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U.S. Private Saving and the Tax Treatment of IRA/401(k)s: A Re-examination Using Household Survey Data

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Abstract

The effect of the tax treatment of IRA/401(k)s on U.S. personal saving is examined using household survey data from the Survey of Consumer Finances. The results suggest that the tax treatment of IRA/401(k)s encouraged households to increase the share of assets held in the form of pension savings, at the expense of saving in the form of housing equity. Some evidence also was found to suggest that the tax treatment of pension savings similarly affected the flow of saving. In particular, the data appeared to reject the hypothesis that the tax treatment of IRA/401(k)s increased total personal saving.

JEL Classification Numbers:

E21, H24

1/ Subject to the usual disclaimer, the authors are grateful to their colleagues in the North American Division for their helpful comments, as well as to Arthur Kennikell of the Board of Governors of the Federal Reserve for kindly providing the data.

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Summary

This paper considers whether tax assistance for pension saving has affected U.S. personal saving behavior by examining survey data from the Federal Reserve's Survey of Consumer Finances. In contrast to previous studies, the data used include the same individuals sampled across time, thereby avoiding the difficulty of drawing inferences from heterogeneous cross sections over time. In addition, the study adopts a more direct approach to testing the effect of tax considerations on saving behavior by including a measure of individual households' marginal income tax rates in the equations explaining household saving behavior.

The analysis suggests that tax considerations have affected households' portfolio allocation decisions, but it confirms the conclusion reached by other authors that tax preferences have not increased overall private saving. In particular, households facing higher marginal tax rates were significantly more likely to hold IRAs or 401(k)s, even after the analysis controlled for income. Estimates of asset demand equations confirmed that a rise in the marginal tax rate tended to cause an increase in IRA/401(k) assets, but the increase was financed by a reduction in net housing equity. The data also suggested that an increase in the marginal tax rate raised the pension saving rate, but that the saving rate for other assets tended to fall by an offsetting amount.

I. Introduction

The U.S. personal saving rate fell sharply during the 1980s from a peak of nearly 9 percent in 1981 to an average of about 4 1/2 percent in the first half of the 1990s, well below the average of the previous three decades (Chart 1). The fact that the decline coincided with a number of important changes to the U.S. income tax system has led to concerns that changes in the tax regime were contributory factors. Partly in response, a number of recent proposals have been made to increase the generosity of tax preferences for retirement saving as a way of boosting the saving rate.

This paper addresses this issue by examining household saving behavior using survey data from the Federal Reserve's Survey of Consumer Finances (SCF). The present study differs from previous studies of this issue in two main respects. First, the survey data used here is derived from the SCF's panel component--in other words, the same individuals are sampled across time. This avoids the difficulty encountered by other studies that have used survey data of drawing inferences from heterogeneous cross-sections over time.

Second, previous studies of household survey data have tended to examine the effect of tax preferences for retirement saving indirectly, for example, by comparing the saving behavior of households eligible to contribute to tax-deferred saving plans to those that are ineligible. The present study proposes a possibly more direct approach to testing the effect of tax considerations on saving behavior. In particular, a measure of individual households' marginal income tax rate is calculated and is included in equations to explain households' saving behavior.

The results of the analysis suggest that tax considerations have affected households' portfolio allocation decisions. In particular, households facing higher marginal tax rates tend to increase their holdings of assets in tax-deferred retirement plans. However, the results seem to confirm the conclusion reached by other authors that the effect is mainly to cause a substitution from other forms of saving, and that tax preferences do not significantly alter overall private saving rates.

The paper is organized as follows. The tax treatment of retirement saving in the United States is reviewed in Sections II and III. Section IV discusses the likely effect of tax preferences on household saving decisions, with reference to a number of recent studies of the issue. Finally, the hypothesis that U.S. saving incentives have affected recent saving behavior is tested using household survey data in Section V.

