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Saving in the United States: How Has It Changed and Why Is It Important?

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Summary

How much we save as a nation has significant consequences for the economy. Saving is that share of income that is not consumed. By saving more now we can raise our living standard in the future. Because it is not consumed, it is available for investment in new capital as well as replacements to the existing capital stock as it wears out. A growing capital stock is an important contributor to increases in productivity and thus a rising standard of living.

Whether or not we are saving enough as a nation is of considerable relevance to a number of public policy issues, including how to reform Social Security, whether or not to balance the federal budget, and the efficacy of individual retirement accounts and other forms of private saving incentives.

There is concern that we are not saving enough. While the *personal saving rate* averaged nearly 7% of gross domestic product (GDP) in the 1970s and 1980s, it fell during the 1990s, and in 2000 fell to near zero. *Total gross national saving* averaged 19.7% of GDP during the 1970s, but fell to an average of 17.1% during the 1990s. In recent years, the national saving rate has recovered somewhat. During the 1990s, *total private saving* fell, but, during the same period, increased *public sector saving* more than offset the decline. Clearly, during that period, without the emergence of significant public sector budget surpluses, the national saving rate would likely have fallen further. More recently, in part due to federal government budget deficits, national saving has fallen.

Saving from domestic sources is insufficient to provide for all of domestic investment. As a result, we are importing resources from abroad. Prior to the 1980s, the United States was a net supplier of saving to foreigners. During the 1980s and 1990s, however, we have been importing saving from abroad at an average of 1.5% of GDP. This net inflow of foreign capital has consequences. In order to invest funds in the United States, foreigners must first buy dollars. That raises the foreign exchange value of the dollar. The rising dollar in turn makes imports cheaper and U.S. exports more expensive. The result is a trade deficit that mirrors the net inflow of foreign capital.

Raising the national saving rate has become a priority to some policymakers. Two routes have been used to achieve this goal. One has been attempts to reduce the federal budget deficit. In the 1990s, this policy was so successful that a substantial surplus was temporarily achieved. This approach to raising the national saving rate was supported by a wide spectrum of economists. The second approach has been to attempt to raise the household saving rate by giving preferential tax treatment to a specific form of household saving, the IRA. The effectiveness of this approach is unclear and it does not share the same widespread support among economists.

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Saving in the United States: How Has It Changed and Why Is It Important?

Saving is considered by many to be synonymous with thrift, which is usually thought of as simply putting money aside in a bank, or buying stocks and bonds. Economists, however, have something broader in mind than putting money in a bank or adding to one's holdings of financial assets. For them, saving represents that portion of total national output that is not used for consumption. As such, it represents output or resources that can be used to create, sustain, and expand the nation's stock of capital.[1]

While the nation's capital stock is often thought of in tangible terms as the machinery, equipment, and structures that are needed to produce output, it also has an important human dimension. This consists of the skills and knowledge of its labor force, its entrepreneurial skills, social organization, etc. — factors that are essential in making the best use of the existing stock of physical capital to produce goods and services, creating new physical capital, improving its efficiency over time, and innovating new ways to produce output.

Thus, a nation's capital stock has both a tangible and intangible component, and the act of saving frees resources to create, renew, and expand both tangible and intangible capital. The growth of this capital over time is closely linked to the growth in the material well-being of a nation's citizens. Growth in per capita real income over time is an important measure of the ability of an economy to "deliver the goods."

When an economy disappoints, in the sense of being unable to deliver a continuously rising standard of living or a standard that rises at the same rate it did historically, economists are often led to investigate the growth rate of the capital stock, and this leads inevitably to an investigation of the saving rate. There is a widespread perception that the U.S. economy has come up short in this regard over much of the past 25 years. For this reason, the national saving rate has come under scrutiny. Whether or not we are saving enough as a nation is of considerable relevance to a number of public policy issues, including what to do with rising budget surpluses, how to reform Social Security, and the efficacy of individual retirement accounts and other forms of private saving incentives.

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[1] The word *saving* is used in this report rather than *savings* for an important reason. In the lexicon of economics, saving refers to the flow of a nation's output which is not consumed. Savings carries a somewhat different connotation: it is generally used as a synonym for wealth, and refers to the stock of assets that have been accumulated as a result of saving a portion of the nation's output.

Investigating the causes for the international differences in economic performance often leads to an investigation of the differences in national saving rates. These differences have been an important part of some explanations for the occasionally lackluster performance of the U.S. economy.

Thus, from both a national and international perspective, concern has arisen about the adequacy of the U.S. saving rate.

The Measurement of Saving

The basic measurement of saving for the United States comes from the National Income and Product Accounts (hereafter NIPA) prepared by the Bureau of Economic Analysis (BEA) of the Department of Commerce. Some may presume that saving is done primarily by individuals or households. While this is an important component of domestic saving, it is not the only source. Saving is also done by businesses and by all levels of government (the "public sector"). Moreover, since the United States is an integral part of the wider world economy, it both supplies saving to and absorbs saving from the rest of the world.

In this section, the various components of aggregate saving will be identified, private saving will be distinguished from public saving, and both private and public will be combined in a measure known as national saving.

In order to define and measure the different saving rates and to organize the discussion, as well as provide some analytical tools for the subsequent discussion of policies toward saving, it is necessary to explore in greater detail the concept of saving found in the NIPA.

Gross domestic product (GDP) can be calculated in two different ways; first by adding up all of the income earned in the production of goods and services, and second by adding up the value of all the goods and services produced. To measure saving, it is necessary to make use of both.[2]

Measures of income can be used to obtain estimates of saving done by the private sector. On the income side of the accounts, GDP is computed by adding up all of the payments made to those who supply inputs (the "factors of production") towards the production of the nation's output of goods and services. These factor payments consist of wages and salaries, interest, rent, and profits. The income recipients then use this income for the consumption of domestically produced goods, for paying taxes, for buying foreign goods (imports), and for saving.[3] Total or gross

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[2] Gross domestic product measures all output produced in the United States regardless of who owns the productive factors. Gross national product (GNP), on the other hand, measures all output produced by American owned factors of production regardless of where they are domiciled. For the United States, the two measures have been virtually the same over time.

[3] Since many governments operate programs which transfer income from one group of (continued...)

private sector saving, then, represents income that is *not* used for the first three purposes.

The private saving rate measures more than just saving by households. The NIPA break down private saving into two parts: that done by households, also referred to as personal saving, and that done by businesses. Household or personal saving consists primarily of the saving of individuals and the profits that are retained by noncorporate businesses (proprietorships). Business saving includes the profits retained by corporate businesses and the depreciation allowances of all businesses, both corporate and noncorporate.[4]

To measure public sector saving and the national saving rate, the alternative or "product measure" of GDP must also be used. On the product side of the accounts, GDP is measured by adding together the nation's expenditures on final goods and services. Such expenditures fall into four categories: the spending of households on the consumption of domestically produced goods and services, the spending of households and businesses on capital goods or investment, the spending of government (or the public sector) on goods and services, and the spending of foreigners on goods and services produced in the United States (or exports).

Since both the income and product approaches measure a common variable (GDP), the sum of the components of each must be equal. Thus, consumption + taxes + imports + saving must be equal to consumption + investment + government + exports. Since consumption appears in both measures of GDP, it can be dropped in the computation of national saving. That leaves taxes (less transfers), or T, + imports, or M, + private saving, or S, which is equal to investment, or I, + government purchases of final output, or G, + exports, or X. Mathematically this is:

$$T + M + S = I + G + X$$

which, after rearranging, gives:

$$S + (T - G) + (M - X) = I$$

This equation yields two important relationships. First, it provides a definition of aggregate saving as the sum of private saving, the net budget position of the public

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[3] (...continued)
citizens to another, taxes, as measured in the GDP accounts, are net of these transfer payments.

[4] Part of total business output is allocated to the replacement of existing capital as it wears out. This part is referred to as depreciation or capital consumption allowances. Since it is output not consumed, it is regarded as saving. It is only a component of "gross" saving, however, because it does not add to the stock of wealth. The distinction between "gross" and "net" saving is explored in more detail below.

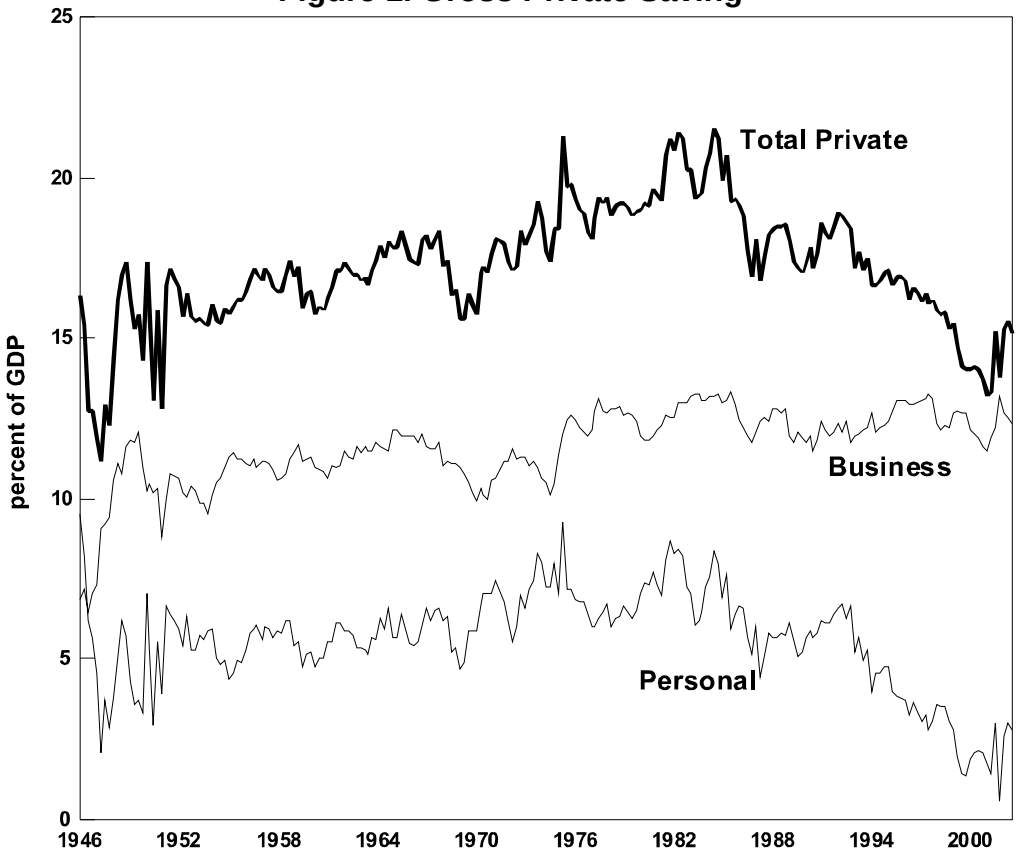
sector (i.e., the difference between taxes less transfers and government expenditures for final output), and the status of the nation's balance of international payments (the difference between the import and export of goods and services).[5] Second, it says that investment is equal to aggregate saving. This establishes the importance of saving to the capital formation of the nation. Should domestic investment change over time, the proximate cause for the change can be traced to changes in private saving, the budget position of the public sector or the balance of international payments.

Data on Various Measures of Saving

Having defined the various measures of saving, the figures and tables below depict their behavior and importance over the post-World War II era.

Private Sector Saving. **Figure 1** shows the gross saving rate of the private sector and the contributions of its two components. Several important observations are worth making. First, the major share of private sector saving is due to businesses and consists of corporate retained earnings and the depreciation allowances of all businesses. Personal saving has played a smaller role.

Figure 1. Gross Private Saving



Source: Department of Commerce, Bureau of Economic Analysis.

[5] Basically, the balance of payments concept used here is close to what is known as the current account of the balance of payments.

