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RECENT U.S. EVIDENCE ON BUDGET
DEFICITS AND NATIONAL SAVINGS

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Recent U.S. Evidence on Budget Deficits and National Savings

ABSTRACT

This paper examines the recent United States experience with sustained budget deficits and concludes that the events of the last five years cast significant doubt on the proposition that the timing of taxes does not affect national savings. Rather than raising private saving, the recent deficits have if anything coincided with reduced saving and increased consumption. These findings suggest that realistic analysis of fiscal policies must recognize that consumers are liquidity constrained and/or myopic.

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At least since Ricardo, economists have wrestled with the dual questions of whether or not government bonds represent net wealth, and whether government deficits affect national savings. The answers are far from obvious. James Tobin (1952) asked rhetorically, "How is it possible that society merely by the device of incurring a debt to itself can deceive itself into believing that it is wealthier? Do not the additional taxes which are necessary to carry the interest charges reduce the value of other components of private wealth? There must certainly be effects in this direction." While Tobin (1980) concluded these effects are small, the economic effects of government indebtedness remain controversial.

The controversy persists in large part because history has provided few satisfactory experiments for assessing the Ricardian equivalence proposition. Most historical fluctuations in budget deficits have been associated with wars, cyclical fluctuations in the level of economic activity, or changes in government spending. Since each of these factors directly affects national savings and interest rates, it has proved extremely difficult to evaluate the separate impact of changes in the timing of tax collections.

The American experience of the last five years provides an unprecedented experiment for evaluating the impact of changes in budget deficits. Peacetime deficits have deviated more than ever before from what would be predicted on the basis of cyclical conditions and inflation. This paper evaluates the results of this experiment. While the data are not wholly free of ambiguity, they are unfavorable to the Ricardian position and support the view that government deficits have a substantial impact on national savings.

The paper is divided into four sections. Section I briefly reviews a number of theoretical considerations suggesting that the effects of deficits on national savings cannot be resolved on a priori grounds and must be examined empirically. Section II assesses the impact of recent deficits on national savings and on the share of national income devoted to consumption. Section III uses Euler equation tests and data on legislated but not yet implemented tax changes to examine the importance of liquidity constraints and myopia in consumption behavior. There is a brief conclusion.

I. Theoretical Considerations

The Ricardian equivalence proposition as enunciated by Barro (1974) holds that changes in the timing of tax collections do not affect the level of national savings. Such timing changes do not alter the consumers' budget constraint, which depends only on the present value of future tax collections, and are therefore presumed not to affect consumption decisions. The most common theoretical rejoinder to this argument recognizes that actual consumers have finite lifetimes, so deferring taxes to the point where they impact on subsequent generations has real effects. While this is correct as a matter of principle, Poterba and Summers (1986) present evidence suggesting that the distinction between overlapping generations and infinite horizon models may be of little practical importance for evaluating the short run savings impact of budget deficits. Because the marginal propensity to consume out of changes in lifetime wealth is small, and because realistic tax policies shift relatively small burdens to subsequent generations, deficits induce relatively small consumption effects in lifecycle models.

It does not follow, however, that simple infinite horizon models can reliably predict the effects of alternative budgetary policies. These models may be unrealistic in a number of empirically important ways which cause the Ricardian equivalence proposition to fail. We consider four possibilities.

First, some consumers are liquidity constrained. In this case changes in government debt policies, which in effect allow consumers to borrow by deferring taxes, will affect consumption behavior.¹ The available evidence generally suggests that liquidity constraints are of some empirical importance. Hubbard and Judd (1986) cite recent survey evidence indicating that the median holding of financial assets in the American economy is only \$3500 and that a sizable fraction of the population does not hold any assets at all. A number of microeconomic studies, notably Runkle (1984), Paquette (1985), and Zeldes (1986), suggest that families with low net worth exhibit excess sensitivity of consumption to income relative to that predicted by the life cycle model. Similar findings emerge from studies using macroeconomic data.²

A second possibility is that consumers are myopic. They may fail to project their future income, fail to systematically incorporate future (possibly unlegislated) tax liabilities that can be inferred from the government budget constraint, or even fail to allocate resources taking full account of future consumption needs. They may employ "rules of thumb" that lead them to consume a higher fraction of their disposable income than the lifecycle model would suggest.

A third possibility is that the non-lump sum character of taxes could cause deviations from Ricardian equivalence. Barsky, Mankiw and Zeldes (1986) argue that taxes reduce uncertainty about future income and so debt policies that

require increases in future taxes will reduce private uncertainty about income, thereby leading to reduced precautionary savings and increased consumption. We are skeptical of the importance of this argument. It predicts that large anticipated reductions in marginal tax rates should increase private savings.³ As we shall demonstrate below, savings have if anything declined since the discussion of rate-reducing tax reforms in 1981 and again in 1984.

A final possibility is that the configuration of growth and interest rates is such that the government need never raise future taxes to pay for increases in its indebtedness.⁴ If consumers anticipate that this is the case, they will treat government debt at least in part as net wealth and government deficits will reduce national savings. Unless deficits are expected to persist over long horizons, however, this effect will not be large. The analysis in the preceding section indicates that the marginal propensity to consume out of wealth is quite low even for consumers with finite horizons.

These considerations suggest that evaluation of the Ricardian equivalence proposition is ultimately an empirical matter. Unfortunately, until recently, history has provided relatively few powerful tests of this proposition. Fluctuations in budget deficits in the United States have been small except during wartime periods, and wars are difficult to interpret because the government affects the composition of economic activity through many channels besides its direct claim on tax revenues. In contrast, recent events in the United States provide a valuable experiment for testing the empirical realism of the Ricardian equivalence proposition. We now turn to a description of this experiment, and an evaluation of the results.

II. Recent Movements in Deficits and Savings

Figure 1 presents annual information on two measures of the federal deficit in the post-war period. The dotted line shows the ratio of the deficit as measured in the National Income and Product Accounts to full-employment GNP, while the solid line corresponds to an inflation- and cycle-adjusted deficit measure, again as a fraction of full-employment GNP. Our inflation adjustment subtracts $\pi \cdot B$ from the measured deficit, where π is the fourth quarter-to-fourth quarter inflation rate and B is the stock of nominal debt outstanding at the beginning of the year. The annual deficit data are presented in the appendix. Both deficit measures increase substantially in recent years. The cyclically and inflation-adjusted deficit averaged 2.23 percent of GNP over the 1981-85 period. The second highest five year interval was 1966-70, when it averaged .61 percent of full-employment output.

