

NBER WORKING PAPER SERIES

THE IMPACT OF THE 1986 TAX REFORM ACT ON PERSONAL SAVING

Jonathan Skinner

Daniel Feenberg

Working Paper No. 3257

NATIONAL BUREAU OF ECONOMIC RESEARCH
1050 Massachusetts Avenue
Cambridge, MA 02138
February 1990

Prepared for the Conference on the Economic Impact of the Tax Reform Act of 1986, Ann Arbor, MI, November 1989. We are grateful to Don Fullerton, Kevin Hassett, Pat Hendershott, Joel Slemrod, Conference participants, and the Public Finance seminar at Columbia University for helpful suggestions. Richard McGrath provided excellent research assistance, and we especially thank John Karl Scholz for allowing us to use his taxpayer survey. This paper is part of NBER's research program in Taxation. Any opinions expressed are those of the authors not those of the National Bureau of Economic Research.

NBER Working Paper #3257
February 1990

THE IMPACT OF THE 1986 TAX REFORM ACT ON PERSONAL SAVING

ABSTRACT

Many critics believed that the Tax Reform Act of 1986 (TRA86) would discourage saving. Yet personal saving rates have rebounded since 1987. This rebound might have been caused by a general decline in marginal tax rates on household saving. And we estimate, at least for the 1980s, a positive elasticity of saving with respect to the after-tax rate of return. But the tax changes alone cannot account for the recent upswing in saving rates. Furthermore, the positive saving elasticity during the 1980s is fleeting and fragile; during the entire postwar period the correlation between the after-tax rate of return and personal saving is at most zero.

We also consider three alternative ways by which the Tax Reform Act could have affected personal saving. First, the cutbacks in IRA eligibility were viewed by some as discouraging saving. But conventionally measured personal saving increased after IRA enrollment plummeted in 1987. We show that this anomalous finding may be an artifact of how personal saving is measured, since a different measure - the real change in household wealth - grew strongly during the mid-1980s, before leveling off after 1987. Second, the phasing out of personal credit interest deductions in TRA86 could have discouraged borrowing and thereby stimulated national saving. We find that wealthier taxpayers simply shuffled their personal credit loans into tax-deductible housing mortgages with little net effect on aggregate saving. Finally, saving could have been reduced in 1986 if taxpayers, rushing to realize capital gains before TRA86, spent their proceeds on bit-ticket consumption goods. We also find little evidence in favor of this view, although we do find much of the capital gains ended up in interest-bearing accounts. In sum, TRA86 had more impact on the composition than on the overall level of saving.

Jonathan Skinner
Department of Economics
University of Virginia
Charlottesville, VA 22901
(804)924-6749

Daniel Feenberg
NBER
1050 Massachusetts Avenue
Cambridge, MA 02138
(617)868-3900

The 1986 Tax Reform Act was viewed by some critics as discouraging saving.¹ While marginal rates were reduced, the preferential treatment of capital gains was erased and IRAs were largely shut down. At first, the pessimistic view of tax reform seemed to be borne out by the statistics; personal saving rates plunged from an already low 4 percent in 1986 to 1.8 percent in the second quarter of 1987. But since that time, the saving rate has rebounded; by the second quarter of 1989 the personal saving rate stood at 5.4 percent.

One of the most difficult tasks in economics is to establish a causal relationship, and in the case of a structural change as recent as the 1986 tax reform, the task is particularly difficult. The first question that must be addressed is, were there large changes in the incentives to saving under the 1986 tax reform? We find that the changes in marginal household saving incentives were substantial.² For example, 27 percent of taxpayers, weighted by dividend income received, experienced a decline in marginal tax rates on dividend income of more than 20 percentage points. We also find that the decline in marginal rates and the increase in the tax on capital gains largely offset one another, leaving the effective household tax rate on investments largely unchanged or even lowered. Furthermore, investments held for a long period of time were most favored under the 1986 tax reform, even when

¹ For example, in late 1986 Murray Weidenbaum stated that under tax reform, "investment incentives are clobbered....[The tax bill] depresses saving and investment, and that reduces economic growth." (quoted in the National Journal [October 11, 1986, page 2457]).

² This paper focuses only on household saving incentives, although the 1986 Tax Reform Act had a major effect on corporate tax incentives. For reviews see Auerbach (1987) and Bovenberg (1989).

accrued capital gains comprised a substantial fraction of the total return.

The second question is, how do these marginal incentives to save -- as summarized by the after-tax rate of return -- affect saving rates? The evidence that the after-tax rate of return affects saving is weak, although for the most part the evidence excludes the latter part of the 1980s.³ We reevaluate the evidence, and first find that simple saving regressions imply a negative interest elasticity of saving during the postwar period. Second, the Euler equation approach to consumption implies essentially no effect of the real after-tax return on saving (Hall, 1988). But when the sample is restricted to the 1980s, both the saving and consumption regressions show a positive and significant effect of the after-tax return on saving. These results either suggest a fundamental shift in saving behavior during the 1980s, or a simple statistical artifact.

If the after-tax rate of return has had little historical impact on aggregate personal saving, then why should the 1986 Tax Reform Act (TRA86) be expected to affect saving? There are three reasons. First, TRA86 sharply restricted IRA eligibility to higher income taxpayers, and IRA contributions fell by 62 percent between 1986 and 1987. Generally, microeconomic studies have been supportive of the view that IRAs represent new saving, so TRA86 could have reduced household saving by restricting IRAs.⁴ But the evidence from aggregate personal saving

³ See Hall (1988), Boskin (1978), Howrey and Hymans (1978), Summers (1982) and Friend and Hasbrouck (1983).

⁴ See, for example, Venti and Wise (1986, 1987, 1989); Feenberg and Skinner (1989); Hubbard (1984); for criticisms of these studies see

suggests that IRAs, if anything, reduced saving. Between 1982 when IRAs became generally available, and 1986 when they were curtailed, personal saving declined from 6.8 percent to 4 percent; since 1986 the saving rate has rebounded by 2 percentage points.

One explanation for the sharply different results between the microeconomic studies suggesting that IRAs increase saving, and the aggregate data suggesting that they do not, is the measurement of saving. Saving can be measured in two ways; either as the difference between the flow of income and the flow of consumption -- which is how personal saving is usually measured -- or as the change in net wealth. Theoretically, the two measures are identical. But in practice, they are quite different.⁵ And saving rates calculated as the difference in net wealth tell a different story of asset accumulation during the period when IRAs were available; this measure of saving remained high during 1982-86, and dropped off slightly after 1987. Obviously, many factors accounted for this increase in net wealth, such as the stock market boom, but the point remains that household asset accumulation was strong during the mid 1980s. Hence it is difficult to make any conclusions about the effect of IRAs on saving based only on an examination of aggregate saving rates, since alternative measures of saving tell such different stories.

The second way that TRA86 affected saving behavior was by phasing out the deduction for personal interest payments and thereby increasing

Gravelle (1989) and preliminary work by Gale and Scholz (1989).

⁵ For recent discussions of this issue, see Auerbach (1985); Boskin (1988); Bradford (1989); and Hendershott and Peek (1989).

the net cost of borrowing. As a result of TRA86, total consumer credit (excluding house mortgages) and revolving credit both fell sharply between the latter half of 1986 and the first quarter of 1987. Holding other factors constant, this would imply that TRA86 stimulated saving, since a dollar not borrowed is a dollar saved. But taxpayers did not hold their home mortgages constant. Using a panel of taxpayers for the years 1985 to 1987, we found that taxpayers shuffled their reduced personal credit into home equity lines of credit or increased home mortgages. Our estimates suggest that of every dollar reduction in personal interest payments, between 67 and 86 cents went back into increased home mortgage payments. Perhaps this is one reason why the ratio of home mortgages to housing value reached 48 percent in 1988, a sharp rise from the 40.4 percent ratio in 1984 (Federal Reserve Board, 1989). At least for the wealthy taxpayers in our sample, the reduction in personal credit deductibility had little effect on overall saving.

The third effect of TRA86 on the level and composition of household saving was the controversial decision to ease the distinction between long term capital gains and ordinary income. The top marginal rate on capital gains rose from 20 percent to 33 percent, while the statutory rates on ordinary income declined. Once it became clear that the new law would raise capital gains taxes in 1987, taxpayers rushed to realize long-term gains in 1986. While a lively debate still continues on whether increased capital gains taxes raises revenue (Lindsey, 1987, Cook and O'Hara, 1987, and Auerbach, 1988), a different, and neglected, question is how announced changes in the capital gains tax affected household saving. The primary impact of TRA86 on saving could have been

to encourage taxpayers to unlocked their long-term gains and spend them (Summers, 1989). Results from the panel survey of taxpayers provide little support for the view that the capital gains realization in 1986 reduced saving, although we do find evidence that taxpayers shifted their capital gains into interest-bearing assets. In summary, then, the Tax Reform Act of 1986 had a stronger impact on the composition of saving and credit than on the actual level of aggregate household saving.