TABLE 1. Gross Private Saving
(As a Percentage of GDP)

1950 - 1959	16.2
1960 - 1969	17.1
1970 - 1979	18.5
1980 - 1989	19.2
1990 - 1999	16.8

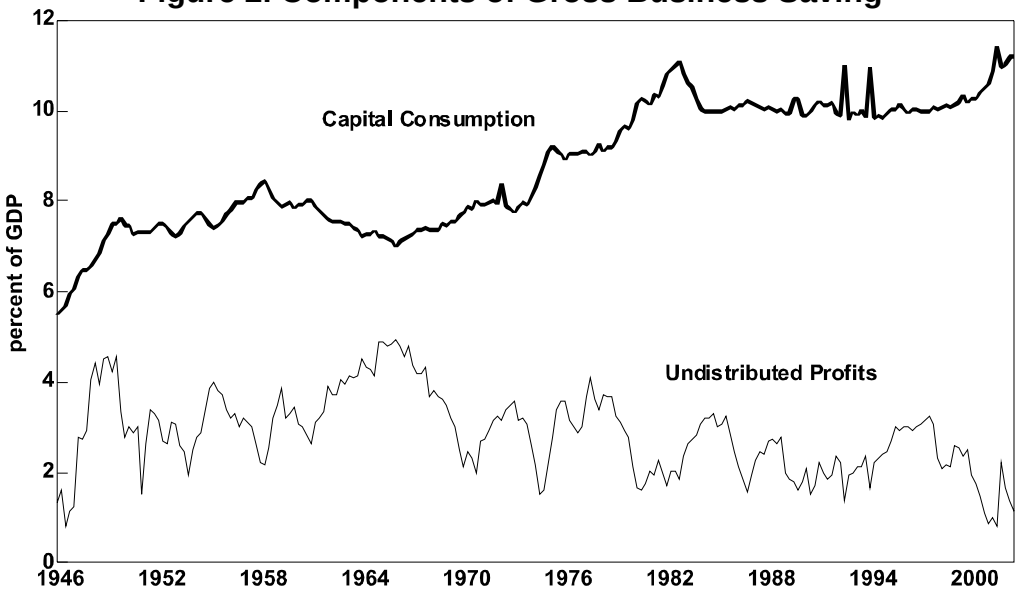
Source: Department of Commerce, Bureau of Economic Analysis.

Second, while the private sector saving rate over the longer run has tended to be stable for fairly long periods of time, it can vary considerably on a year-by-year basis. Some of this is due to the influence of the business cycle. The rate tends to fall in cyclical downturns and rise in upturns.

Third, since the early 1980s, the personal saving rate has been declining and has recently been at or near all-time lows, whereas the business saving rate has held up well over this same period. The decline in the personal saving rate accounts, in part, for a decline in the gross saving rate since the mid-1980s.

In **Figure 2**, the business saving rate is divided into its two components; capital consumption, or depreciation, and undistributed profits, or retained earnings. Until the early 1980s, an increasing proportion of gross business saving was accounted for by capital consumption allowances with a decreasing proportion accounted for by undistributed profits. Some of the rise in capital consumption allowances, up to 1982, reflects the rising proportion of total investment accounted for by short-lived assets (e.g., business equipment as opposed to office buildings).

Figure 2. Components of Gross Business Saving



Source: Department of Commerce, Bureau of Economic Analysis

Because capital consumption allowances are such a large fraction of gross private saving, how they are measured is of importance since it can have a substantial effect on the net saving rate of the country. There has been some controversy over their measurement.[6]

Gross or Net Private Saving? When the gross saving rate is the focus of attention, personal saving is a relatively small fraction of the total. However, a large fraction of business saving in the form of depreciation allowances is destined mainly to replace the existing capital stock as it wears out, and does not increase the size of the capital stock.[7] A growing capital stock depends on the net saving rate, and from a net perspective, personal saving has been more important than the undistributed profits of businesses. Because of this crucial role, it is the decline in the personal saving rate that began in the last half of the 1980s, highlighted in **Table 2**, that has raised the concern of policy makers and has been the subject of considerable analysis by economists.[8] The reasons for this decline are discussed in a subsequent section.

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[6] One element of this controversy centers on the method used to compute capital consumption allowances. See: Goldstein, Henry. Should We Fret About Our Low Net National Saving Rate? *Cato Journal*. vol. 9, no. 3. Winter 1990. pp. 641-662.

[7] Later, the importance of gross versus net will be discussed in connection with investment and productivity. Some economists believe that gross investment is important because new capital that replaces existing capital is likely to embody new technologies and be more productive. Thus, even if no net investment occurs, so that the existing capital stock is just replaced as it wears out, productivity can still rise.

[8] For 2000, the personal saving rate was negative. Households consumed more than their disposable income.

TABLE 2. Net Private Saving
(As a Percentage of GDP)

	Personal Saving	Undistributed Profits
1950 - 1959	5.5	3.0
1960 - 1969	5.7	3.9
1970 - 1979	6.8	3.0
1980 - 1989	6.7	2.3
1990 - 1999	4.4	2.4
1990	5.8	1.8
1991	6.2	2.0
1992	6.5	2.0
1993	5.3	2.1
1994	4.5	2.1
1995	4.1	2.7
1996	3.5	3.0
1997	3.0	3.1
1998	3.4	2.2
1999	1.9	2.5
2000	2.1	1.6
2001	1.7	1.2

Source: Department of Commerce, Bureau of Economic Analysis.

Public Sector Saving. It may not be readily apparent that government (at all levels) spending and tax policies influence the national saving rate. Yet, when government gathers more revenue in taxes than it spends on purchases of final output or in transfer payments, it adds to the resources available for nonconsumption uses. Conversely, when it spends more than it receives in taxes, it absorbs resources that might otherwise be available for investment.

The public sector also owns a considerable amount of capital in the form of roads, bridges, harbors, canals, waterways, airports, etc. These, like capital in the private sector, are subject to depreciation. The NIPA accounts now recognize this depreciation, thus according government capital comparable treatment to private capital.[9] It also makes necessary a distinction between gross and net public saving.

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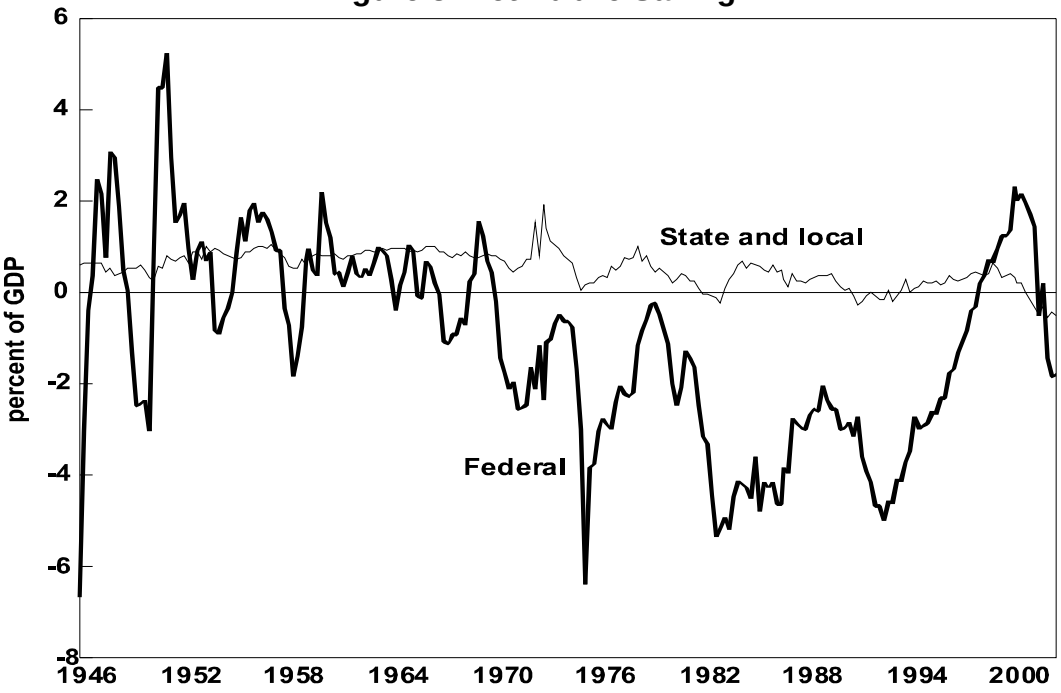
[9] This is a recent innovation in the NIPA accounts. Hitherto, all government expenditures were treated as consumption. Thus, the size and the depreciation of the government's (continued...)

The behavior of the two components of public sector saving is shown in **Figure 3**.[10]

Figure 3. Net Public Saving



Source: Department of Commerce, Bureau of Economic Analysis.

Throughout the post World War II period, state and local governments have made a positive contribution to gross national saving that, averaged over decades, has ranged between 1% and 2% of GDP (on a net basis it has been less than 1%).

After the Korean war ended in 1953, the budget deficits of the federal government were heavily influenced by the business cycle. The recession of 1973-75 led to the largest relative budget deficit in the post World War II period up to that time. Beginning in the 1970s, the federal government became a chronic dis-saver even when the economy was doing well. In 1997, the gross saving rate of the federal government was positive for the first time since 1971, even though its net saving rate in 1997 was a negative 0.6% of GDP.[11]

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[9] (...continued)
capital were ignored. It was treated as though it did not exist.

[10] If gross public sector saving rates were shown, the levels would be slightly higher but the pattern of variation would be similar.

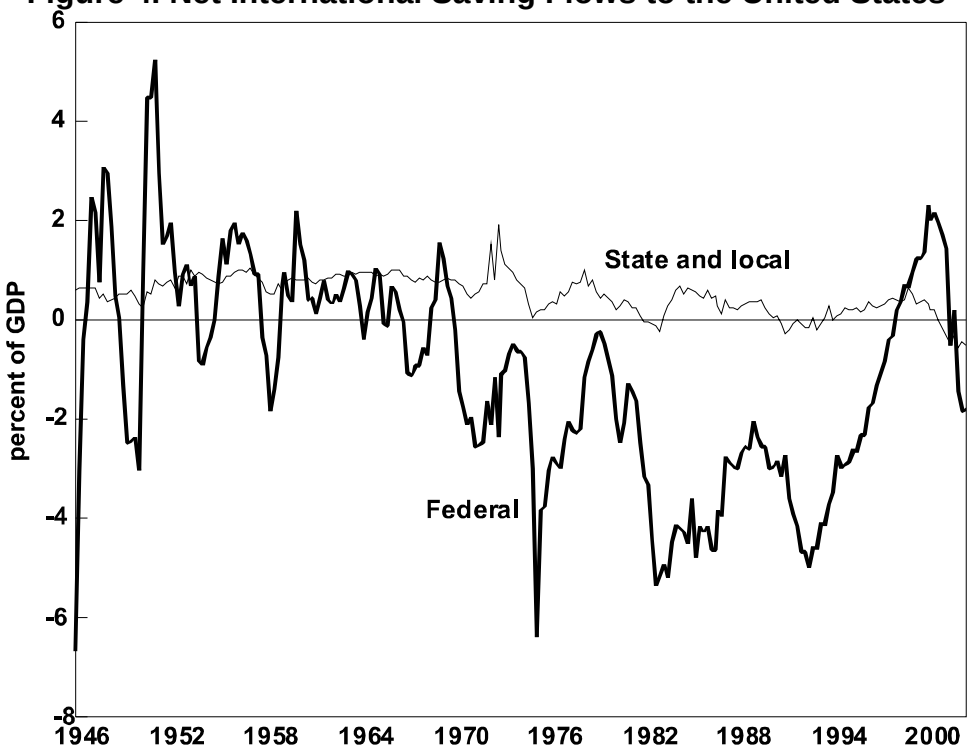
[11] Some of the variation in the federal saving rate arises because of periodic fluctuations of the business cycle. Saving rates based on CBO estimates of the standardized-employment budget deficit and potential GDP yield an average federal saving rate of -1.2% for the 1960s, -1.0% for the 1970s, -2.6% for the 1980s, and -1.6% for the 1990s. See. Congressional Budget Office. *The Economic and Budget Outlook: Fiscal Years 2002-2011*. January 2001.
(continued...)

Thus, beginning in the 1980s, the U.S. faced two developments that substantially reduced the available supply of domestic resources to augment the national capital stock: the fall in both the net private and public sector saving rates.

International Saving. As noted above, the U. S. economy does not operate in isolation. It is part of the world economy, which is becoming increasingly integrated. The United States is thus able to supply saving (lend) to the rest of the world and, at the same time, absorb saving (borrow) from other countries.

During its early years, the United States depended on foreign capital (saving) to an important extent. Until World War I, the United States was, on balance, a debtor nation. With the advent of World War I, that changed. The United States not only emerged from that war as an international power, but as a net creditor nation as well. This position continued until the 1980s, although, as shown on Figure 4, the fraction of U.S. saving lent abroad on an annual basis was never a large fraction of GDP.[12]

Figure 4. Net International Saving Flows to the United States



Source: Department of Commerce, Bureau of Economic Analysis.

