 1982) increased both personal saving rates and the share of business investment in GNP over the past five years. For 1977–81, the personal saving rate is now at 6.0 percent, 0.6 percent higher than reported earlier. The ratio of private fixed investment to GNP increased by 0.4 percent to 16.1 percent.

To recapitulate my major criticism of the Blades and Sturm analysis is that the accounting adjustments they make to overall saving rates leave the overall puzzle unsolved. I suggest more emphasis on specific concepts of economic activity rather than on overall saving rates. This amounts to a comparative study of the structures of various economies. I am confident that such studies would provide a partial solution to the puzzle. Still lacking is a study of differences in the proximate causes of saving. An example of this is the role of demographic structure in determining personal saving.

[3]See D. Jamroz, "Highlights of the Recent National Income and Product Account Revisions," *Quarterly Review,* Federal Reserve Bank of New York, Spring 1981.

My own research showed that this issue is not well understood in the United States and I think that this is the case elsewhere as well.[4] It is clear that a great deal more work remains to be done. Although Blades and Sturm may not have solved the puzzle, we can be appreciative of their efforts in providing a comprehensive catalog for future attempts.

[4]See "Household Savings and Demographic Change: 1950–2050," Research Paper for the President's Commission on Pension Policy (1981) and "Age Structure and Personal Saving Behavior," with Charles Lieberman, in *Social Security versus Private Saving.*

Discussion

Edward F. Denison*

That this is a valuable paper hardly needs stating; it always is interesting to calculate how a change in definition alters differences among places. Blades and Sturm provide several such calculations for saving rates, as well as evaluations of the effect of different institutional arrangements. These results speak for themselves.

I shall concentrate on questions as to what definitions are most appropriate. Blades and Sturm say the correct definition of saving depends on the question analyzed and that their paper gives special attention to analysis of economic growth (par. 2). I accept this as a starting point.

Saving in the Whole Economy

I shall devote most of my time to saving in the economy as a whole. It is axiomatic that total saving should equal total investment if data for saving are to be useful in analyzing economic growth or stabilization. Consequently, I shall use the terms "saving rates" and "investment rates" interchangeably. To equal investment in the national accounts, saving must not include revaluations of existing assets. The authors' discussion of continuing inflation in their par. 48 raises a question as to whether they agree with this, and I would welcome clarification.

Geographic Coverage

National income and product, around which the U.S. NIPAs are organized, include net factor income from abroad so that the income, consumption, and saving of residents and the ratio of their saving to their income are not affected by the geographic origin of their income. OECD statistics, in contrast, center on gross *domestic* product, which confuses these relationships. Blades and Sturm are right to adjust them to a GNP basis. More debatable is their addition of net current transfers from abroad to GNP for use as the denominator of the saving ratio. Although it seems sensible to suppose that *recipients* add transfers from abroad to income before deciding how to divide income between expenditures and saving, it also seems likely that *payers* consider international transfers part of their expenditures rather than a deduction from income. At least, I believe Congress thinks this way.

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Market Price or Factor Cost

Blades and Sturm do not directly consider whether valuations should be at market price (as in their table 2) or at factor cost, but the question is implicit in their discussion of the effects of consumption taxes on personal saving rates (pars. 31–32). There is reason to prefer factor cost because it will not help future growth if the investment rate is increased by taxes on investment goods that raise their relative price rather than by diversion of resources from consumption to investment. Unfortunately, at present we are forced to use market prices because of the absence of a division of GNP at factor cost between investment and consumption and of capital consumption at factor cost. In their studies for OECD in the 1950s Gilbert and Kravis, and Gilbert and Associates, did provide comparable gross output data for nine countries at both factor cost and market price.[1]

National or Uniform Prices

The studies just cited showed that the choice between factor cost and market price is less important than the choice between using its own prices for each country and using the same prices for all countries. Later studies by Kravis, Heston, and Summers for the United Nations also show the importance of differences in price relationships. For example, consider Japan and West Germany. In 1970, gross investment was 31 percent of GDP in Germany when prices in marks were used and 40 percent in Japan when prices in yen were used but when the same prices, international dollars, were used for both countries the German percentage was 37 and the Japanese 38, only one-tenth as large a difference. Similarly, in 1973 the gap was 11 percentage points in national prices and 2 points in international dollars. From 1973 to 1975 the situation changed. The Japanese percentage fell 7 percentage points in yen but only one point in international dollars while the German percentage fell sharply in both marks and international dollars. As a result, in 1975 the Japanese percentage was much above the German by either measurement.[2]

[1]Milton Gilbert and Irving B. Kravis, *An International Comparison of National Products and the Purchasing Power of Currencies: A Study of the United States, the United Kingdom, France, Germany, and Italy.* Paris: Organisation for European Economic Cooperation, 1954. Milton Gilbert and Associates (Wilfred Beckerman, John Edelman, Stephen Marris, Gerhard Stuvel, and Manfred Teichart), *Comparative National Products and Price Levels: A Study of Western Europe and the United States,* (Paris: Organisation for European Economic Cooperation, 1958).

[2]Irving B. Kravis, Alan Heston and Robert Summers, *International Comparisons of Real Product and Purchasing Power,* (Baltimore: Johns Hopkins University Press, 1978), tables 1.5 and 1.6, and *World Product and Income: International Comparisons of Real Gross Product,* (Baltimore: Johns Hopkins University Press, 1982), tables 1.6 and 1.7.

Investment has been cheap in the United States. In the 1950s and 1960s the U.S. gross investment ratio was much higher, compared to other countries, when the same prices were used for all countries than when national prices were used. In 1975 the relative price of capital formation continued to be lowest in the United States although the difference from most other countries had narrowed.[3]

Although Blades and Sturm mention differences in relative prices, they do not refer to the wealth of data about them nor indicate clearly what prices they consider appropriate (pars. 61–62). Since it is not yen, marks, and dollars but structures, equipment, and inventories that contribute to production, it seems to me that if international comparisons of any saving ratios can contribute to analyses of levels or growth of output, it must be ratios based on the same prices that are appropriate. In *Why Growth Rates Differ* I took this position but suggested data in national prices should be used to appraise national effort in the form of "abstinence." (Of course, it was net saving that was appropriate.)[4]

A Look at Table 2

If one postulates a few dozen other-things-being-equals, a persistently *high* gross saving rate leads to a large capital stock and hence a high level of output, while a sharply *rising* gross saving rate leads to a high growth rate of capital stock and hence a rapid growth of output. International differences in gross saving rates have, for the most part, persisted for a long time now so, if they can indicate anything about international differences in capital stock and output, it is about their levels. But can they?

I have ranked the countries from 1 to 24 by their gross saving rates, net saving rates, and capital consumption rates. The first two sets of rates were taken from Table 2 of the paper. The third was obtained by subtraction, which isn't exactly right but should be close enough to rank the countries correctly. The rankings by gross and net saving rates put the same countries at the top and bottom, although the correspondence vanishes once one leaves the extremes. There is no correspondence between capital consumption rates and gross saving rates. Luxembourg is first in gross saving and 17th in capital consumption. The next three countries by gross saving rank are 7th to 13th by capital consumption rank. The United Kingdom and United States rank 22nd and 24th, respectively, by gross saving but the United Kingdom ranks 6th and the United States 4th by capital consumption. On the other hand, Portugal and Turkey rank in the last four by both measures so the relationship is not consistently inverse.

One has to wonder whether the numbers make sense. Firmer assurance about comparability of data than is provided by the authors' assurance in par. 10 that data were compiled according to standard definitions would be comforting. Has government capital consumption been included

[3]For 1975 price ratios see *ibid.,* table 1.8.

[4]Edward F. Denison, *Why Growth Rates Differ: Postwar Experience in Nine Western Countries,* (Washington, D.C.: The Brookings Institution, 1967), esp. chapter 10 and p. 344.

in gross saving in all countries, although it seems not to be in *National Account Statistics*? Do service lives and depreciation formulas bear the same ratio to the truth in all countries? What about the international flow of retained earnings of corporate subsidiaries? Are government and private capital consumption always valued at reproduction cost? (Par. 8 cautions they are not.)

On the other hand, if the trouble is not, or not only, with the data, it may mean that gross saving rates differ from those in the past; or that the distribution of capital stock among inventories, international assets, and depreciable assets in each service-life class differs among countries; or that actual service lives vary from country to country. Any of these would prevent even accurate gross saving rates from indicating the ranking of countries by capital-output ratios and leave a large question as to what useful information they do convey. International differences in the composition of investment or capital stock or in service lives would not, in themselves, destroy *net* saving rates as an indicator of relative capital-output ratios. Nevertheless, to analyze differences in output levels it is far better to develop even crude estimates of capital stock than to rely directly on either gross or net saving rates. To analyze either intercountry differences in output levels or output growth rates in my own studies, I have always relied on capital stock estimates rather than saving rates.

Gross Versus Net Saving

I agree with the authors that there are contexts in which both gross and net saving data have uses. However, I consider gross saving to be decidedly the subordinate series, as does the SNA. Although Blades and Sturm do emphasize household saving, a net saving series, they seem to give priority to gross saving, I shall comment on three points they make in behalf of the gross concept.

In par. 67 Blades and Sturm point out that it is the increase in gross rather than net capital stock that co-determines the growth of productive capacity, and that net saving does not equal the increase in the gross stock if discards differ from depreciation. From this they conclude that gross and net saving are both relevant to growth analysis. This is a nonsequitur, because net saving almost always comes closer than gross saving to the change in gross stock. In the same par. the authors argue in behalf of gross saving that a vintage capital model may be appropriate for analyzing growth. The case against vintage models is decisive, in my opinion.[5] But even if a vintage model were desired, I fail to see how gross saving ratios could substitute for the age distributions that vintage models require. In par. 7 the authors introduce the statistical argument that net saving is less reliable than gross because capital consumption is not estimated by standard procedures. It should be noted that this argument favors gross saving only for business

[5]See, e.g., Edward F. Denison, *Accounting for Slower Economic Growth: The United States in the 1970s,* (Washington, D.C.: The Brookings Institution, 1979), pp. 57–58.

depreciation. It favors net saving with respect to government and nonprofit depreciation, which must be estimated and added, and would do so with respect to depreciation on consumer durables if that were to be included. In any case, if net saving is the appropriate series, the cure is to introduce standard procedures, not to substitute gross saving. Obviously, I do not imply that the authors could have done so for this paper.

Scope of Investment

Suppose output is measured by net national product and the present scope of output is retained. What should be counted as net saving or investment?

Two concepts may be distinguished. One measures additions to the stock of capital that yields future services, whether or not these services will be counted in future net national product. At the least it would include Blades' and Sturm's net saving (i.e., business capital formation including owner-occupied houses, net domestic capital formation by nonprofit institutions and general government, and net foreign investment) plus net acquisitions of consumer and military durables.

The second, narrower concept measures additions to the stock of capital that yields future services that contribute to the net national product as measured. This is approximately the same as net saving in the U.S. NIPAs minus capital formation by nonprofit institutions plus capital formation by government enterprises.[6] General government and consumer capital are excluded. As a minor qualification to exclusion of general governmental capital let me note that in countries that add a small imputed interest-type return on government capital to their national product series, it is arguable that government capital should be included. I prefer to exclude such income, a highly arbitrary number, from output.

Blades and Sturm discuss the possible reclassification of certain intangibles from consumption to investment and the possibility of enlarging the scope of national product so as to raise both consumption and investment. I shall not evaluate here the desirability of such proposals when output is measured by net national product. I do strongly oppose all proposals to enlarge the scope of investment in the NIPAs if output is to be measured by GNP. Gross output is a duplicated measure that there is no reason to maximize. Insofar as large output is a proper goal of society, it is net output that measures success in achieving this goal. Neither is there reason to want a high level of gross saving (insofar as this differs from net saving). Capitalization of government durables adds to the duplication already present in the NIPA concept of GNP and makes it a worse output measure. Addition of consumer durables would go much further. For example, in 1978 consumers actually spent $199 billion for consumer durables in the United States, but consumer durables would be counted as $413 billion of GNP if

[6]For isolated analysis of U.S. growth, capital formation by government enterprises probably should be excluded. See Edward F. Denison, *Accounting for United States Economic Growth 1929–1969,* (Washington, D.C.: The Brookings Institution, 1974), pp. 53 and 273–75.

they were capitalized. Most of the difference is depreciation, which also adds to gross saving. Capitalizing and depreciating items like R and D and education expense would add further huge amounts of duplication to GNP and gross saving.[7] If gross series are to be the focus of attention, I would strongly oppose capitalization of any additional expenditures, whether they are now counted like consumption expenditures in the NIPAs or omitted from them.

Sectors

Any division of saving by sector is inherently fragile because the ownership of all assets and the liability for all obligations ultimately rests on individuals. Given this limitation, the cleanest and most significant division is between government saving and private saving. Saving of social insurance funds is the only item discussed in the paper that possibly bears on this distinction. It belongs in government saving, in my opinion, because government determines the receipts and expenditures of the funds and because, in setting budgets, the rest of government saving is not determined independently of social insurance saving. Saving of government enterprises, which is small in the United States but not (algebraically) everywhere, is the only significant item whose proper classification seems uncertain.

Net private saving is usually divided between personal or household saving and corporate or business saving. I think the most useful division would confine corporate saving to corporations organized for profit—and count all other private saving in personal saving. The NIPAs followed this practice in the 1940s and 1950s but certain mutual financial corporations were subsequently reclassified as corporations, mostly because they paid corporate income tax. Blades and Sturm discuss international differences only in household saving. A legitimate question is whether these data are good enough and comparable enough to warrant comparison. A parallel comparison of business saving might help one judge whether the data look sensible.

In fact, the division of private saving between corporations and persons does not greatly interest me because it is difficult, if not impossible, to improve analysis of total private saving by examining its parts. The following facts, which are based on the latest annual data for 1948 through 1981, with stability judged by the use of the *absolute* standard deviation in percentage points, will suggest why. The ratio of gross private saving to GNP is about as stable as the ratio to GNP of each one of its three major components: personal saving; undistributed corporate profits with inventory valu-

[7]See Edward F. Denison, Comment on "Integrated Accounts for the United States, 1947–80," *Survey of Current Business,* May 1982, pp. 60–65.

ation and capital consumption adjustments; and capital consumption allowances with capital consumption adjustment.[8] (The table shows the data.) The sum of the standard deviations of the components of the gross private saving rate are 3.4 times as large as that for the gross private saving rate itself. Also, the ratio of gross private saving to GNP is considerably more stable than the ratio of personal saving to disposable personal income. So, for that matter, is the ratio of net private saving to net national product. Also to be noted is the presence of negative correlation between year-to-year changes in personal saving rates and corporate saving rates.[9]

You may wonder why I introduce gross private saving here when it is net private saving that matters. It is only because the best way to appraise net saving behavior may be to appraise gross saving behavior first and then to deduct depreciation. To be sure, the gross saving rate is not a great deal more stable than the net but its superiority in this respect is increased if trends are removed.

Selected Saving Ratios for the United States, 1948–81 Averages

Ratio	Mean (percent)	Standard deviation (percentage points)
1. Gross private saving ÷ GNP	16.41	0.76
2. Personal Saving ÷ GNP	4.67	0.70
3. Undistributed corporate profits with IVA and CC Adj. ÷ GNP	2.63	0.81
4. Capital consumption allowances with CC Adj. ÷ GNP	9.07	0.89
5. Wage accruals less disbursements ÷ GNP	0.00	0.01
6. One-half of statistical discrepancy ÷ GNP	0.04	0.17
7. Sum of rows 2 to 6	16.41	2.58
8. Net private saving ÷ NNP	8.07	0.89
9. Personal saving ÷ disposable personal income	6.74	1.01

GNP = gross national product. IVA = inventory valuation adjustment. CC Adj. = capital consumption adjustment.

Note: the statistical discrepancy in the national accounts is divided between gross private saving and gross investment.

Source: Calculated from Bureau of Economic Analysis, *Survey of Current Business July 1982* and *National Income and Product Accounts of the United States. 1929–76 Statistical Tables.*

[8]The coefficient of variation, a measure of relative dispersion, that Blades and Sturm use, is, of course, far smaller for the total than for any of these three parts. In a footnote to their par. 8 the authors wonder whether they shouldn't use the standard deviation instead of the coefficient of variation. I suggest that they at least tell what this measure shows, since they must have the data.

[9]In a footnote to par. 18 the authors acknowledge that several studies argue, as the data for the United States show, "that household and business savings are close substitutes."

Tax Incentives to Promote Personal Saving: Recent Canadian Experience

Gregory V. Jump*

I. Introduction

Recent years have seen a renewal of interest by economists in the behavior of personal saving. There appear to be a number of reasons for this. First, rates of personal saving in the United States, Canada, and other developed countries have generally exceeded their respective historical norms since the mid-1970s, and there has been considerable interest in why this has occurred. The most widely accepted explanation at present is that conventional saving measures are distorted by variations in the (expected) rate of price inflation. This explanation, which is presented by Jump (1980), J.B. Shoven and J.I. Bulow (1976), and others, essentially views the recent rise in personal saving rates as a measurement error attributable to higher price inflation rather than being the result of any behavioral change on the part of consumers. We shall refer to this as the "inflation-distortion" effect and examine it more closely in a later section of the paper.

A second reason for the recent interest in personal saving—at least in North America—is that rates of personal saving in the United States and Canada, which had been of similar magnitudes throughout most of the postwar period, suddenly began to diverge in about 1975. (See Figure 1.) The personal saving rate in Canada has been significantly higher than that in the United States every year since then—giving rise to the question of why this has occurred. Since the two economies have had similar inflation experiences over this period, the answer does not appear to lie with the inflation-distortion effect.[1] Some other factors must be involved. At present no widely accepted explanation has been put forward, but there has been considerable speculation that differences in the personal tax systems between the two countries might be involved. The Canadian and U.S. personal tax systems are similar in many respects, but in the mid-1970s the Canadian Government instituted a number of measures aimed at giving favored tax treatment to savers. That these measures were introduced at the same time the Canadian saving rate began to exceed its U.S. counterpart provides reason to suspect that they may offer an explanation for the differential saving behavior.

A final reason for the renewed interest in personal saving has to do with the generally sluggish growth in investment spending that has been

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[1]It is worth noting that an inflation-corrected time series for the personal saving rate in Canada does not show an increase in the 1975–81 period, whereas an inflation-corrected series for the United States shows a pronounced decline after 1975

Figure 1

Rates of Personal Saving
United States vs. Canada

(National Accounts Basis)

observed in most developed economies over much of the past decade. As anyone who has read a *Principles* text knows, investment must always be equal to saving; hence one cure for a problem of underinvestment might be for the government to provide incentives for increased personal saving. This prescription has been especially strongly endorsed by advocates of "supply-side" economics in the United States. However, the interest in using saving stimuli to provide increased incentives to invest has by no means been limited to supply-siders. The observation that recent rates of personal saving in the United States, while somewhat higher than the postwar average, have been low relative to saving rates in other countries, has prompted a number of economists to come out in favor of having the government use tax policy to stimulate personal saving. In view of the close similarities between the Canadian and U.S. economies, Canadian experience with tax-based saving incentives is of particular interest to those who take this position.

The objectives of this paper are (1) to examine whether tax policies which promote higher rates of personal saving are indeed an effective means of stimulating a permanent increase in investment, and (2) to analyze recent Canadian experience in this regard. We take as given the premise that higher rates of investment are desirable but question whether saving incentives provide the most effective means of accomplishing this goal. The basic message to come out of the paper is that the conventional savings concept is an artificial construct and does not provide a reliable guide to investment behavior. Policies which result in permanently increased personal saving may not lead to greater capital formation. Conversely, policies which result in permanently increased investment activity may have ambiguous effects on personal saving.

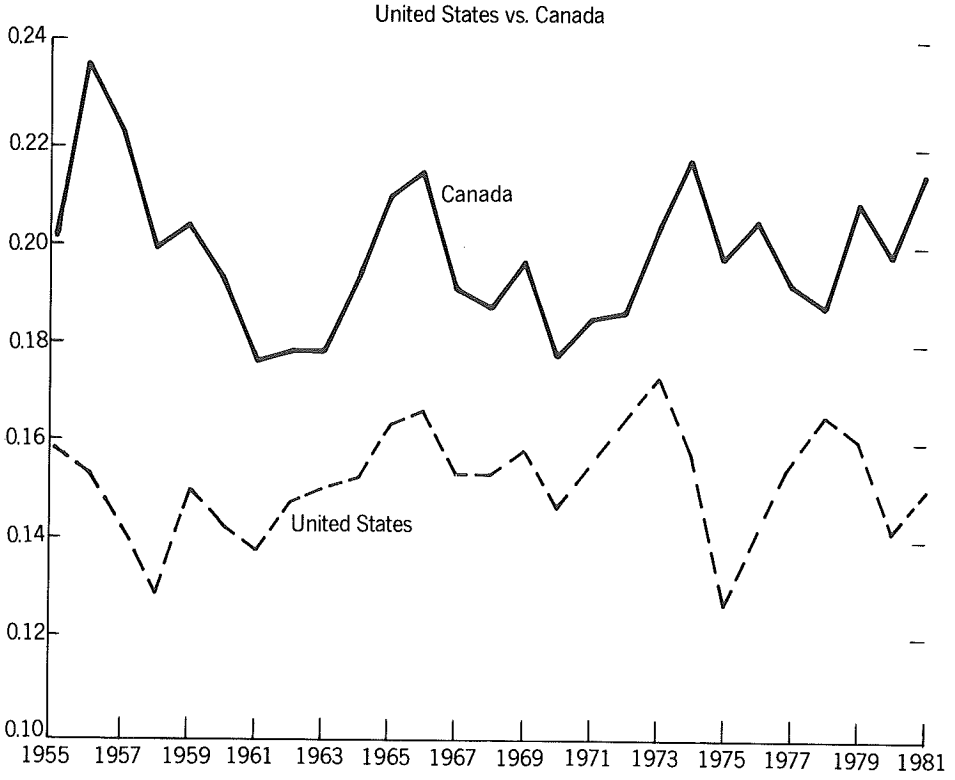
The finding that personal saving and investment do not always respond to stimuli in parallel fashion will come as no surprise to many readers. After all, Robert Barro (1974) demonstrated that a bond-financed temporary reduction in lumpsum taxes will prompt consumers to save more without altering current consumption spending or investment in physical capital. Barro's was a temporary effect, attributable to the fact that his consumers (correctly) anticipated an increase in future taxes sufficient to retire the newly issued government bonds. Consumers "saved" their tax reduction in the current period in order to be able to pay those higher future taxes. Our results will differ from Barro's in the sense that we are able to cite permanent tax reductions that lead to permanent increases in personal saving with no effects on consumption or investment, i.e., the effects are not transitory but persist indefinitely.

Tax policies that have these kinds of permanent effects are more than idle curiosity pieces. The policies instituted by the Canadian Government in the mid-1970s appear to be of this sort. Analysis of the Canadian policies suggests that they may well have contributed to an increase in personal saving but it is doubtful that they have provided increased incentives for capital investment. Those U.S. economists who are envious of recent Canadian saving performance would do well to refocus their attention on investment performance. (See Figure 2.)

Figure 2

Ratio of Real Investment to Real GNP

United States vs. Canada



The outline of the remainder of the paper is as follows. In Section II a general equilibrium model of a closed economy is developed and its steady-state properties are investigated. The model is then used to analyze the effects on equilibrium values of saving and investment of three kinds of permanent tax changes: (1) a reduction in lumpsum taxes, (2) a reduction in income taxes, (3) the introduction of a tax credit for personal saving. These particular policies are chosen because they mirror the essential features of the saving incentives introduced into the Canadian tax system.

Details of the Canadian tax incentives are presented in Section III. After a brief digression on open economy considerations, these tax measures are analyzed using the tools developed in the preceding section. Some empirical estimates of their impacts on measured Canadian saving rates during the mid and late 1970s are derived.

Some concluding observations are offered in Section IV.

II. A General Equilibrium Analysis of Selected Tax-based Saving Incentives

The purpose of this section is to develop a model capable of analyzing the types of tax measures cited in the Introduction. The choice of model is dictated by our ultimate interest in saving and investment decisions. Since these are by nature intertemporal decisions, some sort of optimizing growth model is called for. An unfortunate feature of optimizing models is that they invariably have very complex dynamic response paths. We will evade this complication by restricting the analysis to a static comparison of steady-state equilibria.

Specific features we wish the model to embody are:

(1) Some mechanism whereby tax changes affect the consumption investment decision.

(2) Some form of saving in addition to personal saving; otherwise there can be no discrepancy between personal saving and investment

Feature (1) can be satisfied by simply introducing an income tax which will serve to "distort" the consumption-investment choice faced by economic agents. Feature (2) is most easily satisfied by allowing government saving to exist at nonzero levels. This in turn requires that the government have some means of financing negative values of saving (i.e., deficits). The simplest assumption to make in this regard is to assume the government finances any deficits by printing money. We reject the temptation to include government bond issues as an additional form of deficit finance. The addition of government debt would only complicate the model without adding anything useful.

The decision to include money in the model necessitates some assumption as to why economic agents are willing to hold it. The simplest assumption is a pure transactions motive, and that is what will be adopted here. If we couple this with a tax system that is neutral with regard to inflation, the transactions motive yields a model in which money is both neutral and superneutral. It seems best to deal with such a system in as much as neutrality issues are not directly germane to the objectives of this paper. Some com-

ments on neutrality issues as they affect investment policy will, however, be offered in the final section.

Structure of the Model

A model that possesses the features described above may be described in brief fashion. This economy is assumed to consist of N identical individuals who act as price takers but possess perfect foresight regarding future wages and prices. Each individual is finite-lived and leaves exactly one heir at the time of his death so that the population remains static. Each individual supplies one (perfectly inelastic) unit of labor at all times during his life. Individuals have bequest motives and value consumption by their heirs in the same way they value their own consumption during their lifetimes.[2]

The representative consumer faces the following optimization problem at date 0:

$$\max. \qquad U_0 = \int_0^\infty e^{-\rho t} u(c_t) dt, \tag{1}$$

subject to

$$c_t + \dot{k}_t + \dot{m}_t = (1 - \tau)[r_t k_t W_t] - T_t - \pi_t m_t \tag{2}$$

$$\int_0^\infty e^{-\int_0^\infty (1-\tau) r_s ds} [c_t - (1 - \tau) W_t] dt \leqq k_t + m_t \tag{3}$$

$$m_t = \beta W_t. \tag{4}$$

The variables are defined as follows:

u = an instantaneous utility function; $u' > 0, u'' < 0$

c_t = real consumption at date t

k_t = individual holdings of capital goods at date t

r_t = the before-tax real rate of interest at date t, equal to the rate of return on capital

m_t = holdings of real money balances at date t

π_t = the rate of price inflation at date t

W_t = the real wage rate at date t

T_t = lumpsum taxes at date t

τ = the personal income tax rate

[2]This particular form of the bequest motive is more restrictive than necessary but greatly simplifies the ensuing analysis.

ρ = the rate of time preference

β = the ratio of real balances to real labor income, assumed constant

Note that the transactions demand for money is assumed to be based on labor, as opposed to total, income. Because labor is perfectly inelastically supplied, this guarantees the neutrality and superneutrality of money in the model.[3]

First-order conditions for utility maximization are given by

$$\dot{c}_t = -\frac{u_t'}{u_t''}[(1-\tau)r_t - \rho]. \tag{5}$$

Economic agents will plan rising/falling consumption streams whenever the after-tax return to capital is greater/less than the pure rate of time preference.

Output in this economy is generated by the constant-returns-to-scale production function

$$Y_t = F(N,K_t);\ F_1>0, F_2>0, F_{11}<0, F_{22}<, F_{21}>0, \tag{6}$$

where K_t $(= Nk_t)$ denotes the aggregate capital stock.

Capital depreciates at the rate δ so that

$$\dot{K}_t = I_t - \delta K_t. \tag{7}$$

Factors are assumed to be paid the value of their marginal products; hence

$$F_{N_t} = W_t \text{ and } F_{K_t} = r_t + \delta.$$

Note that the tax function embodied in equation (2) implies that tax depreciation and economic depreciation are identical; i.e., owners of capital are taxed on the return $F_{K_t} - \delta$.

The economy is assumed to be closed; hence the output market clears when

$$Y_t = C_t + I_t + G, \tag{8}$$

where $C_t = Nc_t$ and the level of government expenditures, G, is assumed constant at all points in time.

The government is bound by the budget constraint

$$G - \tau(r_tK_t + W_tN_t) - NT_t - \pi_t\left(\frac{M_{S_t}}{P_t}\right) = \left(\frac{\dot{M}S}{P_t}\right) \tag{9}$$

where M_{S_t} is the nominal money supply and P_t denotes the price level.

[3]If the usual assumption, $m_t = \beta[r_tk_t + W_t]$, were to be made, money would not turn out to be superneutral. The reason is that under this assumption money and capital must be held jointly in the individual's portfolio. The acquisition of one more unit of k_t requires the individual to acquire βr_tk_t more units of real balances. The rate of return to this joint acquisition varies inversely with the rate of price inflation; hence the capital investment decision is not independent of the rate at which money is being created.

Money market equilibrium requires

$$Nm_t = \frac{M_{S_t}}{P_t}. \tag{10}$$

Equations (5), (7) and (9) are the equations of motion of this system and describe its dynamic behavior. The workings of the economy can be completely understood without direct reference to personal or government saving, but saving behavior does underly the consumption-investment relationships modeled here.[4]

The conventional measure of aggregate personal saving is given in real terms by

$$S_{p_t} = (1 - \tau)[r_t K_t + W_t N] - NT_t - C_t \tag{11}$$

Note that S_{p_t} will exceed the gross purchase of real assets by the personal sector by the amount, $N\pi_t m_t$. This is due to the fact that the conventional definition of income, $[(1 - \tau)(r_t K_t + W_t N) - NT_t]$, excludes the inflation tax, $(-N\pi_t m_t)$, which is levied on holders of real money balances in this economy. This "tax" represents a legitimate reduction in the purchasing power of the personal sector whenever $\pi_t > 0$. Its omission from measured income gives rise to an inflation-distortion effect in personal saving of precisely the sort noted in the Introduction.[5]

The exact converse of this inflation-distortion appears in the conventional measure of government saving, expressed here in real terms.

$$S_G = {}^{\tau}(r_t K_t + W_t N) + NT_t - G \tag{12}$$

Measured government saving falls short of net asset accumulation by the government sector by the amount of the inflation tax,

$$\pi_t\left(\frac{M_{S_t}}{P_t}\right).$$

Conventional accounting techniques fail to recognize this as a legitimate source of revenue to the government sector.

Other things being equal, an increase in π_t will cause the value of S_{P_t} to rise and the value of S_{G_t} to decline by an equivalent amount. In other words, the allocation of measured saving between the personal and government sectors will vary with the rate of price inflation. The inflation-distortion effects at work here must always cancel when S_{P_t} and S_{G_t} are aggregated. That is,

[4]It is interesting that J.R. Hicks [1939, pp. 172–80] warned that saving concepts were not likely to be useful tools of analysis more than 40 years ago.

[5]In the real world an additional inflation-distortion effect arises from the accounting treatment of interest income and expenses. Conventional measures of income overstate the flow purchasing power of interest recipients by an amount equal to the product of π and the real value of debts assets, i.e., by the amount of the inflation tax levied on creditors. The converse applies to debtors.

$$S_{P_t} + S_{G_t} \equiv I_t, \tag{13}$$

irrespective of the rate of price inflation.

Steady-State Equilibrium

The economy modeled here will ultimately reach a steady-state equilibrium whenever the government maintains the tax rate, τ, constant and allows the nominal money supply to expand at some constant rate, μ. The values of all real variables will be stationary in steady-state equilibrium and the steady-state inflation rate, π^*, will be equal to μ. (Asterisks will be used to denote steady-state values.) Equilibrium is characterized by the following equality:

$$r^* = \frac{\rho}{1-\tau}. \tag{15}$$

Since $r^* + \delta$ is equal to F_K^*, and the marginal product of capital is a function only of N and K, it follows that equilibrium values for Y and K must be independent of the rate of price inflation. In fact, Y^* and K^* depend only upon N, the parameters ρ and δ, and the tax rate, τ, with

$$\frac{dK^*}{d\tau} < 0 \text{ and } \frac{dY^*}{d\tau} < 0.$$

Equilibrium investment is equal to replacement investment, δK^*. Equilibrium consumption is

$$C^* = Y^* - \delta K^* - G,$$

and this is also independent of the rate of price inflation.

Money is superneutral in this economy in the sense that variations in the rate of monetary expansion, μ, have no effects on the level or composition of equilibrium real output. Another way of expressing this is to say that the inflation tax borne by holders of real money balances is nondistorting. The only distorting tax in this economy is the income tax, which affects the consumption-saving decision of economic agents. A change in the personal tax rate is the only policy action that can alter the values of Y^* and K^*. The equilibrium value, C^*, will be altered by a change in τ and also by a change in G.

The stationary character of steady-state equilibrium means that net asset accumulation will be equal to zero for each sector of the economy. For the government sector this implies

$$S_G^* = -\pi^*\left(\frac{M_S}{P}\right)^*.$$

For the personal sector it implies

$$S_P^* = \delta K^* + \pi^* \left(\frac{M_S}{P}\right)^*.$$

The allocation of measured saving between the government and personal sectors is a function of π even in steady-state equilibrium. The higher the value of π^* the lower will be S_G^* and the greater will be S_P^*.

Analysis of Tax Policies

The simplest policy to analyze is a reduction in lumpsum taxes. What, if any, effects this will have will depend upon how it is financed. A permanent reduction in lumpsum taxes financed by printing money at a faster rate simply substitutes one form of nondistorting tax for another. This policy action can have no real effects on the economy. It will, however, cause π^* to rise and the measured value of government saving to fall, i.e., the measured value of the government's deficit will increase. It will cause the measured value of personal saving to rise by an equivalent amount.

Note that these saving effects are equilibrium, or permanent, effects. They represent the analogue in this model to Barro's temporary personal saving increase in response to a debt-financed temporary reduction in lumpsum taxes. The mechanism which gives rise to these effects is, however, different here than in Barro's analysis. Barro's consumers save more because they *anticipate* an increase in *future* nondistorting taxes equivalent in magnitude to the current reduction in nondistorting lumpsum taxes. In our analysis nondistorting lumpsum taxes are reduced and nondistorting inflation taxes are raised by an offsetting amount at the *same point in time.* Consumers permanently "save" more only because the conventional concept of saving inappropriately ignores inflation taxes. Our results arise from a measurement problem rather than from any behavioral action on the part of economic agents.

It is worth pointing out here that a deficit-financed reduction in lumpsum taxes will produce the same changes in S_P^* and S_G^* if the financing taxes the form of debt issue rather than money creation. Holders of nominally denominated government debt also bear an inflation tax in the form of a reduction in the real value of debt principal as a result of price inflation. This form of inflation tax is also ignored in conventional measures of income and saving and leads to an inflation distortion. The government budget constraint requires that any deficit-financed lumpsum tax reduction be offset by an equivalent increase in inflation taxes. It makes no difference whether this tax is borne by debt holders or by money holders; the measured saving implications are the same.

Let us now consider a permanent reduction in the personal income tax rate. This will lead to the same increase in the equilibrium values of Y, K and C, irrespective of how it is financed. However different financing alternatives will have differing implications for measured saving variables.

Suppose that the reduction in τ is financed by an offsetting change in lumpsum taxes. In this case the equilibrium value of π^* is unchanged, but the equilibrium value of the real money supply will rise due to an expansion of real labor income. S_G^* will fall in this case by the amount

$$-\pi^* d\left(\frac{M_S}{P}\right)^*.$$

S_P^* will rise by the amount

$$dI^* + \pi^* d\left(\frac{M_S}{P}\right)^*.$$

The increase in personal saving will exceed the increase in equilibrium investment.

If a reduction in τ is deficit-financed, the effects on equilibrium saving are ambiguous. The reason for this is that it is impossible to determine from the model whether the level of income taxes collected at the new equilibrium (low τ, high Y^*) are greater or less than the level of income taxes collected at the old equilibrium (high τ, low Y^*). To be able to determine this would require very explicit numerical information about the production function. Lacking this information, the results remain ambiguous.

Intuition suggests that a reduction in τ is likely to lead to lower income tax collections at the new equilibrium. If this turns out to be the case, deficit finance will mean an increase in the rate of monetary expansion is necessary in order to raise inflation tax receipts by enough to compensate for the income tax loss. The rate of inflation will rise and S_P^* will increase by more than it does under lumpsum tax finance. Correspondingly, S_G^* will fall by a greater amount under deficit financing.

On the other hand, income taxes might be higher at the new equilibrium after the reduction in τ. (This is Professor Laffer's case.) If so, deficit finance will require a reduction in the rates of monetary expansion and inflation. The inflation tax will decline in the new equilibrium and S_G^* will increase. The movement in S_P^* is ambiguous in this case because of the offsetting effects of higher I^* and lower inflation taxes. Regardless of which way this turns out, it is clear that movements in personal saving do not provide a very reliable indication of the response in equilibrium investment.

A Tax Credit for Personal Saving

Finally, consider the effects of the introduction of a permanent tax credit for personal saving. Suppose this takes the form that for every \$1 of measured income not spent on consumption, an individual's taxable income is reduced by γ dollars. This policy action reduces the effective personal income tax rate from τ to $(1 - \gamma)\tau$ and imposes what amounts to a consumption tax at the effective rate $\gamma\tau$.

The savings tax credit alters the intertemporal substitution possibilities faced by the representative individual. He can now substitute one unit of current consumption for a continuing flow of future consumption equal

to $(1 + \gamma\tau)(1 - \tau)r_t$. This alters the first-order conditions for utility maximization to

$$c_t = \frac{-u'}{u''}[(1 + \gamma\tau)(1 - \tau)r_t - \rho]. \tag{16}$$

Steady-state equilibrium is now realized when

$$r^* = \frac{\rho}{(1 + \gamma\tau)(1 - \tau)}$$

and $\mu = \pi^* =$ any constant value.

As long as the value of τ remains unaltered, any savings tax credit with $\gamma > 0$ will lower the equilibrium real interest rate and lead to increases in the values of Y^*, K^* and C^*. Thus this type of policy action will have expansionary effects on real economic activity. Whether it will actually lead to an increase in personal saving is a different matter which once again depends upon how this tax action is financed.

If the tax credit is financed by an offsetting change in lumpsum taxes, it will lead to a decline in S_G^* and an increase in S_P^* that exceeds the rise in I^*. These results are identical with those associated with a reduction in τ financed by an offsetting change in lumpsum taxes. They occur for the same reasons which need not be repeated.

If the tax credit is financed by altering the rate of money creation, the saving effects are once again ambiguous—for precisely the same reasons they were ambiguous in the case of a deficit-financed reduction in τ. The earlier conclusion that personal saving responses do not provide a reliable indication of the effects of tax policies on investment is appropriate once again.

III. Recent Canadian Experience with Tax-Based Saving Incentives

In the mid-1970s the Government of Canada introduced several major alterations to the personal tax treatment of investment income. Most significant in this regard were:

1. An investment income exclusion (IIE) applicable to interest, dividends, and capital gains from *Canadian sources.* Beginning with the 1975 taxation year, Canadian taxpayers were permitted to exclude up to a maximum of $1,000 worth of Canadian-source investment income from taxable income. The $1,000 annual limitation has remained in effect.
2. A liberalization of the tax treatment of income allocated to retirement savings in the form of Registered Retirement Savings Plans (RRSPs).