II. The Effect of TRA86 on the Marginal Return to Saving

The objective of TRA86 was to broaden the tax base and lower marginal rates. These lower rates were phased in during 1987, and by 1988 taxpayers faced top marginal rates of 33 percent, with the wealthiest individuals paying a marginal tax of 28 percent. For many taxpayers, the changes in marginal rates were quite small. For example, in a 1987 study Hausman and Poterba evaluated the overall impact of TRA86 on marginal rates:

Our calculations suggest that in 1988, over 40 percent of the taxpaying population will face marginal tax rates equal to or higher than the rates they would face under current law. Only 11 percent of taxpayers receive marginal tax rate reductions of ten percentage points or more. In part, these findings account for our conclusion that the tax reform will have relatively small aggregate effects (pp. 101-102).

Our calculations focus less on the absolute number of taxpayers, and more on those taxpayers who are actually receiving a large fraction of interest, dividend or capital gains income. Our measure of marginal tax rate changes weights each taxpayer by the amount of relevant income

that they received in 1986. Since a large fraction of saving is done by those whose tax rates are affected most by TRA86, we find substantial shifts in the marginal tax rates on a "representative" or average dollar of capital income.

The distribution of these changes may be seen in Figures 1 and 2 (and in Table 1) as calculated by NBER's TAXSIM program. The TAXSIM model uses a stratified random sample of 75,400 U.S. individual income tax returns from 1986 weighted to replicate the universe of tax returns.⁶ Figure 1 shows the distribution of changes in the marginal tax rate on dividends and capital gains between 1986 and 1988, weighted by dividend and capital gains income, respectively. For example, taxpayers who in total account for 27 cents of every dollar received in dividend income experienced a decline in their marginal tax rate of more than 20 percentage points. This number largely reflects those taxpayers formerly in the 50 percent bracket now subject to the 28 percent bracket. But almost every taxpayer experienced a sharp rise in their capital gains tax; the rate jumped by at least 10 percentage points for taxpayers receiving 74 cents of every dollar in capital gains.

The corresponding figures are shown for the marginal tax rates on interest income and personal credit in Figure 2. In the first case, the

⁶ The TAXSIM data includes all information (except taxpayer identification) from the 1040 form and a few items from important supporting schedules. The very rich are oversampled to provide more accurate estimates of tax liabilities, with sampling rates of up to one in three for the highest income levels. To the extent feasible, complexities of the tax code, including income averaging, the minimum tax, etc., are accounted for in the calculation of tax liabilities and marginal tax rates. The tax return data is as rich in income information as it is poor in demographic information. Race, sex, and exact age are pointedly not available.

percentage of taxpayers experiencing a shift in their marginal tax rates are weighted by interest income received, while in the second case, we weight by AGI (since total personal credit is unavailable). There is an overall decline in the marginal tax on interest, but it is less in magnitude than that for dividend income because a smaller fraction of interest income is held by the wealthiest taxpayers. Only 6.2 percent of interest income was taxed at the 50 percent marginal rate in 1986, compared with 25 percent of dividend income in the same year. Finally, the reduction in deductions allowed on personal credit, from 100 percent to 40 percent in 1988, coupled with the lower marginal tax rates in 1988, sharply increased the after-tax cost of personal borrowing. Taxpayers who together accounted for 61 percent of AGI experienced at least a 11 percentage point decline in the marginal deduction for personal interest.

While marginal dividend tax rates went down and capital gains taxes went up, what was the overall impact of TRA86 on investments which pay a combination of dividends and realized capital gains? The popular view was that assets which appreciated in value, especially over the long-term, would suffer under TRA86 because of the higher capital gains tax rate. A simple calculation suggests otherwise. Consider an investment which retains ψ and pays in dividends $(1-\psi)$ of every dollar in net business profits. In the calculations that follow, we assume that the fixed after-corporate-tax nominal return is r , the holding period n years, and dividends paid in each year are reinvested in the same investment.

Consider a two-year investment purchased for \$1; in the first year,

the accumulated value of the investment (after the first-year dividend has been reinvested) is $1 + \psi r + z$, where $z = (1 - \psi)r(1 - \tau_y)$ is the after-tax dividend rate and τ_y is the income tax assessed on the dividend. At the end of the second year, the investment is sold, the capital gains tax is paid, and net of the principal of \$1, the investor is left with

$$[(1 + \psi r + z)(1 + \psi r) - 1](1 - \tau_c) + (1 + \psi r + z)z.$$

The two terms are (i) the accumulated after-tax capital gains, and (ii) the after-tax second-year dividend. In general, the realized return n years in the future, (net of the principal) on an investment of one dollar is written

$$R(\tau_c, \tau_y) = [(1 + \psi r + z)^{n-1}(1 + \psi r) - 1](1 - \tau_c) + z(1 + \psi r + z)^{n-1}$$

To measure the effect on incentives of TRA86, we first calculate the after-tax return R for a representative taxpayer under prior law. For example, the after tax rate of return R on a \$1 investment held for 5 years, paying 12 percent, and with a retained earning percentage of 50 percent is \$0.44 at a marginal income tax rate τ_y of 50 percent and a capital gains tax τ_c of 20 percent. The next step is to consider the effect on the rate of return R of a tax reform which taxes capital gains and dividends at the single rate τ^* along the lines of TRA86. In particular, we calculate the value of τ^* such that the return $R(\tau^*, \tau^*) = R(.4\tau_y, \tau_y)$ so that the investor is indifferent between paying τ^* under the new regime without preferential treatment of capital gains and τ_y under the old regime with preferential treatment of capital gains. Returning to our example above, a tax rate $\tau^* = .32$ on both dividends and capital gains would yield the same after-tax return \$0.44.

Taxpayers always prefer to pay lower taxes: if the taxpayer's true marginal rate under TRA86 is *below* τ^* they are better off; if it is *above*, they are worse off. In the example above, every taxpayer with a marginal rate below 32 percent is better off under TRA86. Note that we need not specify the inflation rate or the internal rate of return on the investment to make this comparison.

The calculations are presented in Table 2 for a variety of parameters. In the first row and first column of results, the reported value of τ^* , 0.35, is the marginal tax rate that would leave the investor indifferent to the original 50 percent tax bracket with 60 percent exclusion of capital gain; nearly every investor under TRA86 will be subject to marginal rates below 35 percent, and therefore will be better off. For longer holding periods, the marginal rate τ^* first falls to 32 percent, and then rises as the holding period increases beyond 5 years. That is, even when half of all profits are retained, and hence subject to capital gains tax, nearly every taxpayer previously in the 50 percent tax bracket will benefit under TRA86 for long-term investments.⁷

The intuition is that as the holding period increases, reinvested dividends account for a larger fraction of the overall return. Under TRA86, those after-tax dividends are larger, and hence augment the overall rate of return.⁸ For a wide range of interest rates and holding

⁷ The calculations presented in the text refer only to new investments made after 1987. Old investments which pay ordinary income tax on capital gains will obviously be disadvantaged by TRA86.

⁸ The timing of the tax collection differs as well; under TRA86 a larger portion of the tax is collected at realization in year n .

periods, TRA86 benefits household investors previously in marginal tax brackets of 40 or 50 percent. We have also calculated τ^* for a 30 percent dividend payout rate ($\psi = .7$); in this case the calculated τ^* s are lower, but even the wealthy taxpayer formerly in the 50 percent bracket and now in the 28 percent bracket will be almost uniformly better off under TRA86.

While these calculations suggest that conventional saving vehicles were relatively unharmed at the household level by TRA86, there were a number of investment categories which experienced sharp increases in tax liability, such as real estate and investments generating passive losses. It is not surprising that partnership and S corporation net losses fell by 40 percent and rental property by 23 percent between 1986 and 1987 (Hostetter and Bates, 1989). This evidence suggests that TRA86 was successful in discouraging household saving in these formerly tax-favored investments. Nevertheless, for orthodox financial investments, and particularly those with low levels of retained earnings, TRA86 generally reduced marginal tax rates on household saving. Whether these lower tax rates translated into higher household saving rates is the topic of the next section.

III. The After-tax Rate of Return, Saving, and Consumption

The impact of a change in the interest rate on saving is ambiguous. The substitution effect induces investors to save more in response to a higher return, but a higher return provides the investor with more future income for a given level of saving; this income effect may lead to a reduction in overall saving. On theoretical grounds, however, the

lower marginal rates under TRA86 might be expected to increase saving. First, the tax reform was designed to be revenue neutral, so that the overall income effect will be nearly zero. Second, as Summers (1981) has demonstrated in a life cycle model, the endowment effect -- that an increased interest rate will reduce the present value of future earnings and thus depress current consumption -- tends to imply a positive saving elasticity.⁹ Yet the empirical evidence for any positive correlation between the after-tax rate of return and the saving rate is very weak. Some studies have found positive effects of the interest rate on saving (Boskin, 1978; Summers, 1982), but they are not robust to alternative empirical specifications (Howrey and Hymans, 1978; Hall, 1988; also see Friend and Hasbrouck, 1983). As a first step, it is useful to reexamine the evidence in light of new data from the 1980s.