Recent deficit behavior appears aberrant by historical standards. While the deficit never exceeded 4 percent of GNP between World War II and 1981, it has exceeded that level in each of the last four years. This increase in deficits is not easily attributed to changes in economic conditions. Drawing on a theory of optimal public finance, Robert Barro (1986) uses data for the period through 1982 to develop a simple predictive equation for debt growth. Assuming for simplicity that actual and expected inflation coincide, Barro's equation substantially underpredicts recent debt movements, as shown below:⁵

| <u>Year</u> | <u>Real Debt Growth (Percent Per Year)</u> | | |
|-------------|--|---------------|-------------------|
| | <u>Predicted</u> | <u>Actual</u> | <u>Difference</u> |
| 1984 | 5.7 | 14.1 | 8.4 |
| 1985 | 4.8 | 13.2 | 8.4 |
| 1986 | 4.6 | 10.6 | 6.0 |

Since the in-sample standard error of Barro's equation is 2.3 percent per year, these underpredictions are both substantively and statistically important.

U.S. Deficits, 1958-1985

Federal Deficit Cycle and Infl. Adj.

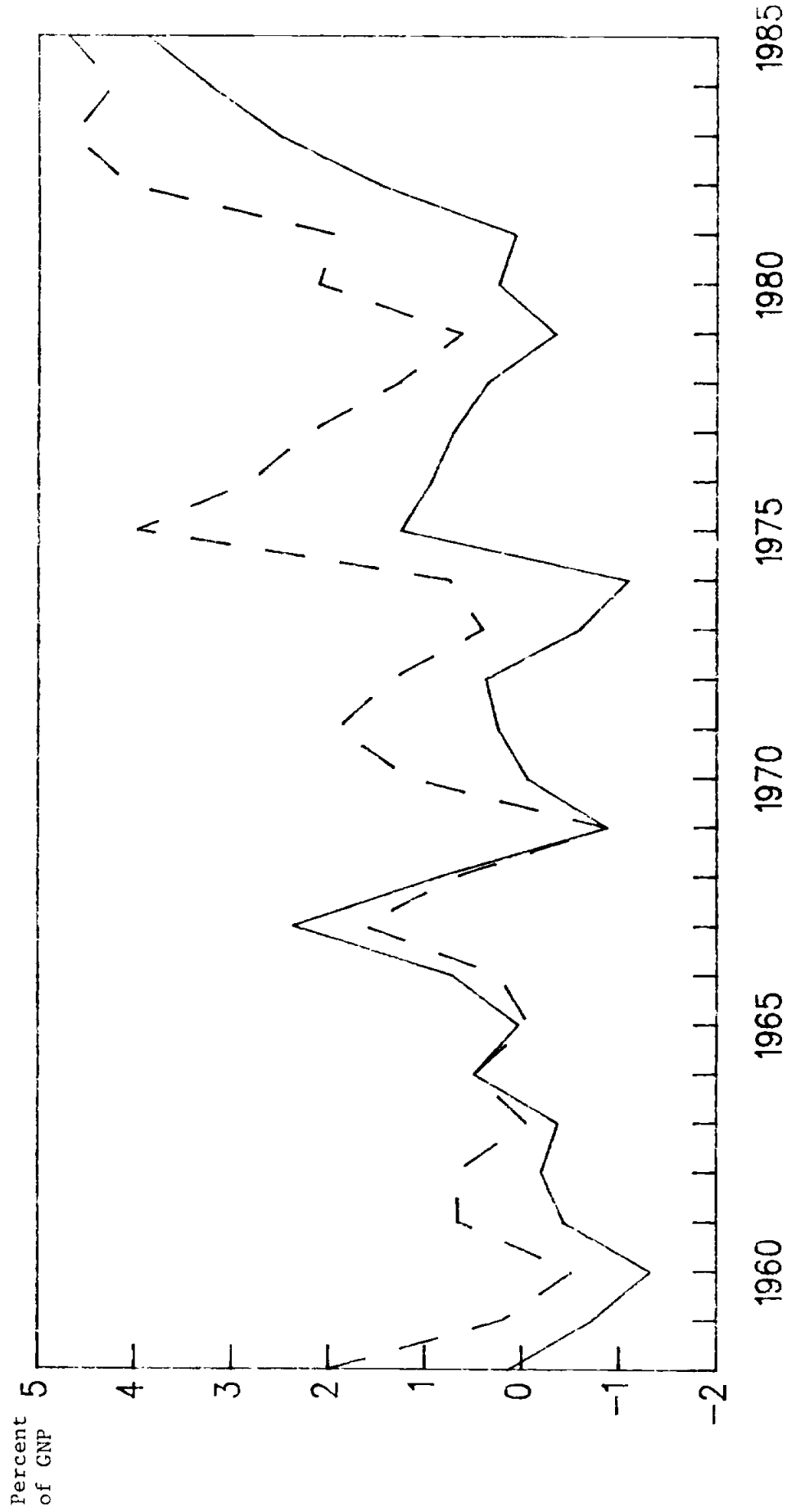


Figure 1: U.S. Deficits, 1958-1986

The sustained budget deficits of recent years represent one of the best experiments for testing Ricardian equivalence that history has ever provided.⁶ As Barro (1986) demonstrates, there are no comparable large and sustained deficit movements (except in wartime) in the United States. In his recent study of deficit experience in Great Britain, Barro (1987) considers two peacetime deficit episodes. Neither is completely satisfactory. In one case, debt was issued to finance one-shot transfers to West Indian slaveowners. Since the recipients of this spending were not located in Britain, however, this episode may have different real effects than a debt-financed transfer to domestic residents. In the other, Barro considers the deficit associated with failure to pass the Income Tax Act of 1909. This deficit as a fraction of GNP was only half the size of recent U.S. deficits, and it was much less persistent.

On the Ricardian equivalence view, the effect of budget deficits on savings depends on their source. Tax changes that are not associated with changes in the path of government spending should have no impact on national savings and should therefore change private savings dollar for dollar. The same should hold for permanent changes in government spending. In contrast, transitory changes in government spending would be expected to reduce national savings because they reduce consumers' endowments by a negligible amount and therefore do not affect private savings.