II. U.S. Tax Assistance for Saving

U.S. tax preferences for retirement savings are offered through 401(k) plans and Individual Retirement Accounts (IRAs); there are relatively few restrictions on 401(k)- and IRA-eligible investments, which can include bank accounts, stocks, or bonds. 401(k) plans are employer-sponsored retirement saving vehicles. Contributions to 401(k) plans can be deducted from taxable income and the return on contributions accrue on a tax-deferred basis. The limit on employee contributions was reduced from $30,000 to $7,000 as part of the Tax Reform Act of 1986. 1/ The features of 401(k) plans depend on the employer; often employers will "match" a percentage of employee contributions. 2/ In some cases individuals may use their savings in 401(k) plans as collateral for consumer and other loans (so long as repayment is within five years). Income tax is payable on amounts withdrawn; in addition, a 10 percent penalty is assessed for withdrawals prior to age 59 1/2, but this penalty can be waived in the event of financial hardship.

Contributions to IRAs also are tax deductible, and income and interest earned on contributions are tax deferred. The maximum contribution that can be deducted from taxable income is $2,000; this maximum is gradually reduced to zero over the $40,000 to $50,000 income range for married individuals ($25,000 to $35,000 for unmarried individuals) who are covered by an employer pension plan. 3/ Taxes are payable upon withdrawal; withdrawals before age 59 1/2 are subject to an additional 10 percent penalty; funds must begin to be withdrawn at age 70 1/2. Individuals not eligible for the income tax deduction may still make contributions to an IRA and defer the tax payable on income earned on contributions. Individuals may finance their contributions to an IRA by borrowing and deduct the interest payments from ordinary income. Keogh plans and simplified employee plans (SEPs) are similar to IRAs except that they apply to self-employed individuals and have higher contribution limits.

Chart 2 shows the recent evolution of IRA, 401(k), and Keogh contributions. IRA contributions increased sharply following the introduction of universal eligibility in 1982, rising from $3 billion in 1980 to $38 billion in 1985. However, with the Tax Reform Act of 1986, which

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1/ The limit was indexed to inflation and reached $9,240 in 1994. The sum of employee and employer contributions to 401(k) and other defined contribution plans cannot exceed the lesser of 25 percent of salary or $30,000. Tax rules increase the stringency of these limits for high-income individuals.