We adopt as our measure of personal saving the Commerce Department (NIPA) saving measure plus contributions to government pension plans,¹⁰ divided by disposable personal income plus the government pension contributions. We include government pensions for consistency with the convention of including private pensions in saving (Hendershott and Peek, 1989). There are alternative measures of saving (discussed below), but we adopt this measure of saving because it addresses a well-defined question: Are U.S. households generating sufficient saving

⁹ Defined benefit pension plans are a perfect example of "target" saving, since a higher interest rate will reduce the contributions necessary to meet future benefit payments. Hence the importance of pension funds in personal saving would tend to reduce the interest elasticity of saving (Bernheim and Shoven, 1985; Makin and Couch, 1989).

¹⁰ Line 6 in the sector statements of saving and investment from the Flow of Funds Accounts of the Federal Reserve (various issues).

to finance domestic investment? If personal (along with corporate business plus government) NIPA saving are low, then foreign inflows are necessary to finance domestic investment. While the economic effect of large foreign capital inflows are not necessarily harmful, future U.S. national income will be reduced as a larger fraction of the return on U.S. capital flows overseas.

Figure 3 shows personal saving rates, both quarterly and a three-quarter moving average, for the NIPA measure of saving with the adjustment for government pension contributions. The adjustment increases the overall saving rate by one or two points, but has no strong effect on the general trend, which at least until 1987 was downward. Since 1987, saving rates have increased, but they still remain below rates during the 1970s.

Although our primary interest is in personal saving rates, we include the three-quarter moving average of private saving (which also includes the government pension contributions) because, in both theory and practice, it is often difficult to distinguish between business and private saving. First, on theoretical grounds, business saving could substitute for personal saving, since the ultra-rational consumer would care little whether the corporation in which she owned stock was saving directly or issuing dividends so that she could save at the household level. Second, and more practically, the personal saving rate is a hybrid of business and household saving because it includes profits from unincorporated businesses (Hendershott and Peek, 1989). But private saving follows the broad pattern of personal saving; both rates decline, and both rebound at roughly the same time.

Figure 3 may suggest that TRA86 encouraged personal and private saving, since saving rates rebounded during 1987, the first year of its implementation. But there were many factors that affected saving in recent years. To list only three; (i) farm support payments were large (and not seasonally adjusted) in 1988, and could account for roughly half of the increase in the saving rate (Koretz, 1989); (ii) strong automobile sales fell in 1988, leading to a decline in consumer durable sales and hence a "rebound" in saving (Koretz, 1989); and (iii) tax collections were high during 1987 (perhaps as a result of TRA86 or payments on capital gains made during 1986) which temporarily depressed disposable personal income. In short, one cannot make inferences about the success or failure of TRA86 by looking at short-term quarterly changes in personal saving rates. Nevertheless, the evidence is clear that while personal saving may have stemmed its downward slide, it still remains below its level of the 1970s.

Another approach to measure the impact of TRA86 on saving is to statistically estimate the impact of the after-tax rate of return on saving during the postwar period, and then use this structural estimate to evaluate tax reform. As a first step, then, we define the after-tax return to be the return on a 3-month treasury bill less the average marginal tax rate on interest income, less expected inflation.¹¹ The expected inflation measure is taken from Hamilton (1985), who used a

¹¹ We are grateful to Joe Peek for providing the tax rate series. He used the Statistics of Income in various years to calculate an average marginal tax rate weighted by interest income received for married taxpayers filing jointly. The rates for 1987 and 1988 were projected using 1986 weights.

Kalman filtering technique to estimate the implied expectations by financial markets of next-period inflation. There are two advantages of this method for measuring expected inflation over the commonly used Livingston inflation survey. The first is that the Hamilton measure of expected inflation is generated every three months, unlike the Livingston survey which applies over a 6 month period. The second is that Livingstone surveys do not use all the financial information available in making inflation forecasts.¹² We extend the Hamilton measure through the 1980s using data on treasury bills and the GNP implicit price deflator.¹³

Three-quarter moving averages of the personal saving rate and the real after-tax rate of return are shown in Figure 4. The most striking relationship between the two is the long-term negative correlation between the saving rate and the interest rate; interest rates were low in the 1970s and high in the 1980s, while saving rates were high in the 1970s and low in the 1980s. But *within* the 1980s, saving rates appear to be positively correlated with the after-tax real return.

Table 3 provides a few simple statistical tests of the correlation

¹² Brown and Maital (1981) suggest that adding additional information, such as money supply changes, would result in inflation forecasts more accurate than the Livingstone predictions. For a discussion of the Livingstone stock market forecasts, see Dokko and Edelstein (1989).

¹³ Most of the updated financial variables and aggregate data come from Citibase through the third quarter of 1988; more recent figures come from the Survey of Current Business (August 1989) and Federal Reserve Bulletin (May 1989). Interest rates were measured in February, May, July, and October. There was some difference between Hamilton's (1985) interest rate figures from Salomon Brothers and the overlapping Citibase rates during the volatile early 1980s, due to differences in how the monthly rate was calculated from daily rates.

between saving and the after-tax return. We also include two other factors to explain saving; the fear of nuclear war as proxied by "Minutes to Midnight," a measure that Slemrod (1986) found to be significant in explaining the postwar saving rate,¹⁴ and the quarterly change in log disposable income to reflect transitory income shifts absorbed by variation in saving. Regression (1) shows that a reduction in the risk of nuclear war has a strong positive effect on saving rates, but as is suggested by the graph, there is a negative (and significant) correlation between interest rates and saving rates.

The same regression using data after 1982, shown in Row (3), yields different results. The regression implies that every one percentage point increase in the after-tax return will increase saving by 0.66 percentage points; this result is somewhat stronger when the other explanatory variables are excluded. A transitory income shift is predicted to have a strong positive impact on the saving rate, while lower fear of nuclear war leads to less, rather than more, saving. It is not clear whether these estimates imply a fundamental shift in saving behavior during the 1980s. For example, the growth of money market funds and interest bearing accounts during the late 1970s could have forged a stronger link between saving and interest rates, but the possibility remains that it is simply a statistical anomaly. But even for this saving elasticity, large by empirical standards, the implied

¹⁴ We used the unadjusted personal saving rate for the regression analysis. The "minutes to midnight" measure is an 11 quarter moving average of the actual count to reflect the relative infrequency of its shifts. Note that high values of the index are associated with lower fear of nuclear war. We are grateful to Joel Slemrod for providing the measure.

impact of TRA86 on saving is very small. The shift in marginal tax rates on interest income between 1986 and 1988 was 7.8 percentage points; at the average interest rates during this period of 6.2, the regression equation predicts an increase in saving of only 0.3 percentage points.

Most macroeconomists have eschewed saving regressions in favor of the Euler equation approach to estimating the interest sensitivity of consumption. The Euler equation approach, as pioneered by Hall (1978), relies upon the notion that consumption at time t , and planned consumption at time $t+1$, will reflect all information known to individuals at time t . Any divergence in period $t+1$ between actual and planned consumption must be the result of a random surprise -- in income, for example -- that occurred in $t+1$. Furthermore, the interest rate affects the time-path of planned consumption. A higher rate of interest, for example, increases the incentive to defer consumption until next year. In sum, the Euler approach implies that consumption in year $t+1$ is a function of consumption in the previous period and of the interest rate. The implied coefficient on the interest rate is the intertemporal elasticity of substitution.¹⁵

Hall (1988) has used Euler equation regressions to show that the after-tax real rate of return has little or no impact on the time-path of consumption, or equivalently, the intertemporal interest elasticity of consumption is essentially zero. Row (3) in Table 3 confirms his results. Consumption is defined to be the log change in real nondurable

¹⁵ One can also interpret the coefficient as the inverse of the relative risk aversion measure (Hall, 1988).

(nonservice) consumption, and the estimated intertemporal elasticity is only 0.04, with a t-statistic of 0.76. Fear of nuclear war also has little effect on consumption, and the adjusted R^2 is negative. One problem with using quarterly data is time aggregation bias; even if monthly consumption follows a random walk, quarterly consumption will not. Hall suggests a simple correction from Hayashi and Sims (1983); the regression using this correction is shown in Row (4), in which the coefficients are not noticeably different from the previous row. Finally, to correct for potential endogeneity of the interest rate, Row (5) instruments the ex post after tax return with lagged values of the interest rate and two-quarter lagged consumption changes; results are unchanged.

Surprisingly, Euler consumption regressions in the sub-period 1979-1988 shows a strong positive effect of the real after-tax interest rate on consumption. Row (6) presents the regression result without the nuclear war variable; the estimated elasticity of substitution is 0.26 with a t-statistic of 4.0. In Row (7) the elasticity estimate drops to 0.16 after including the nuclear war variable, but the coefficient remains significant at conventional levels. The full instrumental variable procedure in this subperiod led to an insignificant (and negative) coefficient on the after-tax real return.

The general consensus in the literature is that positive interest elasticity estimates, either of consumption or saving, are fragile and fleeting. The evidence from the later 1970s, when interest rates were strongly negative yet saving rates relatively high, lends support to this view. Nevertheless, regressions restricted to the 1980s show a

significant correlation between consumption and saving and the after-tax rate of return.