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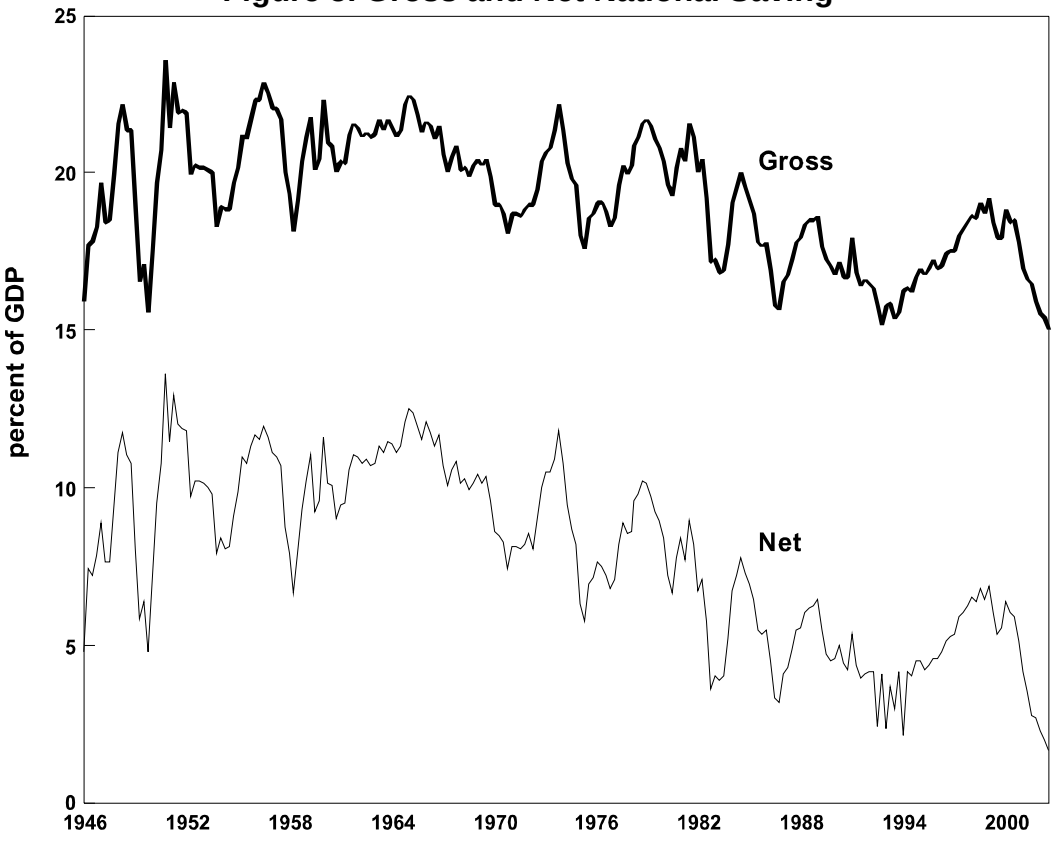
[11] (...continued)
p. 141.

[12] Notice that when the U.S. is a net lender abroad, it is shown as a negative fraction of GDP. This occurs because, to be a net lender, the export of goods and services must exceed the import of goods and services. In terms of the national saving equation on page 3, (M - X) is negative and lending abroad decreases saving available for domestic uses.

This behavior changed in the 1980s. The United States became a net absorber of the saving of the rest of the world. That inflow of foreign saving has recently risen above 4% of GDP. In one decade, the inflow of foreign saving was so large, that according to some estimates, the United States switched from being a net creditor to a net debtor nation. (At the least, the net creditor position of the United States was seriously eroded.) Notice, however, that an inflow of saving from abroad can help to ensure that some net investment takes place even if the dissaving of the public sector absorbs all of the net saving of the private sector.

National Saving. In **Figure 5**, the household, business, and public sector saving rates are summed to arrive at gross and net national saving (these measures exclude international saving). Over the long term, there has been a downward trend to these conventional NIPA saving data which in the mid-1990s was only temporarily interrupted.

Figure 5. Gross and Net National Saving



Source: Department of Commerce, Bureau of Economic Analysis.

Both the gross and net national saving rates displayed little trend in the first three decades after World War II. To be sure, the rates displayed some fluctuations. Both were heavily influenced by the business cycle since private and public sector saving fall in downturns and rise in upturns. Both the gross and net national saving rates were on a downward trend by 1980, a trend which shows up clearly in the decade average data in **Table 3**. This is surprising since the 1980s was a period of sustained economic expansion, an expansion that with the exception of the shallow downturn of 1990-91, continued into 2000. Most disconcerting is the experience that

began late in the 1980s. The net national saving rate, the basis for expanding the national capital stock, has fallen by more than one-half from its average over the period 1950-1979. This development does not bode well for the future growth in the material well-being of the nation.[13]

TABLE 3. Gross and Net National Saving Rates
(As a Percentage of GDP)

	Gross Private	Gross Public	Gross National	Capital Consumption	Net National
1950 - 59	16.2	4.5	20.7	10.5	10.2
1960 - 69	17.1	4.0	21.0	10.2	10.9
1970 - 79	18.4	1.3	19.7	11.1	8.7
1980 - 89	19.2	-0.8	18.5	12.5	6.0
1990 - 99	16.8	0.2	17.1	12.3	4.8
2000	14.0	4.4	18.4	12.5	5.9
2001	13.9	2.6	16.5	13.2	3.3

Source: Department of Commerce, Bureau of Economic Analysis.

What Factors Are Responsible For the Decline?

The proximate causes for the decline in the net national saving rate according to the NIPA can be seen in both **Tables 3** and **4**. Since net national saving results when capital consumption allowances are subtracted from gross national saving, any rise in depreciation, without a corresponding rise in the gross saving rate, can reduce the net rate. And, indeed, this has occurred. During the 1980s, and into the 1990s, capital consumption allowances relative to GDP were higher than they averaged over the 20 year period, 1950-1969.[14]

The data in **Tables 4** and **5** reveal some interesting developments relating to the decline in the net national saving rate in evidence over the last three decades. During

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[13] For a pessimistic assessment of the future consequences for the U.S. economy of a continuation of the low net national saving rate, see Harris, Ethan S. and Charles Steindel. The Decline in the U.S. Saving Rate and Its Implications for Economic Growth. *Federal Reserve Bank of New York Quarterly Review*, Winter 1991, pages 1-19. For a view that questions whether capital formation in the United States suffered as much in the 1980s as one might be led to expect, see Tatom, John A. U.S. Investment in the 1980s: The Real Story. Federal Reserve Bank of St. Louis *Review*. March/April 1989, pages 3-15, and Dewald, William G. and Michael Ulan. Appreciating U.S. Saving and Investment. *Business Economics*. vol. 27, no. 1, January 1992. pp. 42-46.

[14] This development again illustrates how important it is to obtain accurate measures of capital consumption allowances.

1970-79 and 1980-89, the federal budget deficit played the major role in the decline. The fall in the rate at which businesses retained earnings also played an important though lesser role, as did the fall in the personal saving rate during 1980-89.

TABLE 4. Contributions to the Net National Saving Rate
(As a percentage of GDP)

	1950 - 59	1960 - 69	1970 - 79	1980 - 89	1990 - 99
Personal	5.5	5.7	6.8	6.7	4.4
Business	3.0	3.9	3.0	2.3	2.4
State & local	0.8	0.9	0.7	0.3	0.2
Federal	0.9	0.4	-1.8	-3.4	-2.2
Total	10.2	10.9	8.7	6.0	4.8

Source: Department of Commerce, Bureau of Economic Analysis.

TABLE 5. Contribution of Each Sector to the *Decline* in the Net National Saving Rate[a]
(percentage of total)

	1970 - 1979	1980 - 1989	1990 - 1999
Personal	-51.0	6.0	189.4
Business	41.2	24.3	-1.7
State & local	8.8	13.4	12.0
Federal	100.9	56.3	-99.8
Total	100.0	100.0	100.0

Source: Department of Commerce, Bureau of Economic Analysis.
[a] negative sign means that sector made a positive contribution to the saving rate.

During 1990-99, the major role was played by the continued fall in the personal saving rate with a subsidiary role played by the fall in the budget surpluses of state and local governments. The decline in the budget deficits, and the emergence of surpluses, of the federal government contributed a substantial positive boost to the net national saving rate (thus a negative contribution to the decline in the saving rate), as did a minor increase in net business saving.

The personal saving rate is believed by economists to respond to a number of behavioral variables, and so much effort has been devoted to explaining its decline.

Some of the studies reviewed below have implications for national policies that might be used to reverse this decline.

Some International Comparisons

While the U.S. economy created an exceptional number of jobs during the 1980s and 1990s, real per capita income growth during the same period was substantially smaller than that achieved in the previous three decades. In searching for an explanation, many were struck by how much less Americans save in comparison with foreign countries. The data in **Table 6** show the gross and net national saving rates of the United States and the other G-7 countries. (The G-7 countries are all highly developed industrial nations that have substantial trading relations with each other).

Several conclusions can be drawn from these data. Not least remarkable is that saving rates differ markedly across the G-7 countries. For the United States, Canada, and the U.K., saving rates are below the others.[15] Between 1981 and 1992, the United States, Britain, and Canada all experienced significant declines in their rate of saving. Since then, however, those rates have rebounded, especially for Canada. Meanwhile, since 1992, Japan's saving rate has fallen substantially, although it remains well above saving rates in the other countries.

TABLE 6. Gross National Saving of the G-7 Countries
(As a percentage of GDP)

	Canada	France	Germany	Italy	Japan	U.K.	U.S.
1981	22.8	20.0	20.3	23.2	31.9	17.1	20.4
1982	20.1	18.8	20.3	22.8	31.0	17.0	18.5
1983	20.0	18.6	21.2	23.1	30.3	17.7	16.3
1984	20.8	18.3	21.6	23.1	31.2	18.2	18.5
1985	20.2	18.1	21.8	22.6	32.0	18.2	17.2
1986	18.7	19.4	23.4	22.4	32.2	17.3	15.4

[15] Net national saving for Japan may be significantly overestimated. In the Japanese national income accounts capital consumption is based on historic cost which results in a lower estimate of capital consumption than would replacement cost and thus raises estimated net saving. In the U.S. NIPA, capital consumption is based on replacement cost. Shifting to a replacement cost based measure of capital consumption would not change the fact that Japan saves at a higher rate than does the U.S. But, because estimated capital consumption for Japan would be higher, the estimated net national saving rate for Japan would fall and the difference between net saving rates in the U.S. and Japan would be reduced. See Hayashi, Fumio. Why Is Japan's Saving Rate So Apparently High? *NBER Macroeconomics Annual 1986*. pp. 147-210. An updated version appears as an addendum to chapter 11 in: Hayashi, Fumio, *Understanding Saving: Evidence from the United States and Japan*. For a discussion of the very high rate of household saving in Japan relative to the U.S., see: Horioka, Charles Y. Is Japan's Household Saving Rate Really High? *The Review Of Income and Wealth*. Series 41, Number 4 (December 1995). pp. 373 - 398.

	Canada	France	Germany	Italy	Japan	U.K.	U.S.
1987	20.0	19.6	23.1	21.9	32.7	17.4	15.9
1988	20.8	20.8	23.8	21.8	33.6	17.3	17.2
1989	20.0	21.6	25.1	21.0	33.6	17.1	16.7
1990	17.5	21.5	25.0	20.7	33.5	16.2	15.9
1991	14.9	20.9	23.3	19.6	34.4	15.4	16.1
1992	13.6	20.5	23.1	18.3	33.6	14.1	15.1
1993	14.2	19.0	21.9	19.2	32.0	14.0	15.0
1994	16.4	19.2	21.9	19.7	30.1	15.5	15.8
1995	18.5	19.5	21.8	21.6	29.6	15.8	16.4
1996	19.1	19.2	21.3	21.9	29.9	15.7	16.7
1997	19.9	20.4	21.4	21.6	30.2	17.0	17.6
1998	19.5	21.4	21.5	21.1	29.1	17.7	18.3
1999	21.0	21.8	21.0	20.7	27.6	15.8	18.0
2000	23.7	22.0	21.3	20.6	27.7	15.9	17.7

Source: Organisation for Economic Co-operation and Development.

There are those who look at these data and conclude that the slowdown in U.S. real income growth is largely self inflicted. It is said that we save too little, and that Americans consume too much, a tendency that was supposedly encouraged by the cuts in marginal tax rates in the early 1980s. These tax cuts, in turn, compounded the problem by turning the public sector into a large dis-saver.

International Saving Differences and GDP Accounting. It is possible that the conclusions drawn above regarding the U.S. saving rate, both when that rate is considered in isolation and when it is considered relative to other G-7 countries, are heavily influenced by how expenditures are classified in the GDP accounts. When some of these expenditures are reclassified, a more sanguine U.S. picture emerges.

There are several expenditures that are currently treated in the U.S. NIPA accounts as consumption for which a case can be made that they ought to be treated as if they were investments, or capital expenditures. When they are, those adjustments not only raise the level of the U.S. saving rates, but they also raise the U.S. rates relative to foreign saving rates. They accomplish the latter because they

are a larger fraction of GDP in the U.S. than abroad. Specifically, these are expenditures on education, research and development, and consumer durable goods.[16]

An important part of the capital stock of a nation consists of the skills, training, and knowledge possessed by its workforce — in short, its stock of human capital. The conventional NIPA do not treat educational expenditures that enhance and expand the nation's stock of human capital on a par with those for physical capital.[17] If they did, it would not only raise the U.S. saving rate, but raise it relative to those of most other countries since the United States spends a larger fraction of its GDP on education than do most other countries.