Since the early 1960s Canadian taxpayers have been permitted to establish individual retirement savings plans. When the plan is "registered" with a recognized financial intermediary (e.g., a bank or a broker), it becomes an RRSP and is eligible for special tax treatment.[6] RRSP funds are invested in Canadian assets (non-Canadian assets are ineligible). Earnings on these funds are not subject to tax. In addition, holders of RRSPs are permitted to make gross new contributions to the plan, up to some annual maximum, that are tax deductible.

Individuals are eligible to maintain RRSPs up to age 65. At age 65, the plan terminates and its holder has two options: (a) he can either declare the entire amount of funds in the RRSP as taxable income for that year, or (b) use th "funds to purchase an income-averaging annuity (sold by life insurance companies). If option (b) is exercised, the individual is subject to tax on the annuity payments as they are received. Most individuals choose option (b) because this minimizes tax liabilities under the progressive Canadian tax system.

An individual need not wait till age 65 to terminate an RRSP. He can do so at any time but must declare the entire amount as taxable income in the year of liquidation. Because the Canadian tax system is progressive, RRSPs are often used as a means of income averaging. An individual can establish an RRSP in a year of high income and liquidate it in a year of low income, thereby reducing his lifetime tax liabilities. This motive for investing in RRSPs is discussed by Michael Daly [1981] and will be ignored in the remainder of our analysis. For all intents and purposes we will assume that individuals hold RRSPs until retirement. Any individual who does this and faces the same marginal tax rate at all points in time will realize an after-tax nominal rate of return on RRSP contributions that is equal to the before-tax nominal rate of interest.[7]

RRSPs offer taxable investors an attractive alternative to the purchase of unsheltered assets. The one thing that prevents Canadians from investing even more heavily in RRSPs than they already do is the limit placed on annual contributions into these plans. Prior to 1974 the limit was set at the lesser of $2,500 or 20 percent of the earned income for a taxpayer with no employment-based retirement plan. For other taxpayers, the *sum* of RRSP

[6]Technically RRSPs refer to registered plans held by individuals who are not also enrolled in employment-based retirement plans. Registered plans held by individuals who do also have employment-based pension plans are termed Registered Pension Plans (RPPs). The designation RRSP used in the text is intended to cover both cases.

[7]To see that this is the case, consider an individual who faces a marginal tax rate of τ and invests $1 in an RRSP L years prior to age 65. The individual is entitled to an immediate tax rebate of τ dollars. If RRSP funds earn the before-tax nominal rate of interest, i, he will have accumulated a total of $(1 + i)^L$ dollars at age 65. These funds can be used to purchase an income-averaging annuity at the date of retirement. Suppose this annuity is a consol with a before-tax rate of return equal to i. Then the after-tax rate of return earned by the individual is the value of the discount rate, R, which satisfies the following:

$$\$1 = \tau + \frac{(1 - \tau)\, i\, (1 + i)^L}{R(1 + R)^L}$$

The value $R = i$ does this.

contributions and individual contributions to an employment-based retirement plan was limited to the lesser of $1,500 or 20 percent of earned income.

These limitations were sharply modified beginning with the 1974 taxation year. While the 20 percent of earned income restriction was retained, the dollar maximums were raised to $5,500 and $3,500 for taxpayers without and with employment-based plans, respectively. This represented a significant relaxation of the annual limitations. The $5,500 and $3,500 maximums are still in effect at the present time, though the cumulated inflation that has occured since 1974 has acted to substantially reduce their respective real values.

Some Open Economy Considerations

The introduction of the $1,000 IIE reduces the effective marginal tax rate on investment income to zero for any taxpayer who earns less than $1,000 per year from investment in assets. For individuals who earn more income than this, the $1,000 IIE represents a lumpsum tax reduction. The effects of this tax measure can be analyzed with the closed economy model developed in the preceding section, provided we can show that the model is appropriate for a small, open economy like Canada. The same applies to the effects of the increase in annual RRSP contribution limits. This policy action represents the sort of savings tax credit analyzed in Section II for taxpayers who are not constrained by the annual limits. For taxpayers who are constrained, the increase in contribution limits represents a lumpsum tax reduction.

It will be argued here that the closed economy model can be applied to the Canadian situation because both the $1,000 IIE and the special tax treatment accorded to RRSPs are applicable only when taxpayers invest in domestic Canadian assets. Income from foreign assets is not given favorable tax treatment under these provisions. The effect is to segment the Canadian and the rest of the world capital markets and make it possible for Canadian assets to yield lower before-tax rates of return than their international counterparts.

Suppose that prior to the introduction of these tax measures, Canadian and the rest of the world assets were perfect substitutes. Since Canada is a small economy, Canadian investors would have faced a before-tax rate of return, $\bar{r}$, determined in the rest of the world. Any change in Canadian tax laws which applies equally to investment income from all sources would have no effect on $\bar{r}$, though it could alter the consumption-saving patterns of Canadians. An across-the-board reduction in income taxes offset by an increase in lumpsum taxes, for example, would stimulate Canadians to reduce current consumption and accumulate assets at a more rapid rate. With $\bar{r}$ fixed in world capital markets, Canadians would have no incentive to increase domestic capital formation but would, instead, purchase foreign assets. The corresponding rise in Canadian personal saving would be exactly offset by a reduction in foreign saving, i.e., by a capital outflow.

If, as was actually the case, Canadian tax authorities reduce only the rate of taxation applicable to income from domestic assets, individuals will have an incentive to divest themselves of foreign assets and purchase Canadian assets. If the tax rate that is reduced is a distorting tax, Canadians will also have an incentive to reduce current consumption and accumulate assets at a faster rate. Since it is domestic assets that are being accumulated, the real rate of interest in Canada will be driven below the rest of the world rate, $\bar{r}$, and domestic capital formation will rise. The differential treatment of distorting taxes acts to segregate the Canadian and the rest of the world capital markets and allows the Canadian economy to come to the same steady-state equilibrium position achievable by a closed economy.[8] The closed economy model developed in Section II does, therefore, provide an appropriate mechanism for analyzing the effects of recent Canadian tax policies.

Investment and Saving Effects

The task before us now is to determine whether the $1,000 IIE acts principally as a reduction in marginal tax rates or as a lumpsum tax reduction to existing asset holders and to do the same for the change in RRSP contribution limits. It obviously makes a great deal of difference as regards the effects of these policies on Canadian investment incentives. If these are principally distorting tax reductions, they should provide considerable stimulus to Canadian business investment. If, on the other hand, they are principally lump sum in nature, they provide little or no investment stimulus.

Existing evidence on the distribution of investment income in Canada leads us to believe that the $1,000 IIE acts principally as a lumpsum reduction in taxes. Canadian income tax statistics for the 1979 tax year (the latest available) reveal that some two-thirds of total investment income in the form of interest, dividends, and taxable capital gains was earned in that year by taxpayers reporting gross incomes in excess of $20,000.[9] The average amount of investment income reported by taxpayers with gross incomes exceeding this amount was $3,624—well in excess of the $1,000 limit on the IIE. Moreover, the average level of investment income reported by taxpayers with 1979 incomes below $20,000 was $689. These figures do not deny that some less wealthy taxpayers would have an incentive to save and invest due to the IIE, but suggest that the bulk of Canadian investment activity is carried on by individuals for whom the $1,000 limit is a binding constraint.

[8]More correctly, the open economy will achieve the same steady-state equilibrium under these circumstances only if the equilibrium real rate of interest is $r^* \leq \bar{r}$. When $r^* > \bar{r}$, equilibrium will not be attained and the open economy will stay at a position where its domestic real rate of interest remains equal to $\bar{r}$. However, this is not a realistic possibility, for $r < r^*$ implies that domestic consumers will plan consumption streams that continually decrease over time. This sort of behavior is a possibility we rule out as implausible

[9]Source: Revenue Canada, *Taxation Statistics* (1981 Edition). The average amount of investment income exceeded $1,000 for all income classes in excess of $20,000 in 1979.

An even stronger case can be made that the 1974 increase in RRSP contribution limits represented primarily a lumpsum transfer to Canadian taxpayers. The basis for this claim is that RRSPs have offered a perfect arbitrage opportunity to taxpayers with investment income in excess of $1,000 per year. Interest paid on funds borrowed to finance RRSP contributions have been tax deductible against unsheltered investment income. (Beginning with the 1982 tax year this will no longer be the case.) Thus a taxpayer who has such income—either from foreign sources or from domestic sources in excess of $1,000—has been able to borrow at an after-tax cost of $(1 - \tau)\, i$ and earn an after-tax rate of return on a RRSP of i. He has had a strong incentive to undertake this arbitrage activity but will be constrained by the annual RRSP contribution limit. The number of taxpayers in this favorable position has been at least as large as the number bound by the $1,000 IIE limitation. It follows, therefore, that if the $1,000 IIE limitation is a binding constraint on the bulk of Canadian investors, the RRSP limitations must be too.

This does not deny that changing RRSP limits in 1974 served to lower the effective marginal tax rates faced by many lower income Canadians. It simply suggests that the amount of saving and investment funds controlled by these individuals is small relative to the total.[10]

What all of this means is that the 1974–75 tax incentives for saving introduced in Canada are best viewed as lumpsum tax reductions to upper and middle income taxpayers. We have already analyzed the implications of lumpsum tax reductions and found that they have no effect on the equilibrium value of investment—provided such nondistorting tax reductions are financed by offsetting increases in other nondistorting taxes.

It is, of course, not clear how the Canadian Government financed these tax changes inasmuch as numerous other policy actions were being taken at the same time. We must consider the possibility that the IIE and RRSP actions have caused the Canadian Government to set the overall level of personal and corporate income tax rates higher than would have otherwise prevailed. If this has occurred, then the equilibrium levels of output and investment are likely to be lower than would otherwise be the case. In other words, the IIE and RRSP policy might actually have generated perverse effects on Canadian investment activity. It is difficult to say more.

There is even more ambiguity regarding the effects of these policies on measured saving flows. The responses of personal and government saving to a tax change are difficult to assess even when the offsetting financing policy is known. When it is unknown, the situation is indeterminant. This is

[10]It is worth mentioning that neither interest paid on consumer debt nor the mortgage interest of owner-occupants is tax deductible under Canadian tax laws. This feature of the tax system serves to reduce the appeal of RRSPs and the IIE even to individuals not constrained by the annual limitations imposed by these tax policies. Any individual with outstanding consumer or mortgage debt can earn a marginal after-tax rate of return equal to the before-tax rate of interest, i, by simply repaying part of his debts. The opportunity to invest in RRSPs or tax-sheltered Canadian assets would not offer any reduction in effective tax rates to individuals in this position.

unfortunate because of the considerable interest in the question of whether the recent divergence between Canadian and U.S. rates of personal saving can be attributed to Canadian tax policies. While we cannot provide a definite answer to that question, it is possible to compute a rough estimate of the maximum increment to Canadian personal saving that might be attributable to these policies. Such an estimate might at least give some insight as to whether the tax hypothesis is a credible explanation of the observed discrepancy in saving rates.

The maximum response of personal saving to a lumpsum tax reduction occurs under deficit financing. It was shown earlier that the equilibrium value of S_p will increase by the full amount of the tax reduction under these circumstances—a response due entirely to the inflation-distortion effect. We need only estimate the annual tax revenue costs of the $1,000 IIE and the higher RRSP contribution limits in order to derive an upper-bound estimate of the impacts of these policies on personal saving in Canada.

Using detailed taxation data for 1979, it is a relatively simple matter to estimate the tax revenue loss associated with the $1,000 IIE. Data are available on the amount of the IIE by income class. An estimate of the revenue loss can be computed by multiplying the amount of IIE claimed by the marginal tax rate appropriate to each income class and aggregating the results. The resulting value for the 1978 taxation year is $0.90 billion.[11]

It is much more difficult to come up with an estimate of the tax revenue loss associated with the fact that RRSP contribution limits were higher in 1974 and after than they had been prior to 1974. It is the incremental tax reduction associated with the 1974 increase in limits that is relevant here.[12] Available taxation data report only the total amounts of gross RRSP contributions (by income class) on an annual basis. It is not possible to determine by how much these values exceed the annual contributions that would have occurred under the pre-1974 limitations from these data. In addition, taxation statistics do not report the tax-exempt accrued RRSP earnings from past contributions that also represent revenue losses to governments. That is, the tax loss associated with RRSPs in any year is the tax foregone on the sum of gross new contributions and accrued earnings from past contributions. To come up with an estimate of this loss some very crude assumptions must be made.

In 1979 a total of $5.67 billion in RRSP contributions were claimed as deductions by Canadian taxpayers. The 1974 changes acted to approximately double annual contribution limits; hence something in the neighborhood of $2.84 billion, or one-half of the total, probably represents the incremental effect of the 1974 changes on the level of new contributions in 1979. To this figure must be added some estimate of the accrued earnings

[11]$0.64 billion of this represented a loss in federal tax revenues and the remaining $0.26 billion was a loss in provincial taxes.

[12]The reason for this is that RRSPs existed prior to 1974 with no apparent effect on the Canadian-U.S. personal saving rate differential. We seek to determine whether the 1974 changes in RRSP contribution limits have been a factor causing the Canadian saving rate to rise relative to the U.S. rate.

on past contributions. Assuming a 9 percent annual rate of return and that annual contributions were $2.84 billion higher as a result of the 1974 changes in every year over the 1974–79 interval, the total incremental tax-exempt income in 1979 is estimated to have been approximately $4.26 billion. Assuming an effective marginal tax rate of 33 percent, the tax revenue losses associated with this amount are estimated to have been $1.42 billion.

Under the assumption that Canadian governments used (nondistorting) deficit finance to offset their tax losses from the $1,000 IIE and the 1974 changes in RRSP contribution limits, personal saving in Canada was higher by $2.32 billion in 1979 than might otherwise have been the case. Total personal saving was $17.81 billion in that year and the measured personal saving rate (on a National Accounts basis) was 10.3 percent. Thus Canadian tax incentives may have contributed as much as 1.3 percentage points to the 1979 personal saving rate. The effect on measured saving rates for the 1975–78 and 1980–81 intervals is likely to be of approximately the same magnitude.

The average discrepancy between measured rates of personal saving in Canada and the United States from 1975 to 1981 was 4.4 percentage points in Canada's favor. Canadian tax incentives can explain at best only one-fourth of this discrepancy under the most heroic of assumptions. It appears, therefore, that some factors other than Canadian tax incentives have been responsible for the apparent divergence in Canadian and U.S. personal saving behavior.

IV. Concluding Observations

One conclusion to be drawn from this study is that saving behavior is difficult to analyze in the aggregate. The main reason for this is that existing measures of saving do not fully correspond with the concepts of saving that economists have in mind. The analysis here has focused on only one measurement problem—the inflation-distortion effect. If that were the only difficulty, it could easily be solved by redefining saving on an inflation-adjusted basis, i.e., by correcting existing measures for inflation taxes. However in the real world there are many other measurement problems, e.g., what to do with consumer durable goods purchases and business saving by corporations? The list of alterations that could be made to measured savings concepts is long and the number of opinions regarding which of these are appropriate is diverse. Existing measures may well come as close to satisfying the majority of economists as any single set of alternatives. The point to be stressed is that saving is not a particularly useful focus of analysis.

Fortunately, for most problems an analysis of saving behavior is not necessary. The problem analyzed in this paper provides an illustration of this. If the objective of government policy is to promote increased capital formation, it is not necessary to find policy tools that will accomplish this result by first enticing economic agents to save more. It is, instead, much more straightforward to think in terms of policy tools that will directly act

to increase the after-tax rate of return on capital. Reductions in the rates of tax applied to incomes from capital investments will do this and promote higher investment, provided such tax reductions are not financed by increases in other distorting taxes that fall upon investment incomes.

In the model derived in the paper, deficit finance via inflation taxes provides a nondistorting means of finance. Inflation taxes are nondistorting here only because the model was structured to ensure the superneutrality of money. It is worth mentioning that this is probably not the case in the real world. A number of economists (e.g., M. Feldstein and L. Summers [1976]) have argued that the real tax burden borne by investors rises with the rate of price inflation. If so, this helps to explain the sluggish performance of investment over the past several years. Governments interested in stimulating capital formation would do well to consider some form of inflation indexing for income from capital sources. Whether such actions would also lead to higher personal saving is both ambiguous and not particularly relevant.

Recent Canadian experience with tax incentives provides a useful example of how focus on saving behavior can be misleading. The tax incentives enacted by the Government of Canada in 1974 and 1975 were essentially aimed at promoting capital investment by increasing personal incentives to save. Our analysis suggests that these actions were by and large lumpsum transfers to middle and higher income taxpayers. The policies not only provide little incentive for increased investment but may actually have perverse effects insofar as they have been financed by increases in distortionary taxes. Furthermore, their effects on personal saving are ambiguous.

The tax incentives may actually have caused a decline in measured personal saving in Canada. At most, they may have added something in the neighborhood of 1.3 percentage points to the measured personal saving rate over the 1975–81 interval. This increment falls well short of explaining the average 4.4 percentage point relative increase in Canadian versus U.S. rates of personal saving that has arisen over this time period. Canadian tax policies regarding personal saving do not appear to be capable of explaining this discrepancy.

REFERENCES

Barro, Robert J. "Are Government Bonds Net Wealth?" *Journal of Political Economy,* 82, Nov./Dec. 1974, pp. 1095–1117.

Daly, Michael J. "The Role of Registered Retirement Saving Plans in a Life-Cycle Model," *Canadian Journal of Economics,* XIV, No. 3, Aug. 1981, pp. 409–21.

Feldstein, Martin, and Lawrence Summers. "Inflation, Tax Rules, and the Long-Term Interest Rate," *Brookings Papers,* 1978, 1, pp. 61–99.

Hicks, John R. *Value and Capital.* Oxford: Oxford University Press, 1939.

Jump, Gregory V. "Interest Rates, Inflation Expectations, and Spurious Elements in Measured Real Income and Saving," *American Economic Review,* Vol. 70, No. 5, Dec. 1980, pp. 990–1004.

Shoven, J. B., and J. I. Bulow. "Inflation Accounting and Non-Financial Corporate Profits, Financial Assets and Liabilities," *Brookings Papers,* 1976, 1, pp. 15–66.

Discussion

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Gregory Jump's analysis of the U.S.-Canadian personal savings differential is a nice amalgam of theory, facts, and institutional details. In many ways the paper is a model for economic writing.

He begins with an empirically important question (Why have Canadian households outsaved their U.S. counterparts by a wide margin in recent years?), formulates an interesting and tenable hypothesis (that Canadians are responding to tax incentives favorable to saving), and then builds an economic model to address the issue. The model manages to be simple and coherent without being trivial and, in applying his model to the real world, Jump pays careful attention to several relevant facts and institutions. The paper neatly follows a unified thread from start to finish. I enjoyed reading it and profited from doing so.

Nonetheless, I must confess that careful study of the paper led me to conclude that the facts are a bit obscure, that the theory is not very enlightening, and that certain institutional details may be the proverbial Prince of Denmark that are left out of this particular *Hamlet*.

1. Major Themes

Though I will have some critical things to say later, I wish to begin by stressing my broad agreement with the major themes that Jump develops in examining the hypothesis that tax incentives account for the large difference in saving rates between two countries that seem so similar. As I see it, these themes are:

(1) that conventional personal saving rates are distorted upward by inflation because they fail to account for the automatic dissaving that occurs when inflation erodes the real value of money fixed assets.

Jump concentrates on money itself but realizes that corporate and government bonds are far more significant in practice. Even a casual look at this point suggests that it is of great empirical importance. In 1979, a year of high inflation, U.S. households saved 5.25 percent of their disposable income—a total of $86.2 billion.[1] But the disposable income figure included $207 billion of interest income, most of which really represented a return of principal on previous loans. And the saving figure excluded almost $44 billion in interest paid to businesses, most of which would more properly be

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[1]The U.S. data have recently been revised, showing considerably more saving than previously estimated. Specifically, the personal saving rate in 1979 is now put at 5.9 percent. I used the older data because I needed some of the details that I do not yet have in the newer data.

accounted for as return of principal, and hence saving. If we eliminate both interest received and interest earned, on the grounds that the real interest rate was roughly zero, then the revised saving rate jumps from 5.25 percent to 9.1 percent. The inflation distortion is no mere detail.

However, as Jump correctly points out, it is unlikely that this inflation distortion accounts for much of the discrepancy between Canadian and U.S. saving rates because the inflation rates in the two countries have been so similar.

(2) that there is a big difference between household saving and domestic investment.

Jump focuses on government saving and, in particular, on the fact that the household dissaving caused by inflation automatically becomes government saving. But Auerbach's paper for this conference reminds us of the (high, but not perfect) substitutability between business and personal saving and Fieleke's paper reminds us that capital inflows from abroad can also be used to finance domestic investment.

It is significant to note that the OECD study which motivated this conference found that household saving accounts for a much smaller fraction of total national saving in Canada than in the United States.[2] Given this fact, and the high substitutability among household, business, and government saving, we should not make too much of the fact that the personal saving rate is higher in Canada.

(3) that tax incentives used to spur saving (or, for that matter, investment) imply a loss of revenue that must be financed by an increase in other taxes (now, or in the future), including the inflation tax.

In reality, these other taxes will almost certainly be distorting, but Jump concentrates on the nondistorting case to simplify his analysis.

(4) that not all saving (or investment) incentives have marginal effects. Some are more or less lumpsum payments to savers (or investors), and Jump argues that many of the Canadian tax incentives have been of this sort.

These are all terribly important points which need to be made again and again because so many people now argue that we should use tax incentives for saving as a way to spur investment. Together, they lead Jump to be highly skeptical that Canadian tax incentives have made his country's personal saving rate much higher than our own. His skepticism rests on sound grounds and is amply justified.

Having showered all this praise on Jump, let me enter some objections. I will start with the facts, where I merely wish to raise some questions and request clarification. Then I will argue that Jump's theoretical model is ill-suited to dealing with the issue at hand. Finally, I will nominate an institutional difference between the two countries that Jump barely mentions—the tax deductibility of interest expenses—as a candidate to explain the discrepancy in saving rates.

[2]See Diagram 1 on page 8 in "International Differences and Trend Changes in Saving Ratios," OECD, Working Party No. 1, Paris, October 1981.

2. The Basic Facts

As Jump sees the data, "rates of personal saving in the United States and Canada, which had been virtually identical throughout most of the postwar period, suddenly began to diverge in about 1975." Thereafter, the Canadian saving rate went much higher than the U.S. rate. Thus Jump's view of the "stylized fact" is as shown in Figure 1.

Frankly, I just do not see this "fact" when I look at the data. When I look at his Figure 1, I see a "stylized fact" more like Figure 2; that is, a U.S. personal saving rate that is pretty much trendless over the period (though low in the last few years)[3], and a Canadian personal saving rate with a strong upward trend throughout the period. The two lines cross in about 1973.

Beauty may be in the eye of the beholder, but this difference in perspectives is fundamental. It completely changes what you look for by way of explanation. Jump looks for something that started abruptly about 1974, finds the increase in saving incentives, but argues that this hypothesis does not stand up to close scrutiny. Figure 2 would suggest a search for a factor that was present from the outset, but that grew ever more important throughout the period.

One final point should be made about "the facts." Diagram 4 (p. 95) of the OECD report offers a picture of Canadian and U.S. household saving rates that looks quite different from Jump's Figure 1. You can examine it for yourself, but when I look at the OECD diagram I see the "stylized fact" indicated in Figure 3. Both saving rates are trending up throughout the 1960s. The Canadian saving rate continues its upward march until 1975 and then flattens out, whereas the U.S. saving rate stops rising around 1972 and then falls. If these are the "facts" to be explained, then Jump may be looking on the wrong side of the border.

In any case, Jump ought to explain the differences between his "facts" and those of the OECD, and also take account of the recent upward revisions in the U.S. personal saving rates. Before we can appraise the explanation, we really must know which is the true stylized fact.

3. The Theoretical Model

As previously noted, Jump looks to tax incentives to explain the Canadian-U.S. saving differential. He takes the standard intertemporal optimization model of consumer behavior[4] and embeds it in a simple general equilibrium model in which investment is the sum of personal and government saving. There is no uncertainty and no business saving, and particular assumptions are made in order to render money not just neutral, but superneutral. (For example, the tax system is fully indexed, the demand for money is not interest sensitive, labor is supplied inelastically, and wages are

[3]The apparent decline in the U.S. saving rate in recent years was nearly obliterated by the data revisions mentioned in footnote 1.

[4]See, for example, Menachem E. Yaari, "On the Consumer's Lifetime Allocation Process," *International Economic Review,* September 1964, pp. 304–317.

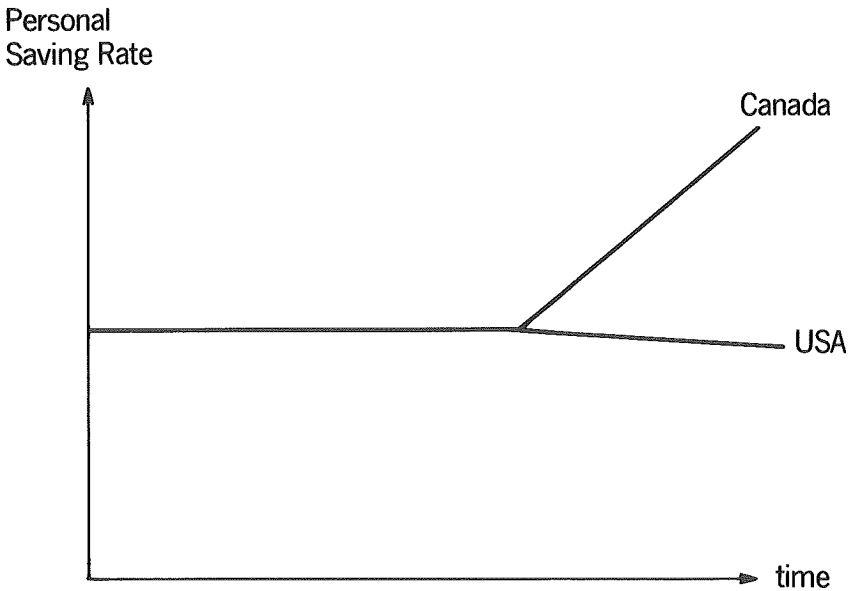

Figure 1

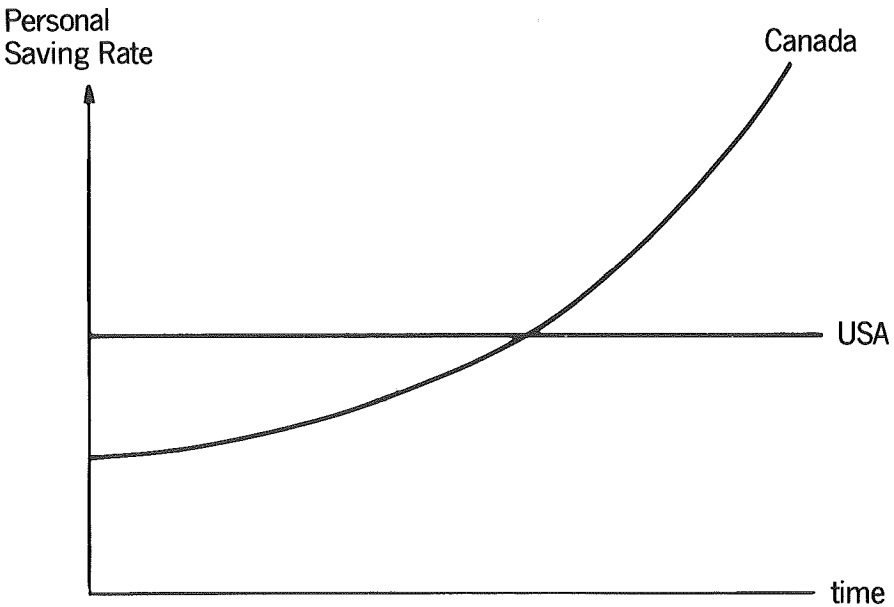

Figure 2

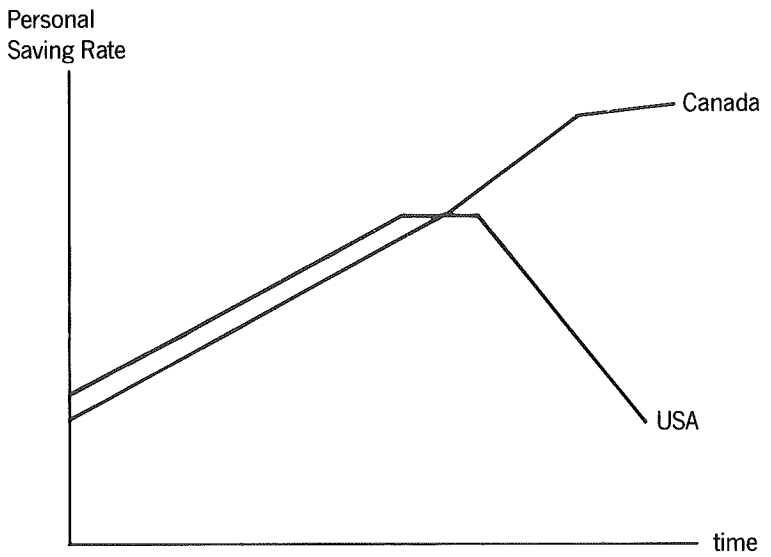

Figure 3

perfectly flexible.) Though the model can handle more general situations, Jump concentrates on the steady state.

If the model is meant to be a vehicle for making the four points which I enumerated at the outset, then I have only a few quarrels with Jump's modeling strategy.

The Model As Model

The first is that his equation (15) is not necessary for steady-state equilibrium. While I am not sure how much things would change if the condition were dropped, the fact that equation (15) is the lynchpin for almost everything Jump does with the model is worrisome.

The equality of the real after-tax return on saving and the subjective rate of time discounting is necessary to make a *single individual's* consumption constant over his life cycle. But in an economy composed of people of different ages, *aggregate* consumption will be constant as long as the age distribution of the population is constant—*regardless* of the shape of the life cycle consumption profile of a single individual. Thus $r\ (1-t) = \rho$ should not be considered as a requirement for a steady state.

This distinction illustrates, by the way, how different the steady-state and nonsteady-state properties of a model can be. A rise in the rate of interest, holding the present value of lifetime wealth constant, "tilts" each individual's consumption profile toward less consumption today and more tomorrow. In the short run, this will raise aggregate saving. But in the long

run it will not raise saving because the shape of the individual lifetime consumption profile is irrelevant in the aggregate.

A second problem is the treatment of the tax incentives offered by the Canadian authorities—which consist of tax exemption for saving (or investment income) up to a certain point, and no tax preference thereafter—as being equivalent to a lumpsum subsidy for big savers (or investors).

In fact, a tax incentive of this sort sets up a multi-armed budget constraint with one or more "kinks," such as the one shown in Figure 4. For people who locate on arm *KD*, the tax incentive does have only income effects, and hence is nondistorting. But some big savers will reach a corner solution at the kink, point *K*, and hence will have their behavior heavily distorted. Thus there are really three groups to be considered: one that experiences the usual type of distortion (a change in the slope of its budget line; see segment *KE*), another that experiences a more extreme type of distortion (those attracted to point *K*), and a third—the group on which Jump focuses—for whom the tax incentive is a lumpsum transfer (see segment *KD*). I am not sure why we should presume that the last group is of predominant importance.

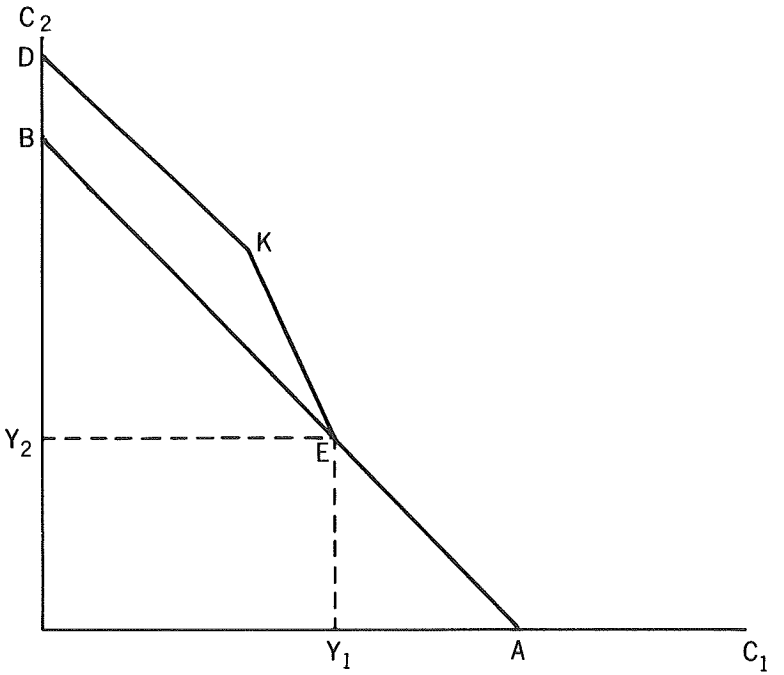

Figure 4

The Model and Reality

But, as I interpret Jump's paper, the model is meant to be more than just a bulletin board on which to hang a few good points. It is designed to study the savings differential between the United States and Canada since 1973. For this task, however, I find almost every aspect of the model objectionable.

Have the two economies been travelling along neoclassical steady-state growth paths? Did full employment prevail in both economies during the 1970s? Is the Canadian economy closed to capital flows? Is the inflation tax nondistorting? Does either country have a tax system which taxes only real interest income and allows deductions only for real interest expenses and true economic depreciation? The answer in every case is no.

It seems most unlikely that the U.S.-Canadian saving differential is a steady-state phenomenon. Neither economy was moving along a full-employment growth path during these years. Neither country's citizens could borrow or lend freely in a perfect capital market. Money was probably neither neutral nor superneutral in either country, and the inflation tax was certainly distorting. Neither country had an indexed tax system in the relevant sense, and both had relatively open capital markets (though Jump's point about the discriminatory nature of Canadian tax incentives is valid and important). The Canadian tax law allowed interest deductions neither for interest paid to finance purchases of consumer durables nor for home mortgages; the U.S. tax law allowed both. And the Canadian tax law was not the only one to have a variety of tax incentives for saving during this period. The U.S. tax law included tax breaks for pensions, IRAs, Keogh accounts, and other provisions.

Now, I know all about abstracting from details and the virtues of "as if" reasoning. But it really seems to me that some of these phenomena may be the essence of the problem. I am skeptical that a model which sweeps them all under the rug can teach us much about the U.S.-Canadian saving discrepancy. And nothing in Jump's paper removes this skepticism.

I also plead innocent to the charge of picking theoretical nits. At the end of the paper, Jump uses the model to put an upper bound on the amount of additional saving that might have been induced by the Canadian tax incentives. His calculation makes use of several of the aforementioned assumptions in an essential way, including the ideas that the Canadian economy is on a steady-state growth path, that the extra personal saving is exactly matched by higher revenues from the inflation tax, and that the inflation tax is nondistorting. Furthermore, this calculation could be relevant to the Canadian-U.S. saving differential only if the Canadian inflation rate had been higher than the U.S. inflation rate—which was not the case to any significant extent.

4. Institutional Differences

I save my most speculative comments for last. Comparisons between Canada and the United States come about as close to a controlled experi-

ment as economists are ever likely to get. The two countries are similar in so many ways that we can feel almost justified in attributing whatever differences we observe to legal-institutional differences. This is the spirit of Jump's inquiry, and I endorse it.

However, what I would have thought was the chief institutional difference between the two countries—the tax deductibility of interest expenses—is barely mentioned by Jump. Let me cite a few numbers to illustrate the potential importance of this issue.

With a 10 percent mortgage interest rate and an 8 percent inflation rate—numbers that are pretty typical for the 1970s, a Canadian pays a 2 percent net real rate of interest if he buys a house. An American pays −1 percent if he is in the 30 percent tax bracket, and −3 percent if he is in the 50 percent bracket. Even down in the 20 percent tax bracket the net after-tax rat e of interest is zero. And this ignores the fact that investments in housing are leveraged to the hilt. Furthermore, the tax distortion in favor of borrowing gets more and more important as the inflation rate rises. And inflation rates were rising for most of the period Jump studies.

The point, of course, is that the U.S. tax law encourages people to save in the form of houses and consumer durables, items that are not counted as saving in the national income accounts. I'll offer myself as a case in point. I bought my first house in Princeton in 1973 and sold it in 1977. At first I made monthly mortgage payments that were enormous relative to my income. Was I being a big spender? Hardly. I was being a big saver, for the (untaxed, and quite anticipated) capital gain that came at the end was far more enormous. A naive calculation suggests that I actually made negative expenditures on rent during those four years. Of course, that was not the case. What happened was that I did most of my saving in the form of housing. So did millions of other Americans.

About two-thirds of American dwellings are now owner-occupied. In 1979, the Commerce Department included about $115 billion in imputed rent on these dwellings in the GNP. This amounted to 6.9 percent of disposable income—far more than total personal saving as conventionally defined. Even if we count only half of this as saving—which is probably too conservative—the personal saving rate would have been 8.8 percent instead of 5.2 percent.

Now, I do not pretend that these remarks offer a definitive solution to the Canadian-U.S. saving discrepancy. The empiricism is in the best armchair tradition, and I would need to know more about the situation in Canada. But both the enormous magnitude and the particular time pattern of the tax distortion point the finger of suspicion at the tax deductibility of interest. It merits more discussion than Jump gives it.

Discussion

David F. Bradford*

I would like to start my discussion by reviewing what Gregory Jump has done in his paper examining the recent Canadian experience with tax incentives to promote personal saving. I shall then address three points, one very briefly, and two at somewhat greater length. The three points:

(i) I am skeptical of the modeling by which deficit financing is connected with inflation. However, I shall argue this is not a very important point as far as the interesting aspect of Jump's analysis is concerned.

(ii) The question of the incentive effects of Canadian tax measures merits a closer look, on which I make a small beginning.

(iii) Inflation tends to magnify certain differences between the tax structures of the two countries in ways that may explain differences in saving rates.

On the face of it, Jump was assigned a difficult task. The starting point is the surprising divergence since 1976 between U.S. and Canadian rates of household saving. These had been rather similar (and low, by OECD standards) until then. But since 1976 (reading from Jump's Figure 1), the Canadian ratio of personal saving to income has drifted up, from about 10 percent to about 12 percent, while the U.S. rate has slogged along near 6 percent. The question apparently posed to Jump: What role in the difference between U.S. and Canadian experience has been played by the tax law changes introduced by the Canadian government in the mid-1970s with the objective of encouraging savings? In brief summary, these changes consisted of allowing taxpayers to exclude from taxable income up to $1000 of (Canadian source) interest, dividends, and capital gains, and substantially liberalized limits on deductible contributions to registered retirement savings plans (holding Canadian assets).

It is, incidentally, significant and probably unfortunate that Jump did not take on the following question: What role did differences in the tax systems of the two countries play in their records? I have in mind here two points. First is the artificiality of distinguishing savings- and investment-encouraging devices. It is curious how often one encounters in this context the apparent view that it matters (in equilibrium) whether it is the buyers or the sellers that are taxed. (I am not suggesting Jump suffers from any confusion on this point.) I shall have nothing more to say about the possible bearing of changes in investment incentives on the matter under study as I do not know the facts about the Canadian rules. However, I shall say a bit

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more about a second aspect of differences in the two systems when I come to discuss the *implicit* changes in the laws brought about by inflation.

The thought that a connection might exist between savings incentive policies and differences in the saving performances of the United States and Canada is plausible in view of the great similarity between the two economies in other respects, and their close links. The OECD staff paper distributed to conference participants (Table 21, p. 97) presents data supporting the view that the two economies have indeed followed similar paths over the last 25 years. I would note in particular the close agreement in the inflation rates.