IV. IRAs and the Measurement of Saving

The 1986 Tax Reform Act should be judged on more than how it affected the after-tax rate of return. In this and the sections that follow, we will examine how TRA86 affected other policies towards saving.

The tax reform placed restrictions on Individual Retirement Accounts (IRAs) for single taxpayers with income over \$25,000 and married taxpayers with income over \$40,000. Some critics viewed these cutbacks on IRA eligibility as a major blow to saving. For example, a recent report by the Joint Committee on Taxation suggested that the drop in the saving rate between 1986 and 1987 was caused by the restrictions on IRAs (New York Times, 1989).

There is no question that TRA86 cut back sharply on IRA enrollment, even for those who remained eligible to contribute (Summers, 1989; Gravelle, 1989). There was at least a 35 percent decline in contributions between 1986 and 1987 for taxpayers at all income levels.¹⁶ Summers (1989) attributes this decline to the fall in aggressive marketing of IRAs by financial institutions following the eligibility restrictions in TRA86.¹⁷

¹⁶ Some part of this reduction may have been caused by the reduction in marginal rates. The tax subsidy is lower when marginal rates are lower, and one advantage of an IRA -- deducting the contribution at a high marginal rate while working, and paying the tax at a low marginal rate while retired -- was sharply diminished by TRA86.

¹⁷ The tax reform also restricted maximum contributions to 401(k)

While there is no question that IRAs contributions fell, there is still some question whether the lost IRAs reduced personal saving. That is, if taxpayers simply shuffle assets from taxable accounts into IRAs, then restricting the use of IRAs will have no impact on saving -- if anything, the restrictions will increase national saving by easing the budget deficit. But the evidence from microeconomic studies of IRAs and saving are consistent with the view that IRAs increase saving. Estimates from Venti and Wise (1986, 1987, 1989) and Hubbard (1984) imply that a large fraction of IRA saving comes from consumption rather than other (taxable) forms of saving. Feenberg and Skinner (1989) compare the taxable interest and dividend income of taxpayers before and after the introduction of IRAs, and find no evidence of simple shuffling. While some recent studies have criticized the econometric specification used by Venti and Wise (Gravelle, 1989, and Gale and Scholz, 1989), and the results of Feenberg and Skinner are consistent with a more sophisticated form of shuffling, there has been no microeconomic study which supports widespread shuffling of existing saving into IRA accounts.

The macroeconomic evidence seems to contradict the view that IRAs are new saving. As is shown in Figure 3, the personal saving rate slid downward during 1982-86, precisely the period during which IRA contributions averaged roughly \$30 billion per year. Once IRAs were restricted in 1987, the saving rate recovered to its current rate of 5.4

plans, although few enrollees were affected by the restrictions. Salisbury (1989) suggested that 401(k)s substituted for IRAs after TRA86.

percent.¹⁸ Can the microeconomic data be reconciled with the aggregate data?

One potential reconciliation of this paradox is to ask whether alternative measures of household accumulation cast a different light on saving behavior during the years that IRAs were available. The Federal Reserve Board compiles yearly measures of household wealth. The Haig-Simons definition of saving is simply the real change in household wealth over the year, a measure which is easily calculated from the Federal Reserve data. In practice, this measure of saving is much different from NIPA saving, primarily because capital gains are included in the household balance sheet (see Bradford, 1989; Hendershott and Peek, 1989). Which saving series one uses depends on what question is being asked. As we noted above, our primary concern is whether TRA86 has stimulated the supply of funds for domestic investment, and for this type of question, the orthodox saving measure (with the government pension adjustment) is adequate. But in looking at household purchases of IRAs, a measure of saving which emphasizes total household wealth may be more appropriate. Figure 5 shows annual household saving rates as calculated for households and nonprofit institutions (Federal Reserve Board, 1989). Because there is a great deal of fluctuation in

¹⁸ Kevin Hassett suggested an alternative test of whether IRAs affected saving and consumption; include an IRA dummy in the Euler equation consumption model during 1982-86. Using postwar data, the regression is

$$c = .0622 + 0.184 \times \text{IRA} - 0.001 \times R + .012 \times \text{Nuke}$$

(3.24) (1.07) (0.01) (0.49)

where the t-statistics are in parentheses and the adjusted R^2 is .01. The coefficient on the IRA variable is positive but not significant.

year-to-year saving rates (caused by shifts both in the value of the stock market and in the implicit price deflator), we have constructed three-year averages of saving rates which excludes durables. Haig-Simon income is constructed by adding capital gains calculated from the Federal Reserve balance sheets to disposable personal income.¹⁹ The saving rates calculated in this way differ sharply from the traditional measures; household wealth declined during the late 1970s and early 1980s (in large part because of the laggard stock market), before recovering in the 1980s. But by 1988, saving rates had stagnated.²⁰ While it is difficult to pick turning points in saving patterns from three-year averages, these results are not inconsistent with the view that IRAs were positively associated with household saving. Note that we do not regard these aggregate results as proving in any sense that IRAs stimulated saving during 1982-86. Instead, we question whether aggregate saving statistics can be used to test whether IRAs are a

¹⁹ Household capital gains were calculated as the difference between the change in real household net worth minus net investment by households.

²⁰ It is difficult to use the Federal Reserve saving data in regressions since it fluctuates so wildly, but it is interesting to note the following pattern in the three-year saving rate and the three-year average real after-tax rate of return:

	Saving Rate	Real After-tax Return
1974-76	.068	-2.23
1977-79	.216	-1.92
1980-82	.058	-0.43
1983-85	.166	1.42
1986-88 (3rd quart.)	.147	0.83

A pattern similar to that found with the Commerce Department saving rate can be seen; a negative correlation between saving and the after-tax real return in the 1970s and a slight positive correlation in the 1980s.

success or failure in encouraging saving, since the answer depends so crucially on how one decides to measure saving.

V. Personal Credit Interest and Home Mortgage Interest

Phasing out deductions for personal interest payments to reduce borrowing is one approach to stimulate net saving. The transition from the pre-1986 tax law allowing full deductibility was gradual, with 65 percent deductible in 1987, dropping gradually to 10 percent deductible in 1990, and completely phased out thereafter. The combination of the partially phased out personal interest deduction and the much lower marginal tax rates led in 1987 to a substantial decline in the tax advantage of borrowing. For example, a taxpayer in the 50 percent bracket in 1986 would pay only half the gross borrowing rate after taxes; the same taxpayer in a 28 percent bracket during 1987 would pay 82 percent of the gross rate after taxes. In this section we present evidence from both aggregate and panel data that taxpayers sharply reduced their outstanding personal credit. Hence TRA86 was successful at reducing taxpayers' reliance on personal borrowing. But TRA86 was unsuccessful at reducing overall borrowing; we show that for wealthier taxpayers, much of the reduction in personal credit was simply shuffled into home mortgage loans, leaving total credit nearly unaffected.²¹

First, consider the aggregate impact of TRA86 on total consumer credit (excluding home mortgages), revolving credit, and mortgages on

²¹ Manchester and Poterba (1989) suggest that home equity loans were used to finance consumption expenditures as well as reducing other types of non-tax-deductible credit.

1-4 family dwellings (Federal Reserve Board Bulletin). Figure 6 shows the four-quarter change in outstanding credit for each of these measures during 1982-88, with a vertical line in the first quarter of 1987 to show the transition to the new tax regime. There is considerable fluctuation from year-to-year depending on interest rates and other factors, but the sharp decline in personal credit between the latter half of 1986 and the first quarter of 1987 is substantial. By contrast, home mortgage credit expanded during the period immediately following TRA86, and thereafter returned to its previous growth rate.²²

It is difficult to make strong inferences based on the aggregate time-series data, since there are so many factors that affect consumer credit. A clearer picture of how TRA86 affected the composition of consumer debt comes from a panel survey of taxpayers during the years 1984-87. While there is no public use sample of 1987 tax returns as of this writing, John Karl Scholz has kindly made available to us a nonrandom sample of approximately 20,000 largely well-off taxpayers collected for a different study. The sample is nonrandom because the choice of the sample was based on their residence. The information available for each taxpayer is essentially the same as for the ordinary public use tapes. Our sample of 7165 excludes nonitemizers, individuals with AGI less than \$10,000, and AGI in excess of \$1 million. The average income of the sample was \$63,760 in 1985.

²² The ratio of consumer credit to mortgage credit has fallen from .41 in December 1985 to .36 in December 1988. But it is not clear whether this change is a temporary fluctuation or permanent trend. In 1975, the ratio was .44, but by 1981 it had dipped to .36 (Federal Reserve Bank, 1989).