Perhaps the strongest case for reclassification concerns expenditures on research and development. These outlays are clearly aimed at enhancing future productivity and living standards. Yet business R & D spending is treated in the NIPA as a cost of current production which decreases the net profits and thus the saving of the business sector.

Household spending on residential housing is currently included as investment. But, all other expenditures on durable goods (e.g., automobiles, appliances, etc.) are treated as consumption.[18] Some argue that this inconsistency should be eliminated. Were this done, the U.S. saving rate would rise absolutely, and relative to other countries since American purchases of nonhousing durable goods are a larger fraction of U.S. GDP than is the case for most other countries.[19]

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[16] Government capital outlays for nonmilitary purposes are treated on a par with private investment. However, since military capital outlays are a larger fraction of GDP in the U.S. than in most other countries, their exclusion from investment can make a difference when international comparisons are involved. It should be noted that the type of adjustments to GDP accounts discussed here are those that change the national saving rate. There are a number of adjustments that, while they affect one or another of the component parts of the national saving rate, have at most a minimal effect on the overall rate. Some of these adjustments are discussed in Appendix B.

[17] Some economists include in educational expenditures the income that is foregone by those who give up jobs to enhance their human capital by going to school. See: Lipsey, Robert E. and Irving B. Kravis. *Saving and Economic Growth: Is the United States Really Falling Behind?* American Council of Like Insurance and The Conference Board. Report No. 901. 1987. See also: U.S. Congressional Budget Office. *Assessing the Decline in the National Saving Rate*. April 1993. 44 p.

[18] Of interest is the purchase of automobiles. When they are purchased by businesses, they are treated in the NIPA as investment; when purchased by households, as consumption.

[19] Lipsey and Kravis made adjustments of the type suggested in the discussion above with data from 10 countries over the period 1970 - 1984. They found that the fraction of U.S. GDP devoted to capital formation rises from 78% of the average of these countries to 92% of that average. In addition, they made two other adjustments. Since capital goods are cheaper in the U.S. than abroad, they want to compare real additions to capital relative to real GDP. When this adjustment is made, it raises the U.S. saving rate to nearly the average of eight other industrial countries for which a comparable adjustment can be made. Secondly, Lipsey and Kravis want to put U.S. capital outlays on a per capita basis. When they do, U.S. expenditures on the broad measure of capital was more than 120 percent of the

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While the reclassification of certain expenditures raises both the gross and net saving rates for the United States, making Americans appear more thrifty, and raising the U.S. saving rates relative to the average for other industrial nations, it does not alter the fact that the U.S. saving rates declined in the 1980s and 1990s.

The International Flow of Saving

The United States is part of the international economy and it both lends part of its saving to the rest of the world, and absorbs part of the saving set aside by the rest of the world. Throughout the 1980s and 1990s, the United States absorbed saving primarily from other G-7 countries. This increased flow of saving helped to sustain and increase the growth rate of the U.S. capital stock. In **Table 7**, the international saving behavior of the United States is added to the net national saving rate. The sum, representing the net saving available for investment in the United States, shows a decline of 40% between the 1960s and the 1990s compared to a decline of 56% when only domestic sources of saving are considered (the decline would have been 27% versus 45% if the 1970s had been used as a base for reference). However, it should be noted that while an inflow of saving helps to sustain domestic investment, that investment or capital is owned by foreigners and the income it earns must subsequently be subtracted from domestic output in computing the growth in well-being of a nation's citizens.[20]

TABLE 7. Net National Saving plus International Flow of Saving for the United States

(percentage of GDP)

	1960 - 1969	1970 - 1979	1980 - 1989	1990 - 1999
Net National Saving	10.9	8.7	6.0	4.8
Net Inflow of Capital	-0.6	-0.2	1.5	1.4
Total Net Saving Available	10.3	8.5	7.5	6.2

Source: Department of Commerce, Bureau of Economic Analysis.

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[19] (...continued)
average for eight industrial countries — it even exceeded the per capita rates for Germany and Japan. The ten countries used in the Lipsey-Kravis study were Canada, Japan, Austria, Denmark, Finland, France, Italy, Netherlands, Norway, Sweden, and the United Kingdom. See Lipsey, Robert E. and Irving B. Kravis. *Saving and Economic Growth: Is the United States Really Falling Behind?* American Council of Life Insurance and The Conference Board. Report No. 901. 1987.

[20] A country that is a net borrower should not necessarily be considered an economic invalid. Countries that have exceptional investment opportunities should be expected to attract foreign capital even over long periods of time. For much of its history prior to World War I, the U.S. was a net borrower. This inflow of foreign capital played a useful role in building the U.S. economy into a world power.

Summary

Saving, in the most simple terms, is the difference between income and consumption. But, translating that standard into a useful statistical measure can be complicated. The most commonly cited measures of U.S. saving are from the national income and product accounts (NIPA). These data are behind much of the concern regarding several saving trends in the United States. First, the personal saving rate is at its lowest in decades. This decline is the major reason for the continued low level of the national saving rate during the 1990s. Second, although the gross business saving rate has not fallen significantly, an increased share of it is accounted for by capital consumption so that net business saving has declined. This decline was especially important during the 1970s and 1980s. Third, public saving, primarily as a result of large federal budget deficits, was the important reason for the fall in the national saving rate during the 1970s and 1980s. In the late 1990s, however, public saving increased substantially, helping to offset the continued decline in personal saving. Overall, the NIPA data indicate a substantial decline in the U.S. national saving rate over the past 30 years, although the proximate cause of the decline varies over the period.

Other official measures of saving, those published by the Federal Reserve Board as well as those published by the Organisation for Economic Co-operation and Development (OECD), lead to similar conclusions. The United States, Canada, and the U.K. all experienced declines. The OECD data show that the United States saves a significantly smaller share of output than most of the other G-7 countries. These official measures of saving, however, are not necessarily the final word.

The adjustments to saving rates found in the Lipsey and Kravis study are just one example of the adjustments that have been made to published estimates of saving rates in a continuing effort to measure and understand saving behavior. Some of these adjustments improve the position of the United States relative to the average of other countries. They also moderate the historical decline in the U.S. saving rate.

Explaining the Personal Saving Rate

The discussion above, pointed out the importance of personal (or household) saving in the level of net national saving and its decline over the past several decades. Understandably, economists have attempted to explain this behavior.[21]

An early effort identified personal saving as depending only on disposable personal income, but this theory by itself could not explain the behavior over time of

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[21] The theories developed by economists are designed to explain both saving and consumption behavior. Since saving is the residual that results when consumption is subtracted from disposable personal income, these theories apply to both variables. See Friedman, Milton. *A Theory of the Consumption Function*. Princeton University Press. 1957, and Modigliani, Franco. Life Cycle, Individual Thrift, and the Wealth of Nations. *American Economic Review*. vol. 76, no. 3. June 1986. pp.297-313.

the personal saving rate.[22] More sophisticated explanations were required. The life cycle hypothesis has become widely accepted by economists as a framework for explaining personal savings.[23] In order to identify those variables that affect personal saving, it is necessary to explain briefly the life cycle theory.

This theory is based on the assumption that individuals, over their expected lifetime, seek to avoid sharp fluctuations in their levels of consumption. If that is the case, then consumers who are just beginning to work and who expect to experience rising income over the course of their career would be able to put off saving or borrow against future income in order to consume a large fraction of their current income. This would also apply to individuals who are near the end of their working life or are in retirement. They would be expected to live off the accumulated wealth and consume more than their current income. Those in their prime earning years, would be expected to save at a substantially higher rate than the other two groups. These individuals would be the main savers in the economy.

Thus, over the course of an individual's lifetime, periods of relatively high income are likely to be characterized by relatively high rates of saving. Periods of relatively low levels of income will likely by characterized by low (or even negative, e.g. borrowing) saving rates. The life cycle hypothesis assumes that typically over an individual's lifetime income will exhibit a "humped" pattern. That is, income will tend to be low early in life, relatively high as career earnings rise through the pre-retirement years and then drop off during retirement. The expected pattern would then be for those at opposite ends of the age spectrum to have low saving rates relative to those in the middle.[24]

Available data indicate that saving rates do tend to vary with age as the life cycle hypothesis would suggest. **Table 9** presents data from the Consumer Expenditure Survey from 2001 showing saving rates by age.

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[22] Explanations of consumer saving behavior have to reconcile two seemingly contradictory observations. At any given time, cross-section data show that individuals with low incomes tend to have low rates of saving while those at the upper end of the distribution tend to have relatively high saving rates. This would suggest that over time, as incomes rise, that overall saving rates would tend to rise as well. But, that has not been the case. With occasional interruptions, real incomes have, over very long periods, trended upward in the United States but the average saving rate has not.

[23] A popular alternative is the so-called permanent income hypothesis developed by Milton Friedman. It shares many features of the life cycle approach. The latter was formulated by Franco Modigliani in collaboration with Richard Brumberg and Albert Ando. See references in footnote 21.

[24] A very important assumption of this theory is that individuals in their early years can borrow against their future income.

TABLE 8. Saving as a Percentage of Aftertax Income by Age of Consumer Unit, 2001

under 25	25 to 34	35 to 44	45 to 54	55 to 64	65 and over
-15.7	15.1	15.2	15.2	14.4	-4.9

Source: Department of Labor, Bureau of Labor Statistics.

When the age distribution of the population changes, such that, on average, the population either ages or gets younger, that demographics can affect aggregate saving behavior. The 1970s, 1980s, and 1990s were a time of such change produced by the aging of the large cohort of "baby-boomers." Thus, demographics might reasonably be expected to have influenced the personal saving rate in those years.

The major variable, however, affecting saving in the life cycle model is expected income.[25] To translate expected income into a measurable concept, the theory divides income into that part expected to accrue from wages and salaries (income from labor), and income from property.

To the extent that markets are efficient (meaning that market prices reflect all available relevant information), the income expected to accrue from property should be reflected in the current market value of assets. Thus, the net worth of households would also be expected to explain personal saving.[26]

In total, the life cycle model suggests that household or personal saving depends on the age distribution of the population, income from wages and salaries, real interest rates, and the net worth of households. Changes in these variables, then, should explain the observed changes in personal saving.[27]

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[25] Since the life cycle model assumes that capital markets are such that individuals can borrow against future expected income in determining how much they wish to consume and save in the current period, the real interest rate can play a role in determining the saving rate. The role is not clear cut, however. For a discussion of this point, see footnote 51.

[26] The role income growth plays in determining saving in the life cycle model can be confusing. An increase in the growth rate of income, all else constant, ought to raise the saving rate since the increase in income will accrue to those who are working and are savers as opposed to those who are retired and are dissavers. On the other hand, in the theoretical formulation of the life cycle model, the current consumption of individuals depends on the present value of current and expected future income. If future income is expected to rise, due, perhaps, to an increase in the demand for labor, the present value of current and expected future income will rise. This would increase current consumption and reduce current saving. Thus the saving rate would fall. The ultimate effect of variations in income growth depends on which of these two effects is the stronger.

[27] Some have suggested other variables that might influence personal saving including the rate of inflation. Inflation might affect the saving rate in that it reduces the value of some assets expressed in dollar terms (e.g. bonds). To the extent that rising prices erode the real value of household net worth, it might be expected to stimulate additional saving. Further, high rates of inflation might raise saving because of increased uncertainty as to economic

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Does the Life Cycle Model Explain Recent Trends?

A number of studies suggest that the traditional formulation of the life cycle model does not explain the recent decline in the personal saving rate. Consider first the age distribution of the population. The life cycle model implies that any change in the age distribution that significantly changes the relative proportion of savers and dissavers ought to have an effect on the saving rate. According to the Census Bureau, between 1980 and 2001, the share of households headed by someone 65 years or older, who would likely be dissavers, increased by 0.1 percentage point. Over this same period, the share of households in the 25 to 64 year old category increased by 2.0 percentage points. Within that group, there was a 4.4 percentage point increase in the share of households in the 35 to 44 age group. The share of households in the 15 to 24 age category fell by 2.0 percentage points.

These figures suggest that recent changes in the age distribution probably had little effect on the saving rate and, thus, do not explain the decline. Both the working age and retirement age populations increased, relative to the overall population. The 15 to 24 age group shrank, but in 2001 they represented just 5.8% of the population so the effect of that decline would be modest.