While there is thus some cause to suspect institutional differences lie behind differences in recently observed saving rates, the number of observations is small. What are the chances that a few years' experience in a rapidly changing world would throw out convincing evidence about the efficacy of a couple of tax incentives for saving? Judging from the contentious record of efforts to detect in time series the responsiveness of saving to the interest rate, we have to regard the chances as not very good. It is therefore understandable that Jump eschewed an econometric attack on his subject. Like any good economist in this situation, he asked what theory can tell us, and looked to the quantitative information for rough estimates of magnitudes.

Although I have reservations about the particular model employed by Jump, I have no quarrel with the essential conclusions of his theoretical analysis. That is, for a tax measure to encourage saving, it must lower the cost of future consumption in terms of present consumption. In other words, it must *raise the rate of return received by savers.* To elaborate slightly, assuming the government budget must somehow balance, as a first approximation the income effects of feasible tax changes must net to zero. If the marginal propensity to consume doesn't vary systematically in the population of taxpayers (not, in my view, necessarily a good assumption), the distributional consequences of feasible tax changes do not affect household saving, correctly measured. This is the critical point provided by theory. If the tax law changes don't raise the rate of return received by savers at the margin, they won't influence savings.

Did the tax law changes in the mid-'70s change the rate of return to savers? Jump correctly refines the question: Compared to what? If the saving incentives reduce tax revenue, it has to be made up somewhere. So the question is incomplete until we specify the offsetting change. Having argued theoretically that an inflation tax, attributable to increased issue of money, is of a lump-sum character, Jump chooses to evaluate the hypothetical alternative of no savings incentives and slower money growth. The no-real-effect argument is complete if one accepts that the tax law changes were themselves also of a lump-sum character. In this case the package of offsetting budgetary effects has no effect on saving, correctly measured.

However, because money issue does raise the rate of inflation, it does bring about a mismeasurement of saving, of a kind Jump has previously brought to our attention. That is, neglect of household dissaving through lost real balances, and of government saving through the offsetting change

in its monetary liabilities, leads to an overstatement of household saving and an understatement of government saving. It is this mismeasurement, and not any real savings effect, to which Jump attaches an upper-bound in the latter part of his paper.

I come then to my first, and minor point. Even recognizing that it is only an issue of measurement, I would take exception to Jump's reliance on a direct connection between deficit finance and inflation in making his estimates. His identification of bond finance and money creation is only valid in a steady-state model. In a model which permits bond finance today to be offset by either money expansion or tax finance in the future, deficit spending is not necessarily inflationary. I therefore question Jump's assumption that deficit finance translated immediately into price level changes.

We are presumably not really interested in the contribution policy made to an apparent but not real difference. Correcting U.S. and Canadian household saving rates for inflation involves about the same adjustment in both, and leaves the puzzle. The interesting question remains the explanation of the differences in correctly measured household saving rates.

Were the saving policy changes, indeed, of a lump-sum character? First, a look at Jump's empirical evidence. Concerning the $1000 tax-free investment income (presumably *net* income is involved—could one borrow from a foreign bank and avoid the netting of interest?), Jump points out that in 1979, two-thirds of total (not just Canadian source) investment income (net?) accrued to taxpayers reporting gross incomes in excess of $20,000. This implies one-third was received by taxpayers with gross incomes below $20,000, a group with average investment income of $689. Presumably this group includes many elderly taxpayers with investment income in excess of $1000. But presumably also the group of taxpayers with gross income above $20,000 includes many young families in the early accumulation phase of life. From these figures, one could imagine that something like one-fourth of investment income was received by taxpayers still exempt at the margin by virtue of the $1000 provision. This is not a wholly negligible magnitude.

It is also perhaps risky to identify saving with the receipt of investment income. Because under Canadian tax law neither interest on consumer borrowing nor home mortgage interest is deductible, there is a tremendous incentive for households to direct saving first to the reduction of these liabilities, or at least there is a strong incentive for them thereby to avoid exceeding the $1000 exempt investment income limit. Thus, simply looking at the evidence in connection with the $1000 investment income, it is quite possible that a very substantial proportion of savers confronts the full before-tax rate of interest at the margin. This proportion is the critical empirical magnitude.

As far as the registered retirement savings plan limits are concerned, Jump presents no evidence at all. Rather he relies upon the argument that households can borrow against contributions to these plans, and therefore have every incentive to maintain contributions at the limit allowed by law (and to restrict withdrawals to the minimum required by law in the retirement phase). If it is possible to borrow costlessly against these plans, at a

rate of interest that equals that received within the plan, it is certainly true that a priori reasoning implies that nearly everyone would borrow to the hilt. However, to the extent that for many individuals the associated interest is not deductible, or to the extent that existing mortgages and the like imply that they already have in effect tax-exempt saving margins, there are many savers who will be indifferent at the margin to even such a costless arbitrage transaction.

It is, furthermore, most unlikely that the arbitrage is totally costless. At a minimum, one would assume that banks and other lenders would extract some spread between the rate of return charged to borrowers against pension savings, and that actually received in the savings plans. Finally, experience in the United States suggests that arguments based on a priori reasoning about what would be obviously sensible financial behavior may be contradicted by the facts. An interesting example is the suggestion by Merton Miller and Myron Scholes that the limitation on the deductibility of borrowing for portfolio investment purposes means that dividends are effectively free of tax. While optimal on a priori grounds the implied behavior is clearly not borne out by the facts in the United States. Wealth owners simply do not borrow to the extent transactions-cost-free theory suggests they ought to do.

If many savers do not borrow to take advantage of the registered retirement savings plan (and particularly now that the law has been changed in Canada) they will often be in a position to expand their contributions or to reduce the rate at which they draw down accumulations in their retirement phase. During such periods they, of course, face the before-tax rate of return on their savings decisions. Furthermore, even during periods in which the constraints on contributions or withdrawals are effectively binding on savers, there will typically be more or less lengthy periods in which they will, nonetheless, maintain larger accumulations under liberalized contribution limits. This may be seen by writing down the full household optimization problem subject to the savings plan limitations.

No doubt the most important question is whether a saver is confronting the before-tax rate of return interest at the margin. What is very striking is how much more likely it is to be the case in Canada than in the United States. The savings incentives we have been discussing here feature importantly: the $1000 investment income exemption and the relatively generous registered retirement savings plan limits. However, critically important as well is the absence of the deductibility of interest on mortgage or personal borrowing. I can well imagine that for a substantial majority of savers in Canada the before-tax rate of interest is the relevant factor at the margin.

This brings me, then, to the way in which the inflation rate, common to both countries, brought about effective changes in their legislation. If the question had been broadened to whether differences in the tax system help explain the differences in savings behavior, the different treatment of interest deductions would have been seen to be very important. Let us make the common assumption that during an anticipated inflation the interest rate

adjusts approximately one point per point in the inflation rate. While such an adjustment maintains the before-tax rate of interest constant in real terms, it introduces a spread in the real after-tax rates of return according to a tax bracket. The *wedge* between the return before and after tax on interest changes markedly during inflation, even with no change in tax rules. In particular, with the inflation at recent levels, high bracket taxpayers find their incentive to accumulate at interest drastically reduced and their incentive to borrow at interest vastly increased. This effect would lead them to reduce rates of savings as measured in the statistics examined here, while possibly to some degree offsetting these reductions through accumulation of untaxed forms of capital, including consumer durables.

This effect is often underrated in importance. Let's take a simple example. Suppose the rate of interest is 2 percent in the absence of inflation and 15 percent with 13 percent inflation. The following little table shows what happens to the real interest rate according to taxpayer marginal bracket:

Real After-Tax Interest Rate

Marginal Tax Bracket	No Inflation	Inflation at 13%
0	2	2
30	1.4	−2.5
50	1	−5.5

Put another way, here is what happens to the price of a real dollar of purchasing power 25 years hence:

Effective Price of a Dollar of Purchasing Power 25 Years Hence

Marginal Tax Bracket	No Inflation	Inflation at 13%
0	61¢	61¢
30	70¢	$1.87 (!)
50	78¢	$3.96 (!)

Even for taxpayers in modest tax brackets there is now an enormous incentive to borrow at interest and to dissave from interest-bearing forms of savings, the margin at which the average Joe in the United States probably makes his savings decision. In Canada, as inflation proceeded, the average Joe was kept confronting the real interest rate before tax. This didn't change much. In the United States, the relevant interest rate was the after-tax interest rate, and it was sharply cut by the effect of inflation. Indeed, a comparison of the tax rates at the margin would lead one to expect a drop in the rate of savings in the United States (measured in this discussion), and the maintenance of the rate of savings in Canada.

While I have the pulpit, let me close with a pious remark. There is a risk in focusing the concern of this conference on overall savings performance. Our concern is more properly with efficient resource allocation, and this has to do as much with the composition and distribution of investment and saving as with the overall aggregates. One of the more distressing aspects of measures that have been recently taken in this country to alter the aggregate is the undoubted distortion that they have introduced into the composition. Alan Auerbach will have much more to say on this aspect of the matter, which I think cannot be overemphasized.

Issues in the Measurement and Encouragement of Business Saving

Alan J. Auerbach*

I. Introduction

In 1981, personal saving in the United States was $106.6 billion, or 4.4 percent of personal income.[1] Net corporate saving, as defined by undistributed profits net of estimated economic depreciation, was $49.5 billion, or 44.0 percent of after-tax corporate profits.[2] Thus, net private saving was just 6.0 percent of net national product, which was $2.6 trillion. This level of savings is low by historical standards even in the United States, where savings as a fraction of income has always been low compared to most other industrialized countries. Moreover, it also appears to represent a shift in the composition of private savings, from the business to the personal sector. These trends are shown in Table 1. Total private saving was between 8 and 10 percent of NNP for most of the 1960s, and business saving represents almost half this total. Total private saving shrunk in the 1970s, especially in the last few years, but business saving has fallen even more. This low rate of saving in the United States, particularly by corporations, provided much of the impetus for the inclusion of several of the "supply side" components in the Economic Recovery Tax Act, notably the acceleration of depreciation allowances, the reduction in the top marginal tax rate on personal "unearned" income, expanded Individual Retirement Accounts, All-Savers' certificates and the reduction in estate taxes. That these provisions, each of which is targeted at individuals with well above the median family income, were generally supported by members of both parties indicates how strongly Congress feels about increased capital formation as a policy goal.

This paper has several objectives. We begin with a discussion of business saving, what it is and what influences it. A key point to be made here concerns the proper definition of such saving. Next, we ask the more fundamental question whether it matters what business saving is, as distinct from a broader savings measure. Since corporations are, ultimately, owned by individuals, there would appear to be little importance to the identity of the saver. However, analysts have traditionally looked at business saving as at least partially independent from household behavior. While such an approach may rest on assumptions about the separation of ownership and control of corporations, or the inability of stockholders to "pierce the corporate veil," it may also be explained by the structure of the income tax.

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[1]Economic Report of the President 1982, Table B-23.

[2]*Ibid,* Table B-82.

The U.S. corporation income tax, small though it may now be as a revenue source, is still a "classical" corporate income tax in that corporations and their stockholders are taxed independently. This lack of full integration of the personal and corporate taxes introduces differences in the incentives to save faced by businesses and individuals. Thus, the saver's identity regains importance, even if no other cause for distinction exists. We review recent theoretical and empirical evidence on this question to help in analyzing the likely impact of savings and investment incentives at the personal and business levels.

Given that the level at which an investment incentive is administered matters, there is a further distinction to be drawn among different strategies of delivering the incentive. In particular, there are two general types of business investment incentive. One (such as an acceleration of depreciation allowances) applies only (in principle) to new investment. The other (such as a corporate rate cut) applies to all corporate income, regardless of source. This distinction can be extremely important in determining both how effective the incentives are in spurring more investment and who gains and loses from the change in policy. After reviewing the theoretical differences between the two types of incentives, we present results from a dynamic, perfect-foresight simulation model to illustrate them. Finally, we discuss the implications of our results concerning both the current and recent changes in the corporation income tax and the various alternatives that might be considered.

Table 1
Saving In The United States, 1962–1981 (percent of NNP)

	(1) Private Saving	(2) Undistributed Corporate Profits	(3) (2) / (1)
1962	8.0	3.5	.44
1963	7.7	3.7	.48
1964	9.2	4.1	.45
1965	10.0	4.7	.47
1966	9.8	4.6	.47
1967	10.0	4.0	.40
1968	8.7	3.5	.40
1969	7.4	2.7	.36
1970	7.8	1.6	.21
1971	8.5	2.3	.27
1972	7.7	2.8	.36
1973	9.2	2.7	.29
1974	7.6	1.0	.13
1975	8.9	2.1	.24
1976	7.7	2.4	.31
1977	7.3	3.0	.41
1978	6.9	3.0	.43
1979	6.7	2.7	.40
1980	6.2	1.9	.30
1981	6.0	1.9	.32

Source: Economic Report of the President 1982, Tables B-19, B-23 and B-82.

II. Determinants of Corporate Saving

Why is U.S. corporate saving so low? In Table 2, we present (in columns (1) and (2)) two measures of deflated after-tax profits of nonfinancial corporations for the period 1962–1981, and (in column (5)) the corresponding levels of dividends. The ratio of dividends to each profit measure is presented in Table 3. The first after-tax profit measure is accounting profits. This measure has grown over the last two decades at an annual rate of 3.4 percent, though the growth has not been continuous. Moreover, dividends as a fraction of such profits have declined in the 1970s, indicating a greater percentage of business saving out of the growing profits. There can certainly be no explanation of a decline in business saving from such statistics.

However, the savings figures quoted in Section I referred to the second profits measure, which corrects profits for the miscalculation of depreciation and inventory profits. The capital consumption adjustment accounts for the fact that accounting depreciation is more accelerated than economic depreciation, on the one hand, but not indexed to price level changes, on the other. Together, these factors may lead to either an overstatement or understatement of profits. The inventory valuation adjustment accounts for the fact that firms using the first-in, first-out accounting method record fictitious inventory profits when there is inflation. Together, the IVA and CCA may either increase or decrease the profit measure, depending on the inflation rate. When inflation is low, as in the early 1960s, the first part of the capital consumption adjustment, for the acceleration of accounting depreciation over economic depreciation, dominates the correction, increasing the profits measure. When inflation is high, the correction leads to a reduction in measured profits. This is quite evident throughout the 1970s up to the present.

Corrected corporate profits have been essentially flat in real terms during the last 20 years. Moreover, dividends, as a fraction of such profits, have grown to the point where corporations have over the past three years distributed two-thirds of their corrected earnings. Together, these trends explain the low level of retained earnings. However, though retained earnings is the measure of net business saving commonly used, it does not include a component of business saving that has become very important in recent years: the inflation gain on nominal indebtedness.

At the end of the first half of 1982, U.S. nonfinancial corporations had $1.32 trillion of outstanding debt, and $203 billion in financial assets.[3] Since nonfinancial corporations are net debtors, they realize a gain when inflation erodes the real value of nominally denominated assets. This component of real profits, which is not taxed, is shown in column (3) in Table 2. From a very small figure relative to the standard profits measure, this gain has grown to the extent that it *exceeded* corrected after-tax profits during each of the last three years. Including this extra gain with profits yields a series that has grown even more rapidly than unadjusted profits since 1962, and of which dividends have been a declining fraction.

[3]Data Resources USMODEL databank.

Evidence that this expanded profits measure may actually be relevant to corporate saving and dividend decisions comes from the regression results presented in Table 4. Here, we estimate a simple, partial adjustment model to explain dividends of nonfinancial corporations, following the basic specification of Lintner (1956), Brittain (1966) and others. The two measures of after-tax profits, plus the inflation gain on nominal indebtedness, are all included as explanatory variables of target dividends D_t^* in the model

$$D_t - D_{t-1} = \lambda(D_t^* - D_{t-1}) \tag{1}$$

The unadjusted profits figure is insignificant, and the coefficient of the inflation gain is significant and approximately two-thirds the size of the coefficient on adjusted profits. This suggests that corporate savings may appear lower only because corporations distribute dividends out of a broader measure of earnings than the one commonly examined by investigators.

It is important to remember that this addition to corporate savings does not raise the overall private savings measure, since measured household saving does not account for the *loss* on net financial assets households

Table 2
Corporate Profits and Distributions, 1962–1981 U.S. Nonfinancial Corporations (1972 Dollars)

	(1) Profits After Tax	(2) Profits After Tax w/ CCA & IVA	(3) Inflation Gain on Net Debt	(4) (2)+(3)	(5) Dividends
1962	33.3	35.3	3.5	38.8	16.1
1963	36.5	39.7	2.8	42.5	17.6
1964	43.2	46.4	2.7	49.1	18.8
1965	51.1	54.5	5.2	59.7	21.1
1966	53.2	55.6	8.7	64.3	22.0
1967	48.9	52.0	8.2	60.2	22.2
1968	48.0	48.3	13.7	62.0	23.2
1969	41.8	39.6	17.1	56.7	22.1
1970	32.6	28.1	16.6	44.7	20.0
1971	37.1	33.7	16.3	50.0	19.2
1972	43.0	29.9	15.6	45.5	20.2
1973	53.0	36.6	27.8	64.4	20.0
1974	55.1	18.9	42.7	61.6	18.7
1975	52.5	35.5	32.0	67.5	20.5
1976	62.2	41.3	19.6	60.9	22.7
1977	69.1	49.9	28.1	78.0	22.8
1978	74.1	50.0	40.4	90.4	25.1
1979	75.0	40.2	40.8	81.0	24.4
1980	66.2	32.6	51.9	84.5	23.7
1981	63.1	42.1	45.9	88.0	27.1

Sources: Federal Reserve Flow of Funds Data, as obtained from the Data Resources Model Data Bank. Deflation by GNP deflator. Inflation gain on net debt equals debt less financial assets, deflated, multiplied by percent change in GNP deflator.

Table 3
Payout Ratios (Dividends ÷ Profits After Tax)

	Profits Definition: (1) Profits After Tax	(2) Profits After Tax w/ CCA & IVA	(3) Profits After Tax w/ CCA, IVA and Net Inflation Gain
1962	.48	.46	.41
1963	.48	.44	.41
1964	.44	.41	.38
1965	.41	.39	.35
1966	.41	.40	.34
1967	.45	.43	.37
1968	.48	.48	.37
1969	.52	.55	.39
1970	.61	.71	.45
1971	.52	.57	.38
1972	.47	.68	.44
1973	.38	.55	.31
1974	.34	.99	.30
1975	.39	.58	.30
1976	.36	.55	.37
1977	.33	.46	.29
1978	.34	.50	.28
1979	.33	.61	.30
1980	.36	.73	.28
1981	.43	.64	.31

Sources: See Table 2

Table 4
Models of Nonfinancial Corporate Dividend Behavior (Quarterly, 1953:II to 1982:I)

	Dependent Variable: Dividends (D) Model (4.1)	(4.2)
Independent Variable:		
Intercept	1.83	1.56
	(3.24)	(3.00)
Dividends (lagged)	.80	.80
	(16.56)	(16.75)
Profits (Adjusted, After Tax)	.06	.05
	(3.79)	(3.98)
Profits (Not Adjusted, After Tax)	−.02	—
	(−1.21)	
Inflation Gain on Debt	.04	.03
	(3.04)	(3.30)
$\bar{R}^2$	.95	.95
Durbin-Watson Statistic	2.48	2.47

Source: See Table 2

suffer due to inflation. Moreover, there are many other ways in which corporate profits could be corrected. One would also like to account for capital gains and losses on long-term debt caused by interest rate changes, for example. However, perhaps the most important omission is the loss on the asset value of future depreciation allowances. Just as financial assets lose value with inflation, so do the "depreciation assets" which equal the stream of depreciation allowances attached to a company's assets (Auerbach 1979a). The exact value of these assets held by nonfinancial corporations is difficult to calculate exactly, but a rough estimate is easily obtained. Assuming an average of N dollars per year in gross investment, depreciated at double-declining balance based on a tax lifetime equal to T, a nominal discount rate of r, an inflation rate of π and a corporate tax rate τ, we obtain the following expression[4] for the annual inflation loss on the present value of future depreciation allowances.

$$L = \tau\pi N\left(\frac{2/T}{r + 2/T}\right)/(\pi + 2/T) \tag{2}$$

For realistic pre-1981 values, ($\tau = .46$, $\pi = .06$, $N = 125$ billion, $r = .12$ and $T = 15$) for example, this figure is \$9.4 billion, which is nearly of the same order of magnitude as the inflation-induced gains on nominal indebtedness in column (3) of Table 2. Thus, the puzzle of corporate saving may not be completely solved after all. However, it seems clear that the apparently drastic decline in the corporate retention rate is an artifact of the mismeasurement of corporate profits.

III. Why Should It Matter Who Saves?

The Modigliani-Miller Theorem challenged a number of cherished views about the ability of corporations to influence their market valuation through changes in financial policy. Modigliani and Miller (1958) showed that it was of no real consequence whether corporations financed with debt or equity, and Miller and Modigliani (1961) demonstrated a similar proposition concerning the indifference between retentions and new share issuance. Both of these results, of course, hinge critically on the absence of taxes and market imperfections. What they imply is that business saving, defined as retained earnings, is a concept of meaningless distinction that has no real relevance for analysis of economic activity. If a firm chooses to pay an extra dollar in dividends, it can replace this reduction in retentions with a dollar of debt or new share issues. In either case, the household investor who receives the dividend can purchase the new security, with the end result that there will be no real change in the position of the stock-

[4]This expression is obtained in the following way:
The present value of depreciation allowances remaining per dollar of asset basis is $(\delta/r + \delta)$, where $\delta = 2/T$. The basis, in real terms, of N real dollars of assets purchased in year $t - s$, in year t, is $N(1 - \delta + \pi)^s$. Thus, total basis is:

$$(N + N(1 - \delta + \pi) + N(1 - \delta + \pi)^2 + \ldots) \cdot \frac{\delta}{r + \delta} = \left(\frac{N}{\pi + \delta}\right)\left(\frac{\delta}{r + \delta}\right)$$

These have a value in tax savings of $\tau(N/\pi + \delta)\cdot(\delta/r + \delta)$, which loses value annually at rate π.

holder or the firm. However, business saving will have been reduced by a dollar, and personal saving increasd by the same amount. Therefore, the breakdown of private saving between personal and business sectors depends on the convention of dividend distribution, but is of no importance. One could increase business saving by inducing reductions in dividends, but this would only induce compensating responses in other financial variables.

This irrelevance result is not consistent with the view that firms can influence the welfare of their stockholders through strictly financial transactions. It also suggests that there is no reason for concern about business saving, rather than private saving.[5] Yet the traditional view has been that there are separate incentives governing the behavior of households and corporations, just as the tax system (in the United States) treats the sectors separately. The justification for such separate treatment must lie in some form of market imperfection, either in the rationality of agents, institutional constraints (such as differential access to capital markets by households and firms) or taxes.

There has long been some question whether stockholders can "pierce the corporate veil" and undo any changes in saving by the corporation that are inconsistent with their own lifetime savings plans. One cannot appeal here to liquidity constraints, for if a liquidity-constrained stockholder wishes not to save, he may respond to a firm's additional retentions by selling some of his shares in the firm. There must be a more fundamental irrationality present for there to be real effects, if markets are otherwise perfect. One method that has been used to assess this possibility is the inclusion of retained earnings in a consumption or savings equation. The notion was that corporate source income, whether in the form of dividends or retentions, should have the same effect on individual consumption behavior as other disposable income. For example, Feldstein (1973) found that retentions had a coefficient about two-thirds the size of that on current disposable income in a regression of consumption on these variables plus lagged disposable income and the current unemployment rate. Column (5.1) in Table 5 presents a reestimate of this equation for the currently available sample period. (Because of a low Durbin-Watson statistic, we correct for first-order serial correlation.) As is evident from the new regression results, the corporate retentions variable is now entirely insignificant, indicating an instability in Feldstein's estimated relationship. The retentions variable is significant in a familiar alternative specification, presented in column (5.2) which includes a lagged consumption rather than lagged income in the regression. However, it is unclear why the coefficients of retentions and disposable income *should* be the same, even if consumers are completely rational. As discussed by Hall (1978), consumption should depend on current variables such as disposable income, retentions and unemployment only to the extent that they were previously unpredictable. Thus,

[5]Indeed, one could argue further, following Barro (1974), that government deficits are of no importance if they simply substitute for taxes, since the form in which resources are taken from the private sector is not important. Like the Modigliani-Miller irrelevance proposition, this result depends on the absence of distortionary taxation and the full rationality of private agents.

the coefficients of these variables in regression (5-2) represent the effects of their innovations on current consumption. There is no reason to believe that the coefficients of disposable income and retentions would be the same, even if consumers don't care whether they save or the corporations in which they hold stock save. This is because the innovations in retentions reflect not only changes in corporate savings policy, holding future prospects fixed, but also changes in future profitability. If corporations increase retentions substantially, this may cause an increase in consumption because business prospects have improved. Similarly, unexpected changes in disposable income, and it is labor income with which we should be concerned (Flavin 1981), will influence current consumption according to how permanent such changes are expected to be. Unless we make strong and unwarranted assumptions about the relationship between the stochastic processes generating disposable income and retentions, we cannot give any structural interpretation to the coefficients in equation (5–2).

Thus, it is difficult to test whether national saving can be increased through greater business saving via consumer irrationality. Perhaps more important, though, this is not the only reason why an increase in business saving might have real effects. The tax system must be integrated into the analysis, since it upsets the Modigliani-Miller results.

Table 5
The Life Cycle Hypothesis and Corporate Saving
(Quarterly, 1960:II to 1982:I)

	Dependent Variable: Consumption Model	
Independent Variable:	(5.1)	(5.2)
Intercept	−8.61 (−0.25)	−29.62 (−1.68)
Disposable Income	.61 (10.79)	.25 (3.57)
Disposable Income (lagged)	.28 (5.09)	—
Consumption (lagged)	—	.72 (9.46)
Household Net Worth	.009 (0.92)	.007 (1.27)
Corporate Retentions	−.02 (−0.10)	.30 (4.09)
Unemployment Rate	−.45 (−0.29)	2.11 (2.59)
Autocorrelation Coefficient	.87 (15.51)	.08 (0.63)
$\bar{R}^2$	.999	.999

Source: National Income Account Definitions of Consumption, Disposable Income and Corporate Retentions (Earnings less Dividends), all in 1972 dollars. Household net worth as constructed from Flow of Funds Data by Data Resources.

IV. Taxes and Business Saving

The United States administers a "classical" corporate income tax, under which corporations and their stockholders are taxed independently, with stockholders being taxed only on dividends and capital gains actually realized from share ownership, rather than on all corporate income. The classical system of taxation has been abandoned by many European countries, who have switched to either partially or completely integrated tax systems (imputation systems). The logic behind taxing corporations as separate entities is unclear. Whatever its foundation, it has distortionary effects on the financial behavior of firms, and on their incentive to save and invest.

Just how the entire classical tax system does distort behavior has been the subject of much debate and research in recent years. The effects of the corporate tax alone were studied by Modigliani and Miller (1963), who pointed out that the provision for interest deductibility, with no similar allowance for dividends, provides an incentive for pure debt finance (and, presumably, no business savings at all) at the margin. However, the situation is complicated considerably by the existence of personal taxes. The two salient features of the personal tax system here are the progressivity of its marginal rates and its differential treatment of personal income from debt and equity. While interest payments are taxed fully, only dividends are taxed at ordinary income rates. Through the 60 percent exclusion of long-term capital gains, and the taxation of such gains only upon realization (a tax that is forgiven if the gain is not realized before death), personal income from corporate equity is favorably taxed. There are two alternative views of how all of these taxes influence behavior, and they have very different implications for the effects of taxation on the incentives of corporations to save.

A. The Traditional View

The traditional view dictates that equity income is subject to double taxation because earnings are taxed first at the corporate level, and then through the tax on dividends. This double taxation may be lessened to the extent that a firm returns some fraction of its earnings and distributes dividends later, because then these earnings are compounded at the rate of return gross of personal tax; there is a deferral advantage.

Mathematically, if τ and Θ are the corporate and personal tax rate, c is the accrual-equivalent of the capital gains tax, i is the after-tax rate of return required by shareholders, r is the rate of return on capital investments, and p is the dividend payout rate, then the corporation's decision to invest up to the point where a dollar of investment yields just a dollar in present value of after-tax equity income may be represented by the equation:

$$1 = \int_0^\infty e^{-it}\{(1-\Theta)[pr(1-\tau)e^{(1-p)r(1-\tau)t}] - c\dot{v}_t\}dt \tag{3}$$

where $\dot{v}_t$ is the change in the investment's values at time t. Since

$$v_t = e^{(1-p)r(1-\tau)t}v_0 = e^{(1-p)r(1-\tau)t},\ \dot{v}_t = (1-p)r(1-\tau)e^{(1-p)r(1-\tau)t}.$$

Thus, equation (3) yields as a solution for the required rate of return, r:

$$r = \frac{i}{(1-\tau)[p(1-\Theta) + (1-p)(1-c)]} \tag{4}$$

That is, the effective tax rate on equity is $\tau + (1-\tau)[p\Theta + (1-p)c]$. Since no such double taxation applies to debt, it is likely (though not certain) that debt finance will still be favored. However, various constraints on firm leverage may limit the extent to which the debt advantage can be explored, so that the double taxation must be experienced on some corporate source income.

It is very much in the spirit of this traditional view of the corporate tax that many integration proposals of the past decade were put forward. For example, some "partial integration" or "dividend relief" schemes, such as a dividend paid or dividend received deduction, effectively would exempt from corporate taxation those earnings paid out as dividends. This would change equation (4) to

$$r = \frac{i}{[p(1-\Theta) + (1-p)(1-\tau)(1-c)]} \tag{5}$$

bringing the tax treatment of equity closer to that of debt. Full integration, or imputation of all corporate earnings to individuals, would result in a symmetric treatment of the income from equity and debt. All such integration schemes have been viewed as a way of encouraging overall saving, because they would lower the tax rate on equity income. Their effect on the breakdown between business and personal saving would be less clear. Presumably, with the discouragement of dividend distributions lessened, there would be lower retentions and a smaller share of business saving.

B. The New View

While the foregoing view of equity taxation is appropriate for the case where firms issue new shares and follow a pattern of fixed dividend payout, it does not necessarily describe the way firms actually behave. Corporations (excluding regulated utilities, to which special tax rules apply) rarely issue new shares.[6] As such, their equity source funds come from retentions, with the key difference being that retentions cause an immediate reduction in the dividend taxes suffered by stockholders. Equation (3) becomes:

$$(1-\Theta) = \int_0^\infty e^{-it}\{(1-\Theta)[pr(1-\tau)\,e^{(1-p)r(1-\tau)t}] - c\dot{v}_t\}\,dt \tag{6}$$

which (see Auerbach 1979b) for a detailed derivation) yields:

$$r = \frac{i}{(1-\tau)(1-c)}. \tag{7}$$

The taxation of equity income depends neither on the dividend tax nor the payout rate. Another, related implication is that the value of "Tobin's q," or

[6]See Auerbach (1981) for relevant statistics.

the increase in equity value per dollar of new installed capital, is $(1 - \Theta/1 - c)$, rather than 1. These two results are really part of the same outcome. When a firm can finance through retentions, it will do so as long as it can increase shareholder wealth *after tax*. Since reinvestment avoids the dividend tax, substituting for it a lighter capital gains tax on the increase in share value, the firm needn't increase share valued by the full amount of the retention, but only $(1 - \Theta/1 - c)$ times this amount.[7] In equilibrium this margin is arbitraged by the firm, so there can be no benefit to the stockholder from a change in the firm's payout rate.

A corollary of this "capitalization" result is that equity only suffers double taxation to the extent of the very low capital gains tax. Moreover, since the dividend tax itself appears nowhere in the expression for the cost of capital, (7), a cut in the dividend tax would have no direct impact on the incentive to retain and invest. In fact, since the after-tax discount rate, i, is likely to rise with a general cut in personal taxes (because taxation of alternative forms of investment income would be lower) it would lead to a rise in the equity cost of capital. The important finding, though, is that the tax on *distributions,* rather than all income, has *no* effect at all on the incentive for businesses to invest (Bradford 1981). But because the long-run value of q is $(1 - \Theta/1 - c)$, a reduction in the tax on distributions would lead to a windfall gain to holders of corporate equity. Thus, any proposal that would provide "dividend relief" would be ill-advised as an incentive for capital formation. On the other hand, a reduction in the rate of corporate taxation would encourage equity investment and, presumably, investment overall.

C. Evidence on the Competing Views

The major difference between the "old" and "new" views of how equity is taxed lies in the assumed margin of finance for new investment. Under the old view, dividends are fixed and new investment is financed by the issuance of new shares. Under the new view, changes in dividends provide needed equity capital.

There are obvious problems with each of these hypotheses. As mentioned above, firms infrequently resort to the issuance of new shares. On the other hand, the dividend behavior of firms is very stable (see Brittain 1966). A realistic compromise between these two extreme views of the world would be the hypothesis that firms "normally" obtain their equity funds through retentions, but cannot vary their dividends substantially in the short run. Therefore, when large amounts of funds are required, they must issue new shares. This type of model is a hybrid of two extreme views of equity policy, since firms can find themselves either in a "retentions" regime or a "new shares" regime, with the values of Tobin's q and the cost of capital in the two regimes corresponding to those formulated above for each of the two hypotheses. This hypothesis was tested by Auerbach (1982b) with a 20-year panel of 274 firms, using a model which relates *ex post* earn-

[7] If a dollar of dividends is foregone, the stockholder loses $(1 - \Theta)$ dollars after-tax. If equity increases in value by q, his after tax gain is $q(1 - c)$, given the way we have defined c. Thus, they are equal when $q = (1 - \Theta)/(1 - c)$.

ings to previous financial and investment decisions. The empirical results strongly support the following conclusions:

(1) Firms face a higher cost of capital when they issue new shares than when they do not; and

(2) Firms held by investors in higher tax brackets face a *lower* cost of capital when investing through retentions.

These findings suggest that firms behave as predicted by the "new" view of the corporate tax, except when they are constrained in their dividend policy and must issue more expensive new equity to finance their investments. In particular, the declining cost of equity capital with the increase in shareholder tax rates is consistent with expression (7), since the after personal tax required return, i, would presumably be negatively related to the personal tax rate (and the capital gains tax rate is relatively unimportant).

Perhaps the most important implication of this evidence is that personal savings incentives, such as the recently liberalized Individual Retirement Accounts, are likely to *discourage* business savings through equity-financed investment because the *effective* rate of taxation of personal interest income is reduced more than that of equity income. Moreover, that part of any tax reduction that applies to dividend income, as opposed to interest income, is basically a lump sum transfer to the holders of corporate equity. Only with respect to equity finance through new shares does such a tax incentive have the desired effect. In recognition of this fact, one recent alternative proposal for corporate and personal tax integration in the United States (American Law Institute 1982) would have allowed a dividends paid deduction against corporate taxes only to the extent that dividends are associated with newly issued equity: integration for new equity only. Interestingly, almost the identical scheme is currently in place in Sweden[8] which, like the United States, still has a classical corporation tax. Referred to as the Annell deduction, it allows corporations to deduct against current profits dividends on newly issued shares for a period of up to 20 years, with the sum of deductions not exceeding the amount raised and no more than 10 percent of the amount deductible in any year. Other countries, such as the United Kingdom, have gone to a full imputation system.

V. Transitional Differences among Savings Incentives

The foregoing analysis suggests that personal savings incentives, such as a reduction in the rate of dividend taxation, and business incentives, such as a corporate rate reduction, may differ markedly in their effects on investment. These differences arise from the distortions caused by the classical system of taxing corporations separately from their shareholders. A second way in which business and household savings incentives have differed *in practice* is in the transition from old to new tax treatment. Business incentives typically have been narrower in scope, in terms of focusing on new investment, than have personal incentives. While this difference in

[8]See King *et al* (1982) for a detailed discussion.

scope is not necessary in theory, political reasons may explain why it has been in practice. As we shall discuss, most savings incentives have important distributional effects as well as their intended efficiency effects. Incentives that focus only on new assets harm members of older generations. Though this is true regardless of whether households or businesses are the direct recipients of the tax incentives, the connection is much clearer when it is the former.

In this section, we compare these two types of incentives theoretically, give examples of their use, and present the results of simulation experiments that demonstrate how important such transitional differences can be. Since there is no theoretical importance whether the tax incentive is given to households or businesses, we analyze the former case.

Consider an individual who lives for two periods, receives labor income in the first period, and consumes in both periods, saving out of labor income to consume in the second. This individual's budget constraint is:

$$c_2 = (1 + r)(wL - c_1) \tag{8}$$

where c_1 is consumption in period 1, L is labor supply, and w and r are the wage and interest rate. With taxes Θ_r on capital income and Θ_w on wage income, the net returns to capital and labor are $r(1 - \Theta_r)$ and $w(1 - \Theta_w)$, respectively. Thus, the budget constraint may be written:

$$\frac{1}{w(1 - \Theta_w)} c_1 + \frac{1}{w(1 - \Theta_w)(1 + r(1 - \Theta_r))} c_2 = L \tag{9}$$

We may think of $P_1 = 1/w(1 - \Theta_w)$ as the price, in labor units, of first-period consumption, and $P_2 = 1/w(1 - \Theta_w)(1 + r(1 - \Theta_r))$ as the price of second-period consumption. Since $P_2/P_1 = 1/1 + r(1 - \Theta_r)$, a capital income tax has the effect of raising the price of future consumption (Feldstein 1978). This disincentive could be removed in two structurally equivalent ways. Either capital income taxes could be removed, or both capital *and* labor income taxes could be removed and replaced with a consumption tax Θ_c. These alternative regimes would yield the following budget constraints:[9]

$$\frac{1}{w(1 - \Theta_w)} c_1 + \frac{1}{w(1 - \Theta_w)(1 + r)} c_2 = L \tag{10.a}$$

$$\frac{1}{w(1 - \Theta_c)} c_1 + \frac{1}{w(1 - \Theta_c)(1 + r)} c_2 = L \tag{10.b}$$

There is no difference if $\Theta_w = \Theta_c$, in which case the present of tax revenues is also the same.

However, consumption and wage taxes differ in the timing of their collections. This means that a government wishing to spend all its revenues in the first period must run a deficit under a consumption tax regime, and pay the deficit back with second period tax revenues. Again, this involves no

[9]The consumption tax here is defined with respect to the *tax inclusive* base; that is, Θ_c is the fraction of gross expenditures on consumption collected in taxes.

real distinction, but government does a greater fraction of national saving under the wage tax than under the consumption tax.

Once we consider the actual context in which such tax changes occur, however, real differences between wage taxes and consumption taxes are introduced by constraints on government behavior. Exact equivalence of the two systems would generally require the capacity to tax different generations at different rates, and to use debt policy. If government is constrained to impose uniform tax rates (or at least a uniform progressive rate schedule) and cannot borrow, the timing differences in tax collections lead to real differences both in the transition and in the long run under the alternative tax regimes. This is most easily seen by comparing the differential impact on retired individuals, who will pay no taxes under a labor income tax, but will face an increased tax burden under a consumption tax. As a result they will be far worse off under a consumption tax, and this added tax revenue will enable the government to impose a lower lifetime tax burden on future generations. Of equal importance, the consumption tax will in this context be more efficient than a wage tax, because these taxes on the elderly are essentially lump sum in nature.