One advantage of a panel data set is that we observe individual taxpayers before and after the tax reform, so we can correct for individual differences across taxpayers. Column 1 of Table 4 shows a least squares regression of the change in personal credit interest as a function of the tax price (i.e., one minus the effective marginal rate), the real change in AGI, and marital status. The tax price exerts a positive and significant impact on personal credit; a 5 percentage point increase in the tax price is predicted to reduce personal interest payments by \$570. For example, a taxpayer previously facing a marginal rate of 50 percent who after TRA86 faces a 28 percent rate would be predicted to reduce personal credit interest payments by \$2507 in 1987. All regressions report heteroscedastic-consistent standard errors as adjusted by the White (1980) technique; in some cases this adjustment reduced t-statistics by a factor of 10.²³

The next question is whether the reduction in personal debt was shifted into home mortgage debt. Table 4 also includes OLS regression results for the change in home mortgage interest payments. Column (2) tests whether the change in personal credit interest had an impact on changes in home mortgage interest payments. The coefficient implies that a reduction in personal interest payments of \$1 is associated with a 67 cent increase in mortgage payments.²⁴ That is, only 33 cents of every dollar reduction in interest payments reflects a cutback in

²³ The sensitivity of the standard error to the White correction suggests misspecification of the equation. We examine this further below when we weight by the inverse of the square root of AGI.

²⁴ If home equity interest rates were lower than personal credit interest rates, the shuffling effect would be even larger.

spending.

There is a potential simultaneity bias when the change in personal credit is used as an exogenous explanatory variable for the change in mortgage interest payments, since both variables will be affected by individual-specific unobservable factors. To correct for this, we estimate a two-stage least squares regression in which the change in personal interest payments is identified by the shift its own tax price. Results are shown in Column 3 of Table 4; they imply an even larger (and significant) shuffling effect of 86 cents for each dollar reduction in personal credit payments.

These results may not be stable with respect to the model specification. If the variance of the error term is proportional to income, then a correction for heteroscedasticity is to weight each observation by the inverse of the square root of AGI. Regressions using this correction resulted in similar results for the least squares regression, but resulted in insignificant results for the 2SLS regressions.

In sum, the evidence suggests that itemizing taxpayers who owned a house circumvented the restrictions on personal interest payments by shuffling their consumer debt into home mortgages. This may be one reason why the ratio of home mortgages to home market value has risen in 1988 to 48 percent, 10 percentage points higher than the average ratio during the 1970s (Federal Reserve Board, 1989).

VI. Capital Gains and Saving

There is some evidence on how capital gains tax rates affect

revenue, although there may be little agreement over how to interpret it.²⁵ But there is little evidence on how capital gains taxation affects saving. One view is that lower capital gains taxation encourages saving, and in particular saving in high-risk enterprises such as venture capital (see Poterba, 1989). Another view is that temporarily low capital gains tax rates will reduce saving rates as investors who realize long-term capital gains are tempted to spend the cash on big-ticket consumption items rather than reinvest it (Summers, 1989). In this view, the 1986 Tax Reform had its primary impact on saving rates before it became effective as investors realized gains just prior to the 1987 capital gains tax increase.²⁶

We use the Scholz panel of taxpayers to gain some indirect evidence on what individuals did with their capital gains realized in 1986; did they spend or reinvest them? To do this, we compare interest and dividend income before and after TRA86 to see whether large capital gains are associated with a decline in asset income. This finding would suggest that the money was spent rather than reinvested. The test is not perfect since we are using information only from a subset of the taxpayer's total assets. An additional question is whether investors who realized capital gains in 1986 reinvested them in interest-bearing assets which, relative to capital gains, are favored under the new tax

²⁵ See Cook and O'Hara (1987), and in particular Auerbach (1988) for reviews of recent literature.

²⁶ Note that this story of taxpayers spending their capital gains because the cash is at hand is not entirely consistent with a model of rational investor behavior. A rational investor separates investment transactions to maximize wealth from consumption decisions to maximize utility; strictly speaking, the decision to realize expected capital gains should have little effect on consumption choices.

law.

Table 5 presents regression results which casts some doubt on the hypothesis that those taking capital gains spent them. The first regression (Row 1) uses as the dependent variable a measure of imputed wealth, defined to be interest income divided by the average interest rate in that year plus dividend income divided by the average dividend yield. The null hypothesis that all capital gains are reinvested is that the 1986 capital gains coefficient should be zero; capital gains should have no impact on future asset income. Should the capital gains tax be paid out of the realizations in the same year, then the coefficient should be negative. Alternatively, if the capital gains are taken on assets which pay neither interest or dividend income, but the proceeds are shifted into taxable accounts, then the coefficient on capital gains would be positive. For example, if private investors dissolved a real estate partnership and invested the proceeds in bonds, imputed taxable wealth would rise.

The regression coefficients in Table 5 are consistent with this latter story. The effect of an increase in capital gains of \$1 during 1986 is to increase 1987 imputed wealth by 38 cents. Thus the evidence provides little support for the view that investors who took capital gains in 1986 spent them. Instead, it appears that investors shifted their assets which previously yielded little taxable income into interest-bearing accounts or stocks.

One possible explanation for this result is that investors park their capital gains in relatively liquid (and taxable) instruments for a year or so before choosing a new investment; hence the coefficient of

.38 on 1986 capital gains is simply a short-run adjustment effect. In this view the coefficient on 1985 capital gains should be less than the coefficient on 1986; in fact it is substantially more. While the 1985 capital gains coefficient is not significant in the regression in Row 1, it is in Row 2 when the regression is weighted by the inverse of the square root of AGI to correct for potential heteroscedasticity of the error term. Row 3 which uses as the dependent variable the sum of interest and dividend income yields similar results.

Rows 4 and 5 in Table 5 enter interest and dividend income separately as dependent variables. These regressions suggest that TRA86 had a stronger impact on the composition of saving than on the overall level of saving. The interest regression shows that for every dollar of 1986 capital gains, interest income rose by 3.8 cents. With average returns on interest-bearing assets roughly double this value, the coefficient implies that almost half the realized capital gains were shifted into interest bearing accounts. By contrast, capital gains taken in 1985 had little or no effect on interest income in 1987.

The regressions explaining dividend income in 1987 (Row 5) suggest a much different pattern. Capital gains in 1986 had no effect on dividends although past capital gains from 1985 affected 1987 dividends. That is, recent realizations of capital gains do not appear to have been heavily reinvested in stocks, but instead are placed largely in accounts paying interest income.

An alternative explanation for this pattern is that capital gains are parked in short-term interest-bearing accounts, so the correlation between 1986 capital gains and 1987 interest income simply reflects

short-run adjustment. To test for this, we regress 1986 interest income on 1985 capital gains to get a measure, untinged by tax code changes, of the normal propensity to place capital gains in temporary interest-bearing accounts (Row 6). The coefficient is 0.014, implying that nearly two thirds of the capital gains shift into investments paying interest income ($1 - [1.4/3.8]$) represented a permanent shift associated with TRA86.

In conclusion, we find more evidence supporting the view that taxpayers shifted capital gains into assets favored under TRA86. While our test for the hypothesis that investors spent some fraction of their 1986 capital gains on consumption is not strong, there is little evidence to support it. Further, the tests are likely contaminated by other factors occurring during this volatile period in financial markets, but at least one -- the stock market rise during most of 1987 -- would have discouraged investments in interest-bearing assets.²⁷

VII. Conclusion

Stimulating the saving rate was never the primary objective of the 1986 Tax Reform Act. Instead, TRA86 was designed to close down abusive tax shelters, equalize the tax treatment of different assets, and lower marginal rates. Were policies to encourage saving consistent with these objectives? We have argued in this paper that TRA86 was successful at the household level in reducing the marginal tax rates on household saving, even for long-term investments with much of its return paid in

²⁷ The stock market crash occurred sufficiently late in the year so that it would have had little impact on annual interest income.

accrued capital gains.

Whether one can detect the effect of these improved incentives on measured aggregate saving rates is another matter. Saving is usually defined as income less consumption. Small percentage changes in either income or consumption can lead to large fluctuations in saving rates, so that attributing the 2 percentage point rise in aggregate personal saving since 1987 to TRA86 is speculative at best. Furthermore, the historical record seems quite clear in indicating little effect on saving of the after-tax real interest rate, although during the 1980s the real after-tax interest rate was correlated with both saving and consumption. Nevertheless, it is difficult to conclude from aggregate time-series data that TRA86 had any impact - negative or positive - on aggregate personal saving.

If the link between the after-tax rate of return and personal saving is weak, then has TRA86 affected saving behavior in other ways? TRA86 favored some forms of saving over others, and the evidence is clear that TRA86 did affect the composition of saving. For example, the eligibility rules were tightened for IRAs, which lead to a 62 percent decline in tax deductible contributions between 1986 and 1987. If IRAs represented new saving, rather than shuffled saving, then TRA86 would be viewed as discouraging retirement saving. Yet standard measures of personal saving show low levels of saving during 1982-86 when IRAs were widely available, and an increase in saving since 1987. Once again, we suggest that one cannot infer a great deal from aggregate saving rates, since an alternative measure of saving from household wealth data tells an entirely different story in which saving rates were quite strong

during the golden age of IRAs.

The 1986 Tax Reform also gradually phased out the deductibility of interest on personal credit. Personal credit declined sharply after 1986, which might by itself be expected to increase net national saving. But we found strong evidence that wealthier taxpayers successfully shifted a large fraction of their personal loan reductions into home mortgage loans. This type of shuffling from consumer credit into housing credit had little impact on saving.