In contrast to the age variable, changes in household wealth do seem to have contributed to the decline in saving. According to the life cycle model, any unexpected increase in household net worth that is perceived to be permanent ought to result in an increase in consumption and a decline in saving. A study by Bosworth, Burtless, and Sabelhaus, attempts to measure the influence of wealth on household saving.[28] For the purposes of their study, households were divided into homeowners and nonhomeowners. These groups were then further divided into those who owned financial assets and those who did not. During the 1960s and 1970s, there were substantial increases in values of both houses and financial assets. This study found that saving fell by a little less in those households with financial assets than it did in those with none, contrary to the predictions of the life cycle model. However, saving rates fell significantly more in the case of homeowners than for the rest of the population, in accord with the predictions of the theory.

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[27] (...continued)
conditions. Further considerations that enter into the decision regarding how much to save within the life-cycle framework are life expectancy and retirement age. The longer retirement is expected to be, the greater a nest egg would be required. Another factor that is presumed to determine the level of saving is saving up for big-ticket purchases such as a car, a down payment on a house, or a college education. Individuals may save more, or less, for a rainy day depending upon their relative degree of risk aversion. The desire to leave a bequest has also been identified as a consideration.

[28] Bosworth, Barry, Gary Burtless and John Sabelhaus. The Decline in Saving: Evidence from Household Surveys. *Brookings Papers on Economic Activity 1*. The Brookings Institution. 1991. pp. 183-241.

More evidence that increases in housing prices help explain the decline in the personal saving rate was found by Munnell and Cook.[29] They suggest two reasons why the increase in housing prices would have contributed to a decline in saving. First is the behavioral response predicted by the life cycle model. In addition, they argue that the NIPA measure of the income, and hence, saving, of homeowners is understated. Adjustments for these two factors yields a reestimated saving rate that surged in the 1970s and subsequently returned to levels comparable to those of the 1950s and 1960s.

Between 1990 and 1999, mean nominal household net worth increased by about 85%.[30] A major contributor to that rise was the large increase in the value of corporate equities. Equity prices rose by over 260% between 1990 and 1999. Increases in household net worth seem likely to have contributed to the decline in personal saving during the 1990s. [31]

With respect to the other variables described by the life cycle model as determinants of the saving rate, the evidence regarding their contribution to recent trends in the saving rate remains unclear. Changes in both income growth and interest rates play a role in determining the saving rate, but since they can affect the saving rate in offsetting ways, their contribution to recent trends in saving is unclear. This motivated some analysts to suggest other possible explanations, for example, inflation and changes in attitudes regarding the importance of thrift.

Saving and Economic Growth

Many claims have been made about what can be accomplished by raising the national saving rate. Among these claims is that an increase in the rate of saving will produce a higher rate of growth in economic output.

The discussion of the relationship between saving and economic growth or the growth rate of real output can become confused because it is carried on in two quite different contexts.

In one it is a discussion about the short-run effect of a change in the saving rate on aggregate demand and the actual output of the economy (in other words it involves the relationship between the saving rate and the business cycle).

In the other context, and the one relevant to this paper, it involves a discussion about the relationship of the saving rate and the long-run growth in the ability of the economy to produce goods and services — or a discussion about the saving rate and the growth rate of potential output.

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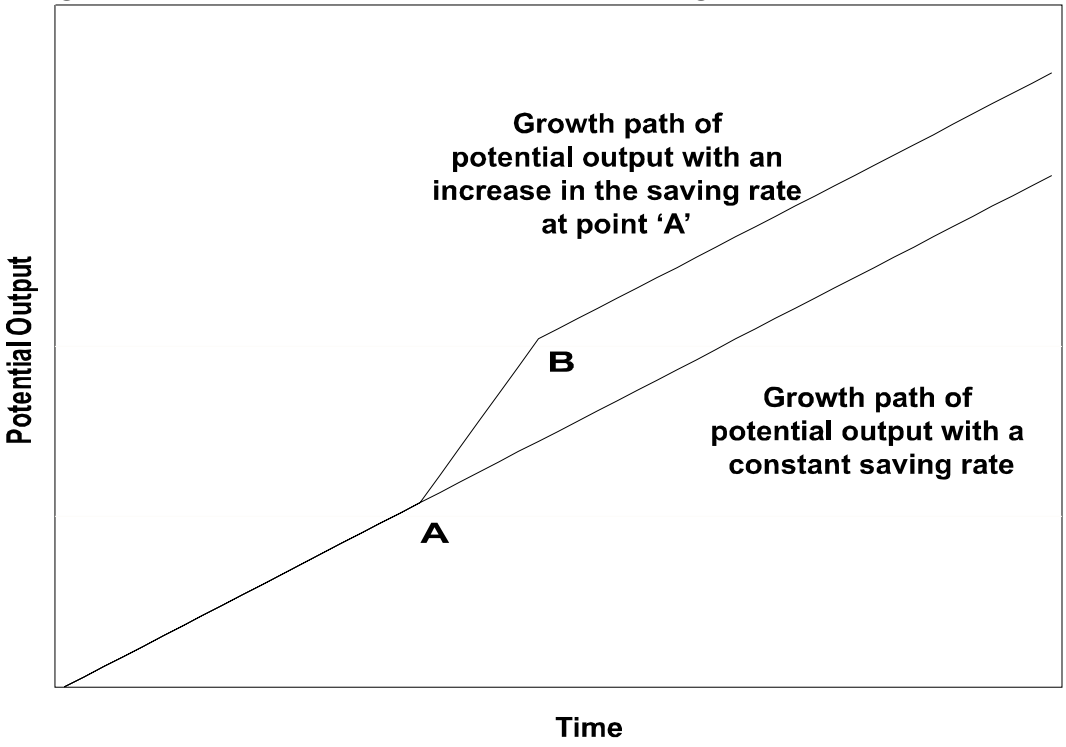
[29] Munnell, Alicia H. and Leah M. Cook. Explaining the Postwar Pattern of Personal Saving. *New England Economic Review*. November/December 1991. pp. 17-27.

[30] Board of Governors of the Federal Reserve System.

[31] See: CRS Report RL31535, *The Falling Personal Saving Rate and Its Economic Implications*, by Brian Cashell.

In the long-run context, the basic question that arises is: can the growth rate of potential output be raised by raising the saving rate? The answer provided by prevailing economic theory is, perhaps surprisingly, no.[32] Thus, for reasons outlined below, by saving a higher fraction of its income a nation may not increase the long run growth rate of potential output. However, a higher saving rate will, during a transitory period, raise the growth rate of potential output and, over the longer run, permanently raise the level of potential output.[33] Since population growth is unaffected by the saving rate, a higher saving rate and the resulting higher level of potential output raises potential per capita income. Thus a higher saving rate is directly linked via a higher level of potential output to an increase in the standard of living. This point is illustrated in Figure 6.

Figure 6. The Effect of an Increase in Saving on Economic Growth



The growth rate of potential output depends on three factors: growth in the labor force, growth in the capital stock, and growth in technological progress. In the standard growth model, the only factor that can be altered by policy is the growth rate

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[32] For a discussion of long-run growth trends, see: CRS Report RL31428, *Productivity Growth: Recent Trends and Future Prospects*, by Brian W. Cashell.

[33] Some recent studies suggest that a higher saving rate may have permanent effects on the growth rate of potential output. This school of thought argues that the composition of the capital stock can influence the rate of economic growth. Known as "endogenous growth theory" this view argues that the pace of technological advance depends on the composition of investment. Evidence suggests that increases in some categories of investment may contribute to a permanently higher rate of economic growth. An increase in investment in education, for example, may create an environment more fertile for technological advances. See Gould, David M. and Roy J. Ruffin. What Determines Economic Growth? Federal Reserve Bank of Dallas *Economic Review*. Second Quarter 1993. pp. 25-40.

of the capital stock, which depends on the saving rate and the rate at which capital depreciates. The rates of growth of the labor force and technological progress are assumed to be given (in order to simplify the subsequent discussion, the growth rate of technological progress is assumed to be zero).

The key to understanding why a higher saving rate will not permanently increase the growth rate of potential output is to understand the nature of the equilibrium or "steady state" that prevails prior to the change in the saving rate (or the conditions that prevail in the economy while it is growing along the line up to point 'A' in **Figure 6**).

That theoretical state is characterized by equal rates of growth of the labor force, the capital stock, and output. Since all grow at the same rate, the ratios of capital to labor and output to labor are constant even though both the numerator and the denominator in each ratio are growing. Any new steady state subsequent to a change in the saving rate must have the same characteristics. Since the growth rate of the labor force is given and unaffected by policy, the growth rates in the new steady state of the capital stock and output must conform to it. Thus, the explanation for why a higher saving rate does not permanently increase the growth rate of output comes down to explaining why the growth rate of output ultimately falls back to the growth rate of the labor force in the new steady state.

To begin, in the prevailing steady state, the amount saved out of a given level of output is just sufficient to cover the depreciation of the existing capital stock and to provide enough new capital through new net investment to ensure that each additional worker in the growing labor force has the same amount of capital to work with as those who are already in the labor force, in other words, new investment is sufficient to maintain a constant capital-labor ratio.

Suppose now that individuals decide to save a higher fraction of their income. The absolute amount of current output that is saved rises and is now sufficient to enable new investment to increase (both absolutely and relatively) — each worker now has more capital with which to work. The additional productivity of the new additions to capital raise potential output. Since output is already growing at a rate equal to the growth of the labor force, the additional output raises its growth rate above that of the labor force.

As additional increments of new investment are made (or as additions to the capital stock are made), the "marginal productivity" of these additions declines. Remember, we are assuming no change in technology. Thus, additional increments of capital per worker yield smaller and smaller increments of output. This means that the additions to the rate at which output was growing are decreasing and that output growth, after rising in the early stages of additional investment, is falling back toward the growth rate that prevailed prior to the rise in the saving rate. As the increments to output decrease, so do the increments to saving as do the increments to new net investment.

Ultimately, the capital-labor ratio will stop rising and a new steady state will be achieved in which the capital-to-labor ratio is higher, the capital-to-output ratio is higher than in the original steady state, but in which the growth rate of the capital

stock is again equal to the growth rate of the labor force. And the two are equal to the growth rate of output. In the new steady state, the absolute amount of income that is saved will be larger and the absolute amount of output devoted to new investment and depreciation will also be larger.

Some studies suggest, however, that the rate of technological advance may depend on the composition of investment spending. Among those types of investments that have been found to be correlated with faster rates of economic growth are education and business equipment.[34]

For example, a number of recent studies have found a connection between investment in computers and other "information technology" investments and the rate of productivity growth.[35] In a similar vein, another study identified the decline in public spending on "infrastructure" as responsible for some of the slowdown in productivity growth the U.S. has experienced since the 1970s.[36] Many of these studies, however, rely on statistical relationships that are not grounded in any widely accepted theoretical framework.

If the growth rate of potential output is dependent on the composition of investment, then it may be that the type of investment made possible by any increase in saving may be as critical as the total amount invested. Moreover, the gains to economic growth available from redirecting current levels of investment may be comparable to those to be had from just increasing the level of saving and investment.

The Internationalization of Saving

A variety of policy proposals have been put forth for raising the national saving rate, the end goal of which is to encourage a higher rate of domestic investment. Suppose, however, that while the policy increased the domestic saving rate, a substantial portion of the incremental saving went abroad to augment the capital stock of foreign countries. Of what benefit would that be to the United States?

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[34] For an overview of the arguments that the rate of economic growth may depend on a variety of economic factors see: Gould, David M. and Roy Ruffin. What Determines Economic Growth?. Federal Reserve Bank of Dallas *Economic Review*. Second Quarter 1993. pp. 25-40.

[35] See: Oliner, Stephen D., and Daniel E. Sichel, The Resurgence of Growth in the Late 1990s: Is Information Technology the Story? *The Journal of Economic Perspectives*, Fall 2000, Volume 14, Number 4. pp. 3-22. Also, DeLong, J. Bradford and Lawrence H. Summers. Equipment Investment and Economic Growth. *Quarterly Journal of Economics*. May 1991. pp. 445-502. For a critique of DeLong and Summers see Gravelle, Jane. What Can Private Investment Incentives Accomplish? The Case of the Investment Tax Credit. *National Tax Journal*. September 1993.

[36] See: Aschauer, David Alan. Is Public Expenditure Productive? *Journal of Monetary Economics*. vol. 23, no. 2. March 1989. pp. 177-200. For a critique of Aschauer, see: Aaron, Henry J. Discussion, in *Is There a Shortfall in Public Capital Investment?* Conference Series No. 34. Federal Reserve Bank of Boston. June 1990. pp. 51-63.

Obviously, it is important to ascertain the degree to which American saving flows abroad and the ease with which foreign saving comes to the United States. In short, one needs to know the degree to which national financial markets are integrated. American experience during the 1980s and 1990s suggests that foreign capital (saving) comes here with considerable ease.