These conclusions may be illustrated by comparing the results of simulations presented by Auerbach, Kotlikoff and Skinner (1983) of immediate transitions from a proportional income tax to a proportional consumption tax and to a proportional wage tax. The simulations are based on a dynamic, one sector general equilibrium model, which in any year is composed of 55 overlapping generations of individuals (each of whom may be thought of as adults who exist from age 21 to age 75) who make lifetime labor supply, retirement, and consumption decisions subject to perfect foresight. Preferences are described by an intertemporally separable, nested CES utility function in consumption and leisure, with preference parameters based on relevant empirical studies. Production is assumed to obey a Cobb-Douglas function in capital and labor. From the initial steady state, in which there is a proportional 30 percent income tax, the simulations trace out the path of the economy under an immediate switch to the new tax regime. Summary statistics of the long-run and short-run effects are given in Table 6. In the long run, under a consumption tax, the tax rate needed to maintain a balanced budget is only 28.29 percent, even though the tax base now excludes saving. This lower tax rate is associated with a higher level of utility. Expressed in terms of units of lifetime labor endowment, individuals in the long run are 6.28 percent wealthier than under the income tax. Under a wage tax, the long-run tax rate is 41.13 percent, and long-run welfare is reduced by 3.46 percent. These differences in long-run outcomes of transitions to structurally identical tax regimes is reflected in the differential impact on transition generations. Older individuals fare worse under a consumption tax; those aged 55 at the time of transition suffer a welfare loss of .65 percent of their full *lifetime* resources, and a much larger fraction of resources remaining. Under a wage tax, this same cohort gains .44 percent of lifetime resources. The fate of those aged 25 at the time of the transition is reversed, with a gain under the consumption tax and a loss under a wage tax.

Even when distributional effects are neutralized, the broader coverage of the consumption tax base to include consumption out of assets already in existence makes it a more efficient tax. With intergenerational redistributive effects neutralized by lump sum transfers and taxes that hold all preexisting cohorts at the *status quo* level of utility and raise the utility of post-change generations by the same amount, there remains a sustainable 1.73 percent welfare gain under the consumption tax, but at 2.33 percent loss under the wage tax. This very large difference occurs because although the tax systems are structurally the same, their transitional impacts are not.

Table 6
Simulation Results: Welfare Effects of Consumption and Wage Taxes

	Tax Regime	
	Consumption	Wages
Long Run:		
Tax Rate (%)	28.29	41.13
Welfare Change (%)	6.28	−3.46
Transition Welfare Change (%)		
Age = 25	1.19	−2.61
Age = 55	−0.65	0.44
Efficiency Gain (%)	1.73	−2.33

Source: Auerbach, Kotlikoff and Skinner (1981).

In a richer model, further differences arise between consumption and wage taxes that make the consumption tax more efficient. One that is of particular relevance here is the treatment of pure economic rents.[10] Under a regular income tax, such rents would be taxed, but this would not be true under a wage tax. However, since the present value of consumption for an individual would, in this case, equal the present value of wages plus rent, a consumption tax would hit such rents.

If one turns to the real world, there is less evidence of a "bang" transition to a consumption or wage tax than a "whimpering" erosion of the personal capital income tax base. In practice all savings incentives enacted recently have had the salient characteristic of the wage tax of lowering the tax on income from existing assets. Some, such as the All-Savers' Certificates, followed the wage tax approach of a direct reduction in the tax rate on capital income. Others, such as the extension of access to Individual Retirement Accounts, followed the consumption tax *approach* of allowing a deduction for saving rather than a tax exemption for interest income. However, this differs from the consumption tax as simulated in that individuals face a tax in withdrawals from an IRA for consumption purposes only to the extent that they already have received a deduction for previous contributions made. The analogy to the simulated transition would be the declaration by the government that all existing assets are already in an IRA.

Put this way, it is hard to imagine the government ever enacting such legislation. But most of the investment incentives introduced over the past three decades have had this very characteristic of lowering the tax rate on income from new investment while penalizing the holders of existing assets.

[10]See Helpman and Sadka (1982).

This is true of the investment tax credit enacted in 1962 and raised in 1975, and of the accelerated depreciation provisions of 1954, 1971, and 1981. Only the corporate tax rate cuts of 1964 and 1978 followed wage tax treatment.

This relationship is most easily seen if we consider the most extreme case of accelerated depreciation, immediate expensing of new investments. As is well known since the work of Brown (1948), expensing is neutral under an income tax, because the tax contributes the same fraction to an asset's cost that it withdraws from its quasirents. It is simply a tax on pure rent. The government may be thought of as a partner in the enterprise, but there is no effective tax rate on capital income. But this is precisely how saving is treated under a consumption tax: a deduction of accumulation followed by a tax on withdrawals.[11] Similarly, consumption out of existing assets is taxed, although in a more indirect fashion. If old assets do not qualify for expensing, they are worth less than they otherwise would have been, by the value of the tax deduction that new assets receive. If we assume a constant production cost for new capital, then holders of old assets realize a capital loss equal to the tax rate times the asset replacement value when they sell the assets in order to consume—precisely as they would if they received the full price for the asset and then had to pay a consumption tax. Like expensing, the introduction of accelerated depreciation or investment tax credits on new investment lowers the tax rate on new investment and induces a capital loss on existing assets. This could be avoided if, as with the Individual Retirement Accounts, all capital, whether new or existing, qualified for the new provisions. However, in contrast to personal savings incentives, this is typically proscribed. For example, the provisions of the Economic Recovery Tax Act dealing with the Accelerated Cost Recovery System expressly forbid the use of the new capital recovery schedules for assets purchased before January 1, 1981.[12]

This characteristic of business investment incentives is simply a different way of expressing more familiar arguments about the superior "bang for the buck" that capital incentives such as accelerated depreciation and investment credits have relative to corporate rate reductions. The latter apply to income from existing capital and pure economic rents, whereas the former do not. That such an argument should be so readily accepted at the business level but not at the personal level is somewhat distressing, but not difficult to understand in light of the common practice in tax legislation debates of distinguishing between "business" and "people" as if the two were not related in some fundamental way. However, given that such targeted savings incentives seem feasible only at the business level, this constitutes a strong efficiency argument in favor of business incentives.

[11]Although all quasirents are taxed with expensing, new investment out of such rents receives a new deduction, so only the net withdrawals are taxed.

[12]While one could qualify for the new treatment by buying a used asset after the effective date, there would normally not be a pure tax gain from engaging in such a transaction, due to the existing recapture provisions. See Auerbach (1982a) for further discussion.

VI. ACRS and Beyond

Recently, the Accelerated Cost Recovery System has undergone its first facelift in the Tax Equity and Fiscal Responsibility Act of 1982; it is a safe bet that more will soon follow. As many analysts have pointed out,[13] the combination of the investment tax credit and fast write-off is *more* generous than expensing for equipment in the three- and five-year recovery classes. Revenue projections suggest a continued drop in corporate tax collections as a fraction of government tax collections. The trend since 1965 is shown in Table 7.

The provisions of ACRS have strained the corporate tax system. The most obvious manifestation of this is the rise and fall of tax leasing over the past year. Leasing was introduced because the combination of low effective tax rates in general and large immediate deductions and credits meant that many firms, particularly those with high growth rates, would end the year with negative taxable income. Because the tax system allows only a limited carry back (three years) and carry forward (15 years now, but still without any accrued interest), such companies would face the prospect, without leasing, of not being able to avail themselves of the benefits accorded firms with taxable income. Leasing was liberalized to provide a paper transaction whereby such unused tax losses could be transferred between companies. While there are a number of problems with the way these transfers have been accomplished under leasing,[14] there is nothing inherently bad about having such transfers. Certainly, the reduction in leasing activity that will come from the current tax legislation makes little sense from an economic perspective.

As a tool for stimulating business investment, ACRS has the abovementioned advantage of being available only on new business investment. However, it has a number of disadvantages, aside from the difficulties faced by firms with tax losses. First of all, as with other recent tax changes such as the capital gains tax reduction of 1978, much of the argument in favor of ACRS was couched in terms of the need to offset inflation's effect on the value of depreciation allowances. However, though it more than offset this loss in present value of depreciation allowances, it did not alter the fact that even the current depreciation schedule still is based on historic cost and hence subject to fluctuations in value depending on the rate of inflation. Furthermore, through the simple system of three main depreciation classes, ACRS has given assets with very different economic lifetimes the same tax depreciation pattern. This has led to a great variation in effective rates of tax across assets as well as across industries according to capital stock composition.[15] In turn, this differential taxation can be expected to lead to a misallocation of business capital, causing an entirely unnecessary deadweight loss.

Alternatives to ACRS that suffer neither from this sensitivity to inflation nor the differential asset taxation include indexed economic depreci-

[13]See, for example, Auerbach (1982a).

[14]See Warren and Auerbach (1982) for a detailed analysis.

[15]See the *Economic Report of the President* (1982), Chapter 5 for relevant calculations.

ation or its present value equivalent (Auerbach and Jorgenson 1980), each of which, by restoring a true income tax, would result in an effective tax rate of 46 percent on all capital investments. Neutrality at a zero rate of tax would occur under expensing, and any intermediate rate of tax could be achieved through a linear combination of expensing and first-year present value economic depreciation. For an equity-financed asset that decays exponentially at rate δ, the user cost of capital to which the gross marginal product will be set equals:[16]

$$c = q(\rho + \delta)(1 - k - \tau z)/(1 - \tau) \tag{11}$$

where q is the relative price of capital in terms of output, ρ is the firm's real, after-corporate tax discount rate, k is the rate of investment tax credit, and z is the present value of depreciation allowances. Since the gross-of-tax in-

Table 7
Corporate Tax Revenues 1965–1987

	(billions of current dollars)		
(1)	(2)	(3)	
Fiscal Year	Corporate Tax Revenues	Federal Budget Receipts	% (2) of (3)
Actual*			
1965	25.5	116.8	21.8
1966	30.1	130.9	23.0
1967	34.0	149.6	22.7
1968	28.7	153.7	18.7
1969	36.7	187.8	19.5
1970	32.8	193.7	16.9
1971	26.8	188.4	14.2
1972	32.2	207.3	15.5
1973	36.2	230.8	15.7
1974	38.6	263.2	14.7
1975	40.6	279.1	14.6
1976	41.4	298.1	13.9
1977	54.9	355.6	15.4
1978	60.0	399.6	15.0
1979	65.7	463.3	14.2
1980	64.6	517.1	12.5
1981	61.1	599.3	10.2
Estimated**			
1982	50	631	7.9
1983	51	652	7.8
1984	62	701	8.8
1985	63	763	8.3
1986	64	818	7.8
1987	73	882	8.3

*Source: *Economic Report of the President*, various years.
**Source: Congressional Budget Office (1982). These projections now understate expected revenue because of the recently passed Tax Equity and Fiscal Responsibility Act of 1982. The Senate Finance Committee Report on the bill projects (on page 101) that its change will increase tax receipts by $42.3 billion in 1987 and by smaller amounts in the intervening years.

[16]The analysis follows Auerbach (1979a).

ternal rate of return on such an asset is $(c/q - \delta)$ and real required return is ρ, the effective tax rate may be expressed as:

$$\phi = \frac{(\frac{c}{q} - \delta) - \rho}{(\frac{c}{q} - \delta)} \tag{12}$$

Since economic depreciation would yield a present value of depreciation allowances of $z = \delta/\rho + \delta$, a system with no investment tax credit and a single, first-year depreciation deduction of $\alpha(\delta/\rho + \delta) + (1 - \alpha)$ would yield an effective tax rate of $\alpha\tau$ for each asset, where τ (currently .46) is the statutory corporate rate.

This analysis assumes equity financed investment. Given the coexistence of debt and equity finance, it is hard to know how to measure effective tax rates. Presumably, firms each choose some optimal debt-equity ratio, but this decision is separable from the investment decision only under restricted circumstances. If, for example, a firm's "debt capacity" increases more with investment in safe, easily identified (and, potentially, easily attached) capital goods, the tax advantage of debt finance may be greater for such goods and their effective tax rate overstated, at least relative to other assets. While little concrete evidence for this viewpoint is available, it would, if correct, imply that the tax disadvantage of structures under ACRS might have been overstated.

Given the low current rate of corporate taxation, and all of the problems that still remain, some have suggested that the corporate income tax should be repealed. This certainly would remove the distortions of the corporate tax. However, particularly for assets that currently receive the equivalent of expensing, this would result in a perverse reversal of the type of "consumption-tax capitalization" discussed above.

Consider again the simple case in which investments are expensed under the income tax, and imagine a transition to a situation with no income tax: in the previous context, a transition from a consumption tax regime to a wage tax regime. Assets that had received a deduction upon investment would now escape taxation of their quasirents, along with new assets not permitted expensing. Since old and new assets no longer would differ in their prospective depreciation allowances, they would sell for the same price, with a resulting instantaneous windfall gain for holders of previously discounted old capital. The net effect would be a lump sum transfer to holders of existing capital.

Naturally, the current situation is more complicated than one of simple expensing, but this argument suggests that it is expensing toward which we should move, rather than abolition. Full equivalence at the margin with a zero corporate tax would be provided by extending the same treatment to financial assets: "expensing" net nominal purchases, and continuing to include interest payments in income. For the typical nonfinancial corporation, this provision would represent an increase in present value tax

liabilities. The result would be a corporate version of the personal consumption tax. That is, if the firm's annual pre-tax cash flow is:

$$f = X - I + \Delta B - iB \tag{13}$$

where X is the gross return to previous investments, I is current gross investment, ΔB is new debt issues, and iB is interest payments, a corporate tax at rate τ with interest deductibility and immediate expensing of investment less new borrowing would yield an after-tax cash flow of $(1 - \tau)f$. As with the individual, the corporation is taxed on its cash flow which, in this case, represents stockholder dividends. Under the "new" view of the corporate tax described above, this is equivalent to a nondistortionary tax on distributions. This method of transition to a zero tax rate at the corporate level, as part of the move to a consumption tax, was suggested for the United Kingdom by the Meade Committee (Institute for Fiscal Studies 1978).[17]

While such a system would increase the present value of corporate taxes collected,[18] it probably would decrease them in the short run because of the change in the timing of the tax payments. Rough static calculations suggest it would be three or four years before the new tax system would raise more revenue than ACRS.

A remaining problem that must be addressed is that of tax losses. Unless the corporate tax is eliminated, there will remain a number of companies with unusable tax credits and deductions. Were there refundability, leasing would be unnecessary. However, moves to make even the investment tax credit refundable have met considerable resistance in Congress, and now leasing is being scaled back. The current system of loss carry-forwards has two effects. Since losses carried forward do not accrue interest, and can expire unused, firms possessing them obtain a lower present value of tax deductions than they would under a full loss-offset. However, *because* of the fact that such deductions lose value over time, the firm has an incentive to overinvest in activities that will generate taxable income against which the losses can be used. In the extreme case, with some carry-forwards expiring unused, they represent free goods with a zero shadow price. The result may be that firms with accrued losses are at a competitive *advantage* relative to taxable firms. In this light, proposals to allow carry-forwards to be taken with interest are a mixed blessing. While they will remove the incentive for firms to speed up the use of carry-forwards, they will also increase the likelihood of some of the carry-forward expiring unused. One proposal that deals with this problem (Auerbach 1982a) would give firms a choice of carrying losses forward with interest or taking a current lump sum payment, the latter sufficiently discounted so that it would only appeal to firms not expecting to utilize the carry forwards in the future.

[17]The United Kingdom currently has an integrated tax system, expensing of equipment *and* interest deductibility at the corporate level. See King *et al* (1982) for further discussion.

[18]Calculations in Auerbach (1982a) show that under current law, effective taxation is negative at the margin, taking account of the deduction of interest.

VI. Conclusions

This paper has focused on structural issues related to business saving, rather than on empirical evidence concerning what we can expect specific savings incentives to do to capital formation. This emphasis is necessary, because it is only institutional aspects of the tax system and the political process that make *business* saving an important concept distinct from a broader measure of national saving. In the absence of such "imperfections" in the competitive process, business saving is simply an accounting concept.

Because of inflation, even the definition of business saving is uncertain, though it appears to have followed the downward trend characterizing personal saving in the United States in recent years. There is some evidence that corporate savings policy accounts for the fact that earnings are measured with error. It is difficult to evaluate the proposition that savings can be increased by taking advantage of shareholder ignorance of firm decisions, but the existence of a classical corporation tax in the United States means that the overall incentive to save does depend on whether the savings is done by businesses, through retentions, or households, through the purchase of new corporate securities. Another institutional difference between business and personal savings incentives lies in the political difficulty of introducing targeted incentives at the personal level that induce losses in the value of existing assets. Such incentives are the rule at the business level, and are much more efficient in their effects.

The Accelerated Cost Recovery System has not dealt adequately with the distortions imposed by the corporate tax, and it has made more acute the problems caused by the tax system's lack of a full loss offset. However, solutions to these problems exist that do not require the abolition of the corporate tax.

Finally, one should keep in mind that the best designed business savings incentives can only aid in producing a climate hospitable to increased business investment. Despite the negative tax rates of ACRS, fixed nonresidential investment has been lower in real over the first half of 1982 than it was during 1981. Recent levels of real interest rates and capacity utilization probably will dominate any tax incentives that one can reasonably envision.

REFERENCES

American Law Institute. 1982. *Federal Tax Project—Subchapter C*

Auerbach, A. J. 1979a. "Inflation and the Choice of Asset Life," *Journal of Political Economy* 87(3), June, pp. 621–638.

———. 1979b. "Wealth Maximization and the Cost of Capital," *Quarterly Journal of Economics* 93, August, pp. 433–446.

———. 1981. "Tax Integration and the 'New View' of the Corporate Tax: A 1980s Perspective." *Proceedings of the National Tax Association Tax Institute of America.*

———. 1982a. "Whither the Corporate Tax?: Reform After ACRS," *National Tax Journal* 35, September, pp. 275–286.

———. 1982b. "Taxes, Firm Financial Policy and the Cost of Capital: An Empirical Analysis." Harvard Institute of Economic Research, June.

——— and D. Jorgenson. 1980. "Inflation-Proof Depreciation of Assets," *Harvard Business Review,* September/October, pp. 113–118.

———, L. J. Kotlikoff and J. Skinner. 1983. "The Efficiency Gains from Dynamic Tax Reform," *International Economic Review,* forthcoming.

Barro, R. 1974. "Are Government Bonds Net Wealth?" *Journal of Political Economy* 86(6), November/December, pp. 1095–1117.

Bradford, D. 1981. "The Incidence and Allocation Effects of a Tax on Corporate Distributions," *Journal of Public Economics* 15(1), February, pp. 1–22.

Brittain, J. A. 1966. *Corporate Dividend Policy.* Washington, D.C.: Brookings Institution.

Brown, E. C. 1948. "Business-Income Taxation and Investment Incentives." In L. Metzler et al., *Income, Employment and Public Policy:* Essays in Honor of Alvin H. Hansen. New York: W. W. Norton.

Congressional Budget Office. 1982. "Baseline Projections for Fiscal Years 1983–1987," February 5.

Feldstein, M. S. 1973. "Tax Incentives, Corporate Saving and Capital Accumulation in the United States," *Journal of Public Economics* 2(2), April, pp. 159–71.

———. 1979. "The Welfare Cost of Capital Income Taxation," *Journal of Political Economy* 86(2), April, pp. S29–S51.

Flavin, M. A. 1981. "The Adjustment of Consumption to Changing Expectations about Future Income," *Journal of Political Economy* 89(5), October, pp. 974–1009.

Hall. R. E. 1978. "Stochastic Implications of the Life Cycle-Permanent Income Hypothesis: Theory and Evidence," *Journal of Political Economy* 86(6), December, pp. 971–987.

Helpman, E. and E. Sadka. 1982. "Consumption versus Wage Taxation," *Quarterly Journal of Economics* 97(2), pp. 363–372.

Institute for Fiscal Studies. 1978. *The Structure and Reform of Direct Taxation.* London: Allen & Unwin.

King, N. *et al. 1982. The Taxation of Income from Capital; A Comparative Study of the U.S., U.K., Sweden and West Germany.* National Bureau of Economic Research.

Lintner, J. 1956. "Distribution of Incomes of Corporations Among Dividends, Retained Earnings, and Taxes." *American Economic Review Papers and Proceedings* 46, pp. 97–113.

Miller, M. and F. Modigliani. 1961. "Dividend Policy, Growth and the Valuation of Shares," *Journal of Business* 34(3), pp. 411–33.

Modigliani, F. and M. Miller. 1958. "The Cost of Capital, Corporation Finance and the Theory of Investment," *American Economic Review* 48, pp. 261–97.

——— and ———. 1963. "Corporate Income Taxes and the Cost of Capital: A Correction," *American Economic Review* 53:55–84.

U.S. Senate, Committee on Finance. 1982. *Tax Equity and Fiscal Responsibility Act of 1982,* Report, July 12. Washington: U.S. Government Printing Office.

Warren, A. C. and A. J. Auerbach. 1982. "Transferability of Tax Incentives and the Fiction of Safe Harbor Leasing," *Harvard Law Review* 95(8), pp. 1752–1786.

Discussion

Martin Neil Baily*

Alan Auerbach has made important contributions to our understanding of the effects of corporate taxation and in this paper he brings together some of the results that he and others have formulated. He discusses the interactions between business and household saving decisions and analyzes policies to promote business saving and investment.

Auerbach starts by asking how much the identity of the saver matters. If businesses save more, will consumers simply save less? He points out that an assessment of the relative contributions to saving of businesses and households requires a careful accounting of capital gains and losses. In particular, inflation has redistributed wealth from lenders to borrowers. It would have been helpful had he given a complete calculation with all the capital gains and losses accounted for. He then goes on to estimate simple dividend equations and consumption functions and he argues that empirical relations of this kind cannot resolve the question of whether or not households will offset changes in business saving. That may well be true, but this section of the paper did not satisfy me that the issue had been fully explored.

Auerbach then turns to a comparison of the new versus the old view of business taxation. The old view says (more or less) that a dollar is a dollar. At one end of the system there are the factories. At the other end are the people who put up the money to buy the factories and they control what happens. The government levies various tolls on the income stream generated by the factories. If all the tolls are added up, this is the total tax burden on capital. The gap between the pre- and post-tax rates of return is substantial and the conclusion is often drawn that capital formation must be reduced by this gap, on the principle that the more heavily an activity is taxed, the less we do of it.

There are plenty of controversial issues that come up with this old view. How are property and sales taxes treated? Are capital gains taxes being overstated, since the stock market has performed poorly? But the bottom line, even with conservative assumptions, is still that capital pays a pretty high rate of tax.

The new view of corporate taxation has provided a fascinating alternative perspective. It argues that there are very big differences among types of taxes. In particular, there is a sharp contrast between the effect of corporate income taxation and dividend taxation. Because a dividend tax falls on payouts but not on retentions, it does not discourage investment even though it does depress the corporation's market value. This is a striking re-

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sult and has the implication that a cut in personal income taxes may actually depress business investment, because it increases the relative attractiveness of alternative assets.

My first comment on the new view is that it is not entirely new. I recall learning as an undergraduate that dividend taxes could encourage retentions and investment compared with an equivalent corporate income tax. Second, I have some misgivings about at least the purest forms of the new view. Very striking results are obtained from the models by severely restricting the options open to firms. At any moment in time a firm has a portfolio of assets and liabilities and presumably adjusts this portfolio in order to maintain equilibrium, allowing both for risk and rate of return. The new models typically constrain the firm so that it cannot issue new shares or change its share of debt financing. This type of constraint is only valid if the firm is at a boundary solution with respect to certain choices. That is hard to justify, because a firm could always buy bonds if it did not wish to sell them (many firms do that), it could buy up old shares if it did not wish to sell new shares.

This is not to say that there is a complete and realistic alternative model of corporate behavior with conclusions different from Auerbach's. There remain puzzles to be understood, particularly the questions of why corporations pay dividends and why they pay "voluntary" taxes on inventory profits. But the point I am making is that simple deterministic models of corporate behavior that impose fairly arbitrary constraints can be, at most, only suggestive guides to tax policy. There is one way to test how important the new view really is. It implies very large effects of tax rate changes on the stock market. If we do not observe those changes actually occurring, then the models are in doubt. My own bottom-line on the new view/old view debate is that probably a corporate income tax depresses investment more than a dividend tax, but I would be surprised if a dividend tax has no effect on investment. Think about a 100 percent tax rate.

Finally, I want to leave aside the Auerbach paper and comment briefly on the life-cycle model of savings that is the centerpiece of this conference. This model in an appropriately general form is surely a good framework for analyzing saving behavior. But it cannot explain the behavior of important fractions of the population. Studies of individual families nearing retirement show many with very low assets and no pensions. Their consumption path falls sharply as they retire and often declines further over time. Many people are somewhat irrational in their saving and consumption decisions. They are myopic about the future and regret decisions they made when they were younger. These families save less than the life-cycle model predicts—a fact we recognize as a society, because we have a compulsory social security system.

There are people, however, who save more than the life-cycle model would predict. The entrepreneur who works 15 hours a day seven days a week piling up $10, $20, or $100 million is not saving for retirement either. Nor is it plausible that the utility of children and grandchildren is driving such people. Wealth represents success, status and power and these are

what motivate the small fraction of the population who accumulate very large fortunes.

These doubts about the validity of the intertemporal maximizing model make me pragmatic about policies towards economic growth. An economy with real growth works much better in many ways than a stagnant economy. Social decisions about how much to spend on defense and on the elderly or the very poor are easier when the economic pie is growing. As the economy recovers from the current recession I hope we will devote more resources not only to new plant and equipment, but also to the development of new technologies and products.

Discussion

Robert Eisner*

Events and correctly observed and measured facts and figures have a way of catching up with conventional wisdom and dogma. And so it is with the measurement and encouragement of business saving—and investment.

Measurement of Saving

We have long heard that business and national saving and business investment were unduly low. In the past decade, certain economists have brought considerable attention to the charge that our tax system, particularly in its interaction with inflation, has seriously discouraged saving and investment, with sharply adverse effects on productivity and economic growth. New saving and investment incentives were urged to counteract these alleged effects.

A climax, and perhaps a critical turning point, was reached with enactment of the so-called Economic Recovery Act of 1981. This enactment was followed shortly by the onset of the most severe economic recession since the Great Depression of the 30s, anticipation of large, long-run federal budget deficits, and a significant decline in the rate of real business investment that it was intended to encourage.

Alan Auerbach cannot be held responsible for the fate that has befallen us. He was and is among those who inveighed sharply and loudly against the key Accelerated Cost Recovery System of the Tax Act of 1981. His current paper repeats early arguments against ACRS and in favor of various alternatives. It also offers a thoughtful and illuminating discussion of the role of business saving under our current tax system, as well as the likely impact of various tax innovations.

A first question we should face is just how low business saving, total private saving, and business investment really have been. As for the last, revisions of the Bureau of Economic Analysis national income and product accounts now make clear that, except for the current recession, the share of gross national product going into business investment, as shown in Table 1, has been at record highs. And now the most recent revisions in the accounts offer a sharp correction to saving figures presented by Auerbach in the first line of his paper. On the basis of data of a few months ago, Auerbach reports 1981 personal saving in the United States as $106 billion, or 4.4 percent of personal income. The new BEA numbers (as in the *Survey of Current Business,* July 1982) place personal saving at $130.2 billion, or 5.4 percent of personal income. BEA net private saving for 1981 is now put at

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Table 1
NIPA Measures of Gross and Net Investment

(1) Years	(2) Gross Private Fixed Investment as Percent of GNP	(3) Net Private Fixed Investment as Percent of NNP	(4) Nonresidential Fixed Investment as Percent of GNP
1962–66	14.5	6.8	
1967–71	14.4	6.4	
1972–76	14.9	5.8	
1977–81	16.1	6.0	
1976	14.3		10.1
1977	15.7	6.1	10.7
1978	16.7	7.1	11.5
1979	16.9	7.1	12.0
1980	15.7	5.1	11.7
1981	15.4	4.6	11.8
1982–II	14.7	3.4	11.6

Source: *Survey of Current Business,* July 1982, particularly p. 17, Table 17.

6.7 percent of net national product instead of the 6.0 percent reported by Auerbach. We may reflect that these revisions in the measures may well exceed changes in saving likely to be induced by most tax incentives.

It has become commonplace to correct business profits and saving figures with capital consumption and inventory valuation adjustments. Auerbach wisely adds measures of the inflation gain on the net debt. In recent years these inflation gains have equalled in magnitude or exceeded conventionally reported profits after taxes with capital consumption and inventory valuation adjustments. Two other significant adjustments or corrections may well be in order, however. First, there is one which Auerbach mentions but does not incorporate, that is the gains on business net debt resulting from increases in interest rates. These have been substantial in recent years.[1]

Auerbach like many others, however, apparently accepts at face value the critical capital consumption adjustments which have so much to do with the low business *net* saving and investment figures. He reports that, "net corporate saving, as defined by undistributed profits net of economic depreciation, was 49.5 billion dollars" in 1981. The new, revised figure offered by the Bureau of Economic Analysis is indeed only $44.4 billion. But that net figure results from a capital consumption adjustment which includes a component of a minus $79.7 billion estimate of the adjustment to replacement cost. This is in turn calculated from the price deflators for investment.

Here it is wise to take a critical second look. In particular, the price deflator for business fixed investment, reflecting the deflators for structures, is remarkably high. Acceptance of recent increases in the price deflators for structures implies a sharp fall in the absolute level of productivity in con-

[1]Cf. Eisner and Pieper (1982), regarding government debt.

struction, not merely its rate of growth. Knowledgeable specialists question the accuracy of construction price indices and, consequently, the implicit price deflator for structures. From 1974 to 1981, the implicit price deflator for nonresidential producers' durable equipment rose 64.5 percent, from 109.3 to 179.8. Over the same period the price deflator for nonresidential structures rose 96.2 percent, from 128.2 to 251.5. By my rough, conservative calculations, indicated in Table 2, if we presume that the deflators for structures and all nonresidential investment should only have risen by the same amount as that for producers' durable equipment, the adjustment-to-replacement cost component of the capital consumption adjustment would be reduced in absolute value by $10.6 billion. This in turn would raise undistributed profits with adjustments by 24 percent, from $44.4 billion to $55.0 billion, and raise business saving correspondingly. And work by my colleague, Robert J. Gordon, on measurement of productivity growth and price indices for capital goods implies that much greater revisions would be in order.

Auerbach suggests that the upward correction of business saving stemming from inclusion of the inflation gain on net debt is offset by the

Table 2
Corporate Capital Consumption Allowances and Adjustment to Replacement Cost, 1981

	Percent or Billions of Dollars
A. NIPA capital consumption allowances, corporations	$189.4
B. Less: Adjustment of capital consumption allowances to consistent accounting at historical cost	$ 62.8
C. Capital consumption allowances with adjustment to consistent accounting at historical cost	$126.5
D. Less: NIPA adjustment to current replacement cost	−$79.7
E. Capital consumption allowances with NIPA capital consumption adjustments	$206.2
F. Relative replacement cost adjustment ($-D/C$)	62.96%
G. Change in nonresidential investment implicit price deflator, 1974–81	74.44%
H. Change in nonresidential producers' durable equipment implicit price deflator, 1974–81	64.50%
I. Change in nonresidential structures implicit price deflator, 1974–81	96.17%
J. Revised relative replacement cost adjustment ($H/G \cdot F$)	54.55%
K. Revised adjustment to replacement cost ($-J \cdot C$)	−$69.0
L. Revised capital consumption allowances with adjustments ($E + D - K$)	$195.6
M. Undistributed corporate profits with adjustments	$ 44.4
N. Revised undistributed corporate profits with adjustments ($M + E - L$)	$ 55.0

Source of underlying data: *Survey of Current Business*, July 1982, Tables 1.11, 7.1, and 8.7, and *Economic Report of the President, February 1982*, Table B-3.

annual inflation loss due to reduction in the present value of tax depreciation allowances. But if we are to include that inflation-related loss, we might well add the inflation gain on existing assets. Particularly if we accept Bureau of Economic Analysis price deflators on new investment in estimating the value of existing capital stocks, we find substantial positive *net* revaluations, that is nominal capital gains in excess of general price increases. Net revaluations on tangible assets of nonfinancial corporations, as noted in Eisner (1980), have added significantly to net business saving in the last decade.

Taxes and Saving and Investment

Auerbach's discussion of taxes and business saving is in many ways illuminating, as he contrasts implications of the "traditional views," which see double taxation of corporate equity raised by sale of stock, and the "new view," where the implication of raising marginal funds by retained earnings is that there is double taxation only to the extent of the minimally effective tax on capital gains. One may be misled, however, by Auerbach's implicit and explicit abstraction from debt financing. Particularly in a world of inflation and high nominal, deductible interest cost, this makes all the difference. As pointed out by Hall (1982) and Chirinko and King (1982), inflation and leverage can readily combine so that taxes on business saving and investment prove substantially negative. Of major importance, as noted by Chirinko and King, nominal interest rates (until the recent episode of extremely tight money) have generally risen no more than, if as much as, the rate of inflation. The rental or user cost of capital, as a consequence, fell with inflation for significantly levered firms. Real, after-tax rates of interest turned very low, frequently perhaps negative.

Inflation has indeed permitted investor-borrowers to deduct high nominal interest rates without having to include in taxable income the reduction in real value of debt to which the high interest payments relate. The view is sometimes expressed that the tax advantage of borrowers is completely offset by the high interest necessary to compensate lenders who face taxes on nominal interest income without an offsetting reduction for the decline in the real values of their financial assets. This ignores important clientele effects. In fact, borrowers can be expected to be and are largely those for whom high tax rates make interest deductions particularly valuable, while lenders are increasingly and very largely institutions and individuals with zero or low effective tax rates. Analyzing the impact of taxes on saving and investment without full note of the role of debt and interest deductibility and, with inflation, related capital gains, is to abstract from the essence. It is almost like trying to explain how a plane flies after assuming away the atmosphere.

Before one can apply much of the type of analysis undertaken so deftly by Auerbach, one must be careful to trace macroeconomic effects on the basis of reasonable assumptions as to government and private behavior. Implicit in much discussion is a notion that changes in tax systems will be introduced under a "balanced budget" constraint; cuts in business or indi-

vidual tax rates will be offset by increases elsewhere, perhaps of a lump-sum nature with no efficiency loss. In fact, cuts in business and personal income taxes and consequent increases in business and personal saving, as we have so recently witnessed, are accompanied by increases in government budget deficits. Thus increases in private saving have been more than offset by increases in public dissaving. As Auerbach of course knows well, but it bears repeating, business saving has little direct connection with business investment, and private saving can and does differ widely from private investment.

Where tax changes do alter the marginal return on saving, critical differences in results can be ignored only with extreme peril to sound analysis. One must first recognize that under most real-world conditions, one can not properly abstract from income effects. A greater anticipated return on saving may generate more or less saving, depending upon whether or not substitution effects outweigh income effects. This, in turn, will depend upon how great substitution effects really are. My own priors suggest that the elasticity of saving with respect to rates of return is very low. Most of us are unlikely to alter our consumption significantly because of modest (frequently poorly perceived) changes in intertemporal rates of substitution.

And complicating matters much more in the real world is the fact, as should again be clear to all in the fall of 1982, that the economy may be far from a full employment general equilibrium. Tax changes which raise business or personal propensities to save may then perversely reduce national income and saving.

I join with Auerbach in his criticisms of ACRS, which has indeed "strained the corporate tax system" (p. 32). To the objections to the leasing system, discussed in detail in Warren and Auerbach (1982), I might add the observation that sales of tax advantages have proved a particularly inefficient way of affecting incentives. Markets for such sales proved initially far from perfect and sellers of tax advantages frequently realized far less than the present value of Treasury revenues of which they disposed.

I have argued elsewhere that there was no sound evidence that the accelerated cost recovery system would increase business investment by anywhere near foreseeable losses in tax revenues.[2] Declines in real business investment have more than confirmed my predictions. As Auerbach observes, increases in real interest rates and reduction in capacity utilization "probably will dominate any tax incentives that one can reasonably envision" (p. 40). One may add that increases in real interest rates cannot be considered independent of the tax incentives and the broad fiscal and monetary policy to which they are related.

I conclude with the perhaps cynical observation that much discussion of business saving in terms of measures to encourage growth and productivity has missed the real policy issue. As Auerbach points out, there are serious questions in the measurement of business saving and the extent to which business saving really matters in the determination of total private saving. There are important further issues as to the connection of business

[2]Chirinko and Eisner (1981) and (1982) and Eisner and Bender (1982).

and private saving to conventional business and private investment. The connection with the ultimate goal of productivity and growth is even more remote and doubtful. These last may well relate much more to total capital formation, both human and nonhuman, as discussed in the paper by Blades and Sturm. My own estimates suggest that net private domestic investment is less than one-fifth of the perhaps more relevant broad measure of capital formation which will include all acquisition of structures and equipment by government, household and nonprofit institutions as well as business, investment in land, resources and research and development, and investment in human capital in the form of education, training and health.

That leaves me to wonder whether the arguments about business saving and investment, taxes on "capital," wages and consumption, and issues of expensing and interest deductibility, upon which we focus so much attention, are really, when all the qualifications are recognized, so important in determining the aggregates of product, growth and welfare as they are in determining their distribution. Encouragement of business saving and investment would appear to have a much greater impact, whether successful or not, on the wealth of some of those who participate in that saving and investment than on the economy as a whole. A tax incentive for business investment may well affect distribution of income and wealth differently than government expenditures for investment in human capital, or a tax incentive to encourage employment, particularly employment of youth, or minorities or women. Beyond our abstractions, how much is the real issue not the size of the economic pie but how it is cut up?

REFERENCES

Blades, Derek and Peter Sturm. 1982. "The Concept and Measurement of Savings: The United States and Other Industrialized Countries." Paper in this volume.

Chirinko, Robert S. and Robert Eisner. 1981. "The Effects of Tax Policies on Investment in Macroeconometric Models: Full Model Simulations," OTA Paper 46, U.S. Department of the Treasury, Office of Tax Analysis, Washington, D.C. (Abbreviated version to appear in *Journal of Public Economics.*)

———. 1982. "The Effects of Tax Parameters in the Investment Equations in Macroeconomic Econometric Models," in Marshall E. Blume, Jean Crockett, and Paul Taubman, eds., *Economic Activity and Finance* (Cambridge, Ma.: Ballinger Co.), pp. 25–84. (Originally prepared as OTA Paper 47.)

Chirinko, Robert S. and Stephen R. King. 1982. "Hidden Stimuli to Capital Formation: Debt and the Non-Adjustment of Financial Returns," Northwestern University.

Eisner, Robert. 1980. "Capital Gains and Income: Real Changes in the Value of Capital in the United States, 1946–1977," in Dan Usher, ed., *The Measurement of Capital, Studies in Income and Wealth,* vol. 45, (University of Chicago Press for the NBER), pp. 175–346.

——— and Steven Bender. 1982. "Differential Impacts of Tax Incentives for Investment," *Journal of Policy Modeling,* (vol. 4, June 1982), pp. 143–159.

——— and Paul J. Pieper. 1982. "Government Net Worth: Assets, Liabilities and Revaluations," Northwestern University.

Hall, Robert E. 1982. "Tax Treatment of Depreciation, Capital Gains, and Interest in an Inflationary Economy," in Charles R. Hulten, ed. *Depreciation, Inflation and the Taxation of Income from Capital* (Washington, D.C.; The Urban Institute).

Warren, Alvin C. Jr. and Alan J. Auerbach. 1982. "Transferability of Tax Incentives and the Function of Safe Harbor Leasing," *Harvard Law Review,* vol. 95, no. 8 (June), pp. 1952–1986.