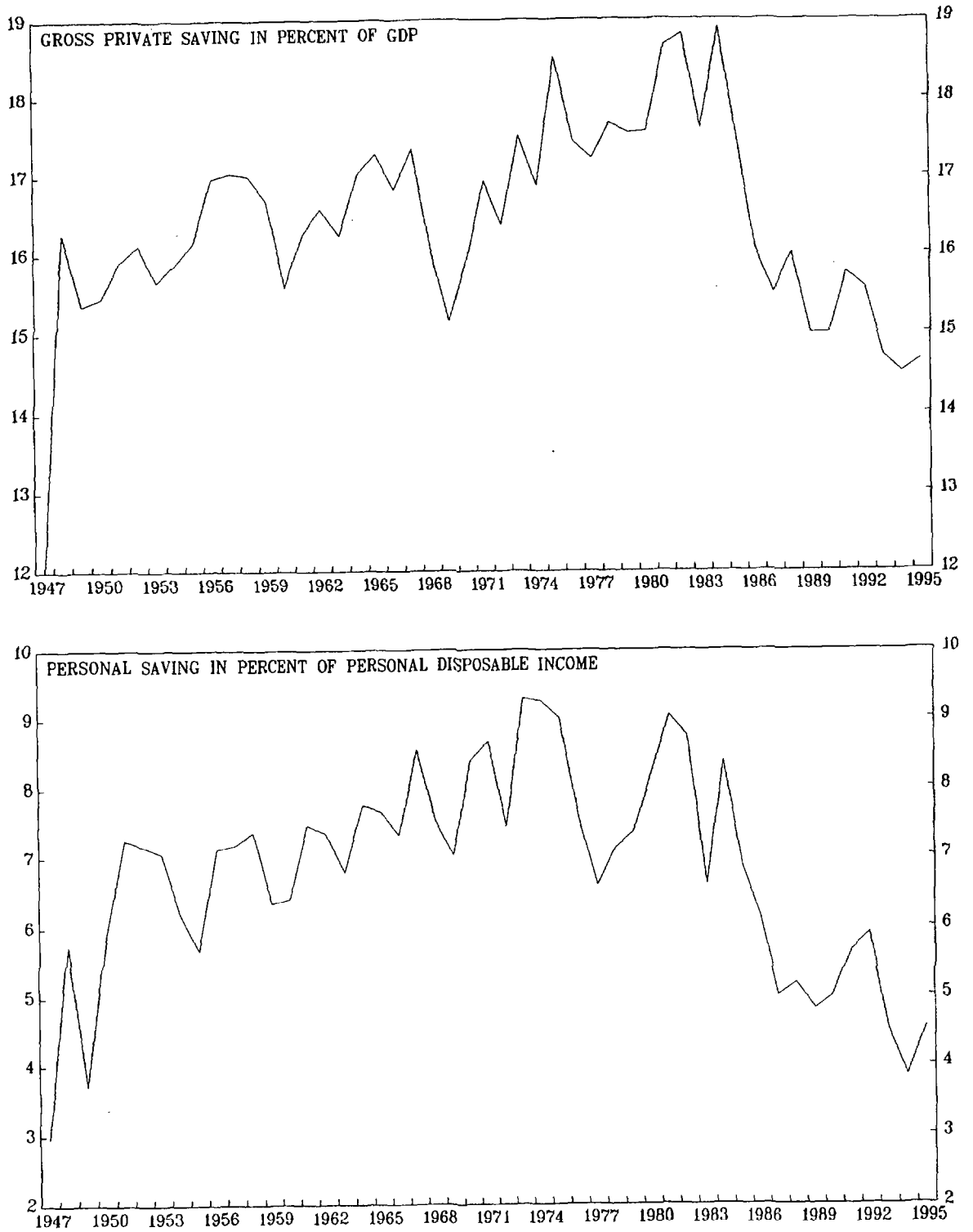
2/ 1991 survey data reported by the U.S. Department of Labor suggests that firms on average matched about 43 percent of employee contributions.

3/ IRAs were first introduced in 1974 (with a limit of $1,500 or 15 percent of income) for employees without employer-sponsored pension plans. The Economic Recovery Act of 1981 removed restrictions on access to IRAs and raised the contribution limit to $2,000. The current restrictions on IRA contributions were introduced in 1986.