The Tax Reform Act of 1986 also increased the tax on capital gains in 1987, and by doing so set off a stampede to cash in gains under the prior law (Auerbach, 1988). There is little evidence that our sample of taxpayers spent their realized capital gains; instead they appear to have largely reinvested them. But they did shift a larger fraction of the 1986 capital gains into interest-bearing accounts to take advantage of their relatively more favorable tax treatment.

We have ignored one very important factor, the change in tax rules for business investment, in evaluating the effect of TRA86 on saving. Some observers during the mid-1980s predicted declines of up to 200 basis points in after-corporate-tax rate of return owing to the lengthening of asset lives for depreciation and the repeal of the investment tax credit (Hausman and Poterba, 1987), and this lower rate of pre-tax return could affect household saving. Yet the after-tax real return should reflect changes in corporate as well as personal income taxes, and there is little evidence that the rate of return available to households has fallen dramatically since TRA86.

Recent developments in Congress suggest that the tacit agreement to

resist tinkering with the 1986 Tax Reform may have now been broken. If there is a lesson, then, from just a few years experience with the 1986 Tax Reform, it is that the tax code has a stronger and more immediate impact on the financial composition rather than the absolute level of personal saving.

Bibliography

Auerbach, Alan J. 1985. Saving in the U.S.: Some conceptual issues. in The level and composition of household saving, ed. Patric Hendershott. Cambridge, MA: Ballinger, 15-38.

Auerbach, Alan J. 1987. The Tax Reform Act and the cost of capital. Journal of Economic Perspectives 1 (Summer): 73-86.

Auerbach, Alan J. 1988. Capital gains taxation in the United States -- Realizations, revenue, and rhetoric. Brookings Papers on Economic Activity 2: 595-631.

Auerbach, Alan J. and Kevin Hassett. 1989. Corporate savings and shareholder consumption. NBER Working Paper No. 2994 (June).

Bernheim, Douglas, and John Shoven. 1985. Pension funding and saving. NBER Working Paper No. 1622.

Boskin, Michael. 1978. Taxation, saving, and the rate of interest. Journal of Political Economy 86: S3-S27.

Boskin, Michael. 1988. Issues in the measurement and interpretation of saving and wealth. NBER Working Paper No. 2633 (June).

Bovenberg, A. Lans. 1989. Tax policy and national saving in the United States: A survey. National Tax Journal 42 (June): 123-138.

Bradford, David F. 1989. Market value vs. financial accounting measures of national saving. NBER Working Paper No. 2906 (March).

Brown, Bryan W. and Shlomo Maital. 1981. What do economist know: an empirical test of experts' expectations. Econometrica 49 (March): 491-504.

Carroll, Chris, and Lawrence H. Summers. 1987. Why have private saving rates in the U.S. and Canada diverged? Journal of Monetary Economics 20 (September): 249-80.

Cook, Eric W., and John F. O'Hare. Issues relating to the taxation of capital gains. National Tax Journal 40 (September): 473-488.

Dokko, Yoon, and Robert H. Edelstein. 1989. How well do economists forecast stock prices? A study of the Livingstone surveys. American Economic Review 79 (September): 865-871.

Feenberg, Daniel, and Jonathan Skinner. 1989. Sources of IRA saving. In Tax policy and the economy 3, ed. Lawrence Summers. Cambridge: MIT Press and NBER.

Federal Reserve Board. 1989. Balance sheets for the U.S. economy 1949-88. Publication C-9 (April).

Follain, James R., Hendershott, Patric H., and David C. Ling. 1987. Understanding the real estate provisions of tax reform: motivation and impact. National Tax Journal 40 (September): 363-372.

Friend, Irwin, and Joel Hasbrouck. 1983. Saving and after-tax rates of return. Review of Economics and Statistics 65 (November): 537-543.

Fullerton, Don, Shoven, John B., and John Whalley. 1983. Replacing the U.S. income tax with a progressive consumption tax. Journal of Public Economics 20 (February): 3-23.

Gale, William G., and John Karl Scholz. 1989. Effects of IRAs on household saving. mimeo (August).

Gravelle, Jane G. 1989. Capital gains, IRAs, and savings. Congressional Research Service Report 89-543.

Hall, Robert E. 1978. Stochastic implications of the life cycle - permanent income hypothesis: theory and evidence. Journal of Political Economy 86 (December): 971-987.

Hall, Robert E. 1988. Intertemporal substitution in consumption. Journal of Political Economy 96 (April): 339-357.

Hamilton, James D. 1985. Uncovering financial market expectations of inflation. Journal of Political Economy 93 (December): 1224-41.

Hausman, Jerry A., and James M. Poterba. 1987. Household behavior and the Tax Reform Act of 1986. Journal of Economic Perspectives 1 (Summer): 101-119.

Hayashi, Fumio, and Christopher Sims. Nearly efficient estimation of time series models with predetermined, but not exogenous, instruments. Econometrica 51 (May): 783-798.

Hendershott, Patric H., and Joe Peek. 1989. Aggregate U.S. private saving: Conceptual measures and empirical tests. in The measurement of saving, investment, and wealth, ed. Robert E. Lipsey and Helen Stone Tice.

Hostetter, Susan, and Jeffrey Bates. 1989. Individual income tax returns, preliminary data, 1987. SOI Bulletin (Spring): 5-18.

Howrey, E. Philip, and Saul H. Hymans. 1978. The measurement and determination of loanable funds saving. Brookings Papers on Economic Activity 2: 655-85.

Hubbard, R. Glenn. 1984. Do IRAs and KEOGHs increase saving? National Tax Journal 37: 43-54.

Koretz, Gene. 1989. Are fatter piggy banks merely an illusion? Business Week (May 15): 24.

Lindsey, Lawrence B. 1987. Capital gains taxes under the tax reform act of 1986: Revenue estimates under various assumptions. National Tax Journal 40 (September): 489-504.

Makin, John H. and Kenneth A. Couch. 1989. Saving, pension contributions, and the real interest rate. Review of Economics and Statistics 71: 401-407.

Manchester, Joyce, and James Poterba. 1989. Second mortgages and household saving. Regional Science and Urban Economics 19 (May): 325-46.

New York Times. 1989. IRAs effect on savings. (September 18): D2.

Poterba, James. 1989. Venture capital and capital gains taxation. In Tax policy and the economy 3, ed. Lawrence Summers. Cambridge: MIT Press and NBER.

Salisbury, Dallas L. 1989. Testimony before Senate Finance Committee (September 29).

Slemrod, Joel. 1986. Saving and the fear of nuclear war. Journal of Conflict Resolution 30: 403-419.

Summers, Lawrence H. 1981. Capital taxation and accumulation in a life-cycle growth model. American Economic Review 71 (September): 533-44.

Summers, Lawrence H. 1982. Tax Policy, The Rate of Return, and Savings. NBER Working Paper No. 995 (September).

Summers, Lawrence H. 1989. How best to give tax incentives for saving and investment? Testimony before Senate Finance Committee (September 29).

Venti, Steven F., and David Wise. 1986. Tax-deferred accounts, constrained choice, and estimation of individual saving. Review of Economic Studies 53: 579-601.

Venti, Steven F. and David Wise. 1987. Have IRAs increased U.S. saving? Evidence from consumer expenditure surveys. NBER Working Paper No. 2217 (April).

Venti, Steven F., and David Wise. 1989. The saving effect of tax-deferred retirement accounts: Evidence from SIPP. Mimeo.

White, Halbert. 1980. A heteroskedasticity-consistent covariance matrix and a direct test for heteroskedasticity. Econometrica 48: 721-46.

Table 1: Distribution of Changes in Marginal Tax Rates on Interest, Dividend, and Capital Gains Income, and Personal Credit Interest

Percentage Point Change in Marginal Tax Rates:	<u>Interest Income</u>	<u>Dividend Income</u>	<u>Capital Gains</u>	<u>Personal Credit</u>
Decline greater than 20	8.2	26.8	0.0	0.0
Decline between 11 and 20	7.8	6.4	0.1	0.3
Decline between 3 and 10	30.5	18.0	0.0	0.3
Change between -2 and 2	31.1	11.8	1.8	30.3
Increase between 3 and 10	15.2	28.0	33.7	8.3
Increase between 11 and 20	3.7	3.9	32.6	25.2
Increase greater than 20	5.1	3.5	31.8	35.6

Notes: Calculated using NBER TAXSIM. Interest, dividend and capital gains changes weighted by their respective sources of income, with negative AGI taxpayers excluded. Personal interest tax rate changes weighted by AGI.