Macroeconomic Policy and Domestic Saving

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I. Introduction

Without a radical change in monetary and fiscal policy, the United States will experience a higher ratio of deficits to GNP in the 1980s than it has in any decade since the 1940s. It is crucial to understand the risk that this poses to future economic growth, but as the following review of the literature indicates, economic research on the issue is in a primitive state. Precise answers are far beyond our grasp, and all that we can do is describe the risks inherent in a very uncertain situation.

Although this is supposed to be a paper about macroeconomic policy and savings, it is impossible to explore the relevant issues without making frequent excursions into microeconomic theory. Consequently, this paper is bound to overlap with others delivered at this conference.

II. Relevant Micro Issues

Discussions of individual savings behavior are dominated by the life cycle hypothesis put forward by Modigliani and Brumberg [1954]. The individual is assumed to maximize the discounted utility provided by consumption over a lifetime subject to a lifetime wealth and income constraint. As a result, the time path of consumption is much smoother than the time path of disposable income over a lifetime. A typical individual might be expected to borrow in early years when income is low, save during the years of peak career earnings, and then dissave during the years of retirement. If the time of death is known with certainty and there is no bequest motive, the individual should spend his or her last penny on the day of death.

The theory can be modified to allow for uncertain lifetimes and income flows and for a bequest motive.

The life cycle hypothesis is ambiguous about whether increases in the after-tax rate of return raise or lower the propensity to consume in any one year. A higher rate of return has an income effect and allows higher consumption in all years even if saving is lowered a bit. However, it also makes the tradeoff between present and future consumption more favorable to the latter. Even if the income effect is neutralized, for example, by replacing a tax on capital income with a tax on wages, the relationship between the propensity to consume and the after-tax rate of return could be positive with a low enough elasticity of substitution between present and future consumption. However, Summers [1982] argues persuasively that this would require an odd utility function. Summers also shows that long-run

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changes in after-tax rates of return have a much more powerful impact on the consumption-savings decision than transitory changes.

With regard to the impact of uncompensated changes in the after-tax rates of return, the empirical evidence is all over the map. Boskin [1978] and Summers [1982] argue that increases in the rate of return raise the propensity to save (Summers argues on the basis of indirect data); Howrey and Hymans estimate [1978] that the impact is insignificant; and Houthakker and Taylor [1970] that there is a negative impact. (For a more complete review of the literature, see OECD [1981].) Summers iconoclastically suggests that most empirical work is dubious anyway because it does not correctly specify the effects of changes in the rate of return on human wealth.

The life cycle hypothesis can itself be questioned. The inability to lend and borrow at will on perfect capital markets adds another constraint on individuals' ability to smooth out lifetime consumption. For example, it may not be possible to borrow against human capital and this would limit the ability to be a dissaver early in life. Similarly, financial regulation, by imposing interest ceilings on small savers, could alter the reward to savings at different times in the life cycle.

The presence or absence of liquidity constraints is crucial to the impact of macroeconomic tax policy on consumption and, therefore, on aggregate demand. If liquidity considerations are constraining the consumption of a significant portion of the population, a tax cut can increase consumption (although other factors to be discussed later may intervene) even if the tax cut is only temporary or involves a rebate of past taxes. If there are no liquidity constraints, a tax cut can only be effective to the degree that it affects perceptions of lifetime income.

Again, it is possible to find evidence on all sides of the issue. Casual observation suggests that consumption and income vary more closely together over a lifetime than would be expected if there were no liquidity constraints.

But this result could also emerge in the absence of liquidity constraints. Money income is endogenous and can be controlled by varying work effort. If goods and leisure are substitutes, more goods will be consumed as wage rates rise along a typical career path. Empirical work by Schmitz [1979], however, suggests that goods and leisure are complements, leaving, in his view, only liquidity constraints to explain the phenomenon. Summers [1982], on the other hand, finds no evidence of liquidity constraints. (See Schmitz for a more complete review of the literature on this issue.)

The most disturbing evidence regarding the validity of the life cycle hypothesis comes from the fact that the elderly, who are supposed to be dissaving, do in fact have a positive propensity to save which rises with age. (Danziger, van der Gaag, Smolensky, and Taussig [1982].) Like most unpleasant facts, this one can be explained away. Perhaps, the bequest motive grows with age. Or the saving may be precautionary. The probability of serious, expensive illnesses rises with age as does the probability of a longer life requiring increased resources. For example, surviving from age 60 to age 61 increases the probability of living beyond any future specific age,

say 75, by about 1.5 percent. Surviving from age 61 to age 62 raises the probability by 1.7 percent and so on. The prospect of becoming destitute must have a very high negative utility weight attached to it. While SSI puts a floor under the real income of the elderly, the typical elderly person has an intense fear of becoming dependent on relatives or on welfare. For this reason, the work of Kotlikoff and Spivak [1981], which shows that the elderly can protect themselves against the uncertainty of the time of death by arranging the equivalent of an annuity within the family, may be made less relevant by an aversion to dependency.

Despite such factors, the surprisingly high propensity to save among the elderly has to be somewhat disturbing to life cycle advocates. I believe the whole issue of uncertainty and the life cycle hypothesis merits more theoretical and empirical work. The uncertainty of the time of death and the change in the probability distribution with each additional day of life must be important, but how important is difficult to say.

Assuming that the life cycle hypothesis is, in fact, valid, it is important to know whether it applies only to saving from income received directly by the individual or whether the individual adjusts for corporate and government saving or dissaving done on his or her behalf. Put another way, are there veils between individual behavior and corporate and government behavior or can we aggregate over all sectors of the economy? If there are not veils, a good theory of individual behavior combined with the effect of demographic variables and a theory of economic growth will tell us most of what we want to know about the long-run time path of aggregate savings. If, however, the savings of the individual sectors are determined independently, we then need separate theories of corporate and government saving behavior.

The notion that individual shareholders adjust their own behavior for changes in the saving and financial practices of corporations is commonly accepted in economic theory. It lies at the basis of the theories of Modigliani and Miller [1958] and is assumed in studies of saving behavior by scholars such as Boskin [1978]. However, a paradox arises. If a dollar of saving by a corporation is a perfect substitute for a dollar of saving by an individual, why do corporations ever pay dividends since they are taxed more heavily than capital gains? Or at least why do we not see more specialization by shareholders according to their tax status? Tax-free institutions might be expected to invest in firms with high payout ratios while high marginal tax rate shareholders would be expected to like firms that reinvested all of their profits. Theorizing on this topic was initiated by King [1977] and a literature too voluminous to review here has been inspired by the puzzle. I think it fair to say that no one has yet come up with a definitive explanation of dividend behavior and without it, one feels uneasy about assuming that shareholders are indifferent between saving directly and having corporations save on their behalf.

But while it may be too facile to assume that corporate and individual savings are perfect substitutes, it is hard to believe that they are not substitutes to some degree. Certainly individuals must pay some attention to changing share values—which are, of course affected by factors other than

current corporate saving—in planning their own savings behavior. A key policy question is whether taxes levied directly on the corporations have a significantly different aggregate saving impact than taxes levied directly on the individual even though they are designed to have the same impact on after-tax rates of return to capital. I do not believe that we know for sure.

It is, of course, possible that the answer differs depending on the time period being considered. Because of transactions costs or other factors, it may take time for individuals to adjust their saving behavior to changes undertaken at the corporate level. Thus policies affecting corporate saving directly may have some leverage in the short run but be washed out in the longer run as individuals adjust.

The veil between government and individual saving behavior is likely to be more opaque than the veil between individuals and corporations. Still, Barro [1974] has argued that individuals adapt their own saving to adjust for changes in government deficits. In other words, they perceive that public debt issues will either have to be repaid out of future taxes or the interest bill has to be financed forever. If the individual has an infinite time horizon because of an extreme bequest motive and if he or she faces the same rate of interest as the government, the time of the repayment of the debt is irrelevant. Borrowing by the government will be offset by an equal amount of saving by the individual. Neither is likely to hold exactly, but to the degree that these conditions are valid, the government becomes powerless to affect national saving and, therefore, to carry out fiscal stabilization policies. In other words, it matters little whether government finances outlays with taxes or debt issues, i.e., they are equivalent.

The Barro equivalence theorem (sometimes blamed on Ricardo) has been much criticized, (see Feldstein [1982]) but it cannot be said that it has been disproved beyond any doubt. After considering evidence that seems inconsistent with the theory, Buiter and Tobin [1979] conclude that "Further empirical work is urgently needed, however, before any conclusion can be more than tentative."

Many discussions of the equivalence theorem, including Buiter and Tobin's, ignore the spending side of the government budget. The level and composition of government spending are taken as given and the only question is whether tax and debt financing are equivalent. If the world is as ultrarational as Barro's theory implies, and if the government increases the deficit explicitly to finance increased public capital formation, and if the return to the public capital is equal to that on private capital, there is no reason for private consumption to fall or rise except as a result of the distributional effects of the operation. Private capital formation is crowded out dollar for dollar, but that is not worrisome as long as public capital formation bears an equal return.

Whether or not the equivalence theorem is valid is crucial to many fundamental issues in economics. If it is valid, we have totally to reject fiscal stabilization theory. In neoclassical theory, we need not worry about crowding out, and since private saving actions offset public actions across the generations, we can dispense with the worry that a pay-as-you-go social security system depresses aggregate savings.

Although the theory cannot be definitively proved or disproved on the basis of the evidence currently available, it must be noted that it places extraordinary demands on the individual. The taxpayer must be completely altruistic toward future generations and must use the same discount rate to value their consumption as is used for his or her own consumption. Moreover, taxpayers must be extremely knowledgable about the saving behavior of the federal, state, and local governments. Further, they must face a borrowing rate no higher than the government's in order not to be pleased to some degree that the government borrows on their behalf.

Economic theories often make unrealistic assumptions, but while economists do not really believe them it is hoped that the departures from the assumptions are unbiased in their impact on the results. In the case of the assumptions underlying the equivalence theorem, I would suggest that most of the departures are likely to be in one direction. That is to say, I doubt that for everyone who does not care much about the consumption of future generations there is someone else who gives it more of a utility weight than consumption by the present generation. Similarly, there are unlikely to be enough investors facing a lower borrowing rate than the government to offset those who face a higher rate. Perhaps, there is more symmetry in the errors made regarding the individual's perception of his or her share of the public debt service burden, but I see no reason to believe that that burden should be overestimated on average.

Consequently, I believe that there are significant biases in the assumptions necessary to derive the equivalence theorem and that those biases are bound to weaken the theorem. This implies that government can have some leverage over aggregate saving by manipulating the deficit and altering the social security system. How much leverage is hard to determine. But some leverage seems almost certain and I shall speculate on the issue further in what follows.

III. Macroeconomic Policies

A. Political and Normative Theories of Government Saving

There are two very different ways of discussing macroeconomic policies. One can idealistically assume that macro policymakers share the goals of the public (as represented in public choice theory by the goals of the median voter) and attempt to attain price stability along a path that deviates as little as possible from that which attains whatever natural rate of unemployment is implied by demography, institutional arrangements, and microeconomic policies. Alternatively, one can be more cynical and assume that policymakers and bureaucrats are out to maximize their own personal objective functions which might involve things like maximizing power, political longevity, and/or future income in the private sector. Differences between the policymakers' and median voters' objective function can evolve because of imperfections in information flows and voting mechanisms.

For most of this analysis, I shall take the idealistic view, but one theory regarding macro policy and long-run saving requires a momentary exploration of the cynical view of policymaking.

Milton Friedman and others have argued that aggregate government spending is limited by available receipts. In other words, politicians think like householders and there is a limit on the dissaving that will be done by government. Put another way, if we can somehow trick politicians into cutting taxes, it will constrain spending in the long run.

The theory is probably true at the state and local level, but a superficial look at federal behavior is not reassuring. During the decade of the 1950s, the NIA budget was balanced on average. Government expenditures averaged 18.4 percent of the GNP. In the 1960s, the deficit equalled 0.3 and spending 19.4 percent of the GNP. In the 1970s the comparable figures were 1.8 and 21.3 percent. In 1980–81 the deficit amounted to 2.2 percent of the GNP and spending 23.2 percent.

If deficits act as a constraint on spending growth, that constraint seems to be getting weaker and weaker over time. Wagner and Buchanan [1977] explain the phenomenon by arguing that the Keynesian revolution destroyed the traditional fiscal norm that budgets should be balanced. Once the old norm was destroyed, no other disciplining rule took its place. While some argued that the budget should be balanced over the cycle and Richard Nixon argued that the high employment budget should be balanced, none of these new rules had the force of the old fashioned religion of budget balancing year after year.

Wagner and Buchanan go even further, arguing that once deficits become acceptable, spending growth is facilitated further by the fact that the sale of debt represents a voluntary exchange and is therefore less unpleasant than financing government by levying compulsory taxes.

Although the Wagner-Buchanan hypothesis would seem at first sight to be a better explanation of recent history than the notion that deficits impose spending constraint, it is obvious that deficits cannot rise without limit. Sargent and Wallace [1981] have shown that if noninterest spending is a greater share of GNP than the total tax burden and if nominal interest rates exceed nominal GNP growth, the system is unstable because the interest bill on the debt eventually explodes. They hypothesize that the debt will eventually be monetized under such circumstances. Accelerating inflation will then diminish the real interest burden on past issues of debt. It is to be hoped that either spending or tax policy would be altered before that occurred, and indeed, that could occur automatically.

Monetary and fiscal policy are intimately intertwined. As debt is monetized, the tax burden rises more rapidly than GNP because of bracket creep in a nonindexed income tax system and because the measure of capital income used for tax purposes is increased as the real value of depreciation allowances erode, false inventory profits are created, etc. The indexing of exemptions and tax brackets now scheduled to be implemented in 1985 eliminates bracket creep but does nothing to adjust the definition of capital income. It is also somewhat imperfect in that many dollar amounts

listed in the tax code are not indexed, e.g., those involving exemptions on homeowner capital gains and unemployment insurance. Consequently, even after indexing, inflation will raise average tax rates, but to a much lesser extent than it does today.

On the outlay side, accelerating inflation slows the growth of real spending because of time lags in the indexation of entitlement programs. In practice, there are also time lags in adjusting appropriations for unanticipated inflation. Frequently, such appropriations are not adjusted at all, since politicians often find it easier to let inflation cut programs than to cut them legislatively.

Because of such automatic adjustments in tax and spending policy, the probability of a Sargent-Wallace debt explosion is lessened, but it cannot be ruled out altogether. During the 1950s and 1960s, on- plus off-budget deficits seldom exceeded the net interest bill of the government and under such circumstances a Sargent-Wallace explosion becomes less likely. In fact, the ratio of privately held debt to GNP was on a strong downward trend from World War II to 1974. In six of the seven years in the 1975–81 period, however, the total deficit far exceeded the net interest bill and recently, interest rates have exceeded the growth of GNP. As a result, the ratio of privately held debt to GNP is back up to the level of the early 70s and growing rapidly. One hopes that Milton Friedman's spending constraint will not be overwhelmed by Sargent and Wallace's arithmetic, but there is nothing very reassuring in the recent evidence.

Robert Barro [1979] has provided a normative theory of government deficits or dissaving based on the assumption that there are welfare gains associated with keeping tax rates as constant as possible. In his model, temporary surges in spending, e.g., those associated with wars, are debt financed as are temporary shortfalls in revenue. The government also runs deficits to compensate for the erosion of outstanding debt by inflation.

Cagan [1981] has investigated the last issue and differentiates the effects of anticipated and unanticipated inflation. Presumably, all other things equal, investors are willing buyers of enough bonds to maintain the real value of their portfolios in the presence of anticipated inflation, but the issue is not so clear with regard to unanticipated inflation. Having dissaved by surprise, will investors be willing to buy enough bonds to restore their wealth? It seems unlikely given that they have just suffered an unexpected capital loss. If investors do not wish to restore their assets, there will not automatically be a flow of saving sufficient to absorb the new debt issued by the Treasury in the name of keeping the real value of the national debt constant. Of course, once that is said it means that we are departing from Barro's world of equivalence which necessarily underlies his theory of optimal deficits. And once the equivalence assumption is dropped, it is not even clear that government would want to replace the debt eroded by anticipated inflation.

Without equivalence, the government can manipulate national saving in an attempt to achieve short-term stabilization goals or long-run growth goals. In doing this it should, of course, take account of the erosion of out-

standing debt in designing its policies, but many other variables are also important and there is no presumption that deficits are appropriate so long as they do not exceed the erosion of outstanding debt or inappropriate if they do.

B. Stabilization Policy

Can fiscal and monetary policy manipulate aggregate demand and real economic activity, and so alter saving? It is not a question that would have been asked much 20 years ago except by a few isolated monetarists. Now it is a matter of considerable controversy.

The power of fiscal policy is, of course, quite limited in monetarist theory. Monetarists believe that the demand for money is fairly stable and inelastic with respect to changes in interest rates. In such circumstances any attempt to stimulate aggregate demand by raising the deficit simply results in an equal crowding out of private activity. That is somewhat of a caricature of the monetarist position since most think that fiscal policy can have some small, ephemeral effect on economic activity. However, I know of none who believe that fiscal fine tuning could lead us to growth consistent with full employment, price stability, and an appropriate amount of aggregate saving.

They also would eschew fine tuning with monetary policy even though, in monetarist and in most Keynesian theory, monetary policy can affect real activity with an uncertain lag. Pure rational expectations theory even rejects this proposition. (See Sargent and Wallace [1975] for the classic article.) Monetary expansion leads people to expect inflation which, in turn, leads them to adjust wages and prices immediately. Monetary policy affects price levels but not real activity. Again this is a caricature. Monetary policy can affect real activity if it catches people by surprise or if price and wage movements are restricted by long-term contracts. But the important conclusion is that monetary and fiscal policy may be much less potent than earlier stabilization theory implied.

It is not, however, necessary to be a monetarist or a believer in the equivalence theorem or rational expectations to question the power of fiscal policy. Even within traditional Keynesian analysis there is reason to ask whether macro fiscal policy has much leverage over the position of the IS curve.

The earlier discussion of the life cycle hypothesis suggests that, in the absence of liquidity constraints, fiscal policy will have to alter expectations of permanent income in order to affect aggregate consumption. In other words, private saving could offset public dissaving for reasons quite different from those relevant to the equivalence theorem. If changes in government spending or tax policy are deemed to be temporary, the Keynesian multiplier could quickly be short-circuited by changes in the propensity to save.

After the experience of the 1970s and early 1980s, it will be particularly difficult for the government to convince anyone that any tax change

is permanent. A whole succession of so-called tax cuts in the 1970s was quickly offset by bracket creep, and the massive tax act of 1981 is so large that no one can be confident that it will not be reversed by new legislation.

It has gone out of style to contemplate using government spending for stabilization purposes, but even if it were popular, it would face the same problems as tax policy in altering expectations of permanent income. Government purchases related to things like accelerated public works programs are explicitly temporary. Changes in government transfers face problems precisely analogous to those faced by tax changes, and changes in grants-in-aid can be short-circuited long before the consumer is affected if, as was often charged with regard to President Carter's 1977 stimulus program, they simply reduce state and local deficits at the expense of the federal deficit.

In all of these matters the question of liquidity constraints becomes crucial. If they are important, either to individuals or to state and local governments, federal spending changes or tax cuts are more likely to have an impact. Even tax rebates or explicitly temporary changes in tax or spending policy could conceivably work. As usual, the empirical evidence on the issue is not conclusive. A particularly interesting debate regarding the impact of the temporary Vietnam surtax occurs between Springer [1975] and Okun [1977].

C. Long-Run Growth

Even if it is assumed that government can alter the aggregate saving rate in the economy, it is not clear whether it should attempt to do so in the long run. There is a long debate regarding the appropriateness of the rate of time preference revealed by the market place. Does it undervalue the welfare of future generations? If so, should government intervene and provide additional saving by running a surplus? Should government use different criteria in evaluating its own investments from those revealed by the market place, especially with regard to the rate of discount and the required risk premium?

The literature on such issues is voluminous, but I shall not attempt a review here. The issues may be important but they are unlikely to be at the heart of policy discussions over the next decade. There is little danger of running surpluses in any of the Western democracies. (See de Larosiere [1982].) All are contending with rapidly growing entitlement programs and a public reluctant to either cut benefits or raise taxes. Deficits are the order of the day and everyone is trying to borrow from everyone else. The United States has the added problem of a generally perceived need to reduce the taxation of capital and to increase defense spending rapidly.

Given large deficits, it is still possible to alter the composition of tax receipts and spending in ways that are more or less conducive to saving, investment, and growth, but I shall leave most of those issues to those writing on micro policy. There is, however, one compositional issue that may be considered macro in content. A naive glance at the saving behavior of dif-

ferent income classes leads some to believe that aggregate saving can be enhanced by making the tax-transfer structure less progressive. However, average saving propensities differ much more across income classes than marginal saving propensities and it is the latter which determine the net income effect on savings of redistributing income. Thus the scope for increasing aggregate saving through redistribution is severely limited. (See Blinder [1975].) However, since small percentage reductions in very high marginal income tax rates result in large percentage increases in the after-tax reward to saving, efforts to improve incentives may have income redistribution effects as a by-product of attempts to exploit substitution effects. Disincentives can be reduced and efficiency enhanced while maintaining tax revenues either by making the marginal rate structure less progressive or by broadening the tax base so that all marginal tax rates can be lowered. The distributional effects of the two strategies are likely to differ radically, but it is necessary to know the details of such strategies in order to make the crudest forecasts of their implications.

D. Recent U.S. Macro Policies

The Reagan administration entered office with a clearly defined set of priorities. It wanted to raise defense spending and business capital formation and to reduce inflation, marginal tax rates, nondefense public spending, and the government deficit. These objectives are not logically inconsistent. The trouble is that the administration got its numbers wrong. Given its tax and spending plans the projected deficit path was inconsistent with the enunciated, anti-inflation, monetary policy. It depended on a higher growth path for nominal incomes than could possibly be financed by the targets stipulated for the growth of the monetary aggregates.

But if a lower deficit was deleted from the list of goals, the policy was not obviously irrational. It was possible to create reasonable scenarios in which the deficit did not exceed 2½ percent of GNP. If one did not believe in the equivalence theorem, it could be considered a high real interest rate strategy, but one that still encouraged business capital formation by providing tax cuts on capital income which more than offset the high interest rates. Consumer durables and housing which were not protected by tax benefits would lose resources to business capital formation and defense spending. The interest rate increase would be mitigated by the increased saving resulting from generally lower marginal tax rates and special incentives for savings. With a bit of luck we could also borrow significant amounts from abroad.

Needless to say, things did not work out that neatly. The administration got an abrupt monetary shock instead of the gradualism that it wanted. The serious recession raised the deficit and the mysterious failure of interest rates to come down in response to economic weakness and falling inflation meant that the government interest bill soared and offset a high proportion of the administration's domestic spending cuts, which, in turn, were about $10 billion less than Reagan requested. While spending went on a higher path than expected, the rapid fall in inflation implied less

bracket creep and lower capital taxes than expected and the administration's tax cuts became real tax cuts to a much greater degree than anticipated.

As a result of all of this, we appeared to be on a path toward deficits equivalent to over 6 percent of the GNP by 1985, even if a healthy economic recovery was assumed.

The administration responded by backing a tax bill which took back a portion of the tax reductions of 1981. To a large degree the correction was applied to the taxation of capital income. Crudely speaking, one can argue that the administration and Congress simply corrected for the fact that a surprising fall in inflation made 1981 tax legislation much more generous toward capital income than they intended it to be.

However, the tax actions and budget cuts of 1982 resolve only a part of the long-term deficit problem. Even assuming a fairly healthy recovery we are on the road toward deficits approaching levels relative to GNP generally experienced in the past only during recessions. The question now is, "What should we do about it?"

The answer depends crucially on the effects of taxes, spending, and deficits on aggregate saving, and the foregoing review of the literature generated more uncertainty than hard information regarding such issues. Indeed, a skeptic might argue that we know so little that this paper might as well end at this point. I believe, however, that such a conclusion would represent a serious misreading of what went on before. We are faced with a problem of decisionmaking under great uncertainty. The risks must be outlined and we must ask how they can be minimized. Knowing what we do not know will be helpful in this process.

In contending with the structural deficit problem it is first important to examine the spending side of the budget. There the options are fairly limited. In the second half of the 1980s, defense, social security (OASDI) and interest will absorb over 70 percent of the total budget. While areas in the remaining 30 percent of the budget could stand careful scrutiny, for example, health services delivery systems, it is obvious that changes in defense and social security policy are essential if spending cuts are to contribute significantly to ameliorating the deficit problem. In both of those areas it is extremely difficult to make rapid changes in the outlay path. I believe it fair to say that the consensus among defense experts is that it would be dangerous to make immediate significant cuts in personnel, operations, training, and maintenance. The state of readiness of our forces could be compromised by such cuts. There is much less of a consensus about the value of expensive weapons systems such as the B-1 bomber, nuclear carriers, MX missiles, etc. But cuts in the budget authority for such programs do not show up in outlays for years. It is already too late in 1982 to achieve major savings in such areas before 1985.

It is equally difficult to constrain social security spending in the short run. Even advocates of reducing social security benefits must admit that a social contract exists between recipients and taxpayers and that recipients and those about to retire must be given time to plan their responses to any

changes in the benefit structure. In other words, changes have to be phased in very slowly. Thus it would be unrealistic to assume that much can be saved by the middle 1980s by reducing social security benefits. That does not, however, mean that all changes should be rejected. There is a potential for massive savings by the early 21st century with only minor reductions in the rate of growth of the program.

Thus, if we are to reduce federal government dissaving significantly in the 1984–87 period, the emphasis will have to be on raising taxes.

What are the risks associated with tax increases? Let us first examine the question in a neoclassical context. Does any risk stem from the possibility that the equivalence theorem is true? I do not believe so. If taxes and borrowing are really equivalent, little loss could be associated with replacing one for another. As previously noted, Barro has developed a model based on the equivalence theorem that yields an optimum deficit, but the welfare losses involved in departing from this optimum on the low side must be tiny compared to the risks that a very large deficit poses for capital formation if there is little truth to the equivalence theorem. Moreover, it is hard to believe that Barro's optimum deficit would grow in the middle 1980s. There is no reason to believe that the spending levels that will prevail during that period are temporary. Moreover, if disinflation continues, the debt issues implied by current policy will far exceed the inflation-induced fall in the real value of the outstanding national debt.

What can be said about the supply-siders' fear that a tax increase, by raising disincentives to work and to save, would reduce economic activity and the propensity to save so much that private saving would be reduced by more than the public deficit is reduced? (If, indeed, the deficit would be reduced at all.) While our review of the economic literature revealed a profound lack of knowledge regarding the response of saving to a change in after-tax return, even the highest response found in the literature would not seem to substantiate the supply-siders' fears. (See Fullerton [1980].)

But it is not necessary to swallow extreme supply-side theory to believe that tax increases should be designed to minimize supply-side effects. That goal can be achieved by what might be called supply-side tax increases. These would concentrate on base-broadening measures rather than on increasing marginal tax rates. It is to be hoped that if it does nothing else, the recent debate regarding the desirability of a flat tax will push tax increases in this direction. Although base-broadening measures could reduce the incentive for particular types of saving and capital formation, their generalized impact is likely to pose far lower risks to incentives than marginal rate increases.

It is when we leave the neoclassical world and enter the Keynesian world that the risks associated with tax increases become more perplexing. The main risk is that the recovery will be retarded more than is warranted by the desire to continue progress against inflation. The theoretical and empirical disputes between Keynesians and non-Keynesians are sufficiently profound and the correlated value judgments regarding the relative costs of unemployment and inflation are sufficiently different that it is impossible to

find a consensus within the economics profession regarding the importance of this risk.

However, there might—and I emphasize the word might—be general agreement regarding the following propositions:

1. By any estimate of the high employment deficit, current policy is expansionary over the whole period 1983–87 and this is inappropriate during a recovery.
2. A tax increase that has its largest revenue impact later in the 1983–87 period is less risky than one that has a relatively large impact initially.

Another proposition must be considered, although there is likely to be little agreement regarding its validity. That is that measures to reduce deficits in the 1984–87 period would actually have a stimulative impact in 1983 even within the context of a Keynesian model.

This proposition seems to stand Keynes on his head, but one could argue on its behalf as follows:

Potential investors believe that the prospective deficits of the middle 1980s are unlikely to be tolerated, but they do not know how the issues will be resolved. The options are legislated spending cuts, legislated tax increases, or the monetization of an inordinate proportion of the debt. Accelerating inflation would lead to large tax increases because of bracket creep before indexing in 1985 (if indexing survives that long) and the increased taxation of the real return to capital which is not prevented by the indexing techniques used in current law. It would also reduce the real value of outlays because current indexing techniques work with time lags and because there would also be lags in adjusting appropriations for nonindexed programs.

Different approaches to the deficit problem have very different implications for the after-tax rates of return on different investments. The resulting uncertainty causes investors to demand large risk premiums on long-term investments. By reducing uncertainty a tax increase that had its main revenue impact later in the 1984–87 period would reduce the demand for risk premiums on investments made in 1983. This would tend to shift the IS curve outward.

That may be a long story to swallow, but it does lead to the same policy conclusion as the discussion of the more typically Keynesian assessment of the threat posed by a tax increase to aggregate demand early in the recovery period. That is to say, any tax increase enacted early in the 1983–87 period should be designed to have its main revenue impact late in the period. In general terms, the tax legislation of 1982 satisfies this criterion.

If taxes are increased, should monetary policy be eased modestly to diminish the risk of declining real activity? Most Keynesians would advocate such a policy. As a by-product, an easier monetary policy would reduce the deficit by expanding money incomes and tax receipts, regardless of whether the expansion took the form of inflation or real growth. But obviously, the latter would be more beneficial in reducing the deficit, because income maintenance outlays would be lowered.

There is considerable dispute over how the expansion of money income created by a slightly easier monetary policy would divide up between real growth and inflation. Some, usually Keynesians, feel that at current levels of economic slack the inflation danger is minimal and that most of the monetary stimulus would show up as real growth. Others believe that investors would see a slight easing as a harbinger that the Fed was giving up its anti-inflation battle. Expectations of accelerating inflation would predominate and wages, prices, and interest rates would rise almost immediately. Investors perceiving greater economic instability in the future would become more conservative implying that the IS curve shifts to the left.

In other words, just as one can concoct stories in which a contractionary tax increase is expansionary, there are stories which make an expansionary monetary policy contractionary. It is a strange world in that such stories cannot be dismissed out of hand.

IV. Conclusions

Economists are ridiculed because of an apparent inability to reach a consensus on any policy issue. The foregoing review of the literature relevant to normative and positive theories regarding the relationship between macro policy and savings did little to dispel the notion that economists are terribly confused. There seems to be little consensus regarding either the effect of changing public deficits or the effect of changing after-tax rates of return on aggregate saving.

However, I would strongly argue that the uncertainty regarding outcomes should not prevent economists from making recommendations regarding policies. We do know enough to identify the risks and to reduce them to some degree.

When faced with burgeoning deficits, it seems clear that a tax increase which emphasizes base-broadening measures poses little risk to the supply side of the economy. Abstracting from the demand-side effects, we can say with considerable confidence that such a tax increase would, at worst, leave aggregate private plus public saving unchanged and at best result in a considerable increase in total saving.

When demand-side considerations are raised, the plot thickens. There is a risk that a tax increase would be contractionary in the short run. But that risk can be greatly reduced by designing the tax increase to have its greatest revenue impact in the second half of the 1980s. Hence, I believe that one could get the vast majority of economists to back a base-broadening tax increase of this type. There would be arguments over the size of the increase but political constraints on future tax increases are likely to become binding long before we reach the range over which economists disagree.

A more vehement argument would be unleashed when economists argue over whether the consensus tax increase would be accompanied by a looser monetary policy. There would even be some disagreement over the definition of a looser monetary policy. But there is considerable agreement regarding the range of possible outcomes even if there are profound

disagreements regarding the probability weight and the social utility weight that should be assigned to each of the possibilities. In such circumstances we have to let the politicians choose the appropriate weights after hearing and reading the profession's internal arguments. That is what we pay them for.

BIBLIOGRAPHY

Barro, Robert J. "Are Government Bonds Net Wealth?", *Journal of Political Economy,* 82:1095–1117.

——— "On the Determination of the Public Debt," *Journal of Political Economy,* 87:940–971.

Blinder, Alan S. "Distribution Effects and the Aggregate Consumption Function," *Journal of Political Economy,* 83:447–475.

Boskin, Michael J. "Taxation, Saving, and the Rate of Interest," *Journal of Political Economy,* 86:3–27.

Buiter, Willem H., and James Tobin. "Debt Neutrality: A Brief Review of Doctrine and Evidence," in George M. von Furstenberg, ed., *Social Security versus Private Saving.* Cambridge, Ma.: Ballinger Publishing Co., 1979.

Cagan, Phillip. "The Real Federal Deficit and Financial Markets," *The AEI Economist,* November 1981, pp. 1–6.

Danziger, van der Gaag, Smolinsky and Taussig. "The Life-Cycle Hypothesis and the Consumption Behavior of the Elderly." Madison, Wis.: University of Wisconsin Institute for Research on Poverty. Discussion paper, May 1982.

de Larosiere, Jacques. "Restoring Fiscal Discipline: A Vital Element of a Policy for Economic Recovery." Address to the American Enterprise Institute, Washington, D.C., March, 1982.

Feldstein, Martin. "Government Deficits and Aggregate Demand," *Journal of Monetary Economics,* 9:1–20.

Fullerton, Don. "On the Possibility of an Inverse Relationship Between Tax Rates and Government Revenues." National Bureau of Economic Research, Working Paper No. 467, April, 1980.

Houthakker, H. S., and Lester Taylor. *Consumer Demand in the United States: Analyses and Projections.* Boston: Harvard University Press, 1970.

Howrey, Philip E., and Saul H. Hymans. "The Measurement and Determination and Loanable-Funds Saving," *Brookings Papers on Economic Activity 1978,* No. 3, pp. 655–705.

King, Marvyn. *Public Policy and the Corporation,* New York: Halsted Press, 1977.

Kotlikoff, Lawrence J., and Spivak. "The Family as an Incomplete Annuities Market," *Journal of Political Economy,* 89:372–391.

Modigliani, Franco, and Richard Brumberg. "Utility Analysis and the Consumption Function. An Interpretation of Cross-Section Data," in Kenneth Kurihara, ed., *Post Keynesian Economics.* New Brunswick: Rutgers University Press, 1954.

——— and Merton H. Miller. "The Cost of Capital, Corporation Finance, and the Theory of Investment," *American Economic Review,* 48:261–97.

OECD. "International Difference and Trend Changes in Saving Ratios." (The Working Party No. 1 of the Economic Policy Committee; document CPE/WPI (81)9), Paris 1981.

Okun, A. M. "The Personal Tax Surcharge and Consumer Demand, 1968–70," *Brookings Papers on Economic Activity 1971,* No. 1, pp. 167–212.

Sargent, Thomas J., and Neil Wallace. "Some Unpleasant Monetarist Arithmetic," *Federal Reserve Bank of Minneapolis Quarterly Review,* Fall 1981, pp. 1–17.

Schmitz, Robert J. "The Life Cycle of Saving and Consumption," in George M. von Furstenberg, ed. *Social Security versus Private Saving.* Cambridge, Ma.: Ballinger Publishing Co., 1979.

Springer, W. L. "Did the 1968 Surcharge Really Work?", *American Economic Review* 65 (September 1975) pp. 644–58.

Summers, Lawrence H. "The Interest Elasticity of Aggregate Saving: Theory and Evidence." Massachusetts Institute of Technology, 1982. (Mimeographed.)

Wagner, Richard E., and James M. Buchanan. *Democracy in Deficit: The Political Legacy of Lord Keynes.* New York: Academic Press, 1977.

Discussion

James Tobin*

Rudy Penner is a sensible and cautious fellow. He did his homework on recent theoretical and econometric literature concerning national saving, seeking to dispel confusions arising from current discussions of fiscal and monetary policies. In sadness more than anger he reports he didn't find many clues—because he found too many. He was tempted to throw up his hands. Indeed at the end, despairing of consensus among economists on monetary policy, he passes the buck to politicians. But he had persevered to the extent of guessing that economists might generally agree that growth of high employment federal deficits should be arrested, by tax increases enacted soon but with "largest revenue impact later in the 1983–87 period."

I thank Rudy for his patient journey through the journals and for the report of his travels. I admire his eclecticism and agnosticism. Still I wish he had worried less about constructing an economists' consensus—you can't make a silk purse out of dozens of sows' ears—and more about stating his own considered views. In commenting on some of the subjects of Rudy's paper, I shall be less bashful.

Life Cycles, Liquidity Constraints, and Bequest Motives

As Rudy's account tells us, theories of saving conflict violently and statistical tests are not powerful enough to choose among contradictory extremes. So what should sensible fellows like Rudy and me believe?

What is the horizon of a consumer, household or individual? By horizon I mean the time ahead over which a consumer will spread an accretion to her current liquid resources. A snapshot cross-section would surely reveal wide variation. Some consumers are living hand-to-mouth, some from paycheck to paycheck. For some young families the horizon is the span of years until higher earnings will permit accumulation of liquid wealth. Thereafter their horizons will be remaining lifetimes or longer. Probably some consumers' horizons are in effect unbounded; these individuals are free of liquidity constraints and, as Barro postulates, internalize descendants' utilities and resources ad infinitum.

Because many persons who would like to consume today future wages, retirement benefits, and other assets cannot do so, Penner is right to reject the so-called equivalence theorem. Hence government deficits do absorb saving for good or ill, and even temporary tax changes and transfers affect consumption. Likewise Feldstein's estimate of the displacement of productive capital by "social security wealth" and other unfunded pension rights

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is an upper limit. Liquidity-constrained workers cannot fully offset compulsory pension contributions by dissaving, and retirees with horizons beyond their own lifetimes save part of their pensions. Their commonly observed strategy—provide against the risk of prolonged life with expensive infirmities, in the comforting knowledge that heirs will enjoy any remainder—is perfectly rational.

The life cycle model is a very useful tool if not taken literally. The model can easily handle liquidity constraints; it generally predicts that their presence will increase aggregate wealth and saving. It can also handle bequests and other intergenerational transfers, more easily if their amounts rather than descendants' or parents' utilities enter the individual's utility function. Without such amendments the model has trouble accounting for observed aggregate accumulations of wealth, especially over periods when retirement spans were much shorter than now.

What is the effect of the after-tax rate of return on aggregate wealth and saving? Theory can't tell us, and econometric inference encounters in extreme measure the usual tedious litany of ambiguities. Yet many, many economists including Rudolph Penner take for granted the premise of "supply-side" policy that capital is overtaxed. If the feared explosion of public debt is to be averted and if, as Penner observes, the path of federal expenditures cannot be cut appreciably this decade, then taxing capital less means taxing labor more. It may be true that the shift will increase wealth and welfare, but tighter argument and evidence than Penner reports are required.

I will illustrate the problem. The life cycle model implies that in a steady state of population and economic growth aggregate wealth is a multiple of after-tax wage income. The numerical size of the multiplier depends on the age distribution, the age profile of wages, the incidence of liquidity constraints, the utilities of consumption of adult and minor household members at different ages, and other factors. Assuming these constant, the multiplier depends on the after-tax return to saving. To simplify, I assume the elasticity of this dependence to be constant. I assume also that aggregate wealth is physical capital, that output is produced by capital and labor and distributed to them à la Cobb-Douglas, and that the government purchases a constant share for public consumption financed by distinct proportional taxes on capital income and wage income.