Yet, there are substantial reasons to doubt that national capital markets are perfectly integrated. There are a number of reasons why savers may be unable or unwilling to seek the highest reward for their capital. First, unlike domestic investment, foreign investment is beset with various special risks and uncertainties. Even the best informed individuals are unable to accurately forecast what may lie five to 10 years in the future. Foreign governments may impose controls on capital exports (including the repatriation of earnings) or may change how they tax foreign owned capital within their jurisdiction. Exchange rate changes may substantially reduce the expected profitability of this investment. Second, countries often enact laws that inhibit the international flow of saving. In the United States, saving institutions are restrained in the type of mortgages they can hold as are insurance companies and other financial institutions (these restraints discriminate against foreign mortgages). In addition, even without constraints, financial intermediaries whose liabilities are denominated in a national currency are unlikely to hold assets denominated in foreign currencies. This will prevent these institutions, who intermediate a considerable portion of some country's saving, from buying foreign securities and sending that saving abroad. Finally, considerable evidence exists that capital may flow from one country to another, not necessarily to seek the highest rate of return, but to implement market strategies, exploit production knowledge, or to overcome trade barriers.[37, 38]

Given the evidence that capital does flow abroad but that barriers exist to prevent the complete integration of national capital markets, a question remains about the degree to which saving is internationalized. This issue was addressed by Feldstein and Horioka in a 1980 study updated in 1989 by Feldstein and Bacchetta.[39]

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[37] Much of the discussion in this paragraph is inspired by Feldstein, Martin and Charles Horioka. Domestic Saving and International Capital Flows. *Economic Journal*. Vol 90. June 1980. pp. 314-329. See also: CRS Report 92-438E, *Offshore Manufacturing: Why U.S. Firms Go Abroad*, by Mark Jickling, and CRS Report 90-569E, *Foreign Direct Investment: Why Companies Invest Abroad*, by James K. Jackson. See also: Mussa, Michael and Morris Goldstein. The Integration of World Capital Markets, in *Changing Capital Markets: Implications for Monetary Policy*, Federal Reserve Bank of Kansas City (August 1993). pp. 245-322 (this includes comments by Martin Feldstein).

[38] For a recent discussion of the degree of international capital integration among developed countries, see: International Monetary Fund, *World Economic Outlook*, May 1997, pp. 59-65. For an historical perspective on the issue of capital market integration, see: Taylor, Alan M. International Capital Mobility in History: The Saving-Investment Relationship. *NBER Working Paper 5743*. September 1996.

[39] Feldstein, Martin and Philippe Bacchetta. National Saving and International Investment, in *National Saving and Economic Performance*, edited by B. Douglas Bernheim and John B. Shoven. University of Chicago Press. Chicago. 1991. pp 201-220.

Both studies employ a common methodology which involves averaging the saving (both gross and net), investment, and income data from each of a number of OECD countries over a given time period and then determining the degree to which the ratios of saving to income and investment to income are correlated. A number of different OECD country combinations were used in the correlations as were different time periods over the years 1960-86. The general conclusion from both studies is that a substantial portion of domestic saving is used for domestic investment.[40] The limitation of both studies is that their conclusion applies to the group of countries studied as a whole. It may not apply well to the United States. Other economists have, however, attempted to isolate the extent to which changes in U.S. saving would flow into U.S. investment. A study by Kim using the Feldstein-Horioka methodology found that somewhere between one-half and all of any increase in U.S. saving would flow into domestic investment, depending on how investment was defined. Nordhaus also published some estimates based on a large-scale econometric model of the U.S. economy. He found that about one-half of the increase in saving from budget deficit reduction would flow abroad. Summers found that some 35 percent of the increase in saving following deficit reduction would flow abroad. (This is similar in magnitude to what Feldstein, et. al., found for the 1974-1986 period for all 23 OECD countries as a group.)[41]

Thus, while evidence exists that there are substantial flows of capital from country to country, it also suggests that national capital markets are not perfectly integrated. In fact, perhaps as much as two-thirds of incremental saving that could be induced by policies designed to increase national saving might be expected to remain at home to increase domestic investment.[42]

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[40] Among the important results of the two studies (using all 23 countries) is that the percent of gross domestic saving used for domestic investment declined from 91.1% during the period 1960-73 to 66.9% during 1974-86. Dornbusch, using the same sample over the period 1960-86, found that 75% of domestic saving went into domestic investment. See Dornbusch, Rudiger. Comment in *National Saving and Economic Performance*, edited by B. Douglas Bernheim and John B. Shoven. University of Chicago Press. Chicago. 1991. pp. 220-226. The methodology used by Feldstein, et. al., has been criticized. For a defense of their methodology, as well as additional empirical support based on a much larger sample of countries, see: Dooley, Michael, Jeffrey Frankel, and Donald J. Mathieson. International Capital Mobility: What Do Saving-Investment Correlations Tell Us? *IMF Staff Papers*. vol. 34, no. 3. September 1987. pp. 503-530.

[41] See: Kim, Sun Bae. Do Capital Controls Affect the Response of Investment to Saving? Evidence from the Pacific Basin. Federal Reserve Bank of San Francisco *Economic Review*. 1993, no. 1. pp. 23-39. Also, Nordhaus, William D. What's Wrong with a Declining National Saving Rate? *Challenge*. July/August 1989. pp. 22-26. And, Summers, Lawrence H. *Issues in National Savings Policy*. National Bureau of Economic Research Working Paper. Number 1710. September 1985.

[42] Care should be exercised in interpreting this evidence. There is a widespread belief that short-term capital markets are highly integrated. Thus, real short-term interest rates should be expected to be roughly the same in major world financial centers. This is unlikely to be true for long term capital, however. Much of this capital probably flows abroad for purposes of business strategies or to get around trade barriers and is unrelated to yield differentials. Thus, real long-term interest rates may not be roughly equal and may not move together.

Can Public Policy Raise the National Saving Rate?

There has long been a consensus among economists that the national saving rate can be raised through public policy. A great deal of support can be found for the proposition that moving the federal budget from deficit to surplus would, all else being equal, increase the national saving rate. During both the former Bush and the Clinton Administrations, legislation was enacted to reduce the federal budget deficit.[43] The shift in the federal budget from deficit to surplus was the major reason why the net national saving rate rose from a low of 3.7% of GDP in 1992 to 5.9% in 2000.

More controversial have been policies to raise the personal or household saving rate. These proposals have centered on individual retirement accounts or IRAs. When these accounts were first introduced in 1982, they drew an impressive amount of funds. It was not clear then nor is it today whether those funds resulted from new saving (saving that would not otherwise have taken place) or mainly from the transfer of dollars from other assets (existing wealth, or saving that would have occurred anyway), to these accounts whose effective yield was raised by their special tax treatment.[44]

Congress later applied various restrictions to IRAs which made them less attractive to some taxpayers. The 105th Congress reversed this trend with legislation that made existing IRAs more available to various taxpayers and created two additional IRAs.[45] Controversy still surrounds the issue of whether these changes to the IRA provisions will raise the personal saving rate, and raise it enough to offset any associated decline in the public sector saving rate due to the revenue losses associated with the tax preferences that make IRAs attractive. The objective of the legislation would remain unsatisfied if an IRA-induced rise in the personal saving rate cost so much in terms of lost tax revenue as to produce an offsetting rise in the federal budget deficit (or a decline in the federal budget surplus).

There are a number of reasons why many economists believe that an IRA approach is unlikely to raise the personal saving rate. First, and foremost, economists using U.S. data have, with rare exception, been unable to show that the U.S. saving rate is at all sensitive to variations in interest rates.[46] Second, economic theory is

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[43] The major piece of legislation making this possible was the Omnibus Budget Reconciliation Act of 1993. Another important contribution was made by the Balanced Budget Act of 1997.

[44] The literature in this area is vast. For an assessment, see: Hubbard, R. Glenn and Jonathan S. Skinner, *Assessing the Effectiveness of Saving Incentives*. Washington D.C.: American Enterprise Institute (1996); Gravelle, Jane G. Do Individual Retirement Accounts Increase Savings? *Journal of Economic Perspectives* (Spring 1991): pp. 133-148; and a symposia on Government Incentives for Saving, *Journal of Economic Perspectives* (Fall 1996): pp. 73-138.

[45] For more information on IRAs, see: CRS Report RL30255, *Individual Retirement Accounts (IRAs): Issues, and Proposed Expansion*, by Jane G. Gravelle.

[46] For a survey of this literature, see: Gravelle, Jane G. *The Economic Effect of Taxing* (continued...)

ambiguous about the overall effect of the interest rate on private saving. It could increase, decrease, or leave private saving unchanged.[47] Third, the fall off in the personal saving rate began during the period when IRA contributions were fully deductible. Despite these reasons for being skeptical about the ability of IRAs to raise personal saving, several studies found that the dollars that flowed into these accounts came from new saving and not from altering the allocation of existing wealth. In a careful review of these studies, Gravelle cast substantial doubt on the methodologies used by the researchers and, hence, on the validity of the results.[48] In general, she concluded that the methodology was better in two studies that failed to find any evidence that IRAs raised the personal saving rate.[49]

The Integration of the Components of the Private Sector Saving Rate

Several routes of inquiry suggest that a high degree of integration should exist since the household sector owns, either directly or indirectly, the business sector. To see how ownership might influence the integration of sectoral saving rates, consider the following. Through depreciation allowances and undistributed profits, businesses renew and add to existing capital assets resources that would otherwise accrue mainly to the household sector as income. These assets, as they are renewed and expanded, may also embody productivity enhancing improvements. Increasing the size and productivity of capital assets should show up as rising profits and rising share prices of ownership claims. This would increase the net wealth of households.[50]

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[46] (...continued)
Capital Income. Cambridge, MA: MIT Press. 1994

[47] The reason for the ambiguity is as follows. The interest rate is the price that induces individuals to give up current consumption for a larger future consumption. If interest rates rise, the price of current consumption rises. As a result, individuals will be induced to give up current consumption and save a portion of their income so as to enjoy a larger future consumption. This "substitution" effect is always positive and leads to a higher personal saving rate. On the other hand, if individuals are target savers in the sense that they save to achieve a given wealth objective, a higher interest rate enables them to achieve that objective with less saving out of current income. Hence, from this perspective, a rise in interest rates leads to a smaller saving rate. The overall effect on personal saving depends on which of the two effects dominates.

[48] Gravelle, Jane G. Do Individual Retirement Accounts Increase Savings? *Journal of Economic Perspectives*, volume 5, number 2, Spring 1991. pp 133-148.

[49] A proposal has been made, that has not gained widespread support, that the federal government require that households save at some minimum rate. See: Gale, William G. and Robert E. Litan. Saving Our Way Out of the Deficit Dilemma. *The Brookings Review*. Fall 1993, pp 6-11.

[50] For a discussion on sectoral integration, see: David, Paul A. and John L. Scadding. Private Savings: Ultrarationality, Aggregation, and Denison's Law. *Journal of Political Economy*. Vol. 82, No. 2. Part 1. Mar/Apr. 1974, pp. 225-250.

The rise in household net wealth tends to diminish the incentive of households to save.[51, 52] Thus, the argument can be made that changes in the business saving rate are likely, through a wealth effect on households, to bring about offsetting changes in their saving rate, leaving the gross private sector saving rate largely unchanged over time.

The ultimate resolution of this issue is empirical. Overall, while the evidence is mixed, it suggests that the degree of integration of household and business sector saving may be high.[53] Thus, policies designed to increase net business saving may not result in a comparable increase in total private, or national, saving since any change in business saving may be largely offset by the saving behavior of households.

The Integration of the Public and Private Sector Saving Rates

Efforts to Reduce the Federal Budget Deficit. A more recent, if controversial, proposition is that the net fiscal position of the public sector is completely offset by the saving behavior of the private sector. According to this view, the fiscal deficits of the federal government during the past decade should have had no effect on the national saving rate. In essence, this view argues that the private and public sector saving rates are completely integrated.

The intellectual inspiration for this view was attributed to one of the founders of modern economics, the English economist, David Ricardo (1772-1823). The view that the public and private sector saving rates are completely integrated is referred to as Ricardian Equivalence.

The essence of Ricardian Equivalence is simple. Suppose, for sake of argument, that a government proposes a one-time increase in expenditures and that to cover this increase it proposes either a one-time tax on the current generation or to borrow from them by issuing bonds. The issue is: should this generation of taxpayers be

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[51] This is most clearly seen when households save for specific purposes.

[52] A similar but indirect route could also operate. Suppose that the rise in business saving enhanced share prices and this increased the market value of the reserves of pension funds. This would mean that smaller contributions would be required from households to fund any future defined benefits. The smaller contributions would show up as a reduction in household saving.