Table 2: The Hypothetical Tax Rate τ^* Under TRA86 That Provides After-Tax Returns Equal to Those under the Prior Law

Interest Rate r	Prior Law Tax Rate τ_y	Retained Earnings $\psi = 0.50$			
		Holding Period			
		1	5	10	25
.12	.5	.35	.32	.33	.36
.12	.4	.28	.26	.26	.29
.08	.5	.35	.31	.32	.34
.08	.4	.28	.25	.26	.28
.04	.5	.35	.31	.31	.32
.04	.4	.28	.25	.25	.26
Retained Earnings $\psi = 0.70$					
.12	.5	.29	.28	.29	.32
.12	.4	.23	.22	.23	.26
.08	.5	.29	.27	.28	.30
.08	.4	.23	.22	.23	.25
.04	.5	.29	.27	.27	.28
.04	.4	.23	.22	.22	.23

Notes: The first column is the gross return on the investment, while the second is the initial income tax rate τ_y under pre-TRA86 tax law.

The third through sixth columns are the marginal tax rates τ^* which under TRA86 (with full taxation of capital gains) leave the taxpayer with an equal after-tax return.

Table 3: Consumption and Saving Regressions

Dependent Variable	Coefficients				\bar{R}^2	Sample Period
	Interest Rate	Min. to Midnight	Change in Log Income	C		
1. Saving Rate	-0.437 (5.88)	0.127 (4.28)	0.183 (1.71)	5.602 (25.10)	.33	51(2)-88(3)
2. Saving Rate	0.663 (2.71)	-0.385 (2.22)	0.658 (3.47)	4.262 (5.87)	.60	83(1)-88(3)
3. Δ Cons	0.040 (0.76)	0.007 (0.34)		0.587 (4.20)	-.01	51(2)-88(3)
4. Δ Cons (Adjusted)	0.040 (0.66)	0.007 (0.31)		0.704 (4.00)	-.01	51(2)-88(3)
5. Δ Cons* (adjusted)	0.038 (0.52)	0.006 (0.22)		0.730 (3.99)	-.01	51(2)-88(3)
6. Δ Cons (adjusted)	0.255 (4.02)			0.389 (3.87)	.29	79(1)-88(3)
7. Δ Cons (adjusted)	0.163 (1.92)	-0.120 (1.60)		0.997 (2.54)	.31	79(1)-88(3)

Notes: Equation (5) which is starred was estimated using 2SLS. The saving rate is defined as personal saving divided by disposable personal income (uncorrected for government pension contributions), and t-statistics are in parentheses. Consumption (Δ Cons) is the log change in real quarterly nondurable nonservice consumption. While the "true" period of consumption is arbitrary, we adopt the time-aggregation adjustment of $\Delta\text{Cons}_t - .27\Delta\text{Cons}_{t+1}$

+ $.07\Delta\text{Cons}_{t+2}$ from Hall (1988).

Table 4: Personal Credit and Mortgage Interest Regressions: 1985-87

Dependent Variable	Δ Personal Interest OLS	Δ Mortgage Interest OLS	Δ Mortgage Interest 2SLS
Δ Price of Mort. Int		-6581 (1.4)	-7105 (1.4)
Δ Price of Pers Int	-11394 (3.4)		
Δ Income	-0.010 (1.4)	0.015 (1.2)	0.014 (1.0)
Δ Personal Interest		-0.673 (2.7)	-0.864 (2.54)
Marital Status	-860 (5.0)	335 (1.3)	129 (0.4)
C	1702	16	144
\bar{R}^2	.02	.18	.17

Notes: N = 7165. T-statistics are reported in parentheses. All OLS regressions report heteroscedasticity-consistent t-statistics.

Table 5: Capital Gains and Wealth Regressions

Dep. Var.	Capital Gains 86	Capital Gains 85	Dep. Var in 1985	Δ Earn	C	\bar{R}^2
1. Wealth* in 1987	0.385 (8.50)	1.056 (1.62)	1.245 (23.92)	1.559 (5.25)	4270	.63
2. Wealth in 1987	0.378 (8.62)	1.182 (10.29)	1.225 (21.02)	1.667 (5.72)	11295	.59
3. Int+Div in 1987	0.037 (12.18)	0.046 (5.75)	0.752 (14.00)	0.102 (5.02)	2615	.51
4. Interest in 1987	0.038 (12.54)	0.014 (1.83)	0.640 (10.97)	0.075 (3.74)	2412	.40
5. Dividend in 1987	0.0002 (0.23)	0.033 (12.25)	0.995 (24.71)	0.026 (3.73)	76	.55
6. Interest in 1986		0.014 (14.15)	0.840 (49.78)	0.001 (0.40)	772	.26

Notes: The sample size is 9368. The sample excludes long term capital loss returns, and t-statistics are reported in parentheses. The sample is weighted by 1/(square root of 1985 AGI) unless noted by a *.

Figure 1: Change in Tax Rates for Dividend and Capital Gains Income

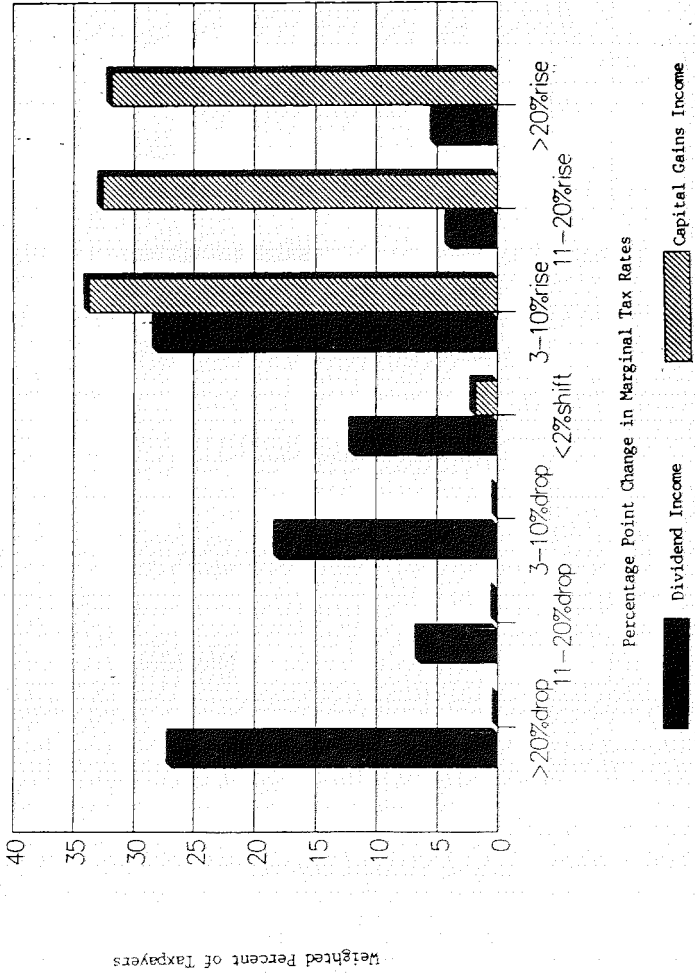
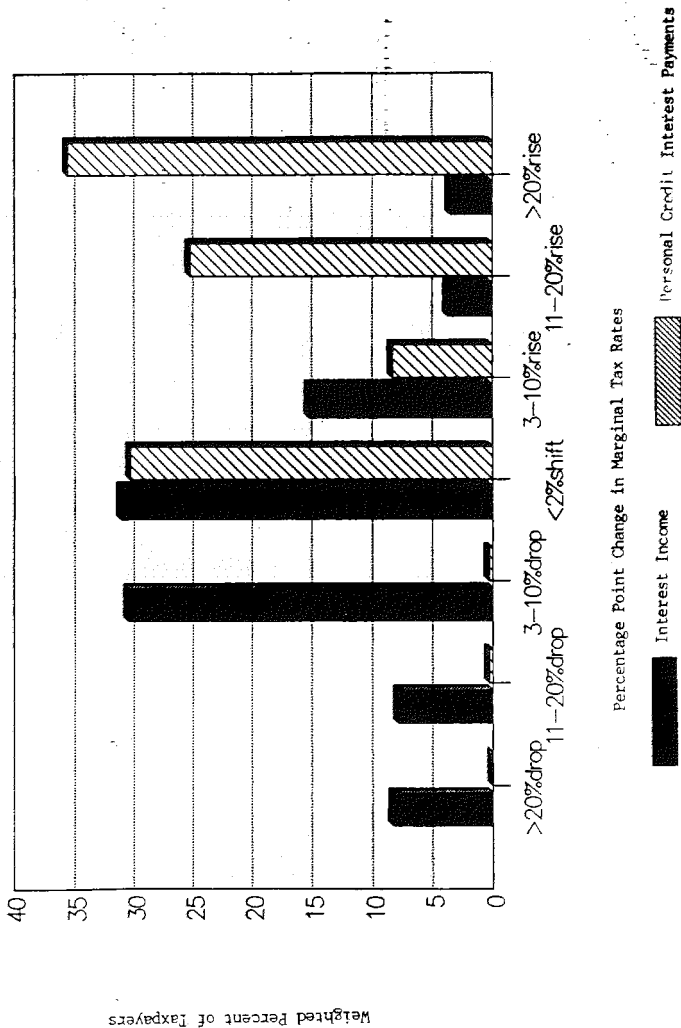
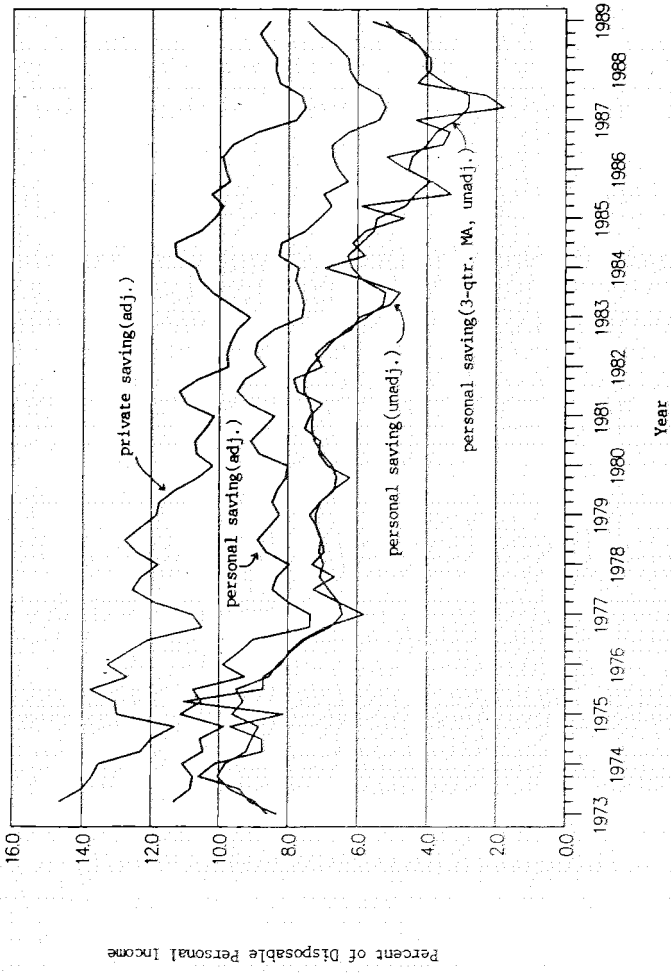