A shift of tax burden from capital to labor will increase the wealth multiplier assuming the relevant elasticity is positive, but decrease after-tax wages, the multiplicand. It will not necessarily increase steady-state stocks of wealth and capital. The pair of tax rates that maximizes these stocks depends on the parameters. I don't know how anyone, even Larry Summers, can *a priori* dismiss as requiring an "odd utility function" the possibility that the elasticity of the multiplier with respect to after-tax return is so low that the maximum is reached with a wage tax rate lower than that on capi-

tal income. Relegating algebra to a footnote[1], I give here the intuitively satisfying solutions.

Let e be the fraction of output the government consumes, t_k and t_w the tax rates on capital income and wage income respectively, α the elasticity of output with respect to capital and the pre-tax share of capital, and σ the elasticity of the multiplier with respect to the after-tax return to saving. The wealth-maximizing values of t_k and t_w are

$$t_k^* = e + (1-e)\frac{(\alpha - \sigma(1-\alpha))}{\alpha(1+\sigma)} \text{ and } t_w^* = e - (1-e)\frac{(\alpha - \sigma(1-\alpha))}{(1-\alpha)(1+\sigma)} .$$

Thus $t_k^* = e = t_w^*$ if $\sigma = \alpha/(1-\alpha)$, $t_k^* > e > t_w^*$ if $\sigma < \alpha/(1-\alpha)$, and $t_k^* < e < t_w^*$ if $\sigma > \alpha/(1-\alpha)$. For example, if $\alpha = \frac{1}{3}$, the dividing line for σ is $\frac{1}{2}$. If σ is $\frac{1}{4}$, and e is $\frac{1}{4}$, $t_k^* = .55$ and $t_w^* = .10$. On the other hand, if σ is 1 and e is $\frac{1}{4}$, $t_k^* = -.125$ and $t_w^* = .44$.

Of course, maximization of wealth and capital is not welfare optimization. Other allocative effects of taxes are relevant, like the labor supply effect Penner mentions. Moreover, one might seek an optimal capital stock defined by the condition that its pre-tax rate of return equal the economy's growth rate plus a social discount rate related to the growth rate of per capita income due to technical progress. If this stock were obtainable given the government consumption share e, there might be various pairs of tax rates that would do the job.

Are governments and corporations mere veils? Are their savings and dissavings automatically offset by equal opposite shifts in household saving? Sensible persons like Rudy and me will believe that institutions exist because they matter and will not ascribe presumptive truth to Modigliani-Miller theorems, Ricardo-Barro equivalences, or Denison's law of stockholders' "ultra-rationality." Agreeing with Penner, I have already expressed my skepticism of the equivalence theorem for government finance.

[1]Let k be capital per unit of effective labor (per person-hour augmented in productivity by technical progress). Let net output per labor unit be k^α. Pre-tax return to capital r is $\alpha k^{\alpha-1}$, and pre-tax wage w per labor unit is $(1-\alpha)k^\alpha$. After-tax factor rewards are $u_k r$ and $u_w w$ where $u_i = 1 - t_i$. Steady state wealth demand is $v^*(u_k r)^\sigma u_w w$, where v is a constant determined by the demographic and other factors mentioned in the text. The two basic equations are:

(1) $v^*(u_k r)^\sigma u_w w = k$ wealth = capital

(2) $\alpha u_k + (1-\alpha) u_w = 1 - e$ government budget balance

Substituting the expressions for r and w in terms of k into (1) and taking logs gives:

(3) $\sigma ln\, \alpha u_k + ln\,(1-\alpha) u_w + ln\, v = (1-\alpha)(1+\sigma) ln\, k$

Assuming $\sigma > -1$, k will be maximized by maximizing the left hand side of (3) subject to the constraint (2). This gives the results in the text.

Similar reasons for skepticism apply to corporate saving: differences between companies and their owners in borrowing rates, liquidity constraints, taxes, and objectives. Retained earnings do not translate into additional wealth for shareowners unless and until they raise market values of shares. If and as they do, the extra wealth will increase household consumption at the expense of personal saving. But the process is slow and uncertain. Unfortunately, there is little evidence that households have saved extra to make up for the real capital losses they have suffered on the stocks and bonds they directly or indirectly own in the recent past. That, by the way, casts doubt on the relevance to crowding-out concerns of inflation-accounting corrections interest to outlays in the federal budget.

The Federal Budget and the Macroeconomic Outlook

I turn to Penner's discussion of the current scene. I will not refrain from calling attention to the irony of the general preoccupation with the adequacy of national saving at a time when the country's propensity to save is patently not the constraint on the formation of capital. Who is crowding out what? Tight monetary policy brought record high real interest rates, devastated interest-sensitive spending, and generated the severe recession. The recession further damaged capital formation and ballooned federal budget deficits. To complain that those deficits are crowding out private investment by raising interest rates is to tell the story inside out.

A two-point reduction of unemployment would increase GNP by about 4 percent, some $120 billion, of which about half would be additional saving by governments, businesses, and households. Does anyone know a supply-side incentive or a deficit-reducing measure that could do as much for saving and investment as soon?

I know of course that the Fed didn't bring the economy and investment to their present low states for the hell of it. They did it to conquer inflation, and in their zeal probably did more than they intended. I just think we and they should be clear about where to charge the costs, not shift them to the federal budget. Rudy Penner is, I think, overgentle to what it is fair to call the Feldstein policy mix, tight money and high real interest rates to shift resources from consumer durables and housing to business capital favored by incentive tax cuts. Just as wet-blanket Keynesians foretold in early 1981, the strategy didn't work.

Forecasters looking for bright spots in the outlook for the next five quarters invariably seize on "the consumer," buttressed by tax cuts this year and next and by gains in indexed transfers, and on the beginnings of the defense build-up. Yet economists of many camps, financial pundits with unanimity, and liberal and old-line conservative politicians of both parties joined the Administration in hailing recently enacted tax *increases* as a big and necessary step toward recovery. Though the legislation will hit some consumption, its main impact is to diminish business saving and investment by withdrawing about half the concessions to capital income enacted only a year before. If the perceived danger was that government borrowing would congest the financial markets and crowd out business investment, it is hard

to see how the 1982 bill was a remedy. Businesses that curtail investment plans are crowded out for sure. Businesses that maintain them will in effect borrow to pay taxes; their demands on credit markets replace those of the Treasury. It would be nice if people who worry about the budget would be clear about their objectives: recovery? capital formation? political cosmetics?

Like Rudy, I am disturbed by the prospect that deficits even in prosperity will combine with high interest rates to raise the debt/GNP ratio throughout the decade. I attach an appendix on the dynamics of this ratio, with calculations showing how dramatically Reagan fiscal policy reverses the history of the past 30 years. Yet hysteria may be not only premature, so far is the economy from full recovery, but also overdone. My calculation does not indicate Sargent-Wallace instability, a real net interest rate greater than the economy's growth rate. If, as my table indicates, the ratio should in the next 10 years return to its level of the 1950s, around 50 percent, this is not a catastrophe. As Penner says, there are some natural correctives short of hyperinflation. The defense build-up, we can hope, is a bulge; if not, the need for taxes to pay for it will become pretty clear.

An interesting analytical question raised in Penner's discussion is whether "measures to reduce deficits in the 1984–87 period would actually have a stimulative impact in 1983 even within the context of a Keynesian model." Rudy's tentative "yes" is based on the stimulative effect of reducing uncertainty: Investors are pretty sure those deficits will be corrected, but they don't know how. They would go forward today if they knew the corrections would be soundly made. Does that condition cover additional doses of 1982 "fiscal responsibility" medicine? I was stimulated to investigate the question in a more Keynesian spirit.

Consider, as in Rudy's question, two periods in neither of which is there full employment. In each period the short-term interest rate r depends solely on contemporaneous GNP Y and on the stock of transactions money M, according to the familiar LM relation. But the position of the first period IS curve depends on the correctly expected outcomes (Y_2, r_2) of the later period. The expectations allow for the effects of fiscal and monetary policies in the second period.

Investment and consumption in period 1 will be lower the higher is the expected interest rate r_2; a higher future short rate deters current spending by lowering the present values of earnings from capital and labor. The period 1 IS curve will, however, be shifted right by increases in expected GNP Y_2, which raise those expected earnings. Given M_2, r_2 and Y_2 are tied together by the second period LM curve. If it is fairly flat, moving up and/or right along it will shift first period IS to the right; the effect of higher Y_2 will dominate that of higher r_2. But if LM is quite steep the reverse will be true. Moving down and/or left along LM will shift first period IS to the right. This latter is what a correctly anticipated tightening of period 2 fiscal policy would accomplish. In the steep LM scenario future budget corrections increase aggregate demand today.

However, in this case the LM curve of period 1 will also be steep. Most of the effect will be to raise r_1 rather than Y_1. Nothing in this Keynesian

scenario supports the common story of the financial press, by which future fiscal tightening lowers short interest rates both tomorrow and today. And nothing in my story "stands Keynes on his head." The major effect of tightening fiscal policy later is to weaken aggregate demand then, which may or may not be a good idea. The expectational effect, possibly strengthening aggregate demand today, is at best a partial offset. In contrast, a future easing of monetary policy, raising M_2, would lift Y in both periods.

Figure 1 is a picture worth the above two hundred words.

Full discussion of a two- or multi-period model of this kind is beyond the scope of this comment. There are other interrelations between periods. Stocks of wealth, capital, and public debt carried over from one period to the next affect behavior in the later period. So do price level and inflation rate transmitted from one period to the next, especially if nominal M targets remain fixed. But I think the simple story of the previous paragraph is the major mechanism relevant to the question Penner raised.

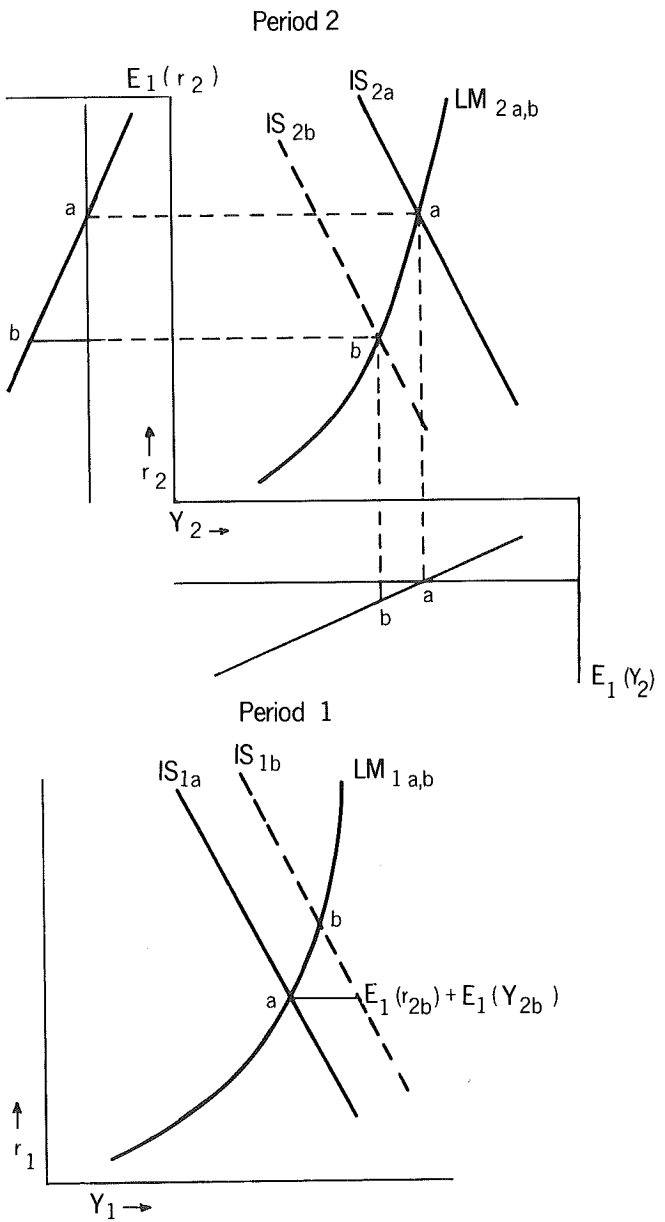
As I mentioned at the start, Rudy despaired of finding or building consensus on whether fiscal tightening should be accompanied by monetary easing. He did not even tell us his own view. I think monetary policy is the key to recovery. Tightening of fiscal policy will, to be sure, help to provide a policy mix more favorable to capital formation. But the effort will be wasted unless the Fed engineers low enough real interest rates to absorb in investment the resources released by government, its taxpayers, and its transferees—plus a big fraction of the resources made idle by the recession. I can see the logic of those who do not want to see recovery until inflation is completely vanquished. I cannot understand the logic of those who would welcome recovery should it occur by a miraculous surge of monetary velocity but reject equivalent growth of money supply. They fear that a burst of money supply growth, albeit temporary, would be entirely dissipated in renewed inflation and have no real effects. Or they fear that enough others believe primitive monetarist stories to make them come true. Penner doesn't count those expectations as rational, and neither do I. It is a sad day when irrational models, for which our profession is in large measure responsible, immobilize macroeconomic policy.

Appendix: Fiscal and Monetary Policies and the Dynamics of Federal Debt

The present combination of high interest rates and large budget deficits raises the question whether deficits and debt will grow faster than the economy. Does a one dollar deficit increase the interest service on the debt so much that, with given expenditure and tax programs, the deficit and the debt are higher relative to GNP the following year?

Suppose that the budget of year t involves a *primary deficit* of $x_t\, p_t\, y_t$, where p_t is the price of commodities and y_t is real GNP. The primary deficit excludes outlays for interest on the debt and receipts from taxes on debt interest. Net interest outlay is $i_t^B B_{t-1}$, where B_{t-1} is the outstanding stock of publicly held interest-bearing debt and i_t^B is the nominal interest rate paid on it allowing for the tax recoupments. The total debt, including that part,

Figure 1



Tightening period 2 budget shifts IS_2 and lowers Y_2, r_2 from a to b. $E_1(r_2)$ and $E_1(Y_2)$ (both zero at a) are effects on aggregate demand in period 1. Their sum at b is the horizontal shift of IS_1 in the period 1 diagram below. It raises Y_1, r_1 from a to b. Imagining a flatter LM_2 through a, you can see how the IS_1 shift could be reversed.

H_{t-1}, monetized by the Federal Reserve is D_{t-1}. Thus the nominal interest rate on the total debt is $i_t^D D_{t-1}$ where

$$(1) \qquad i_t^D D_{t-1} = i_t^B B_{t-1} = i_t^B (D_{t-1} - H_{t-1}) = i_t^B D_{t-1} \left(1 - \frac{H_{t-1}}{D_{t-1}}\right)$$

The dynamics of deficit and debt are as follows:

$$(2) \qquad D_t - D_{t-1} = x_t p_t y_t + i_t^D D_{t-1}$$

Let d_t be the ratio $D_t/p_t y_t$. If y is growing at rate g_t and p is increasing at rate π_t, then

$$d_{t-1} = \frac{D_{t-1}(1 + \pi_t)(1 + g_t)}{p_t y_t},$$

and from (2)

$$(3) \qquad d_t - d_{t-1}\left(\frac{1 + i_t^D}{(1 + \pi_t)(1 + g_t)}\right) = x_t$$

Define the real interest rate on federal debt as

$$(4) \qquad r^D = \frac{i + i^D}{1 + \pi} - 1 \approx i^D - \pi \text{ , so that}$$

$$(5) \qquad d_t = d_t - 1\left(\frac{1 + r_t^D}{1 + g_t}\right) + x_t \approx d_{t-1}(1 + r_t^D - g_t) + x_t$$

With constant primary deficit x, constant real interest on debt r^D, and constant real growth g, the stationary equilibrium debt/GNP ratio would be:

$$(6) \qquad d^* \approx x/(g - r^D)$$

This equilibrium is stable if g exceeds r^D and unstable if r^D exceeds g:

$$(7) \qquad (d_t - d^*) \approx (d_0 - d^*)(1 + r^D - g)^t$$

In the Table, average values of x, r^D, g are shown for five historical periods since 1951 and for the Congressional Budget Office (CBO) February 1982 baseline projection for the period 1982–87. Corresponding equilibria d^* are also computed, each designed to show the hypothetical long-run consequences for d of continuation of the fiscal, monetary, and economic environment of the period or projection.

Here are the noteworthy features of the Table:

1. All the situations are stable; the real growth rate always exceeds the real net interest rate on debt. This is true even for the CBO baseline projection of 1982–87. However, the CBO may have overestimated inflation, underestimated interest costs, and possibly overestimated real growth.

2. Only in 1980–81 and in CBO 1982–87 projection is the initial debt/GNP ratio smaller than the hypothetical equilibrium. Only in those cases, then, has the constellation indicated a value of d increasing over time. In the case of the CBO projection, which implies an eventual debt nearly twice GNP, the rise in d is quite rapid.
3. The primary deficit was on average negative in the first two periods, from 1952 to 1966, and the combination of high real growth and negative r^D brought rapid reduction of the high debt/GNP ratio inherited from World War II. This continued through most of the next 15 years. Even though the primary deficit turned positive, the real interest rate was very favorable.
4. After the dramatic increase in monetization (about 50 percent of deficits between 1958 and 1974), Fed policy has reduced seignorage to negligible amounts. This is of course a major reason for the rise in r^D to positive values.
5. These calculations do not touch on the asset-demand side of equations, i.e., what debt interest rates are necessary to induce the public to hold debt in the indicated ratios to GNP. It could well be that the increasing rates necessary in the final column could impart instability to the process.

U.S. Fiscal and Monetary Policy and Federal Debt Dynamics 1952–1987

Period, Fiscal Years: (number of years)	1952–1957 (6)	1958–1966 (9)	1967–1974 (8)	1975–1979 (5)	1980–1981 (2)	1982–1987 (6) CBO Baseline
1. Federal debt: % of GNP, beginning and end of period	64.8–48.5	48.5–35.7	35.7–23.4	23.4–26.5	26.5–27.6	27.6–38.0
2. Federal deficit (+) or surplus (−), excluding interest: % of GNP, avg.	−0.58	−0.47	+0.28	+1.38	+0.80	+2.58
3. Share of debt monetized: %, range	10.5–11.3	10.7–16.6	16.6–24.0	24.0–18.1	18.1–15.7	15.7–8.0
4. Share of deficit (including interest) monetized: %, avg.	0	50	46	12	6	2.6
5. Growth of real GNP: % per yr., avg.	2.8	3.4	3.8	3.5	0.9	3.1
6. Inflation of GNP deflator: % per yr., avg.	2.2	1.9	5.2	7.2	9.1	6.4
7. Treasury 90-day bill rate: % per yr., avg.	2.1	3.2	5.8	6.7	12.8	10.4

(cont'd. next page)

U.S. Fiscal and Monetary Policy and Federal Debt Dynamics 1952–1987 (cont'd.)

Period, Fiscal Years: (number of years)	1952–1957 (6)	1958–1966 (9)	1967–1974 (8)	1975–1979 (5)	1980–1981 (2)	1982–1987 (6) CBO Baseline
8. Real net interest rate on debt: % per year, avg.	−0.7	−0.7	−2.8	−2.8	−0.1	1.7
9. Real GNP growth less real net int. rate	3.5	4.1	6.6	6.3	1.0	1.4
10. Hypothetical equilibrium debt/GNP ratio: %	−16.6	−11.5	+4.2	+21.9	+80.0	+184.3
Indicated Trend of Debt/GNP Ratio:						
11. Actual, beginning of period	64.8	48.5	35.7	23.4	26.5	27.6
12. After five years	51.9	37.6	27.1	23.0	29.1	38.1
13. After 10 years	41.1	28.6	20.8	22.7	31.6	48.0

NOTES

1. Debt held by Federal Reserve and by nonfederal owners, par value, at end of fiscal year, relative to nominal GNP for fiscal year, from fiscal year preceding the period to final year of period.
2. Sum of National Income Accounts deficits less surpluses for period, relative to sum of nominal GNP for period. Debt interest outlays (calculated by subtracting Federal Reserve payments to Treasury from "Net Interest" line of budget) are excluded in calculating deficit or surplus, as are estimated tax receipts recouped from such outlays, estimated at 25 percent.
3. Monetized debt is the amount held by the Federal Reserve. The denominator of the ratio is, as in line 1, the monetized debt plus the debt held outside the federal government.
4. The increment of monetized debt from beginning to end of period, divided by the increment of total debt as defined in line 1.
8. [line 7 $\times$ .75 $\times$ (100 $-$ line 4)/100] $-$ line 6. The average Treasury bill rate for each period is taken to be the permanent cost of financing new debt and refinancing old debt, which is reckoned at par value, given the conditions and policies of the period. It is multiplied by .75 on the assumption that the Treasury recoups 25 percent of nominal interest outlays in taxes. The third factor reduces the net interest cost for "seignorage," the fraction of the debt monetized by the Federal Reserve. Subtracting line 6 converts the net nominal interest rate on the debt to a real rate.
9. line 5 $-$ line 8.
10. line 2/line 9. A negative figure means that the hypothetical equilibrium debt/GNP ratio is negative, i.e., the government would be a net lender to the private sector.

12, 13. [line 11 $-$ line 10] $\times$ [(100 + line 9)/100]$^{-n}$ + line 10. See text.

National Saving and International Investment

Norman S. Fieleke*

In 1981 a number of changes were made in federal tax law, partly with a view to stimulating private saving. For example, the reductions in personal income tax rates, the tax-exemption for interest on "All-Savers" certificates, and the liberalization of the use of Individual Retirement Accounts are measures that tend to raise the after-tax rate of return on capital invested by individuals. For business, tax changes designed to enhance profitability include liberalization of provisions relating to depreciation and the investment tax credit. Thus, according to the Council of Economic Advisers, "Much of the Administration's tax program is designed to increase the private saving of the Nation. As a consequence, both public and private borrowing will be accommodated more easily."[1]

Aside from the issue of whether the nation's saving will rise in response to these measures, any such rise will fail to accommodate more domestic borrowing if the increased saving is invested abroad. What, then, does experience teach us about such international capital flows? If saving increases in one country, does the increase get invested primarily in that country, or is it dispersed abroad via integrated and efficient capital markets? On the other hand, if a country experiences a decline in saving, perhaps because of increased government deficits, is most of that decline offset by increased borrowing from abroad?

Questions such as these are the focus of this paper. The first section reviews the most relevant literature. Thereafter, some exploratory regression analysis for OECD countries is undertaken, and historical data for these countries are then considered. Finally, the analysis is extended in part to a much larger sample of countries.

The State of the Inquiry

For at least the past two decades—indeed, since the marked advance of convertibility in 1958—many scholars as well as practitioners have marvelled at the seeming mobility of capital throughout most of the industrialized world, a mobility manifested by the behavior of particular interest

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[1] *Economic Report of the President Together with the Annual Report of the Council of Economic Advisers* (1982), p. 96.

rates as well as by actual capital movements. Among practitioners, none has experienced more convincing demonstrations of capital mobility than the monetary authorities who sought to maintain interest rates or foreign exchange rates at patently artificial levels. For example, on June 23, 1972, nearly $900 million poured into the Deutsche Bundesbank within the first hour of foreign exchange trading, leading the Bank temporarily to abandon its effort to resist an appreciation of the mark; on March 1, 1973, the Bank absorbed another $2.6 billion before again surrendering to market forces.[2] More recently, foreign officials have publicly protested against U.S. fiscal-monetary policy for putting upward pressure under foreign interest rates. In addition to such evidence on capital mobility from officialdom, numerous other indicators could be marshalled, including the fact that 26 percent of the total equity of Canadian corporations in 1980 was held by foreigners.[3] The repeated references to the billions, or hundreds of billions, of dollars "sloshing around" in the Euromarkets and the close correlation of short-term interest rates (after adjustment for cost of forward cover) in Chart 1 also testify to the mobility of capital between the markets concerned.

Considerations such as these have led many to conclude that capital is highly mobile internationally, especially between the industrial countries. As Whitman has noted, ". . . much of the recent analytical work in international economics has moved away from closed-economy models to models based on the fundamental assumption of a highly integrated world economy."[4] In the same paper this point is illustrated by her own analysis, wherein she maintains, "Finally, there is the fact that flexible exchange rates provide only limited insulation against foreign disturbances in a world of capital mobility."[5] More recently, McKinnon (1981, p. 533) has argued, "The development of the eurocurrency market now enables both firms and governments to borrow (or lend) internationally, on a large scale, for long periods in a variety of convertible currencies. Clearly, the international integration of capital markets in the 1980s parallels that prevailing in world trade in goods and services, whereas in the late 1940s national capital markets were segmented by exchange controls and eurocurrency transacting did not yet exist."

In a recent pathbreaking article Martin Feldstein and Charles Horioka (1980) have reached a different conclusion; they have found capital to be so immobile in the long run that any new saving in an industrial country typically gets invested almost exclusively in that same country, with little or none being invested abroad! The seeming contrast between their results and the prevailing consensus provides the chief stimulus for this paper.

[2] *Federal Reserve Bulletin*, September 1972, p. 765, and March 1973, pp. 148–49.

[3] For 1975 the comparable figure was 35 percent. These data were supplied by staff of the Bank of Canada and are based on Statistics Canada, *Financial Flow Accounts*.

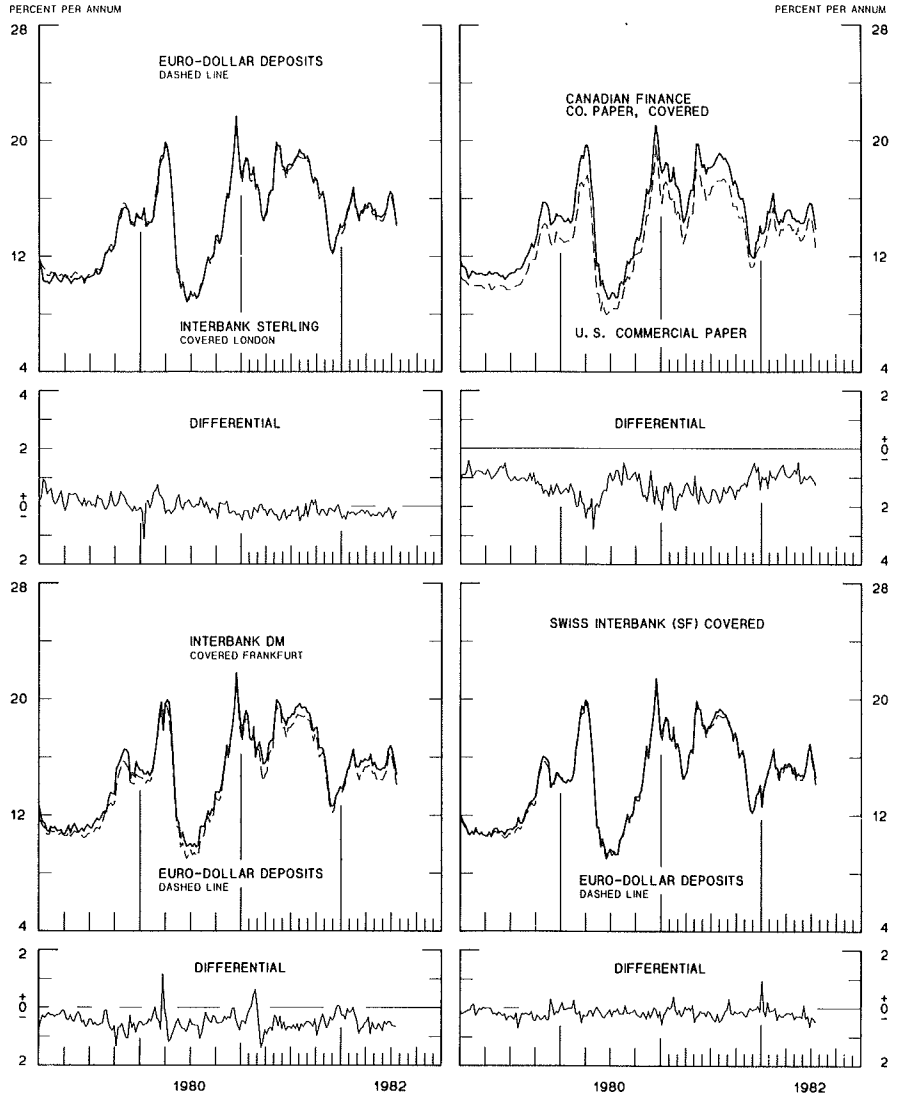
[4] Whitman (1976), p. 183.

[5] *Ibid*, p. 207.

Chart 1

Interest Arbitrage: 3-Month Funds

Differential: Plus (+), Indicates Favor Dollar Assets
Averages for Week Ending Wednesday



1 Percent on Differential Scale = 2 Percent on Rate Scale

Source: U.S., Board of Governors of the Federal Reserve System, *Selected Interest and Exchange Rates,*

To launch the formal analysis, consider that

$$GNS = GNP - C + R,$$

where GNS is gross national saving, GNP is gross national product, C is all consumption, public and private, and R represents net remittance and other unilateral transfer receipts from abroad. Now,

$$GNP = C + GDI + X - M + D,$$

where GDI is gross domestic investment, X and M are exports and imports, respectively, of goods and services (excluding factor services), and D is dividend and other net receipts from factor services supplied other nations. Thus,

$$GNS = GDI + X - M + D + R, \text{ or}$$
$$GNS = GDI + NFI,$$

where NFI is net foreign investment, or the addition to net claims on foreigners (or, essentially, the current account of the balance of payments); the gross saving of a nation can be invested at home or abroad.

To assess how an increment of saving within a nation gets divided between domestic and foreign investment, Feldstein and Horioka estimated the following equation:

$$(1) \qquad (GDI/GDP)_i = \alpha + \beta(GNS/GDP)_i,$$

where GDP is gross domestic product, or $GNP - D$, and both $(GDI/GDP)_i$ and $(GNS/GDP)_i$ are average ratios for country i of the corresponding yearly ratios over long periods; one regression employed the average ratios for 1960–74, and others employed the average ratios for 1960–64, 1965–69, and 1970–74.[6] Thus, the analysis sought to determine how sustained differences in saving rates from one country to the next influence the corresponding investment rates, and in this long-run context the observed variation in saving rates was assumed to be exogenous, reflecting basic structural differences among countries rather than short-run phenomena affecting saving and investment jointly. Equation (1) was estimated with data for 16 OECD countries, and a variant employed net saving and investment in place of gross saving and investment.

From this regression analysis Feldstein and Horioka found that the estimated value of β in equation (1) did not differ significantly from one, whether saving and investment were measured gross or net of depreciation allowances. The conclusion was that "nearly all of incremental saving re-

[6]Although Feldstein and Horioka presented their explanatory variable as (GDS/GDP), where GDS is gross domestic saving, their measure of saving is called gross national saving in publications of the United Nations and the World Bank, and a different definition is given for gross domestic saving. The Feldstein-Horioka measure of saving is the one used in the United Nations System of National Accounts (S.N.A.), and this measure is characterized as "national saving" in the U.N. *Yearbook of National Accounts Statistics, 1979*, Volume I, p. XXV. Gross national saving is defined as $GDI + X - M + D + R$, while gross domestic saving is $GDI + X - M$; see The World Bank, *World Tables*, 2d ed. (1980, p. 7) and *World Development Report 1981* (p. 185).

mains in the country of origin" (p. 317). A subsequent paper by Feldstein (1982) offers further support for this view.

This remarkable conclusion has significant implications for policy. First, policies to stimulate national saving may have more domestic appeal if it is likely that any increased saving will be invested at home; other things equal, a nation receives a higher return on its saving invested at home than on its saving invested abroad because foreign taxes are collected on earnings from investments abroad. Second, if saving—and more generally, capital—is unlikely to be invested abroad, that fact is relevant for tax policy, because a tax on income of capital will not induce a capital exodus and a corresponding shift of the tax burden to domestic labor. Finally, even though a current-account balance of payments deficit corresponds to a shortfall of national saving below domestic investment, there will be little reason to try to reduce such a deficit by enlarging national saving if virtually all of any increased saving is allocated to domestic investment. These deductions, like the regression analysis, apply to the long run; Feldstein and Horioka recognize the evidence that capital does flow across national boundaries in the short run in response to changing short-term covered-interest differentials, but they argue that in the long run capital is much less responsive to yield differentials because of the greater risk and controls to which long-term international investments are subjected.

While it may be appropriate, in this long-run context, to treat saving as exogenous, with investment following along, such treatment would seem more questionable in an intermediate or short-run context. Indeed, Sachs (1981) has argued that in the intermediate term changes in domestic investment rather than saving should be taken as the central exogenous variable for purposes of explaining international capital flows, and that at least for this time horizon changes in domestic investment tend to induce changes in the current account of the balance of payments.[7] The present paper, in focusing on the role of exogenous changes in national saving, retains the longer run perspective adopted by Feldstein and Horioka.

Abstracting from the time horizon of the analysis, Harberger (1980) has argued that domestic investment is more likely to diverge widely from saving in a small (and poor) country than in a large (and wealthy) country, just as they are more likely to diverge widely in a city block than for an entire city. Since Feldstein and Horioka include in their analysis only OECD countries, which have relatively large incomes (both in total and per capita), their results may be biased, or unrepresentative of the wider world.

The Basic Model

To provide a starting point for theorizing about the relationship between net foreign investment, national saving, and domestic investment, it may be helpful to employ some simple geometry. At the outset, assume a world of perfect competition without any market failures (i.e., without ex-

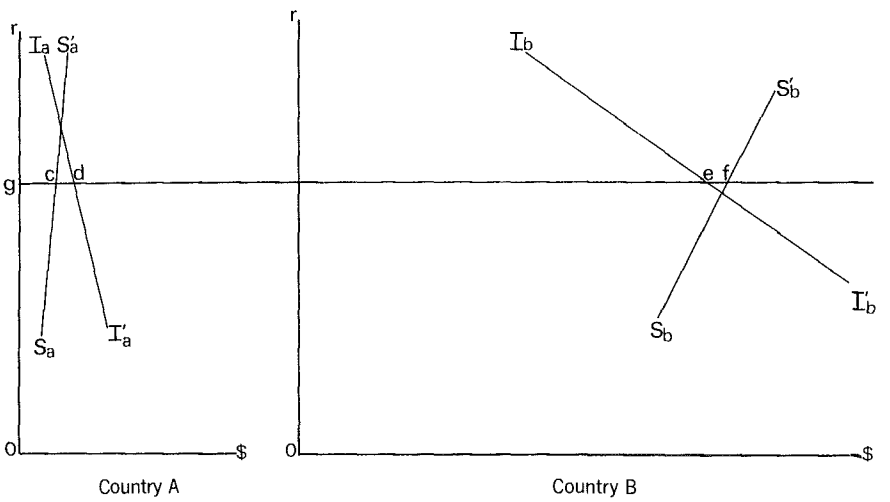
[7]For comment by Feldstein on Sachs's analysis, see Feldstein (1982, pp. 27–29).

ternalities). In Chart 2, r represents the rate of interest and the marginal efficiency of investment, SS′ and II′ represent national saving and domestic investment, respectively, and all variables are measured in real terms. In this two-country world, with perfect capital mobility, equilibrium is assumed to prevail at the interest rate 0g, with country B making net foreign investment in country A in the amount of ef=cd.

Since capital is mobile, it seems reasonable to measure country size in terms of the stock of noncapital or internationally immobile factors which are present in each country. In this illustration, country B is assumed to be the "large" country, and because the quantity of other factors with which capital can work is much greater in B than in A, the investment schedule in B is markedly flatter than in A (but not necessarily more elastic at any given interest rate), provided technologies are similar in the two countries. In consequence, domestic investment in B greatly exceeds that in A. Now, if national saving, too, is correlated with country size, domestic investment will be observed to increase as national saving increases (from one country to the next) merely because of their common correlation with size, even with perfect capital mobility, so that a significant correlation between national saving and domestic investment would *not* be proof of capital immobility. Thus, any regression of domestic investment on national saving should allow for the probable correlation between national saving and national size; failure to do so would invite bias in the estimate of the coefficient for national saving.

Chart 2

Saving, Investment, and Net Capital Flow between a Large and Small Country



To my knowledge, this problem has not been tackled explicitly by previous statistical analyses, although Feldstein and Horioka (1980), Feldstein (1982), Sachs (1981), and Harberger (1980) all express saving and investment as fractions of *GDP*. Such "normalization" fundamentally changes the nature of the analysis, however, as is illustrated by the following table.

Table 1
Illustration of Correlation between *GNS/GDP* and *GDI/GDP* in the Absence of Correlation between *GNS* and *GDI*
(Dollar amounts in billions)

Country	GNS	GDI	GDP	GNS/GDP	GDI/GDP
A	$12.0	$14.0	$100	0.120	0.140
B	13.0	14.0	90	0.144	0.156
C	14.0	14.0	80	0.175	0.175
D	15.0	14.0	70	0.214	0.200
E	16.0	14.0	60	0.267	0.233
Total	70.0	70.0			

In this example there is no correlation between gross national saving and gross domestic investment, but there is a perfect correlation of +1.0 between them after they are divided by gross domestic product.

More generally, if $(GDI/GDP)_i = \alpha + \beta(GNS/GDP)_i$,

$$\text{then } \beta = \left(\frac{GDI_2}{GDP_2} - \frac{GDI_1}{GDP_1}\right) \Big/ \left(\frac{GNS_2}{GDP_2} - \frac{GNS_1}{GDP_1}\right),$$

$$= \frac{(GDP_1)(GDI_2) - (GDP_2)(GDI_1)}{(GDP_1)(GNS_2) - (GDP_2)(GNS_1)},$$

where the subscripts 1 and 2 refer to any two points on the regression line. This definition of β is not what is desired if the goal is to test for capital mobility; what is desired is

$$\beta = \frac{GDI_2 - GDI_1}{GNS_2 - GNS_1}.$$

Thus, equation (1) is less than ideal for purposes of testing whether capital is internationally mobile, or whether national saving gets invested only at home.

An alternative to equation (1) is the following:

$$(2) \qquad GDI_i = \alpha + \beta_1 GNS_i + \beta_2 GDP_i,$$

where GDP_i represents the influence of country size. This formulation seems to flirt with other problems, including simultaneous equations bias, heteroscedasticity, and multicollinearity. As for the simultaneity bias, it is true that all variables in equation (2) are jointly determined at least in the short run, but in our regression analysis we shall follow the approach of

Feldstein and Horioka and employ average long-period values of these variables, on the assumption that in the long run the observed variation in saving and in domestic product is exogenous, corresponding to fundamental intercountry differences in resources, time preferences, and the like, rather than to transient disturbances jointly influencing saving, domestic investment, and domestic product. Thus, GDI_i, GNS_i, and GDP_i are each taken as an annual average of 1971–1978 (a period which neither begins nor ends with a business cycle peak or trough for any of the countries included). As will be indicated, neither heteroscedasticity nor multicollinearity seems to affect the regression results in a crucial way.

Regression Results for OECD Countries

For the variables in equation (2) it is desirable to have data expressed in a currency unit which has the same purchasing power from one country to the next, and it is well known that use of market-determined foreign exchange rates to convert units of one currency into another will generally fail to yield such data. Fortunately, the OECD has recently published purchasing power parities for a number of OECD countries, and we have used these PPPs in lieu of market exchange rates to derive data expressed in dollars of comparable purchasing power across countries; these data were then deflated by a price index for U.S. gross domestic product to obtain data of constant purchasing power over time.[8] The desired data could be obtained for 13 OECD countries, including all of the "Big Seven" except Canada.[9]

The method of ordinary least squares was then used to estimate equation (2) as well as several variants. The results are presented in Table 2, where *GDI* and *NDI* refer to gross and net domestic investment, respectively, and *GNS* and *NNS* refer to gross and net national saving, respectively. Because of correlation between *GDP* and each of the savings variables, the coefficient for each explanatory variable is larger if it is used as the sole explanatory variable (aside from the intercept). However, when both *GDP* and saving are included as explanatory variables, the coefficients on both remain significant at the 0.01 level. This outcome suggests that collinearity does not invalidate the analysis; it is also consistent with the view that a measure of country size, such as *GDP*, should be included.