The data presented in Table 1 shed light on the extent to which recent deficits are due to changes in government spending that can plausibly be regarded as transitory. For the five years since 1981, government spending on goods and services was lower than in the preceding five year period, though it rose between 1983 and 1985. A primary cause is the decline in taxes net of transfers.

Table 1

Federal Government Spending, Taxes, and Transfers, 1960-85

| Year | Federal Spending and Revenue as a Percentage of Full-Employment GNP | | |
|---------------------|---|--------------------------|--|
| | Purchases of Goods and Services Plus Intergovernmental Grants | Net Interest Payments | Taxes Net of Transfers and Subsidies to Government Enterprises |
| 1960 | 10.76 | 1.20 | 12.51 |
| 1961 | 11.12 | 1.07 | 11.53 |
| 1962 | 11.76 | 1.10 | 12.17 |
| 1963 | 11.63 | 1.14 | 12.82 |
| 1964 | 11.44 | 1.19 | 12.14 |
| 1965 | 11.23 | 1.18 | 12.47 |
| 1966 | 12.47 | 1.21 | 13.43 |
| 1967 | 13.43 | 1.21 | 13.02 |
| 1968 | 13.46 | 1.28 | 14.06 |
| 1969 | 12.46 | 1.32 | 14.66 |
| 1970 | 11.67 | 1.34 | 11.83 |
| 1971 | 11.16 | 1.20 | 10.45 |
| 1972 | 11.49 | 1.15 | 11.26 |
| 1973 | 10.73 | 1.31 | 11.63 |
| 1974 | 10.37 | 1.34 | 10.99 |
| 1975 | 10.52 | 1.32 | 7.86 |
| 1976 | 10.34 | 1.40 | 8.94 |
| 1977 | 10.45 | 1.39 | 9.64 |
| 1978 | 10.36 | 1.52 | 10.60 |
| 1979 | 9.96 | 1.64 | 10.98 |
| 1980 | 10.17 | 1.83 | 9.90 |
| 1981 | 10.04 | 2.20 | 10.30 |
| 1982 | 9.95 | 2.36 | 8.24 |
| 1983 | 9.74 | 2.48 | 7.60 |
| 1984 | 10.08 | 2.88 | 8.72 |
| 1985 | 10.73 | 3.09 | 9.13 |
| Five-Year Averages: | | | |
| 1961-65 | 11.44 | 1.14 | 12.23 |
| 1966-70 | 12.70 | 1.27 | 13.40 |
| 1971-75 | 10.85 | 1.26 | 10.44 |
| 1976-80 | 10.26 | 1.56 | 10.01 |
| 1981-85 | 10.11 | 2.60 | 8.80 |

Source: National Income and Product Accounts, Table 3.2. Full employment GNP data were provided courtesy of Data Resources, Inc.

An additional factor in the increase in budget deficits is the increase in government interest payments caused by reduced net tax collections during the early 1980s. The Ricardian equivalence proposition therefore predicts that public dissaving should, at least to some extent, have been offset by increased private saving. In contrast, the traditional view of government deficits predicts that private savings should not have increased and that national savings should have declined sharply.

We examine the savings response to recent deficits using several measures of savings. Table 2 presents five year averages of eight different measures of the allocation of resources between savings and consumption. The accompanying figures plot the annual data, which are tabulated in the appendix. The first row reports the national savings rate, which includes government as well as private saving.⁷ It declines by a factor of two in the last decade, from just under seven percent of GNP during the 1970s to only 3.35 percent in the 1981-5 period. The 1970s also show a slightly lower savings rate than earlier periods.

The next two rows focus on measures of private savings based on the National Income Accounts. Row two shows the NIPA private savings rate, while row three presents an inflation-adjusted version of this series. These measures of the savings rate were relatively low by historical standards in the early 1980s. Inflation-adjusted private saving was only 5.1 percent of GNP in the last five years, down from 6.5 percent during the 1970s and even higher previous levels. There is no evidence that private savings increased in response to the deficits of the 1980s.

There are both conceptual and measurement problems with the NIPA savings rate.⁸ We therefore examine less standard measures of the savings rate as well.

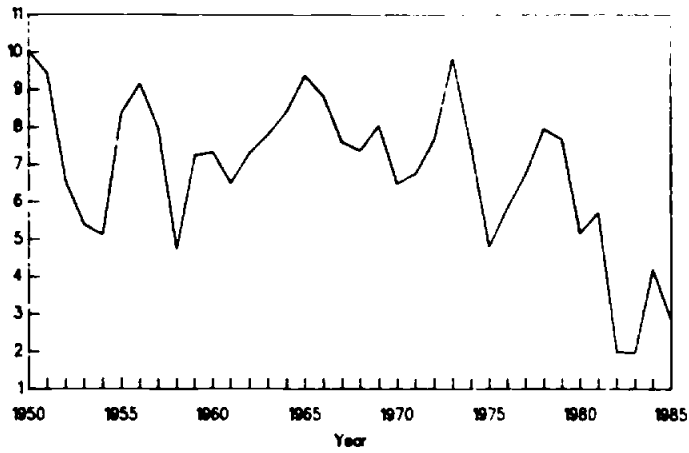
Table 2

Five-Year Averages of Various Measures of U.S. Savings Rate

| Savings Concept | Time Period | | | | | |
|---|-------------|---------|---------|---------|---------|---------|
| | 1955-60 | 1961-65 | 1966-70 | 1971-75 | 1976-80 | 1981-85 |
| Net National Savings/GNP | 7.29 | 7.88 | 7.67 | 7.31 | 6.67 | 3.35 |
| Net Private Savings/GNP | 7.50 | 8.20 | 8.17 | 8.48 | 7.44 | 6.21 |
| Inflation- Adjusted Net Private Saving/GNP | 6.40 | 7.54 | 7.05 | 7.10 | 5.86 | 5.06 |
| Net National Savings/GNP (Flow of Funds) | 6.96 | 7.26 | 6.58 | 6.39 | 6.93 | 3.85 |
| Net Private Savings/GNP (Flow of Funds) | 7.35 | 7.66 | 7.21 | 7.87 | 8.06 | 7.12 |
| Change in Real Household Net Worth/GNP | 10.23 | 12.88 | 5.24 | 3.02 | 15.43 | 7.22 |
| Consumption/GNP | 63.78 | 63.05 | 62.09 | 62.47 | 62.96 | 64.53 |
| Nondurable and Service Con- sumption/GNP | 55.20 | 54.60 | 53.29 | 53.66 | 54.11 | 56.11 |