CHART 1

PRIVATE SAVING

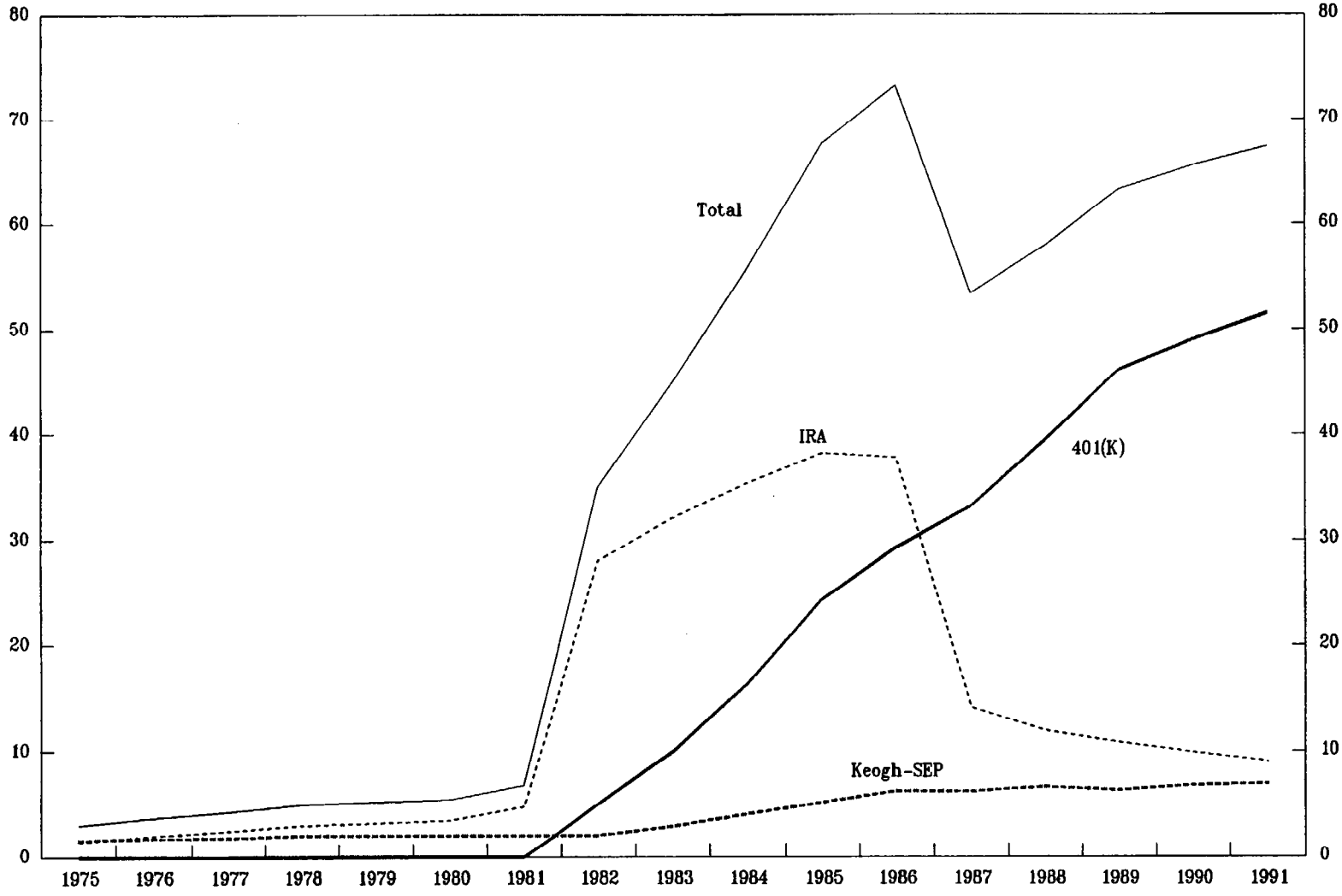
(In percent)



Source: Bureau of Economic Analysis, U.S. Department of Commerce, supplied by Haver Analytics.

CHART 2

CONTRIBUTION TO TAX-ASSISTED SAVING PLANS
(Billions of dollars)



Sources: U.S. Internal Revenue Service; and U.S. Pension and Welfare Benefits Administration.

eliminated the deductibility for higher income individuals, contributions declined to $9 billion in 1991. By contrast, contributions to 401(k) plans have steadily increased.

III. A Simple Analysis of Saving Incentives

The return to tax-assisted saving plans as compared to other taxable saving vehicles can be illustrated as follows. 1/ Assuming a constant nominal interest rate r, and a constant marginal tax rate τ, the value A at the end of T periods of one dollar of pretax income saved through a taxable saving vehicle is:

$$A = (1-\tau)e^{r(1-\tau)T}$$

Alternatively, the value of the pretax dollar invested in an IRA or 401(k) for households who can take advantage of the tax-deductible contribution is (assuming that the before-tax rates of return on taxable and IRA assets are the same, and that the tax rate on all forms of income are the same):

$$A_{IRA} = (1-\tau)e^{rT}$$

On an after-tax basis, the IRA accumulates income at the rate r while the taxable saving vehicle accumulates income at the rate $r(1-\tau)$.

The future value of the IRA investment is not affected by the timing of the deduction, assuming that tax rates are constant over time. For example, if the taxpayer is required to pay tax on the initial dollar invested but does not pay tax on the final value of the investment, the after-tax dollars withdrawn are the same. However, if the tax rate is lower after retirement or when the withdrawal is made, then the present value of the front-loaded deduction is higher.