[8]The price index for *GDP* was used because the PPPs are for *GDP*, because the index is compatible with the S.N.A. (System of National Accounts), and because price indexes for the *GDP* components used in the regressions were not available in terms of the S.N.A.

[9]Countries were included only if data were available for them in terms of the "present System of National Accounts;" they are listed in the note to Table 2.

Table 2
Regression Equations for Domestic Investment Based on Average Annual Data in Constant Dollars for the Period 1971–1978 for 13 OECD Countries

Dependent variable	Coefficients of explanatory variables and t-ratios				$\bar{R}^2$
	GNS	*NNS*	*GDP*	Intercept	
GDI	0.925		0.017	0.236	1.00
	(48.43)		(4.20)	(0.43)	
GDI	1.002			−0.093	1.00
	(123.42)			(−0.11)	
GDI			0.200	8.159	0.93
			(12.96)	(1.07)	
NDI		0.914	0.009	0.456	1.00
		(42.04)	(4.15)	(0.80)	
NDI		0.992		0.313	1.00
		(56.01)		(0.35)	
NDI			0.082	9.717	0.75
			(6.11)	(1.45)	

Note: Countries included are Austria, Belgium, Denmark, France, Germany, Ireland, Italy, Japan, Luxembourg, Netherlands, Spain, United Kingdom, and United States.
Source: Underlying data are from Organisation for Economic Cooperation and Development, *National Accounts, Volume 1, 1951–1980* (1982).

Tests and experiments relating to heteroscedasticity suggest that it is of little consequence. Taking equation (2)—along with the usual disturbance term—as the basic model, we plotted the regression residuals against *GNS* and then against *GDP*. We discerned a slight tendency for the absolute values of the residuals to rise with each of these variables. Application of the Goldfeld-Quandt procedure to test for proportionality between the variance of the disturbance and, first, GNS^2, and, second, GDP^2, yielded in each case an F-statistic barely significant at the 0.05 level, suggesting the presence of some such proportionality. Because of high correlation between *GNS* and *GDP*, it seemed sufficient to focus on only one of these variables in transforming equation (2) so as to attain homoscedasticity, and we selected *GNS*. Dividing through equation (2) by *GNS* produced an equation whose regression residuals also were heteroscedastic, according to the Goldfeld-Quandt test; indeed, the F-statistic was easily significant at the 0.05 level. Consequently, on the assumption that the variance of the disturbance term for equation (2) was proportional to *GNS* rather than GNS^2, we divided equation (2) by $\sqrt{GNS}$ and then obtained the following estimated equation, with residuals homoscedastic according to the Goldfeld-Quandt test:

$$(GDI/\sqrt{GNS})_i = \underset{(-0.33)}{-0.071}(1/\sqrt{GNS_i}) + \underset{(20.27)}{0.912}\sqrt{GNS_i} + \underset{(2.06)}{0.021}(GDP/\sqrt{GNS})_i$$

Note that this kind of transformation is not the same as the "normalization" represented by equation (1), which retains the traditional intercept. Because the relevant coefficients in this transformation of equation (2) are signifi cant at the 0.05 level (under the one-tail test appropriate) and are virtually identical to the corresponding coefficients reported for equation (2) in Table 2, we conclude that heteroscedasticity is probably of little consequence.[10]

For the two regression equations in Table 2 that include *GDP* along with either *GNS* or *NNS*, the coefficients of both *GNS* and *NNS* not only differ significantly from zero, as shown by the customary t-statistics in the table, but they also differ from one at the 0.01 level of significance. Consequently, unlike Feldstein and Horioka, we can reject the hypothesis that capital is completely "immobile" internationally over the long term.

Nonetheless, for a country represented in these regressions, it seems that roughly $0.92 of each extra "dollar" saved gets invested at home in the long run. Moreover, it does not necessarily follow that the remaining $0.08 is estimated to be invested abroad. For one thing, the fine detail of the System of National Accounts shows that the difference between gross national saving and gross domestic investment consists not only of net foreign investment but also of international "capital transfers," such as international grants (including receipts of special drawing rights issued by the International Monetary Fund), as well as the statistical discrepancy. As for the discrepancy, there seems no more reason to pretend that it is foreign investment than to pretend that it is national saving, as a general rule; this matter is not inconsequential, for the magnitude of the discrepancy sometimes dwarfs that of net foreign investment.[11] For these reasons, it is better to estimate directly the share of national saving invested abroad than simply to assume that this share is equivalent to one minus the fraction of national saving estimated to be invested domestically.

Such direct estimates are reported in Table 3, where the variables are defined as in Table 2. For the countries included, over the long run about $0.07 of each $1.00 increase in national saving is estimated to be invested abroad, whether saving is measured gross or net of capital consumption. In each equation the coefficients for both *GDP* and the savings variable are significant at the 0.05 level, and the sign of the coefficient for *GDP*, as should be expected, is negative, indicating that for a given level of saving the amount of foreign investment declines as country size increases. Because the coefficients of determination are not so high for these equations as for those in Table 2, we tested for nonlinear relationships by reestimating the first equation in Table 3 after adding squared values of the explanatory variables; the coefficients of these added variables were not significant at the 0.10 level, so nonlinearity does not seem to be present. In addition, the

[10]I am indebted to Stanley Black for urging an investigation of this matter. For an illustration of the Goldfeld-Quandt procedure, see Kane.

[11]For example, in 1971 net foreign investment by the United States was −$726 million, while the statistical discrepancy was $4.1 billion.

Goldfeld-Quandt procedure was used to test for proportionality between GNS^2 and the disturbance variance in this first equation; the F-statistic was not significant at the 0.05 level.

Table 3
Regression Equations for Net Foreign Investment Based on Average Annual Data in Constant Dollars for the Period 1971–1978 for 13 OECD Countries

Coefficients of explanatory variables and t-ratios				
GNS	*NNS*	*GDP*	Intercept	$\bar{R}^2$
0.065		−0.012	−0.575	0.48
(3.50)		(−3.13)	(−1.07)	
	0.072	−0.005	−0.744	0.45
	(3.31)	(−2.38)	(−1.30)	

Note: For source and countries included, see notes to Table 2.

Thus, in spite of the statistical discrepancy, Tables 2 and 3 tell a consistent story for the 13 OECD countries included. While capital is not completely immobile internationally over the long run, it does seem to be so immobile that more than 90 percent of an increase in a nation's saving will be invested in that same nation.[12]

What explains this seeming immobility of capital? One possible explanation is the existence of governmental controls over international capital flows, for it is well known that such barriers can have a substantial impact. One current and noteworthy illustration is afforded by the Canadian Government's measures to reduce the share of foreign ownership in Canada's oil and gas industry from the current level of about 65 percent to less than 50 percent by 1990. As another recent example, in March 1982 the French Government prohibited transfers of funds abroad by French companies for foreign investments in excess of one million francs. The list of such restrictions goes on and on, as can be seen from the International Monetary Fund's latest *Annual Report on Exchange Arrangements and Exchange Restrictions.*

Moreover, there are countries between which long-term capital might not readily transfer even if there were no governmental restrictions. As I have argued elsewhere, "Foreign investment is aptly named, not only because it is investment in other countries, but because the word 'foreign' connotes that which is different from one's experience, that which is strange. The strangeness of foreign stocks and bonds, the difficulty and expense of acquiring information about them, surely constitutes a major, if not the major, obstacle to their purchase by the typical investor. The language barrier alone is a significant hurdle. In addition to the difficulty of acquiring information on particular securities, the potential foreign investor should con-

[12]This finding tends to render more relevant the traditional models of international trade which assume factors of production to be immobile internationally.

sider the risk of devaluation of the foreign currency as well as varied political risks, such as the relatively great uncertainty of recovering defaulted foreign obligations through legal proceedings."[13] These factors lower the expected net return from foreign securities and raise the variance of that return, thereby rendering such securities less competitive with domestic securities (other things equal) in the portfolio deliberations of the representative investor.[14]

Governmental controls and, more generally, the extra costs and risks often associated with foreign securities may serve partially to explain the apparent long-run international immobility of capital, but even in the absence of these factors the long-run magnitude of net capital flows might be constrained by balance of payments considerations. Some evidence relevant to this issue is examined in the next section.

OECD Country Experience in Historical Perspective

The preceding analysis suggests that at the margin only a small fraction of national saving in an OECD country gets allocated to net foreign investment, or to improving the current account of the country's balance of payments, in the long run. This finding raises questions about the broader historical experience of the OECD countries. How large have the current-account balances of these countries been in relation to gross national saving or gross domestic product? Has there been a tendency for these balances to increase or to diminish in a relative importance over the years?

In order to address such questions, we have compiled time series of relevant data for two groups of OECD countries. For 14 countries data could be gathered on the current-account balance, gross domestic product, and national saving beginning with 1952, the first year for which national savings data were readily available for major countries. For nine countries the data on current-account balances and gross domestic product were readily available back to 1948. To gain perspective on the average experience of these countries, we have computed for each country the ratio of the (absolute) current-account balance to *GDP*, and to saving if possible, and then taken the average of these country ratios for each year. The resulting percentages for the two groups of countries are presented in Tables 4 and 5. Table 4 shows that in 1976, following the oil shock, current-account balances in relation to national saving were, on average, nearly 14 percent, an historical high for the 14 countries for the 29 years under scrutiny. It is difficult to discern long-term trends in either table, but the percentages have been relatively high in most years since 1973.

Table 6 provides selected statistics on the experience of the 14 countries individually. Columns 4 and 8, which present the average yearly ratio of net lending (positive) or borrowing (negative) to gross national saving or *GDP*, show that Ireland has experienced by far the largest average net capi-

[13]Fieleke (1971), pp. 18–19; also see Kenen (1976), pp. 24–31.

[14]The investor may still acquire foreign securities, of course, partly for diversification; the point is that he would acquire even more were it not for the factors mentioned.

Table 4
Current-Account Balances as Percentages of Gross National Saving and of Gross Domestic Product: Averages of Absolute Values of the Percentages for 14 OECD Countries, 1952–1980[1]

	Average percentage			Average percentage	
Year	Of gross national saving	Of gross domestic product	Year	Of gross national saving	Of gross domestic product
1952	9.22	1.94	1967	5.02	1.20
1953	11.16	2.51	1968	5.24	1.29
1954	8.05	1.80	1969	6.49	1.58
1955	10.52	2.08	1970	6.36	1.50
1956	6.61	1.36	1971	6.78	1.66
1957	5.36	1.24	1972	4.38	1.13
1958	8.49	1.87	1973	6.38	1.63
1959	6.84	1.54	1974	13.13	3.03
1960	5.62	1.35	1975	10.22	2.42
1961	4.96	1.21	1976	13.80	3.22
1962	8.37	1.95	1977	13.76	3.10
1963	5.53	1.26	1978	9.39	2.20
1964	6.41	1.43	1979	10.19	2.27
1965	7.07	1.64	1980	11.60	2.45
1966	6.36	1.53			

[1]The countries included are Austria, Canada, Denmark, Finland, Germany, Ireland, Italy, Japan, Netherlands, Norway, Sweden, Switzerland, United Kingdom, and United States.

Source: International Monetary Fund: *Balance of Payments Statistics Yearbook,* various issues; *International Financial Statistics Yearbook, 1981,* and *Supplement on Exchange Rates, 1981.* Organisation for Economic Cooperation and Development, *National Accounts, 1951–1980,* Volume 1.

tal transfer (an inflow), relative to saving or *GDP*, among the 14 countries represented. Ireland again tops the list—followed by Norway—when the same ratios are averaged without regard to algebraic sign (columns 5 and 9); these absolute percentages, of course, measure the importance of net international capital flows (in relation to national saving or *GDP*) regardless of the direction of the flow.[15] The smaller the country, the larger tends to be its current-account balance relative to its size; if the countries are ranked according to the percentages in column 9 and then according to the average of their current-dollar *GDP* for 1952 and 1980, the correlation (Spearman's) between the two rankings is −0.70, with a t-statistic of −3.36. This correlation accords with intuition, for the smaller the country, the larger is the rest of the world with which it can transact.

[15]The more detailed statistics show that for the countries and years covered by Table 6 the largest absolute current-account balance in relation to saving or *GDP* in a single year was recorded by Norway in 1977, when rapidly rising domestic demand and prices, partly associated with North Sea oil development, helped to boost the country's current-account deficit to 63 percent of gross national saving and 14 percent of *GDP*.

Table 5
Current-Account Balances as Percentages of Gross Domestic Product[1]: Averages of Absolute Values of Percentages for Nine OECD Countries, 1948–1980.[2]

Year	Percent	Year	Percent
1948	1.86	1964	1.29
1949	2.49	1965	1.14
1950	1.54	1966	1.34
1951	1.93	1967	1.86
1952	1.87	1968	1.72
1953	1.90	1969	0.80
1954	1.24	1970	1.28
1955	1.82	1971	1.93
1956	1.63	1972	1.18
1957	1.48	1973	1.68
1958	1.89	1974	3.13
1959	1.59	1975	3.07
1960	1.88	1976	2.39
1961	1.36	1977	2.07
1962	1.62	1978	1.34
1963	0.64	1979	1.65
		1980	2.38

[1]Data on *GDP* could not be obtained for all years for Iceland and the Netherlands, so *GNP* data were used for them.
[2]The countries included are Austria, Canada, Denmark, Finland, Iceland, Netherlands, Sweden, United Kingdom and United States.
Source: International Monetary Fund: *Balance of Payments Statistics Yearbook*, various issues; *International Financial Statistics Yearbook*, various issues; and *Supplement on Exchange Rates, 1981*. Organisation for Economic Cooperation and Development, *National Accounts*, various issues.

For most countries there has been considerable variation over the years in the current-account balance relative to saving or *GDP*, as indicated by the standard deviations and coefficients of variation shown in columns 6, 7, 10, and 11. With all this variability, is there a tendency for the current-account balance to net out to zero for the typical country over the years? It might seem reasonable to expect some such balance of payments constraint, on the grounds that in the long run capital-importing countries will repay their debts, either because of natural shifts in schedules such as those in Chart 2 or because the governments concerned will adopt policies to limit the accumulation of positive or negative current-account balances.[16]

[16]In fact, of course, a country's net indebtedness varies not only with its current-account deficits but also with "valuation and other adjustments," such as changes in the value of foreign holdings of stock in the country's corporations; see, for example, *Survey of Current Business*, August 1981, pp. 52–57.

Table 6
Selected Statistics on Current-Account Balances for 14 OECD Countries, by Country, for 1952–1980

Country	Cumulative current-account balance (in billions of U.S. dollars) (1)	Col.(1) divided by 1980 gross national saving (2)	Col.(1) divided by largest (absolute) annual balance[1] (3)	Current-account balance as percent of gross national saving, yearly: Average Algebraic (4)	Average Absolute (5)	Standard deviation (6)	Coefficient of variation (7)	Current-account balance as percent of gross domestic product, yearly: Average Algebraic (8)	Average Absolute (9)	Standard deviation (10)	Coefficient of variation (11)
Austria	−13.2	−0.6	3.7	−3.7	5.8	7.7	2.1	−1.0	1.5	1.9	1.9
Canada	−41.4	−0.8	8.9	−9.6	10.4	8.4	0.9	−2.0	2.2	1.7	0.8
Denmark	−15.4	−1.6	5.2	−8.2	10.5	9.8	1.2	−1.6	2.0	1.8	1.1
Finland	−7.5	−0.6	3.4	−4.9	7.5	8.5	1.7	−1.2	1.9	2.2	1.8
Germany	30.0	0.2	1.9	3.9	5.2	4.8	1.2	1.0	1.3	1.2	1.2
Ireland	−6.5	−1.6	4.4	−19.4	20.0	14.1	0.7	−3.7	3.8	2.6	0.7
Italy	8.5	0.1	0.9	2.2	7.5	8.8	4.0	0.6	1.7	2.0	3.3
Japan	24.9	0.1	1.4	0.8	3.0	3.5	4.4	0.3	1.0	1.2	4.2
Nether-lands	5.3	0.2	1.9	4.6	8.3	10.5	2.3	1.3	2.2	2.7	2.1
Norway	−16.1	−0.9	3.2	−8.1	13.2	18.1	2.2	−2.1	3.4	4.4	2.1
Sweden	−11.7	−0.6	2.2	−2.4	4.4	6.7	2.8	−0.4	0.9	1.3	2.9
Switzer-land	18.4	0.7	4.2	5.9	9.0	10.1	1.7	1.5	2.4	2.7	1.8
United Kingdom	−5.8	−0.1	0.7	*	5.6	7.2	361.0	0.0	1.0	1.2	∞
United States	41.9	0.1	2.3	1.2	2.3	2.6	2.1	0.2	0.4	0.5	2.1

[1]Absolute value.
*Less than 0.05 in absolute value.
Source: See notes to Table 4.

This expectation is supported by the relatively small cumulative current-account balances reported in column 2 of Table 6. To shed some additional light on this issue, we have calculated the number of years that would be required for each country to reverse or offset its aggregate current-account deficit or surplus accumulated over the period 1952–1980 if the country were to run an annual surplus or deficit equivalent to its largest absolute annual balance during this period. The results, presented in column 3, reveal that by this measure most countries could repay or collect their accumulated deficits or surpluses within a few years; by far the longest "reversal period," nearly nine years, would be required by Canada. Even if this approach substantially underestimates the reversal periods that would actually be required, those periods would still be short for most countries.

Although the cumulative balances shown in Table 6 are small, occasionally a country does record a very large current-account balance in relation to gross national saving, as suggested by the measures of dispersion in columns 6 and 7. This combination of circumstances is consistent with the view that capital is very mobile between countries but that balance of payments-related considerations set fairly tight limits on *cumulative* net capital flows for most countries. In particular, governments concerned about the consequences for employment or inflation of continuing sizable current-account deficits or surpluses may adopt not merely controls but monetary and fiscal policies designed partially to eliminate or reverse those deficits or surpluses, influencing relative marginal efficiencies of investment in the process.[17]

The Wider World

The regression results presented in Tables 2 and 3 suggest that for the 13 OECD countries more than 90 percent of an increase in a nation's saving gets invested in that same nation over the long run. However, the world is not confined to these 13 countries, whose experience may be unrepresentative, so extension of the analysis to a much larger sample of countries is highly desirable. Such an extended application of equation (2) might not be fruitful for want of sufficiently precise purchasing power parity data; but an equation such as (1) can be estimated using data for 87 countries compiled by the World Bank, and the results compared with those obtained by Feldstein and Horioka from their much smaller sample of countries.[18] One suspects that the data for the non-OECD countries included in these 87 may be generally less accurate than the OECD-country statistics, which themselves present formidable problems. By way of illustration for the OECD countries, the data on gross saving for the United States published

[17]In a discussion of external policy targets of major industrial countries, Black (1978, p. 619) argues that "large [current-account] deficits or surpluses would not be sustainable over a long period of time, though moderate ones could represent a stable pattern of capital flows." Insofar as the difference between GNS_i and GDI_i is controlled by government policy, the models specified in equations (1) and (2) will not detect the "market" relationship between the two variables.

[18]As we have pointed out, equations (1) and (2) are not equivalent.

by the OECD in 1981 contain revisions (of the data published in the prior year) of between 8 and 11 percent for each of the years 1973 through 1978. But even though enlarging the sample might multiply the measurement error, the enlargment seems justified by the need to transcend a small and perhaps unrepresentative sample.

The basic equation estimated was

$$(3) \qquad (GDI/GNP)_i = \alpha + \beta_o (GNS/GNP)_i,$$

where $(GDI/GNP)_i$ and $(GNS/GNP)_i$ are average ratios for country i of the corresponding yearly ratios for 1968 through 1977, the latest year for which the underlying data have been published by the World Bank. Ordinary least squares regression results are exhibited in Table 7 for the 87 countries as well as for selected subsets of the 87. Each coefficient of GNS/GNP is significant at the 0.01 level.

According to these estimates, over the long term 89 percent of an increase in the saving rate in an industrial country goes to enhance the investment rate in that country, a finding which is consistent with that of Feldstein and Horioka and also with the estimates for 13 OECD countries presented in Table 2. On the other hand, the comparable figure for both the 69 nonindustrial countries and the full sample of 87 countries is only 65 or 66 percent. Examination of the residuals for the regressions involving the 87 countries and the 69 countries disclosed that one "capital-surplus oil-exporting country," Saudi Arabia, accounted in each regression for by far the largest absolute residual, whose size and negative sign indicated that the country's actual average domestic investment rate was well below that estimated by the regression equations.[19] Chart 3 depicts this outcome for the first regression reported in Table 7.

The temptation was irresistible to reestimate without Saudi Arabia, on the grounds that this "outlier" is in some way *sui generis*.The results of these reestimations are reported in Table 7 for "all [countries] but Saudi Arabia" and for "nonindustrial [countries] less Saudi Arabia." These results indicate that the gross domestic investment rate in an included country rises by about four-fifths of an increase in the national saving rate, an estimate more closely compatible with that for the 18 industrial countries. Even after the exclusion of Saudi Arabia, however, the estimated coefficient of the saving rate is somewhat lower for the nonindustrial countries than for the 18 industrial countries, suggesting that capital is less mobile internationally for the industrial countries than for the nonindustrial countries![20]

[19]"Capital-surplus oil-exporting countries," a classification employed by the World Bank, included six countries. The available data permitted only two, Libya and Saudi Arabia, to be included in the regression analysis.

[20]Any such inference must be very tentative, partly because β_o in equation (3) should not be interpreted as equivalent to β_1 in equation (2); see the discussion accompanying Table 1.

Table 7
Regression Equations for (*GDI/GNP*) for 1968–1977 for Selected Groups of Countries

Countries included	Coefficients of explanatory variables and t-ratios		$\bar{R}^2$
	GNS/GNP	Intercept	
All 87	0.662	9.374	0.58
	(11.03)	(7.21)	
18 industrial	0.890	3.347	0.78
	(7.78)	(1.154)	
69 nonindustrial	0.654	9.618	0.55
	(9.12)	(6.52)	
All but Saudi Arabia	0.787	7.150	0.71
	(14.52)	(6.24)	
Nonindustrial less Saudi Arabia	0.816	6.932	0.70
	(12.55)	(5.36)	

Source: Underlying data are from the World Bank, *World Tables*, 2d ed. (1980).

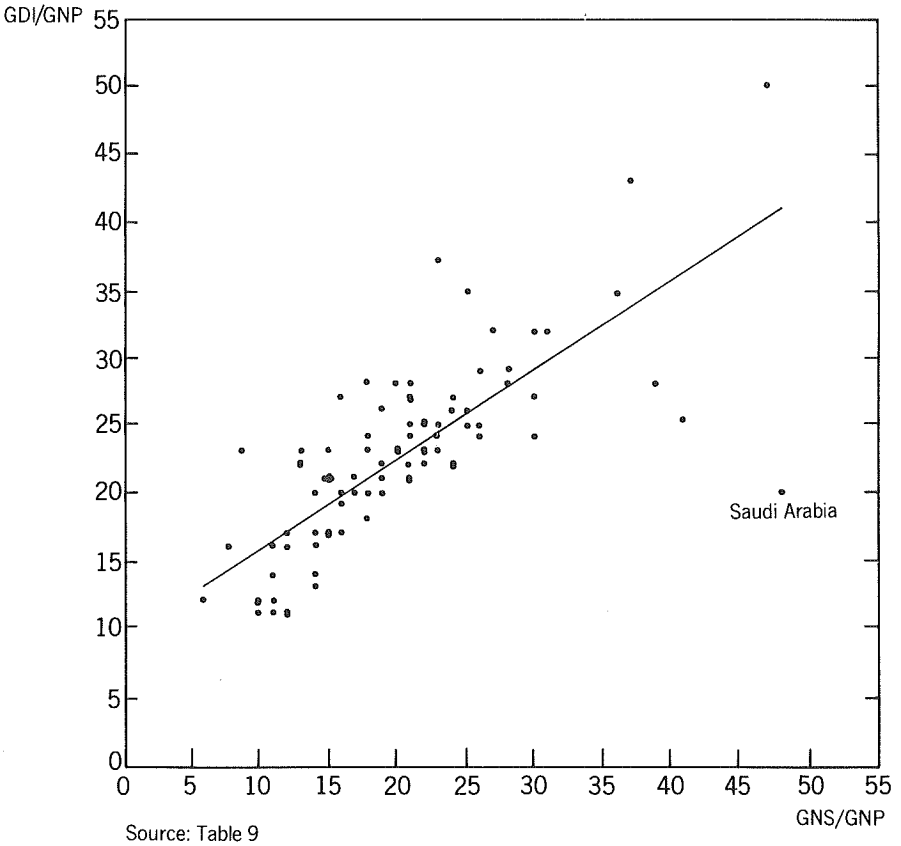
Note: The 18 industrial countries are Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Ireland, Italy, Japan, Netherlands, New Zealand, Norway, Sweden, Switzerland, United Kingdom, and United States.

The 69 nonindustrial countries are Algeria, Argentina, Barbados, Bolivia, Brazil, Burma, Central African Rep., Chad, Chile, Colombia, Costa Rica, Cyprus, Dominican Rep., Ecuador, Egypt, El Salvador, Ethiopia, Fiji, Gabon, Ghana, Greece, Guatemala, Guyana, Haiti, Honduras, Indonesia, Iran, Israel, Ivory Coast, Jamaica, Kenya, Rep. of Korea, Libya, Malawi, Malaysia, Mali, Malta, Mauritania, Mexico, Morocco, Nicaragua, Niger, Nigeria, Pakistan, Panama, Paraguay, Peru, Philippines, Rwanda, Saudi Arabia, Senegal, Sierra Leone, Singapore, Somalia, South Africa, Spain, Sri Lanka, Sudan, Syria, Taiwan, Tanzania, Thailand, Trinidad and Tobago, Tunisia, Turkey, Uganda, Uruguay, Venezuela, and Zambia.

As was true of the results reported in Table 2, the estimates presented in Table 7 generally contradict the hypothesis that capital is perfectly immobile in the long run. Except in the equation for the 18 industrial countries, the coefficient for *GNS/GNP* differs from one at the 0.01 significance level in every instance.

Chart 3

GNS/GNP and GDI/GNP, 1968 - 1977, for Eighty-Seven Countries



Source: Table 9

Conclusion

The evidence examined in this paper supports the view that, for the typical nation, especially an industrial nation, only a small fraction of an increase in saving is invested abroad in the long run. Whether this phenomenon should be interpreted as capital "immobility" is another matter, for international net capital flows—not to mention gross flows—have risen to large percentages of gross national saving in some countries for periods longer than a year. The likelihood that investors attach much higher risk to long-term than to short-term foreign investments (compared to domestic investments) does not serve to reconcile this high short-term mobility of capital with its seeming long-term immobility, because international inves-

tors who eschewed long-term commitments could simply continue to roll over their short-term investments. A different hypothesis set forth in this paper is that national policymakers act so as to enforce a balance of payments constraint which limits the accumulation of current-account deficits (net debt) or surpluses (net claims). Although fuller testing is needed, this hypothesis helps to reconcile the high short-term international mobility of capital with its apparent long-term immobility.

REFERENCES

Black, Stanley W. "Policy Responses to Major Disturbances of the 1970s and Their Transmission through International Goods and Capital Markets", *Weltwirtschaftliches Archiv,* 114(4), 1978, pp. 614–41.

Board of Governors of the Federal Reserve System. *Federal Reserve Bulletin,* 58 (September 1972) and 59 (March 1973).

Feldstein, Martin. "Domestic Saving and International Capital Movements in the Long Run and the Short Run," paper presented at the NBER-EHESS International Seminar on Macroeconomics in Mannheim, Germany, 22 June 1982.

——— and C. Horioka. "Domestic Saving and International Capital Flows," *The Economic Journal,* 90 (June 1980), pp. 314–29.

Fieleke, Norman S. *The Welfare Effects of Controls over Capital Exports from the United States.* Princeton Essays in International Finance, No. 82 (Princeton, N.J.: Princeton University, 1971).

Goldfeld, Stephen M. and Richard E. Quandt. "Some Tests for Homoscedasticity", *Journal of the American Statistical Association,* 60 (June 1965), pp. 539–47.

Harberger, Arnold C. "Vignettes on the World Capital Market," *The American Economic Review,* Papers and Proceedings of the 92nd Annual Meeting (May 1980), pp. 331–37.

International Monetary Fund. *International Financial Statistics Supplement on Exchange Rates,* 1981.

Kane, Edward J. *Economic Statistics and Econometrics*(New York: Harper & Row, 1968), pp. 373–79.

Kenen, Peter B. *Capital Mobility and Financial Intergration: A Survey.* Princeton Studies in International Finance No. 39 (Princeton, N.J.: Princeton University, 1976).

McKinnon, Ronald I. "The Exchange Rate and Macroeconomic Policy: Changing Postwar Perceptions," *Journal of Economic Literature,* XIX (June 1981), pp. 531–57.

Organisation for Economic Cooperation and Development. *National Accounts, Vol.I, 1951–1980,* 1982.

Sachs, Jeffrey D. "The Current Account and Macroeconomic Adjustment in the 1970s,"*Brookings Papers on Economic Activity,* 1 (1981), pp. 201–82.

U.N. *Yearbook of National Accounts Statistics, 1979* (New York: U.N. Publications, 1980).

U.S. President. *Economic Report of the President Together with the Annual Report of the Council of Economic Advisers* (Washington, D.C.: Government Printing Office, 1982).

Whitman, Marina v.N. "International Interdependence and the U.S. Economy," in William Fellner, ed., *Contemporary Economic Problems 1976,* (Washington, D.C.: American Enterprise Institute for Public Policy Research, 1976), pp. 183–223.

World Bank. *World Tables,* 2d ed. (Baltimore: The John Hopkins University Press, 1980).

———. *World Development Report* (New York: Oxford University Press, 1981).

Discussion

Stanley W. Black*

One theme of this conference has been that from the point of view of economic growth, one is interested in *national* saving, so that policies which merely reshuffle saving between different groups in the economy do not add to domestic capital accumulation. Reshuffling abroad counts too. Domestic saving that is invested abroad of course adds to national wealth. But it does not add to the domestic capital stock. As we have been forcefully reminded in the last few years, the United States is not a closed economy, and this paper usefully raises the question of the extent to which increases in national saving are likely to result in changes in domestic or foreign investment.

It came as something of a surprise to most international economists when Martin Feldstein and Charles Horioka concluded on the basis of cross-national regressions that capital was basically not very mobile between countries in the long run. After all, we had spent the last 10 years arguing over and testing the hypothesis that short-term capital was perfectly mobile between countries and even perfectly substitutable between assets denominated in different currencies. In the long-term area, the analysis of multinational corporations is a highly developed subfield. No matter that for some of us a purely neoclassical analysis of long-term investment misses most of the interesting problems. No matter that the evidence does not now seem to support perfect substitutability of assets denominated in different currencies. We were still convinced that capital was substantially mobile between countries. One can argue that short-term capital mobility is high on the basis of covered interest differentials as shown in Fieleke's Chart 1. The volume of private international long-term investment flows has also been large during the last 10 years of recurrent current-account deficits in oil-importing countries.

So I am very pleased that Norm Fieleke has taken on the job of confronting the Feldstein-Horioka conundrum. Or is it a conundrum? The basic idea, as Norm points out, was to regress long-term average investment/GDP ratios on long-term average saving/GDP ratios across a group of industrialized countries. With a coefficient of approximately unity, this seems to imply that increased domestic savings go entirely into domestic investment, "in the long run." The basic problem with this approach, as Fieleke convincingly points out, is that the saving and investment rates are jointly determined. I would add that they are jointly determined even in the long run by what neoclassical economists called productivity and thrift. And these factors differ significantly between countries. Furthermore, saving

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and investment are connected by a well-known identity, and the net foreign balance component of that identity often shifts around suspiciously like a random variable.

Norm Fieleke concentrates his analysis on size as a determinant of both saving and investment, but I think he could go even further. To illustrate, I ran the following cross-national regression on ratio data for 23 OECD countries, averaged over the period 1960–1980:

$$G/Yi = .004 + .998\ T/Yi \qquad R^2 = .895$$
$$(13.7)$$

In this regression G/Yi is the average 1960–80 ratio of government spending to GDP in country i and T/Yi is the average ratio of government receipts to GDP.[1] On the basis of this regression one might be tempted to conclude that governments always spend their revenues and do not borrow in the long run! Well, I doubt if many of us would be likely to accept that conclusion as relevant for economic policy questions. As Rudy Penner has just pointed out, G/Y has risen faster than T/Y in the United States in recent years and is expected to fall by less in the near future. So if the Feldstein-Horioka regressions are not reliable, how should we approach the question of the degree of long-term capital mobility? Fieleke's paper tries several alternatives. First, in Tables 2 and 3, he reruns the Feldstein-Horioka regressions and some additional ones for net foreign investment using levels instead of ratio data, after converting savings, investment, and GDP into dollar terms. I also have reservations about these regressions for several reasons. First, I believe that size as measured by GDP is not the only underlying cause of differences in national saving and investment rates. Other factors, such as the rate of growth of output or productivity and demographic factors such as the dependency ratio have been found to have significant influences on cross-national differences in saving rates and therefore investment rates, as indicated by studies reviewed in the OECD background paper available to conference participants.[2] If that is the case, such factors should definitely be taken into account.

Second, the Sturm and Blades paper indicated that changes in the definiton of saving can affect the cross-national distribution of savings ratios. If the adjusted ratios were close to uniform across countries, then the statistical regression would tend to break down. A cursory look at their results does not suggest that definitional changes will be very important, however. While the coefficient of variation of gross savings ratios declines from .20 to .15 with the adjustment for consumer durables, the variance of savings ratios remains about the same, with most of the difference attributable to an

[1]Data from *OECD Economic Outlook, Historical Statistics, 1960–1980.* (Paris: Organization for Economic Cooperation and Development, 1982), Tables 6.4, 6.5. Data include all OECD members except New Zealand.

[2]See Franco Modigliani, "The Life Cycle Hypothesis of Saving and Intercountry Differences in the Saving Ratio," in W. A. Eltis, M. F. Scott, and J. N. Wolfe, eds., *Induction, Growth and Trade* (Oxford: Clarendon Press 1970), pp. 197–225.

increase in the mean of savings ratios. Other factors seem to have even less impact on the dispersion of savings ratios.

More fundamentally, it seems to me that a simultaneous equation approach is needed to sort out the long-run factors determining domestic saving and investment rates and therefore net foreign investment. This would undoubtedly be a formidable job and is clearly beyond the scope of Fieleke's paper. George von Furstenburg has made such an effort for the United States in an article in the IMF Staff Papers, so perhaps he can comment on the difficulties of this approach in the general discussion.[3]

Fieleke's next attack on the problem is to examine time series data on current account balances in a group of OECD countries. The data in Tables 4 and 5 show no trends. Table 6 indicates the relatively greater reliance on foreign borrowing (or lending) that is typical of smaller countries, as Fieleke notes the inverse correlation between size and average absolute current balances. Table 6 further shows that current accounts are quite variable, which is not news to people who try to forecast their movements. This is the basic piece of information that ought to enable us to dispose of the Feldstein-Horioka contention. The issue of capital mobility as it affects saving and investment behavior should be related to capital movements at the margin, that is, in response to some change in saving or investment incentives. The fact that on average most capital is invested at home is not relevant to the question.

Fieleke goes on to point out that cumulative current account imbalances do not appear very large according to his data. This, as he notes, could be in response to policy reactions to current account imbalances. Recently I have estimated a series of monetary policy reaction functions that attempt to determine what internal and external factors appear to be causing changes in the instruments of monetary policy in 10 OECD countries.[4] I found that current accounts as proxied by trade balances were significant determinants of policy reactions in the 1960s and 70s for France, Japan, and the United Kingdom. Some indicator of external imbalance, not always the current account, appeared to be significant for all 10 of the countries in my sample, although the apparent magnitude of response to external factors varied considerably from case to case. The United States had the smallest response to external factors and the United Kingdom the largest, at least before Mrs. Thatcher took power.

These findings support Fieleke's view that some part of the long-run stability in current accounts that is evident in the data arises from economic policy. One reason for such policies may be the "noneconomic" objective of minimizing foreign control over domestic industry or resources, which is evident in France, Japan, Canada and elsewhere. Another reason particularly relevant in a period of floating exchange rates is unwillingness

[3]George von Furstenburg, "Domestic Determinants of Net U.S. Foreign Investment," *IMF Staff Papers* 27(4) (December 1980), pp. 637–678.

[4]Stanley W. Black, "The Use of Monetary Policy for Internal and External Balance in Ten Industrial Countries," in J. Frenkel, ed., *Exchange Rates and International Macroeconomics* (Chicago: University of Chicago Press, 1983 forthcoming).

to accept the exchange risk inherent in large foreign currency debt obligations. And even if governments are willing to assume such risks, limits to foreign borrowing exist even for OECD countries and occasionally are reached, as witness the cases of the United Kingdom and Italy in 1976.

Fieleke's paper concludes with an extension of the Feldstein-Horioka methodology to a larger group of countries, with findings that appear to contradict the Feldstein-Horioka results. For reasons stated above, I do not think this evidence is very strong in either direction and would prefer to see the analysis pursued in some other way.

If the question is the mobility of long-term capital, I believe the correct approach is to test the responsiveness of direct foreign investment to factors affecting its profitability. I think the results of such tests support the conclusion that capital is rather mobile. If the question is mobility of *short-term* capital, then evidence on arbitrage and risk premia in forward markets is relevant information. Here again, I believe the tests support the conclusion that capital is rather mobile.

I have recently heard the view that it is inappropriate to look at the capital account of the balance of payments for such information, that we must look instead at the determinants of domestic saving and investment behavior. But these are simply two sides of the same coin, as a quick look at the national income or flow of funds accounts should tell us. Whether it is easier to explain foreign investment by itself or as the difference between total investment and domestic investment is a tactical research question, not an issue of principle.

Let me conclude with some remarks about implications for policy. I don't think we can analyze the effects of incentives to savings and investment without considering the possibility that their impact leaks abroad. It should be no surprise that the investment tax credit applies only on domestic investment. The strenuous debates over deferral of tax on foreign source income and the foreign tax credit-versus-deductibility issue should alert us to the stake that major U.S. corporations on the one hand and unions on the other have in foreign earnings and investment. Offshore assembly is important for U.S. firms and increasingly for foreign firms operating in the United States. These kinds of location decisions are influenced, if not determined, by tax considerations. But to find out how they respond, I think we must look to disaggregated data, not to cross-national data on long-period averages of aggregated data.

Reflections on Saving Behavior

Robert M. Solow*

Economics needs no special excuse to study the determinants of saving. It is one of those perennial questions always on the agenda. I remember being taught that the Founding Fathers, among them Hume and Smith, had definite views about saving behavior. (I even think I remember being taught that they held a rather sociological theory—thrifty bourgeois merchants, spendthrift hereditary landlords—and *The Fable of the Bees* contains the same suggestion.)

Nevertheless, it is no accident—as we deep-thinkers say—that a conference on government policies affecting saving should be taking place right now. There has clearly been an upsurge of interest in the subject, in this country and elsewhere. One source of curiosity was the apparent fall in reported household saving rates in the United States after 1970 and more particularly after 1975. That may turn out to have been a nonevent, partly a measurement error, partly a short-run phenomenon, partly a shift to other forms of saving, we are still not sure. But whether it happened or not, it helped to focus attention on the saving rate. A more substantial impulse came from the international comparisons, now refined and analyzed in the valuable OECD work of Sturm and Blades. At a time when the U.S. economy felt itself to be losing out in competition with other countries, especially West Germany and Japan, both in international competitiveness and in general economic performance, it was natural to ask: what do they do that we don't do? Clearly one of the things they do is to save and invest a larger share of aggregate income.