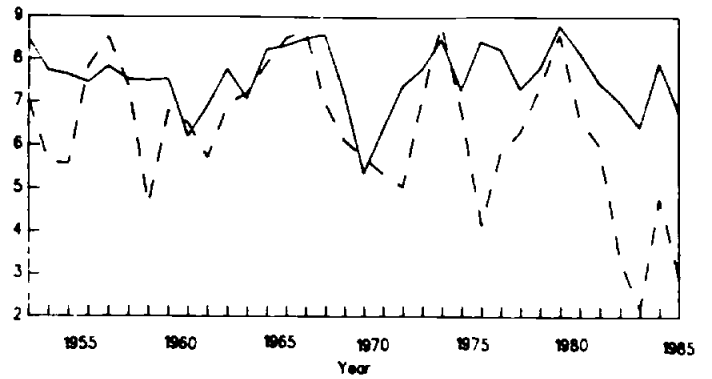
Source: All data are drawn from National Income Accounts except for the Change in Real Household Net Worth, which is found in the Federal Reserve Board's Balance Sheets of the U.S. Economy, and the inflation-adjustment to saving, which subtracts the fourth quarter-to-fourth quarter change in the GNP deflator times the net financial assets of the household sector (excluding corporate equities) from NIPA net private saving.

Net National Savings, 1950-1985



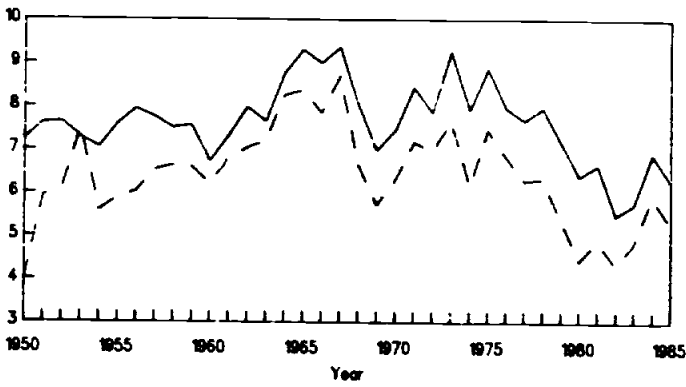
Flow of Funds Savings Rates, 1950-1985

FOF Private Savings FOF National Saving

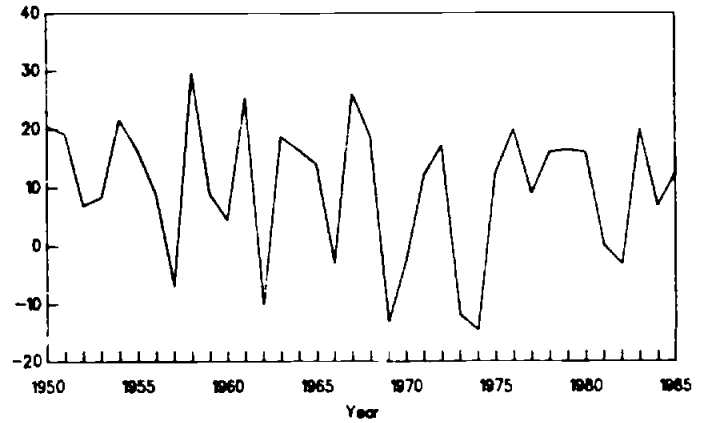


Private Savings Rate (NIPA Basis) 1950-1985

NIPA Net Savings Infl. Adj. Net Sav.



Change in Real Net Worth/GNP 1950-1985



Consumption to GNP Ratios, 1950-1985

Total Consumption Non-durable and Services

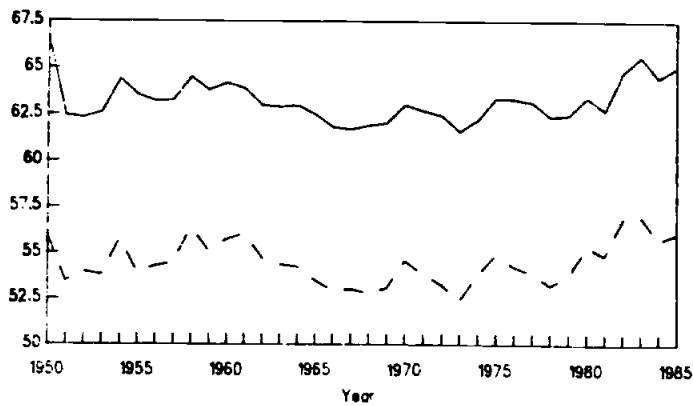


Figure 2: National Savings Measures, 1950-1985

The fourth row reports the Flow of Funds national savings rate. It is inferred from the increases in asset stocks rather than from the difference between income and outlays as in NIPA. One important difference between the two is the inclusion of consumer durables expenditure as savings in the Flow of Funds accounts. DeLeeuw (1984) shows that because of measurement problems, the Flow of Funds private savings rate (presented in row five) exceeds the NIPA private rate. Both measures decline in recent years.

A major conceptual problem with all the savings measures considered so far is that they ignore capital gains and losses. One might expect that savings measured as the change in household wealth would appear very robust during the 1980s given the strong performance of the stock market. Surprisingly, this is not the case. The data in row six of Table 2 reveal that the savings rate inclusive of capital gains and losses, computed as the change in real household net worth divided by GNP, was below its historic average in the early 1980s. This savings rate was 7.2 percent for the 1981-85 period, compared with 9.2 percent during the 1970s. While savings measured inclusive of capital gains are very volatile and so inference is difficult, it appears that unmeasured gains do not explain the decline in the official private savings rate. Moreover, these calculations assume that government debt represents net wealth. If we do not treat the increase in the privately held public debt as representing wealth, the savings rate over the 1981-1985 period averaged only 2.7 percent compared with 7.2 percent during the 1970s.