[53] The most recent study is by Bosworth and shows that for a variety of countries including the United States, the integration is virtually one-for-one. See Bosworth, Barry P. *Saving and Investment in a Global Economy*. Brookings Institution. 1992. pp. 73-76. For other recent studies examining this issue see: Auerbach, Alan J. and Kevin Hassett. Corporate Saving and Shareholder Consumption in *National Saving and Economic Performance*. University of Chicago Press. Chicago. 1991, pp. 75-98. and Poterba, James M. Tax Policy and Corporate Saving. *Brookings Papers on Economic Activity*. The Brookings Institution. Washington, D.C. 1987, pp. 455-503.

indifferent between the two methods of finance (i.e., should they regard the two as equivalent)?[54]

Ricardo reasoned that they would regard the two as equivalent only if the current taxpayers lived forever. Since they do not, they would prefer to finance these additional expenditures by selling bonds.[55] By choosing the bond option, some of the taxes that would have to be paid to provide for the debt service can be shifted forward to a future generation of taxpayers.[56]

In 1974, Professor Robert Barro, in what is claimed to have become the most frequently referenced paper ever written by an economist, revived this Ricardian discussion.[57]

Barro proposed that if existing taxpayers regarded the well-being of their children on a par with their own well-being, and their children's children, etc., behaved similarly, the existing taxpayers would, in effect, achieve an infinite life and behave accordingly. Thus, they would not prefer the bond finance option but would be indifferent between the two.[58]

The basic question posed by Ricardo can be put in a slightly different way which makes its relevance to the federal budget deficit and its relation to the national saving rate clearer.

Suppose a government considers a tax cut to stimulate the economy. What will individuals do with the increase in their disposable income? Conventional macroeconomic theory implies that a large fraction would be spent and serve to stimulate the economy. The end result would be a larger federal deficit, some increase in private saving, but a fall in national saving. This would not happen in a Barro world. The recipients of the tax cut in that world would realize that their taxes would have to rise in the future to cover debt service and they would, accordingly,

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[54] The two methods of finance are mathematically equivalent. When the bond option is selected, taxes will have to be raised to pay the debt service on the bonds that are issued to pay for the additional expenditures. While this increase in taxes is, on an annual basis, less than the one time increase that would be needed to pay for the additional expenditures, the present discounted value of these taxes is the equal to the one time tax.

[55] One of the ironies of this debate is the suggestion that Ricardo regarded the two methods of finance as identical. He did not. Thus, in a very important sense, the term Ricardian Equivalence is inappropriately used.

[56] In terms of footnote 55, the two methods are mathematically equivalent only if the present discounted value of the extra taxes for debt service are calculated over an infinite time horizon. In Ricardo's view, the typical taxpayer would only discount them over his/her expected lifetime which would yield a present discounted value that was less than the amount of taxes that would have to be paid immediately should that option be selected to finance the increased expenditures.

[57] See his Are Government Bonds Net Wealth? *Journal of Political Economy*. Nov/Dec 1974, pp. 1095-1117.

[58] There is an old adage that says that only death and taxes are inevitable. In the Barro world, since individuals in essence live forever, only taxes are inevitable.

save the entire amount of their increased disposable income in order to pay those future taxes. Not only would there be no short-term fiscal expansion from the tax cut, but the entire increase in public sector dis-saving would be offset by a rise in private sector saving. In the Barro world, the saving rates of the two sectors are perfectly integrated and the national saving rate remains unaffected by changes in the fiscal position of the public sector.

The issue raised by Barro is empirical. Do individuals behave as his theory implies? For the United States, the evidence accumulated during the 1980s and 1990s strongly suggests that they do not.[59] Thus, most economists believe federal efforts to reduce a public sector budget deficit, or increase a surplus, should raise the national saving rate. The relationship, however, is unlikely to be one-for-one.[60]

Conclusions

It is a curiosity of the economic literature investigating saving that, in general, the theory regarding saving and its consequences appears to be more widely accepted than is any particular measure of saving. That having been said, all of the measures of saving available from official sources tell more or less the same story. The U.S. national saving rate fell significantly during the 1980s and 1990s. Personal saving is the lowest it has been for decades. Although the gross business saving rate has been fairly stable, a larger share of business saving is being allocated to replace capital that is wearing out, leaving a smaller share available to augment the capital stock. The federal government saving rate fell substantially beginning in the late 1970s. It recovered in the late 1990s, but has since fallen. The combined effect of these events has been a large decline in gross national saving and an even larger decline in net national saving. The OECD data show that the United States, Canada, and U.K. rates have all fallen. The United States also appears to be much less frugal than most of the other major industrial economies.

These official measures, not being the final word on the subject, are sometimes adjusted in various ways so that the estimates more closely reflect the theoretical notion of saving. For example, when Lipsey and Kravis added government capital outlays, spending on education, research and development, and consumer durable goods to official measures of saving, the United States appeared to be much less of a spendthrift relative to other countries. Just as modifications to official saving estimates can change the level of U.S. saving, others may shift saving from one sector to another without affecting the total. For example, some of the interest payment on the federal debt represents a premium for the effect of inflation and this premium is more appropriately counted as repayment of principal and as such should

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[59] The controversy over the Barro proposal and the literature it has given rise to is extensive. It is effectively surveyed in a symposium consisting of papers by Yellen, Gramlich, Barro, Bernheim and Eisner in the *Journal of Economic Perspectives*. Vol 3. No. 2. Spring 1989, pp. 17-94.

[60] Work by Bosworth for the United States over the period 1965-1990, suggests that for each dollar change in the fiscal position of the government, gross private sector saving changes in the opposite direction by 19 cents. See Bosworth, Barry P. *Saving and Investment in a Global Economy*. The Brookings Institution, Washington, D. C. 1993, p.74.

be counted as federal government saving. But to the extent that this adjustment raises estimated public saving, private saving will be reduced (see Appendix B).

Aside from how the particular estimates are made, there is an important distinction between gross and net saving rates. Many comparisons, especially those between countries, are made using gross saving rates. But, often the reason for concern about the decline in the saving rate is its effect on the growth of the stock of productive capital. In that context the more relevant measure is net saving. Estimates of net saving, however, depend on how depreciation is calculated. While depreciation accounts for a very large share of gross national saving, the way in which it is computed is a subject of some controversy.

Most of net national saving is accounted for by personal saving and standard economic theory seeks to explain personal saving behavior. The dominant approach uses the life cycle model. Although the life cycle model is widely accepted, it falls short of yielding a convincing explanation for the recent decline in the personal saving rate. An amended life cycle model incorporating the effects of social security and government provided health benefits provides a better, but by no means generally accepted, explanation for the decline. One can not rule out that some of the decline could just as well be attributed to a change in attitudes about thrift.

Raising the national saving rate has become a priority among policymakers. Two routes have been used to achieve this goal. One is the elimination of the federal budget deficit. This approach to raising the national saving rate is supported by a wide spectrum of economists.

The second approach has been to attempt to raise the household saving rate by giving preferential tax treatment to a specific form of household saving, the IRA. The success of this approach is unclear and it does not share the same widespread support among economists.

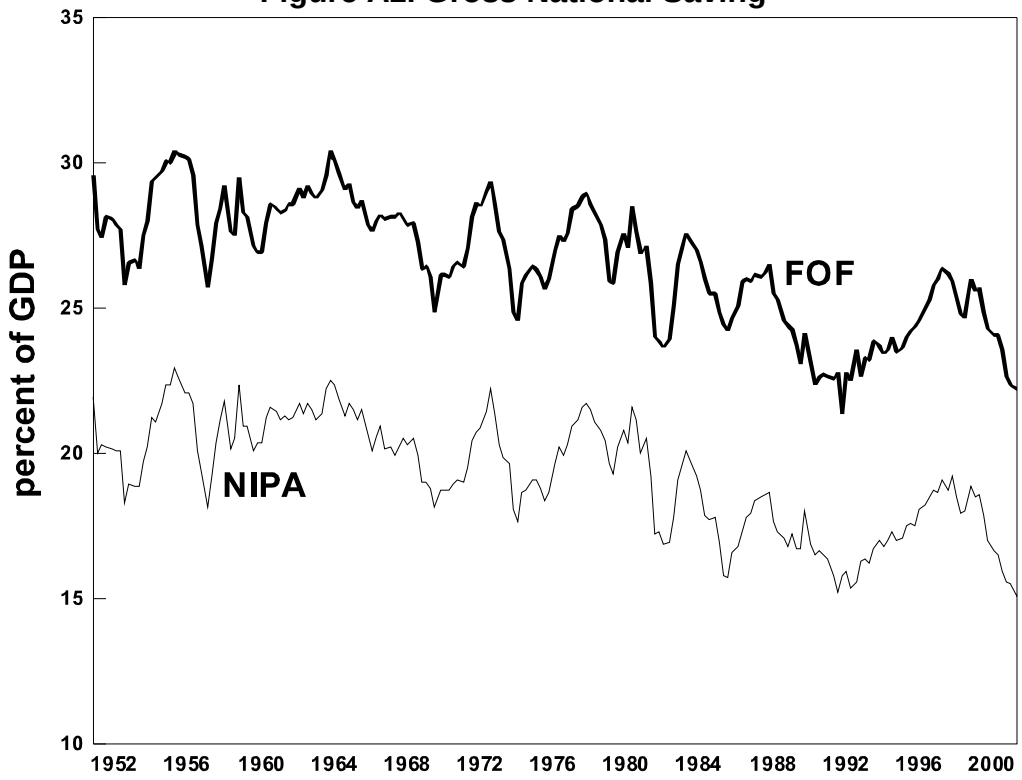
Given the substantial deficit reduction that has occurred and, perhaps, a major change in attitudes about thrift, what effect would a higher national saving rate have? Some of the increase would likely contribute to a larger domestic capital stock, a higher capital-labor ratio and increased output and productivity. Some of the increase would tend to flow abroad, or reduce U.S. dependence on foreign capital. But, even to the extent that it does, U.S. households would still be better off in the future because of the increase in income from those foreign investments.

An increase in the saving rate would have real consequences for the long-run performance of the economy. But these consequences might not seem striking in the short run. First, any increase in the increments to capital through new net investment would be very small in comparison to the total stock of capital. Second, the labor force is expected to grow more slowly now that the baby-boom generation has come of age and the labor-force participation rate of women has leveled off. The expected slower growth in the labor force means a smaller saving rate will be sufficient to sustain trend growth in the capital-labor ratio. Thus, the fall in the net national saving rate may not be as troubling as would have been had growth in the labor force not fallen.

Appendix A: An Alternative Measure of the U.S. Saving Rate From the Flow of Funds

Different ways exist to measure the U.S. saving rate. A popular alternative to the NIPA measure is one derived from the Flow of Funds (FOF) accounts published by the Board of Governors of the Federal Reserve System. **Figure A1** plots the two gross national saving rates derived from the NIPA and FOF since 1952. The rate derived from the FOF is substantially higher. On a decade average basis, however, the difference between the two measures, as shown in **Table A1**, is a virtual constant.

Figure A1. Gross National Saving



Sources: Department of Commerce, Bureau of Economic Analysis; Board of Governors of the Federal Reserve System.

The comparisons in **Figure A1** and in **Table A1** raise a basic question: why are the two gross saving rates so different? The data in **Table A2** provide some insights. There, the gross saving rate is decomposed into its component parts.

TABLE A1. Alternative Measures of Gross National Saving

	Saving as a percent of GDP		FOF rate as a percent of NIPA rate
	Flow of Funds	NIPA	
1960 - 1969	28.4	21.0	135.2
1970 - 1979	27.2	19.7	138.1
1980 - 1989	25.8	18.5	139.5
1990 - 1999	24.1	17.1	140.9

Sources: Department of Commerce, Bureau of Economic Analysis; Board of Governors of the Federal Reserve System.

TABLE A2. FOF and NIPA Saving Rates by Sector

	Business		Household		Federal Government		S&L Government	
	FOF	NIPA	FOF	NIPA	FOF	NIPA	FOF	NIPA
1960 - 1969	9.4	11.4	14.6	5.7	2.0	2.2	2.4	1.7
1970 - 1979	9.3	11.6	16.1	6.8	-0.7	-0.5	2.4	1.8
1980 - 1989	10.4	12.6	16.1	6.7	-2.5	-2.2	1.9	1.4
1990 - 1999	9.8	12.4	13.6	4.4	-1.2	-1.1	1.7	1.3

Sources: Department of Commerce, Bureau of Economic Analysis; Board of Governors of the Federal Reserve System.

Quite clearly the difference arises in the household sector. According to the FOF, the household saving rate is nearly three times larger than that given by the NIPA.