Figure 2: Change in Tax Rates for Interest Income and Personal Credit Interest Payments



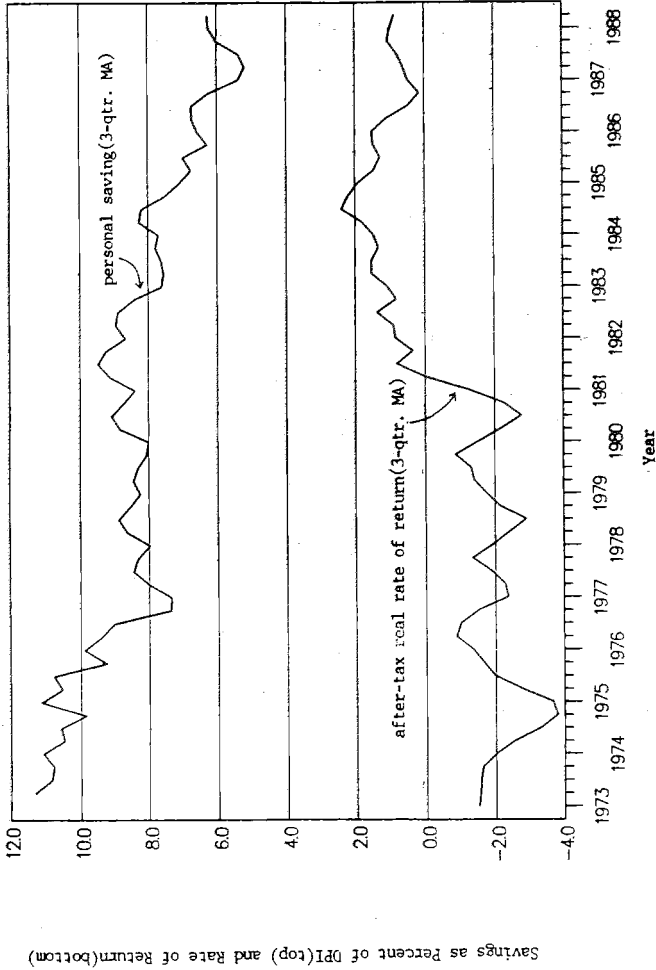
SOURCE: NBER TAXSIM.

Figure 3: Private Saving, Personal Saving, and Adjusted Personal Saving Rates, 1973-89



Source : Survey of Current Business, Federal Reserve Z.7 (various issues), and CITIBASE.
 Note: Adjusted saving rates are 3-quarter moving averages.

Figure 4: Adjusted Personal Savings Rate and the After-Tax Real Return



Source: Survey of Current Business, Federal Reserve Board Bulletin (various issues), CITIBASE, and Hamilton (1985).

Figure 5: Personal Saving: NIPA and Household Wealth Measures

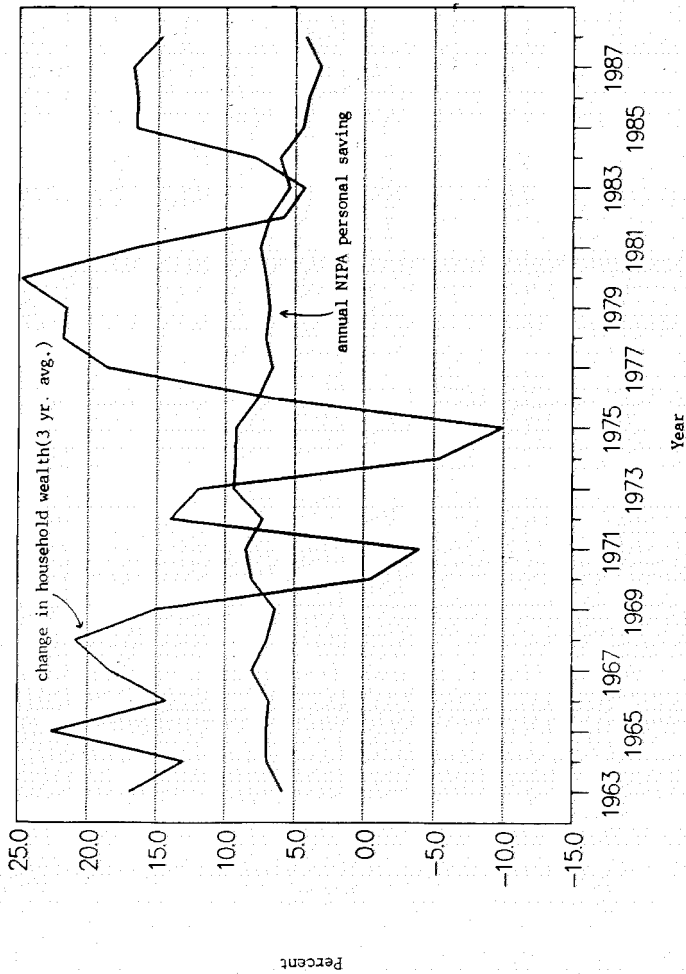
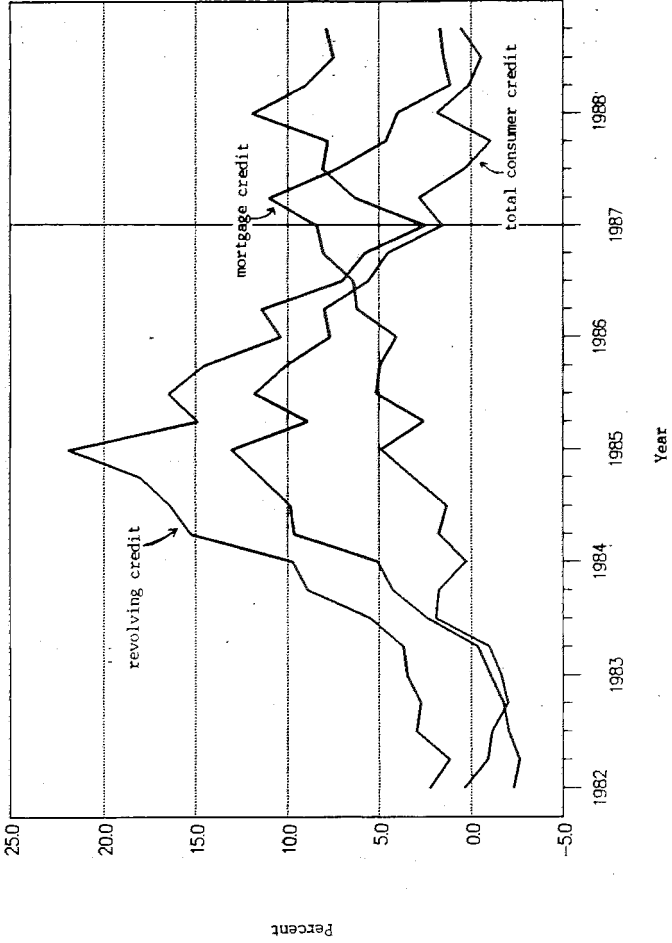


Figure 6: Four Quarter Change in Total Consumer Credit, Revolving Credit, and Mortgage Credit



Source: Federal Reserve Board Bulletin Tables 1.54 and 1.55 (May 1989 and various issues) and CTRBASE.