A final indicator of savings behavior is the share of consumption in GNP. Unlike the savings measures just considered, this ratio is essentially independent of the measurement of depreciation. The last two rows of Table 5 show the

ratio of total consumption, and of the consumption of non-durables and services, to GNP. We distinguish the two concepts because outlays on consumer durables are in an important sense a form of savings. Both measures of consumption peaked relative to GNP in the early 1980s, corroborating our earlier evidence that savings has declined. The total consumption-to-GNP ratio was 64.5 percent, compared with an average of 62.8 percent during the 1970s and 62.5 percent in the 1960s. Similar patterns emerge from the durables-exclusive consumption measure.

The observation that national savings and even private savings have fallen as budget deficits have risen need not falsify the Ricardian equivalence hypothesis. It is logically possible that increased deficits raised private savings, keeping national savings constant, but that other larger shocks caused national savings to decline. The difficulty is in identifying plausible shocks that could have led to significant increases in the private savings rate. One such explanation, consistent with Ricardian equivalence, is that expectations of future income growth increased. This does not seem very plausible. The recent performance of productivity has been very disappointing relative to prior expectations. Although 1985 was a recovery year, for example, productivity in the non-farm business sector did not increase at all. Since changes in the rate of productivity growth dwarf other determinants of long-run income prospects, the basis for optimism is unclear. One type of explicit evidence on future income expectations is the long-range macroeconomic forecast history of economic forecasting firms. DRI, for example, periodically produces long term forecasts. The implied ten-year growth rate in the 1978 forecast was 3.5 percent. In their 1980 forecast it was 3.1 percent, 3.2 percent in 1982, 2.9 percent in 1984, and

2.6 percent in 1986. This evidence also contradicts the view that growth expectations have improved.

As a way of further investigating the recent decline in national savings, we estimated equations relating the savings measures in Table 2 to a trend, four lagged values of GNP growth, and a dummy variable set equal to one for the post-1981 period. In alternative specifications, we added lagged rates of unemployment, inflation (measured using the GNP deflator) and lagged stock market returns as additional explanatory variables. By examining the coefficients on the post-1981 dummy variable, we can determine whether economic conditions, apart from deficits, can account for the low national savings rates of recent years. The results are presented in Table 3. They indicate that relatively little of the recent reduction in national savings can be explained by cyclical conditions, inflation or the behavior of the stock market. In most cases, the post-1981 dummy is statistically significant, and it typically suggests a national savings decline of 2.5 percent of GNP.

While it is difficult to isolate factors that could have outweighed the effects of budget deficits and caused the savings rate to decline, it is easy to identify considerations that might have raised the savings rate. Most obviously, real interest rates at all maturities appear to have increased substantially in recent years. Unless these increases were caused by shocks that also increased future income prospects, they would have been expected to increase private savings. In addition, changes in tax rules that were enacted in 1981 should have had a positive impact on savings. The behavior of the private savings rate in the face of the clearest Ricardian experiment in the last half century should shift the burden of proof to those who believe that changes in the timing of tax collections do not affect private savings.

III. Anticipated Tax Cuts: Evidence of Liquidity Constraints and/or Myopia?

The 1981 tax cut provides a useful test of Ricardian equivalence, not only because it dramatically lowered personal taxes, but also because it was announced in advance and implemented gradually. With non-myopic, non-liquidity constrained consumers, its implementation should not have had any effect on consumption. Following in the tradition of Hall (1978), we test these predictions by maintaining the hypothesis that per capita consumption evolves as a random walk with innovations that are unpredictable given lagged information. As Hall demonstrates, this theory can be tested by examining the correlation between consumption innovations and any lagged variable. To maximize power against the alternative hypothesis of interest here -- that consumption is affected by policies that affect the timing of tax collections -- we use as lagged variables a measure of the impact of pre-announced tax policies.

We measure these policy shocks for the recent tax reforms using data from Ziemer (1985), who estimates the effect of the statutory changes enacted in 1981, 1982 and 1984 on tax collections and withholding assuming they had no impact on economic behavior. His measure thus captures the exogenous component of the policy changes on budget deficits. We also use unpublished Department of Commerce data on the impact of three earlier tax changes, those in 1964, 1968, and 1975. The tax shock in 1968 was due to the Vietnam War surcharge for the 1968:3-1970:3 period. It was an explicitly temporary tax change. In 1975, we focus on the one-time rebate that occurred in 1975:2. We do not consider the long-run effects of the 1975 rate changes, which are analyzed in Blinder (1981). The remaining tax change, the 1964 cut, was similar to the current reform in

Table 3

Post-1981 Changes in Savings After Adjustment For Economic Conditions

| Savings Concept | Control Variables for Economic Conditions | | | |
|---|---|--|---|---------------------------------------|
| | Lagged GNP Growth | Lagged GNP Growth and Stock Market Returns | Lagged GNP Growth and Unemployment Rate | Lagged GNP Growth and Inflation Rates |
| Net National Savings/GNP | -3.34 (0.92) | -3.29 (1.28) | -1.92 (0.95) | -3.24 (1.03) |
| Net National Savings (Flow of Funds)/GNP | -2.39 (0.88) | -3.49 (1.17) | -1.83 (0.96) | -2.10 (1.08) |
| Consumption/GNP | 1.92 (0.51) | 1.86 (0.83) | 0.88 (0.50) | 1.60 (0.54) |
| Consumption of Nondurables and Services/GNP | 2.50 (0.63) | 2.57 (1.03) | 1.25 (0.60) | 2.44 (1.34) |

Notes: Standard errors are shown in parentheses. The reported coefficients correspond to a post-1981 dummy variable in the equation

$$SAVE_t = \alpha_0 + \alpha_1 TIME_t + \alpha_2 DUM81_t + \beta(L)\Delta \ln GNP_{t-1} + \gamma(L)X_{t-1} + \epsilon_t$$

where X_t denotes either stock market returns, inflation, or the unemployment rate. See text for further details.

enacting across-the-board reductions in personal taxes and marginal tax rates. The law took effect beginning in 1964:1. We set our tax change measure equal to the law's effects in each quarter of 1964 and 1965, but to zero thereafter. This decision to truncate the effects after two years is arbitrary, but the results are insensitive to minor changes.⁹

The consumption Euler equation we estimate is of the form:

$$c_t = \alpha + \beta c_{t-1} + \gamma_1 \Delta \text{tax}_{64,t} + \gamma_2 \Delta \text{tax}_{68,t} + \gamma_3 \Delta \text{tax}_{75,t} + \gamma_4 \Delta \text{tax}_{81,t} + \epsilon_t$$

where each Δtax variable is comprised of information available as of period $t-1$. We adopt the convention that Δtax is positive when the tax change reduces tax payments; this means Δtax corresponds to the increment to disposable income.