Now, of course, raising the saving rate has become a declared object of national policy. The arguments offered on behalf of the policy are not always cogent; and the particular policy measures proposed are not always effective. But it is easy to see why questions about saving behavior are now of special interest. A question can be of interest without being interesting: think of the somewhat related fuss about imminent "capital shortage" just a few years ago. As I mentioned at the very beginning, however, the study of saving is a hardy perennial. It is so closely connected with other aspects of social and economic structure that the basic questions may never be permanently settled. As the dairy industry used to say about milk, you never outgrow your need for the study of saving behavior.

To the eye of an economic theorist, those large international differences in saving rates are the obvious target for explanation. Reasonable people may differ about the capacity of econometrics to make fine analytical distinctions between parameters. But if theory can contribute anything

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to the study of actual saving behavior, it ought to be able to give a meaningful account of the possible sources of gross differences like those we see across countries in the figures of Sturm and Blades.

Here a digression is in order. In making international comparisons, we can choose among the household, private, and national saving rates. A believer in the applicability of the Ricardo-Barro equivalence theorem would choose the national saving rate. If the government budget can neither absorb private saving through deficits nor supplement it through surpluses, because households will take whatever offsetting actions are needed to enforce their own intertemporal plans, then it will be the national saving rate that registers the intentions of the private economy. (There is no further implication that public policy is powerless to influence the saving rate. Nobody doubts that a shift from income taxation to a consumption tax would induce an increase in national saving at a given level of economic activity. Any regulation that affects the private incentive to save could do as much. It is only the aggregate budget process that has no force.) Someone like Penner or me, who believes that the Ricardo-Barro proposition is a poor guide to the way the world actually works, will conclude that a country's national saving rate is in part a political decision. Whether that decision is made sensibly or not, economic theory will have little to say about the public component of international differences. The choice of an object for analysis will be between the household saving rate and the private saving rate. I prefer the aggregate private saving rate, because any wealth-oriented theory of saving will suggest that increments of asset value, wherever they are located, will be of approximately equal relevance to the saver. It may be noticed that this is the sort of reasoning that, carried much further, leads to the Ricardo-Barro proposition. That is as it should be, because one of my objections to the Ricardo-Barro view is precisely that it carries a reasonable idea too far, and asks it to function in inappropriate circumstances.

Well, then, why is the private saving rate in the United States x percent and that in Japan 2x percent? There is one sort of explanation that hardly ever occurs to an economist contemplating those figures, but might be the first thought in the mind of a civilian. The Japanese save more because they are the sort of people who save; they are naturally thriftier than we are. Or perhaps they live in a culture that inculcates and values the habit of thrift and the results of thrift more than ours does. Such a response would not have seemed strange to Alfred Marshall who, if not a Founding Father, is certainly a Great Uncle. When he came to consider saving behavior (in the *Principles*) Marshall wrote: "(T)he causes which control the accumulation of wealth differ widely in different countries and different ages. They are not quite the same among any two races, and perhaps not even among any two social classes in the same race. They depend much on social and religious sanctions . . . (T)he chief motive of saving is family affection."

If that were the correct answer to the question, it would be a matter of some importance for the agenda of this conference. The main reason we are struck by the high Japanese saving rate is because we wonder how the U.S. saving rate could be made to look more like it. If the anthropological explanation were the right one, it would suggest strongly—though it does

not prove—that there is not much public policy could do. However much we might wish to achieve a Japanese saving rate, and even if we wished it for the right reasons, it is idle to suppose that we would or could Nipponize our culture, the socialization of our children, our attitudes toward the old or to the family, or whatever it would take to achieve the goal. (This is only a suggestion and not an air-tight argument because nobody believes that nature and/or nurture determine the saving rate to two decimal places. Even an unthrifty society can be induced to save more by economic incentives. It just seems unlikely that differences as large as those between top and bottom in the international pecking-order could be obliterated unless economic incentives were driven intolerably far; and maybe not even then.)

Having raised that question, I want to sketch an economic theorist's answer to it. Most of us hold to a life-cycle theory of saving in one form or another. As several participants in this conference have argued, the life-cycle model is not an unmitigated success; for example, it has difficulty in accounting for the cross-sectional distribution of wealth by age. Nevertheless, that is the vehicle I shall use. For my purpose, familiarity and general acceptability are all-important. It would do me no good to invent an *ad hoc* theory of saving for checking out the significance of "anthropological" variations in the parameters. It comes easily to mind, for instance, to enter wealth itself in the representative saver's utility function (and no doubt this would help to explain the continued saving of the old); but after having remarked sagely that a stronger preference for wealth would lead one to save more, I would have no well-worn standard with which to compare parametric variations.

Even within the life-cycle context, I shall simplify, though I am not happy about that. In particular I ignore uncertainty (because it is difficult to deal with and has ambiguous effects on saving), liquidity constraints (because it is known that their binding presence encourages saving), and social security (because its effects are the subject of current controversy.)

In the absence of uncertainty, then, saving arises for two reasons. The first is what Harrod called "hump-saving": accumulation and decumulation of assets arising because the representative household wants a lifetime consumption pattern that is smoother than its lifetime profile of earnings. Saving for retirement is the most important factor here. The hump of assets is built up during the working life and run down during retirement. It is well understood that this mechanism causes the saving rate to depend on the age distribution of the population. A rapidly growing population will have relatively fewer households of retirement age and relatively more still working, and therefore generally a higher saving rate. (The burden of supporting minor children must also be factored into such calculations.) The second reason for saving is the accumulation of a bequest to be passed on to the next generation. (The existence of uncertainty about income and costly contingencies generates a precautionary motive for saving as well.)

Sociological and cultural influences on saving behavior enter an economic model like this primarily through parameters describing tastes. In the life-cycle framework, there are three points at which tastes must be specified: (1) a time-preference or utility-discount rate, (2) a weight to be

attached to the bequest motive, and (3) the choice of an instantaneous utility-of-consumption function, especially its concavity, which will affect the desired degree of consumption-smoothing. It is worth pointing out that the major analytical discussion in the literature of international comparisons from the life-cycle point of view—Franco Modigliani's 1970 article—simply dismisses the possible significance of intercountry differences in taste with the remark that the parameters of the saving function do not seem to be very responsive to such forces within the relevant range of variation. Modigliani concludes that ". . . all the evidence supports both qualitatively and quantitatively the role of the two principal variables suggested by the life cycle model, productivity growth of income and the age structure of the adult population. Furthermore, these variables appear to account for two-thirds to four-fifths of the inter-country variance in the saving ratio." That would leave some room for policy, but not a lot, because it is farfetched to imagine the age distribution as a tool or object of policy, and the rate of productivity growth is not easily controllable either, in practice.

Until quite recently there has been little discussion of even something as "obvious" as the bequest motive as a source of intercountry differences in saving rates. I have the (casual) impression that this neglect was more or less accidental. In the early days of life-cycle theory, it was natural for Modigliani and others to assume away the existence of bequests in the search for the simplest formulation of the theory that would highlight its most novel feature, the emphasis on hump-saving. Then a well-known paper by James Tobin used carefully constructed numerical examples to show that hump-saving alone could generate substantial net saving in a growing population. Tobin concluded that ". . . it seems quite possible that life cycle saving can account for the United States capital stock." The combination of convenience and parsimony tended to favor playing down the bequest motive.

Lately, however, the opposite conclusion seems to have gained force. Numerical calculations by Betsy White imply that pure life-cycle saving by itself can not generate a realistically high volume of saving. Unfortunately such numerical experiments are not very transparent. Söderström comments: "The reason why White and (Tobin) reach such different conclusions is not quite clear. Since their models are similar in general design, the reason has to be sought in differences of details, and those are numerous . . . (O)ne can only say that details are very important." That is bad news for the theorist. Nevertheless, White's results at least suggest that it might make sense to supplement hump-saving with the desire to accumulate a bequest. Söderström's own contribution is entirely consistent with this suggestion. He too does numerical exercises with a model in which there are no planned bequests. But there is uncertainty about time of death, and so some individuals die unexpectedly soon, owning positive net worth which is passed on to survivors. These transfers (also unexpected) will be saved, at least initially, and show up in measured aggregates. In Söderström's formulation of the life-cycle model, these unplanned bequests turn out to be very important. The model can generate saving rates as high as those observed (in Sweden, to which the model is calibrated) and even higher.

Finally, Kotlikoff and Summers proceed differently, though still within the framework of the life-cycle theory of saving. Instead of making hypothetical calculations to show what the theory would predict for reasonable parametric specifications, they look at profiles of earnings and consumption by age to estimate the stock of life-cycle wealth directly. They find that life-cycle wealth accounts for only a small fraction of aggregate private wealth in the United States. They say: "The evidence presented in this paper rules out life-cycle hump saving as the major determinant of capital accumulation in the U.S. economy. Longitudinal age-earnings and age-consumption profiles do not exhibit the kinds of shapes needed to generate a large amount of life-cycle wealth accumulation . . . Intergenerational transfers appear to be the major element determining wealth accumulation in the United States."

My tentative conviction is that this view of the matter is essentially right. It is reinforced by general qualitative considerations. The natural temporal habitat of a theory emphasizing the life cycle ought to be periods of 50–100 years. Over historical time, the impression is inescapable that successive generations start (economic) life with larger per capita endowments of tangible wealth than their predecessors. Since the distribution of wealth is known to be highly concentrated, this description need only apply to the relatively small group of families owning among them a large share of the capital stock. But then it becomes important to understand how the bequest motive influences the saving rate.

I want to report one primitive experiment along this line. It is too crude to provide more than a hint that there is something worth exploring, but I have limited myself to what could be done with pencil and paper and a small hand calculator. The version of life-cycle theory I adopt is essentially that described by M. Yaari.[1]

The representative individual is born (at age 20, say), works for 45 years, lives in retirement for 10 more years, and dies. The population is constant and so, in this one-person-shay world, the age distribution is uniform. An individual born at time zero starts with an inheritance that I set equal to some multiple of the annual wage at time zero. (Later I put that multiple equal to one, so the representative person inherits wealth whose present value discounted back to age zero (calendar age 20) is one year's pay at the wage ruling at time zero.) The annual wage is independent of *age* but grows exponentially through time at $100g = 2$ percent a year. So everybody of working age at time t earns $y_0 exp(.02t)$. At birth, the individual disposes of the present value of the rising earnings over a 45-year work-

[1]After the conference was over, Peter Sturm called my attention to a characteristically lucid article by Michael Farrell ("The Magnitude of 'Rate-of-Growth' Effects on Aggregate Savings," *Economic Journal* LXXX (Dec. 1970), pp. 873–894) that I had missed. It is exactly in the spirit of my paper, though with much more extensive computation. As its title indicates, Farrell's work is aimed at the sensitivity of the saving rate to the rates of growth of population and earnings, whereas I fix those. It is hard to compare his results on other parameters with mine, but there is to my eye some hint that "incidental" details may matter. This suggests a lot of handles for policy, but also warns that surprises are easily possible.

ing life, plus the inheritance already described. The (real) interest rate is constant at 3 percent a year.

The same individual, at birth, plans consumption over a 55-year life span. S/he maximizes

$$\int_0^{55} e^{-jt} u(c)dt + kv(b)$$

where j is a rate of time preference, $u(.)$ is the instantaneous utility-of-consumption function, and $kv(b)$ is the utility of contemplating a bequest of amount b to one's descendant. I imagine the bequest to be paid out at death. The number k is a parameter carrying the strength of the bequest-motive. I set $j = .01$ and have not bothered to try other values. We know about the qualitative influence of time preference on the propensity to save. At $j = .01$, a person at age zero discounts utility at age 55 by about one-half. Some economists have experimented with rates of time preference as high as $j = .04$. In that case, the discount factor over a 55-year life span is one-tenth; from the vantage point of age 38, I can *feel* that must be wrong. As usual, I have taken $u(c) = c^{1-h}/(1-h)$ and experimented with a few values of h in the range from $h=1$ to $h=2$. I have also taken $v(.)$ to be the same function as $u(.)$, even to the same value of the elasticity parameter. It is simply a great arithmetical simplification to do so, and there is nothing much against it. I will come back to the bequest-parameter k later on.

The choice of a consumption profile is subject to a constraint that I need not write down in detail. It merely requires that the present value of the inheritance plus the present value of earnings over the working life equal the present value of the bequest plus the present value of consumption over the life span. All this discounting is done at the interest rate $i(=.03)$, so there is a tacit assumption that the capital market is perfect. Many others have studied the effect of a social security scheme in this context, so I ignore that question.

The rest is routine. Optimal consumption at age a is proportional to $exp((i-j)a/h)$. Since I have the interest rate (.03) bigger than the utility discount rate (.01), optimal consumption grows throughout the lifetime. The return on savings is big enough to overcome normal impatience. If $h=1$ (the logarithmic utility function), consumption grows at 2 percent a year. If $h=2$, so that the marginal utility of consumption falls considerably faster, consumption grows at only 1 percent a year over the lifetime; greater smoothing is achieved.

The *level* of the consumption profile and the size of the optimal bequest are determined together to meet two conditions. Consumption at any age could always be made a little bit larger or a little bit smaller; with due allowance for interest earnings, any such variation in saving can be translated through time into a corresponding change in the bequest. Optimality requires the obvious utility-balancing at the margin. In addition,

of course, the consumption level and the bequest are tied together through the lifetime budget constraint.

The first result I want to report is about the sensitivity of the saving rate to variations in the bequest parameter (called k). The model can be calibrated to give results that are not outlandish. For instance, with the specifications already made (time preference rate = .01, productivity growth rate = .02, interest rate = .03, working life = 45 years, lifetime (from age 20) = 55 years, inheritance at age zero = one year's wage at that time), the choice $h = 1$, $k = 0.7$ leads to the following results: the optimal bequest is (approximately) equal to one year's wage at the time of bequest, and an aggregate saving rate of about 12 percent. The optimizer thus leaves a bequest equal to $exp(55(.02)) = exp(1.1) = 3$ times the inheritance s/he had received 55 years earlier, but that just allows for rising incomes. In calculating the saving rate, national income is defined as aggregate wage income plus interest at 3 percent on the aggregate wealth of the population summed across the uniform age distribution. By the way, with these parameters, the wage share in aggregate income is about 85 percent, and the wealth-income ratio is about 5:1.

Now suppose the bequest parameter is changed to $k = 0.8$, with the rest of the specification as before. The size of the optimal bequest rises by about 15 percent. But the aggregate saving rate does not change at all to two decimal places. If k is reduced to 0.5, the optimal bequest is 30 percent lower than with $k = 0.7$, but again the saving rate moves imperceptibly.

Obviously I should spend my spare time replicating these calculations for other parameter-sets, for a growing population, for alternative initial inheritances, etc. For now, I interpret the model as saying that modest changes in each generation's concern for its heirs will have very little effect on the aggregate saving rate. Since more than modest changes in such attitudes are not likely to be achievable, there is not much to be gained in that direction. The intuitive reason why modest changes in the bequest motive have so little effect on the saving rate must be something like the following. If the bequest is the order of magnitude of one year's income, then the intention to accumulate a somewhat larger estate will not call for any large increase in saving in any given year. The added saving effort will be spread over a lifetime according to the standard marginal equivalences. The effect on the saving rate will be further moderated by the extra interest income earned *en route*. It seems likely that this generalization will be approximately true even if the target bequest is a bit bigger than one year's earnings so long as it constitutes a number of years' earnings, that is, small compared with the working lifetime.

The implication for international comparisons is trickier. It is clear from the mathematics that a sufficiently large value of k can drive consumption toward zero. So it is possible in principle that Japanese save more than Americans primarily because they just get much more satisfaction from providing for their heirs. Somehow I doubt that; but it would take comparative data on inheritances and incomes to check it out.

The second preference-indicator is h, the concavity-parameter. Here the story is rather different. I go back to $k=0.7$. With logarithmic utility, $h=1$, the bequest keeps pace with earnings, and the aggregate saving rate is 12 percent. Let $h=1\frac{1}{2}$, so the representative saver experiences more sharply diminishing marginal utility of consumption and thus is more risk-averse, more desirous of smoothing consumption over the lifetime. Someone with $h=1\frac{1}{2}$ leaves a bequest about a quarter smaller than someone with $h=1$, but such a population's saving rate falls only to 11 percent. If, however, we set $h=1.75$, the bequest falls another 6 percent below the level at $h=1$ and the saving rate drops to $7\frac{1}{2}$ percent; and at $h=2$ (a value recommended by Ragnar Frisch, I think) the saving rate falls drastically to 4 percent. Evidently the effects of this parameter are strongly nonlinear, and the impact on the saving rate can be dramatic.

Remember that these calculations automatically equate the elasticity parameters in the utility functions for bequests and for own consumption. That was done for mere arithmetical convenience, though it is perhaps not bad to assume that tastes which saturate more quickly with respect to consumption will do so also for bequests. Anyway, it is pretty clear that the main effect of sharper concavity is to reduce the desired rate of growth of consumption over the lifetime, to favor the early low-income years. It seems to me entirely possible that the sort of difference in tastes captured by variations in h could dominate international comparisons.

That would be a pessimistic conclusion from the policy standpoint. There are some puzzles, however. It goes against deeply entrenched clichés to conclude that Germans and Japanese save more than Americans because they are insatiable gamblers, while we are unambitious conservatives who soon tire of the pleasures of high consumption. But of course the difference, if there is one, need not refer to personality type. It could reflect institutional differences that favor or disfavor the conversion of a rising income stream into a more nearly level consumption profile. That effect could be modified by policy, though it is hard to imagine how a democratic government would justify depriving its citizens of borrowing opportunities they have customarily enjoyed.

Another cliché, that Americans are more oriented toward the short run than others, that we "want it now," does suggest itself. That sounds more like a statement about time preference, however. I commented earlier that small values of the time-preference parameter (in the neighborhood of .01) sound most plausible. A little experimentation shows that minor variations around so small a rate of discount do not have dramatic effects on the saving rate. The possibility remains that there may be very large intercultural differences in time preference. They would, of course, strongly affect the saving rate in a well-understood way. It is not clear that economic policy could, or should, do anything to increase a private saving rate that is low because citizens do not care much about the future. If there is a social rate of time preference that is systematically smaller than the private rate, for the sorts of reasons that have been discussed in the literature, it would seem more straightforward to give effect to the social interest through the government's contribution to the national saving rate.

My conclusions from these "anthropological" experiments are on the whole pessimistic. Small changes in the bequest-motive and in the rate of time preference have only small effects on the saving rate. Drastic changes would no doubt have large effects, but there is no opening for economic policy in that observation. No democratic government could or should try deliberately to generate big changes in the preferences of its citizens, especially not when the parameters in question may have deep cultural roots and are not obviously self-destructive.

The case of the concavity parameter is slightly different. It is far from clear what constitutes a "small" difference in the elasticity of the marginal utility of income, but one has the impression that the saving rate is fairly sensitive to changes in the speed with which marginal utility diminishes. It is tempting to think of this parameter as measuring risk-aversion; if it is "too much risk-aversion" that makes the saving rate "too small" then, even if public policy can do nothing about preferences, it can certainly do something about the degree of risk to which private savers are exposed. But there is no uncertainty in the simple model I have used as a trial horse. We know from other models that do admit uncertainty that there are offsetting effects to be dealt with. Strong risk aversion (rapidly diminishing marginal utility of income or wealth) favors saving to protect the saver against painful unfavorable contingencies, and also works against saving because the added interest income is not much valued. Under certainty only the latter effect operates; a high value of h goes against saving in order to achieve a flatter lifetime consumption profile. Somehow I doubt that governments will have much luck in preaching either the Puritan ethic or the pleasures of the pot of gold at the end of the rainbow.

The life-cycle model has something to say, in principle, about the effectiveness of interest rate variations in stimulating saving. As Marshall knew, of course, there are offsetting effects; bequests, for instance, are cheaper to accumulate but it takes less saving to accumulate them. The net effect can go either way. In the model used here, it turns out that a rise in the real rate of interest from 3 to 4 percent does indeed increase the saving rate: from 12 to a bit under 15 percent in the base case. Tobin does not address that question directly in his simulations with a life-cycle model, but his calculations seem to imply a similar favorable effect of higher interest rates on saving. White's calculations with an apparently similar model produce the reverse effect: a higher interest rate is accompanied by a lower saving rate. This finding points up Söderström's discouraging remark that the details seem to matter in these models. It might be worth someone's effort to discover just why these two experiments yield contradictory answers to important questions, but it is hard to imagine who would go to the trouble.

When theory suggests offsetting forces, one says we are faced by an empirical question, but in some ways that is even more discouraging. Over the years, we had come to accept a piece of folk-econometrics: no one had succeeded in finding a reliable interest rate effect on saving, and so macroeconomics proceeded on the presumption that the saving rate was effec-

tively independent of the interest rate. But now first Boskin and then Summers claimed to have found a significant and substantial positive effect in U.S. time series. In principle, why not? The passage of time adds new observations, more sophisticated statistical techniques, and clever new formulations. Still more recently, however, Friend and Hasbrouck have reviewed the new evidence and concluded that it will not stand up. It is too sensitively dependent on particular definitions, particular sample periods, and particular formulations. The only robust result is the old folk result.

The sad part of this story is the suggestion that applied econometrics could become a forensic subject. One fears that econometric testimony about the effect of interest rate changes on saving—or the effect of unfunded social security wealth on private saving, to take another prominent and relevant example—is on the same footing as psychiatric testimony about John Hinckley's sanity. That is to say, it provides moral support for one side or another, but no one would confuse it with scientific evidence. In this state of affairs, it seems plain that robustness is the prime econometric virtue. On that basis, there is no solid intellectual foundation for the notion that feasible variations in the after-tax return to private saving are a good way to increase the share of private income saved.

Economic theory could have something to say about a logically prior question: is there any good reason to desire a higher private saving rate than there actually is? The natural place to look for an answer is in the theory of optimal capital accumulation, with the caution that so abstract a theory can not be asked for more than order-of-magnitude indications of the socially optimal saving rate. To avoid complications, I shall limit myself to steady-state calculations.

Right at the start, there is a subtle distinction to be made. The literature contains two versions of the quantity "society" should be thought to be maximizing. One version suggests

$$\int_0^\infty e^{-at} c^{1-h}/(1-h)\, dt.$$

The notion is pretty much as before: $c^{1-h}/(1-h)$ is the (social) utility of a per capita rate of consumption equal to c, and a is a rate of (social) time preference. This discounted social utility is to be maximized subject to initial conditions, a given time path for the labor force, and a technology that converts accumulated capital and available labor into an output that can be used either for current consumption or for capital accumulation. Under generally acceptable technical assumptions, it is traditional to show that the optimal policy drives the saving rate to a steady-state value

$$s^* = \frac{gb}{a+n+hf}$$

where b is the (Cobb-Douglas) elasticity of output with respect to capital input, f is the rate of (labor-augmenting) technical progress, n is the rate of growth of the labor force, and $g=n+f$ is the "natural rate of growth" of the economy.

I happen to prefer this formulation. The literature also suggests an alternative, in which the integrand above is multiplied by e^{nt}. The idea is that society "credits" itself at each instant not with the discounted social utility of consumption per head but with that quantity multiplied by the number of people enjoying the representative utility level at that instant. There is no point in arguing the pros and cons here; obviously this alternative formulation leads to a larger optimal steady-state saving rate if the population is growing, because it pays to shift consumption to the future, when there will be more people. This higher optimal saving rate can easily be seen to be

$$s^{**} = \frac{gb}{a+hf}.$$

To get a feel for the magnitudes, suppose we put $n = .01$ and $f = .02$ (although this may be an optimistic figure after so many years of stagnating productivity). Then $g = .03$. I continue with $a = .01$, as if the social rate of time preference were the same as the private discount rate used in the life-cycle calculations. I owe to Peter Sturm a reminder that the use of these formulae as bench marks calls for explicit attention to the difference between gross and net saving and gross and net income. In theory, optimal saving rates are net concepts. In practice that means being careful about the value assigned to the elasticity b. (I would add that the breadth of the capital concept must also affect b.) In the United States, capital consumption allowances in the national accounts run about 10 percent of GNP. That suggests a value of b between, say, .15 and .20.

Then s^* ranges from 11 to 15 percent if $h = 1$, and from 8 to 10 percent if $h = 2$. Setting the social rate of time preference equal to zero, as Frank Ramsey thought proper, would increase s^* to 15–20 percent with $h = 1$ and 9–12 percent if $h = 2$. Going back to $a = .01$ but setting $f = .01$ leaves s^* at 15–20 percent if $h = 1$ and makes it 11–15 percent if $h = 2$. The alternative formulation leads to larger values of s^{**}, going as high as 22½ percent at its maximum.

What should a reasonable person make of this? The numbers are not to be taken literally, of course. But I do not think they are totally irrelevant. Policy talk sometimes seems to take it as axiomatic that it would be a Good Thing to promote a higher saving rate. Even an excessively formal model like this one has the merit of forcing one to provide reasons. The classical reason for Growthmanship still holds: if private savers discount the future more drastically than "society" ought, then private saving will fall short of the social optimum. One could make the same argument in terms of a difference in the relevant risk premia for private decisions and social decisions. I notice with regret that the slippery concavity parameter h turns out to be important here too, but I don't know that one can make much of that, for reasons already mentioned.

Do we actually save too little? Presumably it is the national saving rate that should be compared with s^* (or s^{**}). Presumably also at least some of the Sturm-Blades adjustments should be made to the current figures from the national accounts; logic would seem to call for the inclusion of consumer durables and at least public nonmilitary durables in the total. In those terms, the gross national saving rate in the United States is at least 24 percent, and shows no downward trend, according to Table 13 in Sturm and Blades. In net terms, the adjusted saving rate must be close to 15 percent. That is in the ballpark bounded by the theory of optimal capital accumulation, and could even be on the high side. Even without consumer durables, their figure is 18.6 percent. Robert Eisner rightly calls attention to the fact that these are all steady-state calculations. If other countries are moving up to their steady-state capital stocks, while the United States is more nearly there, a further reason for the observed international difference emerges. Leaving aside the arguments about divergence of private and social costs and benefits, the possibility exists that it doesn't matter much that we don't know how to fix the saving rate, because it ain't broke.

There is, after all, something fishy about the current enthusiasm for saving incentives. In the first place, as I have just argued, no very good reasons have been proposed for believing that the national saving rate in the United States is too low. (I do not count merely pointing at Japan as a reason, although I would be happier if we understood the Japanese economy better.) Nor do the data of Sturm and Blades suggest that the national saving rate has been falling. Taking a longer period of time would almost certainly reinforce that finding.

Secondly, as Jump argues convincingly for Canada, the incentives that have been proposed and enacted for increasing the household saving rate are uncertain, maybe even perverse, in their effects. In this country, no one argues that the All-Savers Certificates, for instance, generated any measurable *ceteris paribus* rise in personal saving. If it were desirable to engineer an increase in the household saving rate, there are more effective ways: a shift from the taxation of income to the taxation of consumption is one obvious possibility, though I hasten to add that so drastic a change would need to be considered from many points of view, especially since the need for more personal saving is not firmly established. The particular incentives for saving that have been proposed—in Canada too, apparently—are so uniformly in danger of turning into mere lump-sum transfers to the well-off, that a person with even an ounce of healthy cynicism is bound to wonder if that were not their primary purpose.

Third, whatever the long-run need for national saving may be, there is no intelligible case to be made that the volume of plant and equipment spending in the United States is now or in the near future limited by an inadequate willingness to save. At a time when capacity utilization rates are below 70 percent and not visibly going up, it is hard to believe that an investment boom is waiting to be touched off by incentives for personal saving. (I noticed that Secretary Regan is trying to direct the public's attention away from the prime rate, because he thinks that it gives the impression

that the level of interest rates is higher than it actually is. He said something about our need to get people into the banks and borrowing. Are we all Keynesians again?) As several papers in this conference have noted, it would make far more sense to be thinking about sweetening the inducement to invest than about raising the propensity to save, and Auerbach's paper shows how it can be done.

Fourth, this whole line of argument suggests the wisdom of a policy direction that will be nostalgically familiar to at least two Old Growthmen in this group: a shift toward easier credit and tighter fiscal policy, with the first looking after the inducement to invest and the second providing the saving through the public budget. It goes without saying that Old Growthmen know full well that this is a policy that makes sense only when the economy is operating near its normal capacity to produce.

Which brings me to my fifth and last point. There is an incomparably larger source of personal saving waiting to be tapped than any fiddling with the taxability of interest could generate. If I may give it a name, how about the multiplier process? The GNP gap can hardly be a lot less than 9 percent of current output. I do not know what the best estimate of the marginal national propensity to save is, but if the short-run multiplier is a little less than two, the national marginal propensity to save—counting in retained earnings and induced tax revenues—must be close to one-half. So a mere closing of the gap would add 4 percent of GNP to the national saving rate. I understand the dangers of overheating an economy not yet out of the inflationary woods; and I realize that any initial expansionary impulse might come in part from a step reduction in public saving. The point of this exercise is only to underline the wisdom of Penner's willingness to trade stimulus later for stimulus now—which I would make more overt—and to remind you "where the saving will come from."

REFERENCES

Boskin, M. "Taxation, Saving and the Rate of Interest," *Journal of Political Economy,* Vol. 86 (1978)

Friend, I. and J. Hasbrouck. "Saving and After-Tax Rates of Return," Mimeo (1982).

Kotlikoff, L. and L. Summers, "The Role of Intergenerational Transfers in Aggregate Capital Accumulation," *Journal of Political Economy,* Vol. 89 (1981) 706–732.

Modigliani, F. "The Life Cycle Hypothesis of Saving and Inter-country Differences in the Saving Rate," in W. A. Eltis, M. F. G. Scott, J. N. Wolfe, eds. *Induction, Growth and Trade,* (Essays in honor of Sir Roy Harrod) Oxford: Clarendon Press, 1970, 197–225.

Söderström, L. "The Life Cycle Hypothesis and Aggregate Household Saving," *American Economic Review,* Vol. 72 (1982) 590–596.

Summers, L. "Capital Taxation and Accumulation in a Life-Cycle Model," *American Economic Review,* Vol. 71 (1981).

Tobin, J. "Life Cycle Saving and Balanced Growth," in Fellner et al., eds., *Ten Economic Studies in the Tradition of Irving Fisher,* New York: Wiley, 1967, 231–256.

White, B. "Empirical Tests of the Life Cycle Hypothesis," *American Economic Review,* Vol. 68 (1978) 547–560.

Yaari, M. "On the Consumer's Lifetime Allocation Process," *International Economic Review,* Vol. 5 (1964) 304–317.

Discussion

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When I read Bob Solow's elegant paper, I thought I had a few things to say. After then looking at all the other papers, I realize that everything has been said before. I can only make a few remarks from, as it were, an intuitive perspective rather than with theoretical rigor or econometric analysis. I fear that Bob is correct in suggesting that this discussion of whether to stimulate saving has some of the aspects of the discussion of John Hinckley's sanity. It is always pro domo. No matter what you hear about what kind of tax change is needed, it always ends up with a tax benefit for the speaker or his constituency. I am just as suspect here as anybody else.

I share the perplexity as to the need for accelerated growth. I used to feel quite strongly about that need, mostly on the grounds of international power relationships and also in order to ward off domestic pressure for redistribution. I feel a little less hopeful now that those things are going to be resolved by accelerated growth, but I think growth is still a desirable objective. However, I also feel uncertain whether accelerated investment is the way to get accelerated growth. Bob Solow was one of the first to cast doubt upon that seemingly obvious proposition. One proposition that I think is reasonable is that if we want more investment, then we need more savings. To fiddle with investment makes sense only if that produces more saving. The only way in which encouraging investment will raise saving is if by raising investment, we first raise interest rates and if saving then responds positively to that higher interest rate. As Bob has pointed out, on a folkloric basis that is a mute subject. We do not know if there is an effect or not.

As far as Bob's parting shot is concerned to the effect that given present-day excess capacity and unemployment, there is really no need to worry about saving, I would say yes to that in a short-run view. But when one fiddles around with anthropological parameters and thinks that maybe one can change various propensities of the population, one does have to allow some time. Over that time, the Federal Reserve and the Congress may get us back to a higher rate of capacity utilization.

Let me look at some of the motives for saving that appear in Solow's paper, beginning with the life cycle hypothesis. Somehow it seems to me that in this particular area, economists are dealing with motivations as if they were looking at an alien species; they are not looking at human beings but at an ant hill and are trying to explore why they run in one direction or another. It seems to me that the life cycle hypothesis violates a very basic instinct—the acquisitive instinct. People do not like to decumulate. Once they have got something, they like to hold on to it. They are aware that they

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cannot take it with them, and they are also aware that if they could, it would only melt there. Nevertheless, I think there is a profound reluctance to use up one's savings. You see that in the way people have organized their savings. If we wanted to implement the life-cycle hypothesis in our personal lives, then presumably we would all be buying annuities. Now we are, of course, buying some annuities as well as relying on Social Security. We rely quite heavily on pension funds and some life insurance. These usually take the form of an annuity. But the great bulk of savings, I think, is still in discretionary rather than contractual form. People could have changed that by relying more heavily on pension funds and on life insurance but they have not. They invest in deposits, they invest in money market instruments, they invest in securities and real estate. The Federal Reserve flow of funds tells us that these are the bulk of investment.

Now look at the bequest motive. Everybody has a desire to leave his children a good education. That is one bequest everybody makes who can. They like to make this bequest early in life. Perhaps that is another reason for including investment in human beings in total savings, with education as part of total investment expenditure.

Other than that, the bequests that Bob analyzes are really very small ones. Two or so years' income is not very much, and it is not only too little, it is also too late. By the time a person's life expectancy expires at 75 or so, his children are not very far from retirement themselves and they do not need the bequest. Moreover, they are probably making a great deal more than daddy, at least if their daddy is in the academic line, and so he really is not doing a great deal for them. There may be some sense of social obligation here, and being near Newburyport puts me in mind of the late John P. Marquand and *The Late George Apley.* You may recall in that book that there is a scene where George's father tells him how to use his money. You take your income, the father says to George, and divide it in two equal parts. One part you set aside for saving. He does not say for bequests, he just says "save it." The other half you again divide into two equal parts, one of which you give to charity, and the other half, which is one-fourth of the total income, you spend for your living needs. Now that was a good bourgeois attitude, just like the bourgeois attitude that a man should not retire until he has enough to maintain his standard of living in retirement and still save a little. As you know, the data we have on our aged seem to say that although they may not be maintaining their standard of living, nevertheless, they are still saving. This acquisitive instinct, I think, is at work rather than a bequest motive.

Last, I turn to the precautionary motive that Bob mentioned. The paper first eliminates uncertainty and later admits it. By eliminating uncertainty, Solow arrives at a very peculiar proposition, namely that risk aversion reduces saving, and that is quite true. If there is no uncertainty, then the concavity parameter has only the effect of making people want to have a flat income stream throughout their lives rather than to accumulate capital. Therefore, they do not react to interest rates and they save little. But as soon as you give up the certainty postulate and admit uncertainty, there is a very powerful precautionary motive for saving. The great risk of the

saver, of course, is to outrun his original life expectancy. If he does not want to invest in an annuity that would eliminate that risk, he can avoid it by planning on living to 100 or 110. We know, of course, that no one ever reaches his full life expectancy on the day of his death, but looking ahead there is a great deal of exposure to be covered if one wants to be completely sure. We see the strength of the precautionary motive in the differential saving behavior in particular social groups. Farmers save more because they are exposed to risk, the self-employed save more because they are exposed to risk. That seems to be a very powerful factor.

As for the determinants that take the form of interest rate and, I would note, inflation, I have nothing to add to the findings. We have a study at the Board by Steindel which does find a positive effect of interest on saving. Bob knows that study, and I am not telling him anything new. I could give you some purely anecdotal evidence. We get complaints from automobile dealers who report people come into their showroom and say they have $5,000 or $10,000. They say they could buy a car for cash but they are getting 15 percent on their money market mutual fund and they hate to give that up. That seems to be an influence of the interest rate on saving even though the person probably has money illusion because after taxes he is probably still getting the negative real rate.

As for the effect of inflation on saving, that seems to pose a problem similar to that of the rate of interest on saving. Is it positive? Is it negative? Inflation influences the real rate of return. What is the real rate of return after tax? That we have to think about. We do not know which way that pushes the saver. We do know that the borrower borrows more as inflation reduces his real rate after tax.

But far more important, of course, is the effect of inflation on accumulated past saving. If we were talking here about what I would really like to discuss, we would not talk about how to increase saving, but how to make it possible for people to keep the savings they already have. I know, of course, that for everybody who loses from inflation there is somebody else who gains, including these days the federal government which behaves exactly as if its dissaving were responsive to inflation. Its debt is reduced and it responds by borrowing more. In any event, the impact of inflation on past saving, through its redistributive effect, seems to me to be far more serious than the impact on new saving whatever that would be. It creates a degree of uncertainty in people's lives—the difficulty of knowing how to put your children through college, the difficulty of knowing how to provide for old age. It is very curious that, in the midst of this uncertainty, there have not been greater changes in the savings ratio of the United States than we have observed.

I suppose you were made aware yesterday there seemed to be a tremendous drop in the savings ratio in the United States in the second half of the 1970s. Excellent papers were written about it. I have with me a paper here from the Federal Reserve Bulletin dated August 1980 that analyzes this phenomenon. Unfortunately, in January 1981 and July 1982 all these shortfalls were largely revised away. Now we have got to find a new set of

reasons for a different set of phenomena. The savings ratio has indeed been remarkably constant and this is in the face of a great deal of uncertainty on the part of people who do the saving. But these people have one other way out and that is to rely increasingly on the federal government. Under conditions of inflation, you cannot rely on what you may get from your insurance company. You cannot rely on the money you put in the savings bank, or government bonds, because it may be inflated away. The only party that can give you certainty is the federal government with an indexed pension and Social Security. That is a very troublesome situation. It is surprising that we have not developed indexed bonds. I cannot believe that the risk would be all that high even for private issuers. If firms can deal with 10 percent wage increases, why can't they deal with an increase in interest costs? I think the real reasons why private borrowers have not developed indexed bonds is that interest is tax deductible. Presumably the inflation premium in an indexed bond would not be deductible.

Let me turn to some of the measures we might take other than to manipulate the anthropological parameters. First, it seems to me that something could be done about the income tax treatment of inflation with respect to holding gains. I realize that as soon as someone says do not tax inflationary holding gains, somebody else will mention the tax deductibility of interest. These two things have to be weighed against each other. Something clearly should be done about the capital gains tax. The British have done something very interesting. All inflation gains after a certain date are nontaxable; that has enabled them to issue an indexed bond and to make the inflation premium in that bond nontaxable because it is identical with the rate of inflation. Today, the capital gains tax for people who acquired their assets long ago is really a tax on capital and not on gains. Something could be done about the estate tax if one were really minded to protect saving. The estate tax is paid almost wholly out of saving. It presumably ought to influence people's desire to make bequests but apparently all it does is influence their desire to make a tax-exempt bequest to Yale, Harvard, or MIT rather than leave it all to their children. There is the possibility, that Bob discussed, of a consumption tax. One could certainly shift the balance of saving and consumption in that way. Finally, a budget surplus to my mind would add to saving. I cannot believe, and I do not see, that people respond to this large government deficit by increasing their own saving. At least in the short run, there is a strong dissaving element in the posture of the federal budget.

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