Finally, consider a nondeductible IRA. After taxes, the taxpayer would invest only $(1-\tau)$ but would be able to invest it at the pretax rate of r. Upon withdrawal, tax would be payable on the interest earned on the investment (but not on the initial amount deposited). Thus the future value of a dollar saved would be:

$$A_{IRA'} = (1-\tau)e^{rT} - \tau[(1-\tau)e^{rT}-(1-\tau)]$$

$$= (1-\tau)[(1-\tau)e^{rT} + \tau]$$

In order to compare the yields of different saving vehicles, suppose that τ=0.3 and r=0.03. In this case, the future value of one dollar invested for 20 or 40 years would be:

1/ This presentation is based on Poterba et al. (1993).

Future Value of Saving

$1 invested in:	For 20 Years	For 40 Years
Taxable saving instrument (A)	$1.07	$1.62
IRA (A_{IRA})	$1.27	$2.32
Nondeductible IRA ($A_{IRA'}$)	$1.10	$1.84

The tabulation illustrates that the tax deductibility of saving (whether frontloaded or backloaded) strongly affects the return on saving. For example, over 20 years the return on the deductible IRA is roughly four times the return on the taxable saving instrument. It also demonstrates that the return of the nondeductible IRA improves relative to the deductible IRA as the investment horizon lengthens. In other words, for shorter investment horizons, the existence of the initial tax deduction is relatively important. However, for longer horizons, the relative importance of the initial deduction falls and the relative importance of the ability to invest at a tax-free rate of return increases. This suggests that the incentive to over-contribute to IRAs in excess of $2,000 (i.e., without deducting the full contribution) would be greater for younger rather than older savers.

IV. The Effect of Tax Incentives on Saving

While tax preferences can have a substantial effect on the return to saving, there is considerable controversy regarding the responsiveness of total saving to changes in the after tax rate of return. Standard consumer theory suggests that the effect is ambiguous. For example, increasing the return to saving would tend to encourage a substitution of saving for consumption. However, this effect is offset by the tendency of consumers to increase consumption in response to an increase in wealth, which would occur with an increase in the rate of return. The ambiguous effect of the rate of return is evident in much of the empirical literature on saving behavior, in which the elasticity of saving to the after tax rate of return is often found to be small. 1/

Research on the effects of tax incentives on saving using macroeconomic data has generated mixed results. Carroll and Summers (1987) find that the substantial rise in the saving rate differential between Canada and the United States in the mid-1970s was the result of the liberalization of Canada's tax-deferred savings plan. Skinner and Feenberg (1990) question

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1/ For a discussion of this issue in a multi-country context see Ogaki, Ostry, and Reinhart (1994) and Masson, Bayoumi, and Samiei (1995).

the effectiveness of IRAs in promoting saving, noting that their importance depends on the definition of saving that is used. 1/

Studies using microeconomic data also have produced conflicting results. Venti and Wise (1993) find that most households finance IRA contributions through a reduction in consumption, suggesting that IRAs promote total saving. 2/ Poterba, Venti, and Wise (1993) also present evidence suggesting that tax preferences have promoted private saving. Using data from the Survey of Income and Program Participation (SIPP), they find that total assets of 401(k)-eligible individuals were significantly higher than the assets of those who were not eligible, while non-IRA and non-401(k) assets were comparable across the two groups. They also found that after 1986, IRA contribution rates fell across all income groups and the decline in the IRA contribution rate was largely independent of 401(k) eligibility. Feenberg and Skinner (1989) find, using the IRS-Michigan tax panel, that IRA contributors increased their taxable financial assets by more than noncontributors over the period 1980-84, suggesting that IRAs have promoted an increase in personal saving.