We estimate this equation separately for non-durable consumption, consumption of services, and total consumption. We also use two tax variables, one the change in total per capita personal tax and nontax receipts, and the other the change in per capita tax withholding. Although either variable can be used to test the null hypothesis, the withholding variable probably has more power since taxpayers whose taxes are withheld seem more likely to be liquidity constrained than do those who pay estimated tax. For the 1975 tax rebate, we use the same variable (the actual rebate) for both tax measures.

The estimation results are presented in Table 4. They tend to reject the premise of the Ricardian equivalence hypothesis. The coefficients on the tax variables are all positive, indicating that when tax collections were reduced by tax legislation consumption increased abnormally. This is true even though the tax changes were all anticipated. In most cases we can reject the hypothesis that $\gamma_i = 0$ at the .05 significance level, while in others, we reject at

Table 4

Consumption Responses to Pre-Announced Tax Changes

| Consumption Measure | Tax Measure | Constant | C ₋₁ | Tax Reform Episode | | | | D.W. | R ² |
|---------------------|----------------------|------------------|------------------|--------------------|------------------|------------------|------------------|------|----------------|
| | | | | 1964 | 1968 | 1975 | 1981 | | |
| Nondurables | Withholding | 10.61 (15.43) | 0.998 (0.005) | 0.217 (0.070) | 0.073 (0.119) | 0.155 (0.095) | 0.044 (0.021) | 1.78 | .997 |
| Nondurables | Total Personal Taxes | 10.96 (15.38) | 0.998 (0.005) | 0.259 (0.079) | 0.066 (0.091) | 0.162 (0.098) | 0.035 (0.016) | 1.79 | .997 |
| Services | Withholding | 2.55 (5.36) | 1.005 (0.002) | 0.091 (0.047) | 0.107 (0.080) | 0.121 (0.068) | 0.010 (0.017) | 1.91 | .999 |
| Services | Total Personal Taxes | 2.63 (5.36) | 1.005 (0.002) | 0.106 (0.053) | 0.074 (0.061) | 0.113 (0.069) | 0.008 (0.013) | 1.91 | .999 |
| All Consumption | Withholding | 12.03 (21.32) | 1.002 (0.003) | 0.402 (0.161) | 0.150 (0.272) | 0.349 (0.218) | 0.134 (0.051) | 1.79 | .999 |
| All Consumption | Total Personal Taxes | 12.98 (21.31) | 1.002 (0.003) | 0.462 (0.183) | 0.121 (0.208) | 0.351 (0.217) | 0.108 (0.041) | 1.80 | .999 |

Notes: Values in parentheses are standard errors. All equations are estimated using seasonally adjusted, quarterly, per capita consumption data for the period 1947:1-1986:2. Further details can be found in the text. The basic estimating equation is:

$$c_t = \alpha + \beta c_{t-1} + \gamma_1 \Delta \text{tax}_{64,t} + \gamma_2 \Delta \text{tax}_{68,t} + \gamma_3 \Delta \text{tax}_{75,t} + \gamma_4 \Delta \text{tax}_{81,t} + c_t.$$

Further details are provided in the text.

somewhat lower levels. Only the 1969 tax surcharge has a statistically insignificant effect.

The estimated consumption effects are also substantively important in many equations. For total consumption, for example, the withholding variable applicable to recent tax policy changes implies that an anticipated change of one dollar in tax withholding generates a 13.4¢ change in consumption within the quarter of the tax change beyond what would have been predicted using lagged consumption. For personal taxes the effect is smaller (10.8¢) but still non-trivial. The earlier tax reforms are estimated to have even larger short-run consumption effects. These results corroborate the earlier evidence that the tax reductions of the early 1980s significantly increased consumption and thereby reduced national savings. They also support the findings of Wilcox (1987) that anticipated tax policies such as the payment of refunds affect consumption.

We also examined the residuals from our consumption equations to see if they were correlated with the announcements of tax policy. We found little evidence along these lines. For the last quarter of 1980 and the first three quarters of 1981 for example, the residuals were actually negative even though consumers learned of the massive 1981 tax cut during this time period. Earlier announcement periods also yielded statistically insignificant effects. This may be evidence of myopia since the implementation of the tax cuts did affect consumption, even though its announcement did not.¹⁰

IV. Conclusions

The recent American deficit experience represents a natural experiment for testing the Ricardian equivalence proposition. It provides clear evidence of a decline in national savings in the face of increased federal deficits, and direct evidence that preannounced tax policies affect consumption spending at the time of implementation. It is noteworthy that recent high U.S. deficits have coincided with unprecedented real interest rates as predicted by traditional (non-Ricardian) theories. The large real appreciation in the dollar and the associated trade deficit provide further support for the traditional view of the economic effects of deficits.

While we are aware of no interpretation of recent the experience that convincingly reconciles it with the Ricardian equivalence view, our conclusions are inconsistent with a significant body of work which has used historical data to support that view. In large part this is because historical data do not contain the information necessary to evaluate the Ricardian equivalence theory. Since most previous changes in U.S. budget deficits are associated with cyclical fluctuations, inflation, or wars, and since these factors all act directly on both nominal and real interest rates as well as national savings rates, it is difficult to use observed fluctuations in deficits to evaluate the validity of Ricardian equivalence. The failure of empirical efforts such as Evans (1985, 1986, 1987), Plosser (1982), and the studies surveyed in Seater (1985) to relate the exogenous component of deficits to interest rates is not surprising, since this component is likely to be measured very imprecisely. Furthermore, the observation that real interest rates frequently fail to rise during wars, when

nearly all theories predict that they should, suggests that these findings may tell us more about our ignorance concerning interest rate determination than about the consumption effects of debt policies.