To understand why, it is necessary to explain briefly how the household saving rate is constructed in the FOF. (Recall that in the NIPA, it is the residual that arises when personal consumption is subtracted from personal disposable income). When households save, it should show up as an increase in household net worth. To compute household net worth, the FOF constructs a balance sheet for the household sector. The gross increase in net worth is then equal to the sum of the net acquisition

of financial assets and the net investment in tangible assets less the net increase in liabilities issued by the household sector to finance the purchase of assets.[61]

In the FOF framework, the household acquisition of all tangible assets is used to measure saving. This involves, in addition to housing, the acquisition of all consumer durable goods. Recall that in the NIPA, spending by consumers on all durable goods with the exception of housing is treated as consumption in arriving at the household saving rate. Since spending by households on nonhousing consumer durables is large, including it as an element of investment by households on a par with housing, dramatically increases the saving rate of households. This is a major reason for the higher FOF gross saving rate.

Another, but secondary, reason for the difference is that the FOF treats contributions to and payments from government life insurance and retirement funds as changes to household net worth whereas the NIPA treat them as items that affect the current income of households.[62] This difference in treatment is only important when the life insurance and pension funds are either building or depleting reserves.[63]

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[61] To compute the net saving rate of the household sector involves the additional step of subtracting out the depreciation or capital consumption of household assets.

[62] Conceptually, the FOF treats government life insurance and pension funds on a par with similar transactions involving private companies where the NIPA makes a distinction between the two (i.e., it does not treat them the same).

[63] Note that this differential treatment in the NIPA has no effect on the gross national saving rate. It does, however, have an effect on the sectoral saving rates. When government insurance and pension funds, for example, build up reserves, the NIPA method, lowers the household saving rate and raises the public sector saving rate relative to the rates computed in the FOF. This difference helps to explain why the Federal government and State and local government saving rates computed in Table A2 under NIPA differ from similar computations in the FOF.

Appendix B: The Saving Rate and the Long Run Rate of Growth

To understand why an increase in the saving rate will not lead to a permanent increase in the rate of growth of potential output, we begin with what is called a production function.

A production function expresses a relationship between physical inputs and output. It is common to express the relationship in a general form as:

(1) $$Y = A \cdot F(K, N)$$

where Y measures output or income, A the state of technical knowledge and K an N inputs of capital and labor respectively.

Since interest centers on the growth rate of Y or $\Delta Y/Y$, equation 1 can be broken down into the contribution each factor makes to output growth or:

(2) $$y = \Delta Y / Y = (1 - b) \cdot \Delta N / N + b \cdot \Delta K / K + \Delta A / A$$

which says that the growth rate of output, y, depends on the growth rate of the labor force, $\Delta N/N$, the growth rate of the capital stock, $\Delta K/K$, and changes in the state of technology. The coefficients b and (1-b) measure the respective contribution of capital and labor to output. They are usually measured by the income share that accrue to each and their values sum to one.

To simplify the discussion, it will be assumed that there is no technical progress in the economy (that $\Delta A/A = 0$). Thus, in the economy under discussion, the growth rate of output depends only on capital and labor. Moreover, a further reasonable assumption will be that the growth rate of the labor force is given.

The next task is to describe this economy in its so-called "steady state" or equilibrium. Such a state is one in which while the labor force, the capital stock, and output are all growing, the ratios of capital to labor and output to labor (or per capita income) are constant. This means that the growth rate of the capital stock, the growth rate of the labor force, and the growth rate of output are all equal. Under these conditions, the new additions to the labor force are supplied with the same amount of capital as those currently in the labor force (and who are working) and who, as a result, will add the same amount to output.

Notice, that in this steady state, the factor to which all others must conform is the growth rate of the labor force. This growth rate is assumed to be given. Since it remains given throughout this exercise, in the new steady state it will govern the growth rate of the capital stock and the growth rate of output. As it does not change, the rate of growth of output in the new steady state must be the same as in the prevailing steady state.

The only conditions remaining to be specified in the existing steady state are the equilibrium levels of per capita output and the capital to labor ratio. These depend on the condition that saving is equal to investment or:

(3) $$S = I$$

Recalling from the body of the text, that gross saving, S, is equal to net new investment In, plus the depreciation of the existing capital stock D, or:

(4) $$I = In + D$$

and that D is equal to the depreciation rate d times the capital stock K and that new net investment In is equal to the change in the capital stock ∆K, or:

(5) $$I = dK + \Delta K$$

which, after substitution in equation 3 yields:

(6) $$S = dK + \Delta K$$

Further, since saving is equal to the saving rate, s, times income, Y, equation 6 becomes:

(7) $$sY = dK + \Delta K$$

If both sides of equation 7 are divided by K, the result is:

(8) $$s \cdot Y / K = d + \Delta K / K$$

and since the rate of new investment ∆K/K is, in the steady state, equal to the growth rate of the labor force, ∆N/N = n, the result is:

(9) $$s \cdot Y / K = d + n$$

When both sides of equation (9) are multiplied by K, the result is:

(10) $$s \cdot Y = (d + n) \cdot K$$

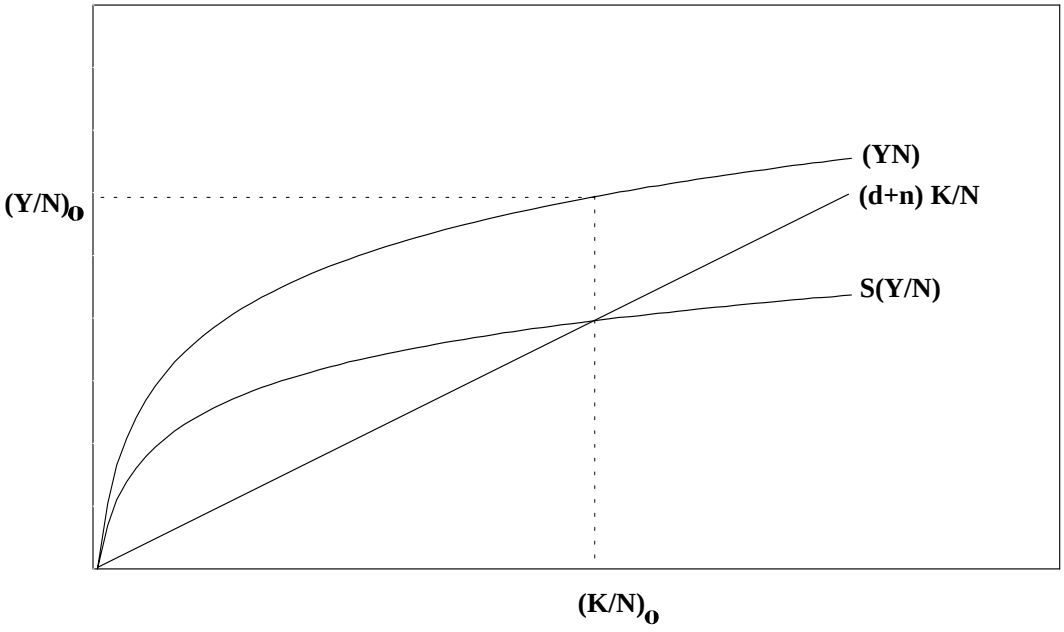
which says that in the steady state, the absolute amount of output that is saved (sY) is just sufficient to replace the capital stock that is worn out in producing output (dK) plus what is needed to equip the new additions to the labor force with the same amount of capital as is available to those presently in the labor force (nK).

To put the above on a per capita basis, both sides of the equation are divided by N resulting in:

(11) $$s \cdot Y / N = (d + n) \cdot K / N$$

The steady state is described graphically in **Figure B1**.

Figure B1. Saving in the Steady State



The schedule Y/N is one in which output increases rapidly at first and then at a diminishing rate as the capital/labor ratio increases. This means that as more capital is added to labor, the marginal product of capital falls.

The saving schedule, s(Y/N), lies inside the Y/N schedule since the value of the average saving rate, s, is less than one. Since this constant is multiplied by Y/N, the slope of the saving schedule mirrors that of Y/N.

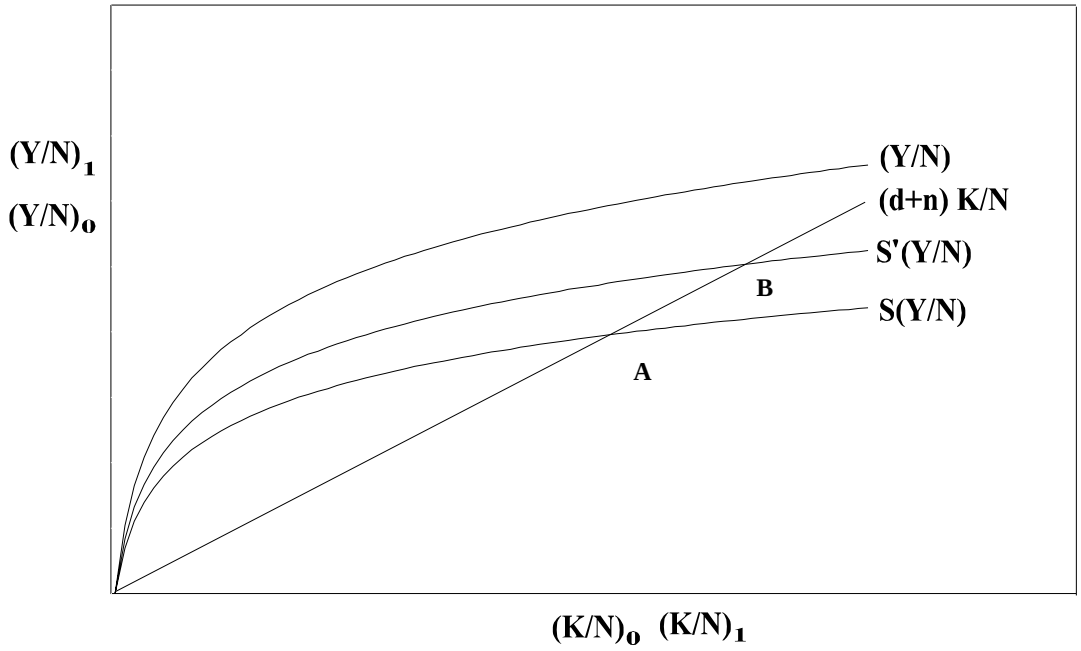
The investment schedule (d + n)K/N is a straight line from the origin whose slope depends on the values of d and n.

The equality of saving and investment determines the equilibrium levels of output per capita and of capital-to-labor.

It will pay to recall that in equilibrium, while Y/N and K/N are constant at values $(Y/N)_0$ and $(K/Y)_0$, both the labor force and capital stock are growing at rate n as is output.

How is this steady state equilibrium affected by an increase in the saving rate? In **Figure B2**, the schedule s(Y/N) will shift up to s'(Y/N) and the new equilibrium point, where saving equals investment, rises from point A to point B along the investment schedule (d + n)K/N. The investment schedule does not shift since neither the depreciation rate, d, nor the rate of new investment, n, needed to maintain the capital/labor ratio constant have changed.

Figure B2. Effect on the Steady State of an Increase in the Saving Rate



The net result in the new steady state is a larger capital/labor ratio and a larger output per capita, but no change in the equilibrium rate of growth of output. This is still equal to the growth rate of the labor force. Were it not so and, for example, greater than the growth rate of the labor force, output per capita would not be constant at level $(Y/N)_0$, but would be rising and the economy would not be in a steady state.

There is, however, the transition period during which the capital/labor ratio is rising as is the growth rate of output that needs to be explained.

When the saving rate rises from s to s', the amount of saving at the then equilibrium level of income $(Y/N)_0$ is now greater than needed for depreciation and net new investment that maintains the capital/labor ratio at $(K/N)_0$. The additional new investment that takes place increases per capita output and the economy moves along the schedule (Y/N). The increase in output that occurs is in addition to that already accruing in the growing economy. As a result, the growth **rate** of output rises.

However, as additional units of capital are added to the labor force, the marginal product of capital falls, i.e., while output increases, it does so at a diminishing rate. This has several implications. First, it means that smaller and smaller increments of output are added to the ongoing flow of output. As a result, the growth rate of output falls over time as the economy moves toward the new steady state. Second, as output growth falls over time, less and less saving is available for new net investment and the growth rate of the capital-labor ratio, while still rising, does so at a diminishing rate. Ultimately, in the new steady state, the output saved will be equal to the output

that is needed to replace the depreciated capital and to provide enough new equipment so that additions to the labor force have the same amount of capital as do those that are currently in the labor force (at which point the capital-labor ratio is again constant). Again, for simplicity, all of this assumes no concurrent growth in technology.

In the new steady state, while the per capita income and the capital/labor ratio will be higher, the growth rate of the labor force, the capital stock, and per capita income will be the same as in the previous steady state. The absolute amount saved and used for depreciation and net new investment will be larger, however.

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