Other authors have used the same data sets to argue that tax assistance for saving has only had a limited effect on the size of aggregate saving. Gale and Scholz (1994) estimate a life-cycle model of saving using data from the Survey of Consumer Finances (SCF), and present simulation results suggesting that only 2 percent of an increase in the IRA contribution limit would result in an increase in private saving. The weak response of private saving to IRA contribution limits results from the fact that most contributors are relatively wealthy and already have contributed the maximum amount to their IRAs. Burman, Cordes, and Ozanne (1990) report similar findings from the IRS-Michigan Tax Panel. Engen, Gale, and Scholz (1995) examine the effect of IRAs and 401(k) plans using data from the SIPP, and find that saving by 401(k) participants is somewhat higher than for other households but that the increase in saving would be only slightly larger than the decline in public saving generated by the tax assistance. 3/

1/ For example, if saving is defined to include purchases of durable goods.

2/ These results have been criticized for adopting a functional form that is not consistent with any underlying utility function and does not allow individual attributes such as age and asset holdings to have first-order effects on saving.

3/ Attanasio and Deleire (1994) examine the possibility that saving behavior differs for those households that just opened an IRA with those that already had IRA accounts. They find that IRA contributions are primarily funded through a reduction in the stock of other assets and that less than 20 percent of IRA contributions represent an addition to national saving. Papke, Petersen, and Poterba (1993) survey pension plan administrators, and conclude that 401(k)s tended to replace other pension saving plans.

V. Further Evidence from Household Survey Data

The issue of whether tax preferences affect saving behavior is examined below using data from the 1983 and 1989 Survey of Consumer Finances (SCF), which provides detailed information on assets, liabilities, and demographic characteristics of U.S. families. The approach adopted in this paper is different from the studies cited above for two main reasons. First, the analysis below focuses on the panel component of the SCF--in other words, the same individuals are sampled in the 1983 and 1989 data. 1/ This avoids the problems of heterogeneity in comparing different cross-sections over time. Second, a proxy for the relative after-tax rate of return on tax-assisted saving plans is included in the empirical analysis below in order to directly test the effect of tax assistance on saving.

Two hypotheses are examined below: (i) whether the tax treatment of pension saving affects the distribution of saving between tax-assisted and other assets and (ii) whether the tax treatment of pension saving affects the total amount of saving. To test these two hypotheses we estimate equations explaining saving as a function of variables usually thought to affect private saving behavior and test whether a proxy for the tax advantage of IRAs and 401(k)s is a significant determinant of saving behavior.

1. Sample characteristics and LOGIT analysis

Charts 3 and 4 illustrate the sample characteristics of the SCF survey for four age classes--under 45 years of age, 45 to 55 years of age, 56 to 65 years of age, and over 65 years of age. Chart 3 demonstrates that in both 1983 and 1989 median income tended to rise until age 65, when income fell, reflecting the effect of retirement on earned income. Interestingly, income disparity across age groups tended to be substantially less in 1989 than the earlier period. As can be seen the median level of "liquid" assets--financial assets excluding 401(k) and IRA holdings--tended to increase with age, while the median level of 401(k)/IRA assets rose only to age 56-65, and tended to be run down in retirement.

Chart 4 shows estimates of the median saving rates estimated for the four age categories. The liquid saving rate--the rate at which liquid assets are accrued--is a relatively small fraction of income, declining from about 1/2 percent in the under 45 age category to about 1/4 percent in the 56 to 65 age category. The median saving rate falls sharply for those over

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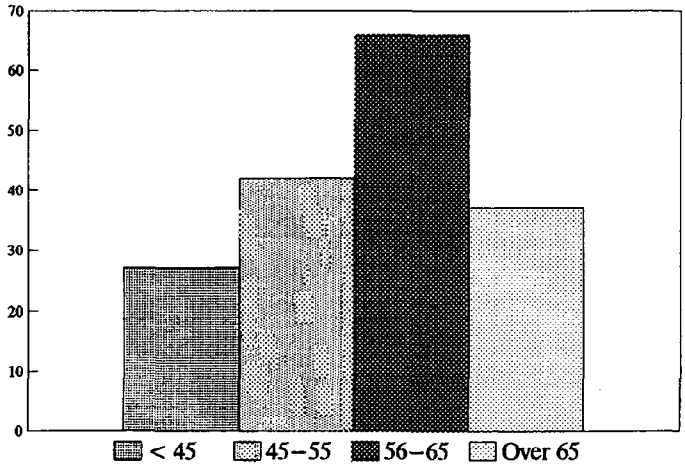
1/ The SCF survey was conducted every three years from 1983 to 1992. Beginning in 1989 a cross-section survey was added to the panel survey that was conducted in 1983, 1986, and 1989. The survey is based on a dual-frame design. An area-probability sample is carried out to provide adequate population coverage of assets and liabilities and is supplemented with a list of names from the Income Division of the Internal Revenue Service to improve the precision of estimates of assets and liabilities held more narrowly by wealthy households.