Footnotes

1. Hayashi (1985) raises the possibility that if liquidity constraints are generated by adverse selection effects, Ricardian equivalence could still hold because tax policies affect the nature of consumers borrowing constraints. His argument is not valid if liquidity constraints are caused by limitations on the ability of consumers to borrow because of enforcement problems created by bankruptcy laws and other protections accorded to debtors.

2. Hayashi (1985) and Hall (1987) survey recent work on consumption and liquidity constraints. Of particular importance for historical studies of government deficits, DeLong and Summers (1986) suggest that liquidity constraints were extremely important in the pre-war United States as one would expect given the volatility of income and the absence of well developed capital markets.

3. If distortionary taxes are raised and lowered as part of the deficit program, the path of taxes may induce intertemporal substitution on the part of consumers. These effects are analyzed by Auerbach and Kotlikoff (1987).

4. In the simplest models, this will occur only if the steady state growth rate exceeds the steady state interest rate and the economy is dynamically inefficient. However, perpetual debt issue is possible in dynamically efficient economies if government debt provides non-pecuniary services or if there are taxes on capital income.

5. The equation we use in predicting real debt growth, taken from Barro (1986, p. 387), is

$$\hat{DB} - \pi = -.15 + 2.8*U$$

where \hat{DB} denotes the percentage change in the nominal debt stock held by the public, π is the inflation rate, and U is the aggregate unemployment rate. Barro reports somewhat better performance for his equation for 1983 and 1984 based on what seem in retrospect to be unreasonably high values of expected inflation. The predicted values in the table should be increased by one percentage point for each point by which the reader thinks predicted inflation exceeds actual inflation. For 1984 and 1985, we use the annual average unemployment rates of 7.4 and 7.1 percent in our calculations. For 1986, we use the Congressional Budget Office (1986) forecast of an annual unemployment rate of 7.0 percent, as well as their estimates of outstanding federal debt, in our text calculations.

6. It has been suggested that since the 1964 tax cut was roughly as large as the 1981 tax cut, it is also useful in evaluating Ricardian equivalence. This argument is not valid. For issues of Ricardian equivalence, changes in the level of tax collections, not changes in tax rules, are of central importance. As the appendix illustrates, the deficit effects of the 1964 reform were much smaller than those from the 1981 tax change.

7. To the extent that federal deficits have been offset by state and local surpluses in recent years, their coincidence with declining national savings is all the more surprising.

8. The most important problems involve unmeasured capital inflows which cause increases in assets to be falsely imputed to the household sector, and the underground economy which may lead to underestimates of disposable income. See DeLeeuw (1984) for a thorough discussion.

9. These data, which are similar to those Ziemer (1985) reports for the post-1981 tax reforms, were provided by the Bureau of Economic Analysis. The data series for the 1975 tax change is published in Blinder (1981), while the 1968 data may also be found in Okun (1971).

10. Aschauer (1985) examines Euler equations like those estimated here and argues that rejection of Ricardian equivalence occurs only because of the failure to include some of government spending in private consumption. He does not include variables of the type considered here in his tests. In results not reported here, we re-estimated his system (15) including our Δ tax variables in the consumption Euler equation. The null hypothesis of zero effect for these tax variables is rejected at the .10 level.

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Table A-1

Behavior of Federal Deficits, 1960-1985

| Year | Deficit Measures as a Percentage of Full-Employment GNP | | | |
|---------------------|---|-----------------------------|----------------------------|--|
| | Actual Deficit | Cyclically-Adjusted Deficit | Inflation-Adjusted Deficit | Cyclically- and Inflation-Adjusted Deficit |
| 1960 | -0.53 | -0.84 | -1.01 | -1.32 |
| 1961 | 0.66 | 0.02 | 0.21 | -0.43 |
| 1962 | 0.68 | 0.67 | -0.19 | -0.20 |
| 1963 | -0.05 | 0.05 | -0.46 | -0.37 |
| 1964 | 0.49 | 0.98 | 0.00 | 0.49 |
| 1965 | -0.07 | 0.97 | -1.00 | 0.04 |
| 1966 | 0.24 | 1.89 | -0.93 | 0.72 |
| 1967 | 1.63 | 3.04 | 0.96 | 2.36 |
| 1968 | 0.68 | 2.29 | -0.75 | 0.86 |
| 1969 | -0.87 | 0.41 | -2.15 | -0.87 |
| 1970 | 1.17 | 1.03 | 0.10 | -0.05 |
| 1971 | 1.91 | 1.46 | 0.70 | 0.25 |
| 1972 | 1.35 | 1.25 | 0.48 | 0.38 |
| 1973 | 0.41 | 0.98 | -1.16 | -0.58 |
| 1974 | 0.75 | 0.59 | -0.92 | -1.09 |
| 1975 | 3.97 | 2.54 | 2.68 | 1.25 |
| 1976 | 2.80 | 1.99 | 1.76 | 0.94 |
| 1977 | 2.20 | 2.04 | 0.87 | 0.71 |
| 1978 | 1.27 | 1.96 | -0.33 | 0.36 |
| 1979 | 0.62 | 1.40 | -1.12 | -0.34 |
| 1980 | 2.10 | 2.07 | 0.27 | 0.24 |
| 1981 | 1.94 | 1.69 | 0.32 | 0.07 |
| 1982 | 4.07 | 2.47 | 3.07 | 1.47 |
| 1983 | 4.64 | 3.32 | 3.82 | 2.51 |
| 1984 | 4.23 | 4.15 | 3.32 | 3.23 |
| 1985 | 4.69 | 4.81 | 3.74 | 3.87 |
| Five-Year Averages: | | | | |
| 1961-65 | 0.34 | 0.54 | -0.29 | -0.09 |
| 1966-70 | 0.57 | 1.73 | -0.55 | 0.61 |
| 1971-75 | 1.68 | 1.36 | 0.36 | 0.04 |
| 1976-80 | 1.80 | 1.89 | 0.29 | 0.38 |
| 1981-85 | 3.91 | 3.29 | 2.85 | 2.23 |

Source: Actual deficits are drawn from the National Income Accounts. Cyclically adjusted deficits and full-employment GNP were provided courtesy of DRI. Inflation-adjustment subtracts the Q4 to Q4 change in the GNP deflator, times the outstanding debt stock at the end of the previous year, from the measured deficit (note deficits are measured as positive values).

Appendix Table A-2

Annual Data on Various Measures of U.S. Savings Rate

| Year | Net National Savings/GNP | Net Private Savings/GNP | Net Inflation-Adjusted Private Savings/GNP | Flow of Funds Private Savings/GNP |
|------|--------------------------|-------------------------|--|-----------------------------------|
| 1950 | 10.02 | 7.25 | 3.98 | NA |
| 1951 | 9.45 | 7.62 | 5.93 | NA |
| 1952 | 6.57 | 7.65 | 6.12 | 8.47 |
| 1953 | 5.41 | 7.29 | 7.50 | 7.74 |
| 1954 | 5.13 | 7.06 | 5.59 | 7.65 |
| 1955 | 8.38 | 7.59 | 5.88 | 7.47 |
| 1956 | 9.15 | 7.94 | 6.03 | 7.84 |
| 1957 | 7.98 | 7.76 | 6.53 | 7.54 |
| 1958 | 4.75 | 7.51 | 6.63 | 7.51 |
| 1959 | 7.24 | 7.56 | 6.61 | 7.54 |
| 1960 | 7.34 | 6.73 | 6.20 | 6.21 |
| 1961 | 6.52 | 7.31 | 6.81 | 6.91 |
| 1962 | 7.31 | 7.97 | 7.03 | 7.77 |
| 1963 | 7.79 | 7.66 | 7.22 | 7.09 |
| 1964 | 8.40 | 8.76 | 8.25 | 8.23 |
| 1965 | 9.37 | 9.30 | 8.37 | 8.33 |
| 1966 | 8.83 | 9.00 | 7.85 | 8.49 |
| 1967 | 7.61 | 9.36 | 8.69 | 8.59 |
| 1968 | 7.37 | 8.04 | 6.63 | 7.23 |
| 1969 | 8.03 | 7.00 | 5.73 | 5.37 |
| 1970 | 6.49 | 7.45 | 6.33 | 6.38 |
| 1971 | 6.75 | 8.44 | 7.18 | 7.37 |
| 1972 | 7.65 | 7.87 | 6.98 | 7.77 |
| 1973 | 9.84 | 9.26 | 7.68 | 8.48 |
| 1974 | 7.50 | 7.93 | 6.17 | 7.29 |
| 1975 | 4.81 | 8.87 | 7.46 | 8.42 |
| 1976 | 5.82 | 7.98 | 6.85 | 8.24 |
| 1977 | 6.73 | 7.69 | 6.29 | 7.31 |
| 1978 | 7.94 | 7.96 | 6.32 | 7.80 |
| 1979 | 7.68 | 7.18 | 5.38 | 8.79 |
| 1980 | 5.17 | 6.39 | 4.44 | 8.17 |
| 1981 | 5.71 | 6.64 | 4.89 | 7.45 |
| 1982 | 2.00 | 5.49 | 4.36 | 7.02 |
| 1983 | 1.97 | 5.74 | 4.84 | 6.42 |
| 1984 | 4.20 | 6.90 | 5.92 | 7.91 |
| 1985 | 2.86 | 6.27 | 5.27 | 6.78 |

Note: See text for data description.

Appendix Table A-2, Continued

| Year | Flow of Funds National Savings/GNP | Change in Household Net Worth/GNP | Consumption/ GNP | Nondurable and Service Con- sumption/GNP |
|------|--|---|---------------------|--|
| 1950 | NA | 20.54 | 66.63 | 55.98 |
| 1951 | NA | 19.21 | 62.42 | 53.45 |
| 1952 | 7.03 | 6.97 | 62.32 | 53.98 |
| 1953 | 5.61 | 8.33 | 62.59 | 53.79 |
| 1954 | 5.57 | 21.56 | 64.38 | 55.76 |
| 1955 | 7.84 | 16.30 | 63.54 | 53.95 |
| 1956 | 8.54 | 8.87 | 63.19 | 54.27 |
| 1957 | 7.41 | -6.83 | 63.26 | 54.46 |
| 1958 | 4.63 | 29.57 | 64.49 | 56.35 |
| 1959 | 6.80 | 8.96 | 63.80 | 55.16 |
| 1960 | 6.52 | 4.54 | 64.18 | 55.73 |
| 1961 | 5.72 | 25.36 | 63.90 | 56.05 |
| 1962 | 6.95 | -10.05 | 62.98 | 54.80 |
| 1963 | 7.21 | 18.68 | 62.89 | 54.37 |
| 1964 | 7.91 | 16.45 | 62.99 | 54.25 |
| 1965 | 8.50 | 13.97 | 62.50 | 53.51 |
| 1966 | 8.70 | -2.89 | 61.83 | 52.95 |
| 1967 | 7.00 | 25.99 | 61.69 | 53.03 |
| 1968 | 6.13 | 18.71 | 61.89 | 52.81 |
| 1969 | 5.74 | -13.08 | 62.03 | 53.08 |
| 1970 | 5.35 | -2.55 | 63.02 | 54.58 |
| 1971 | 5.04 | 12.04 | 62.72 | 53.87 |
| 1972 | 7.07 | 17.09 | 62.47 | 53.30 |
| 1973 | 8.84 | -11.87 | 61.59 | 52.42 |
| 1974 | 6.85 | -14.56 | 62.23 | 53.83 |
| 1975 | 4.15 | 12.41 | 63.36 | 54.89 |
| 1976 | 5.81 | 19.85 | 63.34 | 54.29 |
| 1977 | 6.31 | 8.96 | 63.16 | 53.89 |
| 1978 | 7.35 | 15.91 | 62.39 | 53.25 |
| 1979 | 8.58 | 16.41 | 62.47 | 53.74 |
| 1980 | 6.61 | 16.01 | 63.42 | 55.39 |
| 1981 | 5.99 | 0.13 | 62.74 | 54.88 |
| 1982 | 3.33 | -3.12 | 64.77 | 56.79 |
| 1983 | 2.19 | 19.90 | 65.61 | 57.12 |
| 1984 | 4.78 | 6.89 | 64.49 | 55.70 |
| 1985 | 2.94 | 12.32 | 65.04 | 56.06 |

Note: See text for data description.