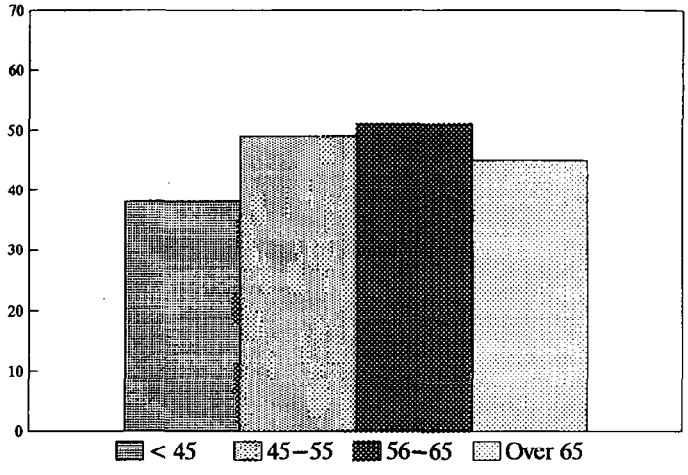
Chart 3
Household Incomes and Stocks of Financial and Pension Assets
(in thousands of dollars)

Median Household Income, By Age of Household Head

1983

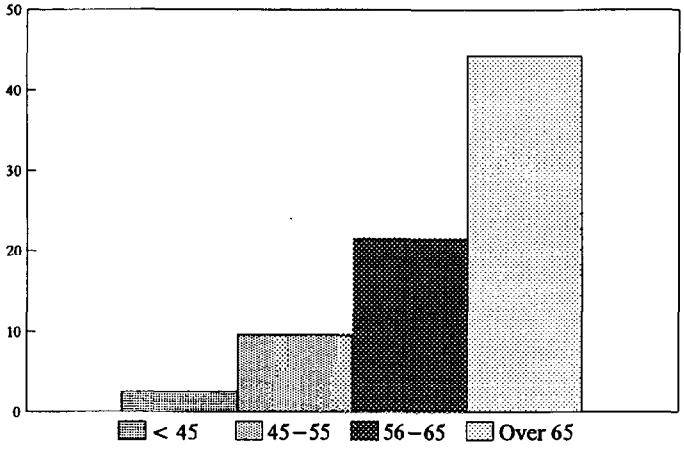


1989

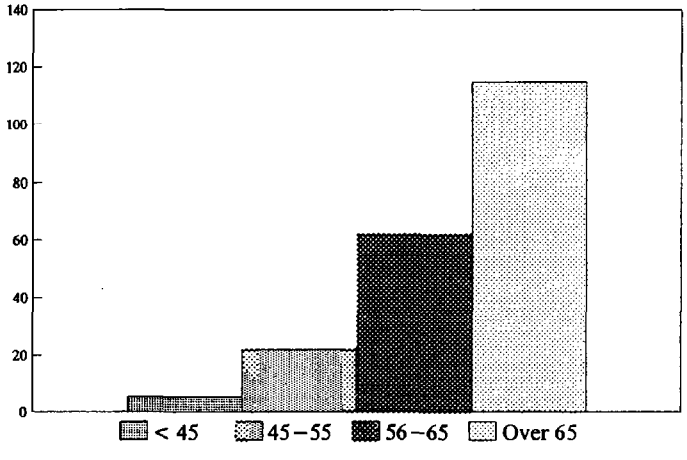


Median Stock of Financial Assets Excluding Pensions, By Age of Household Head

1983

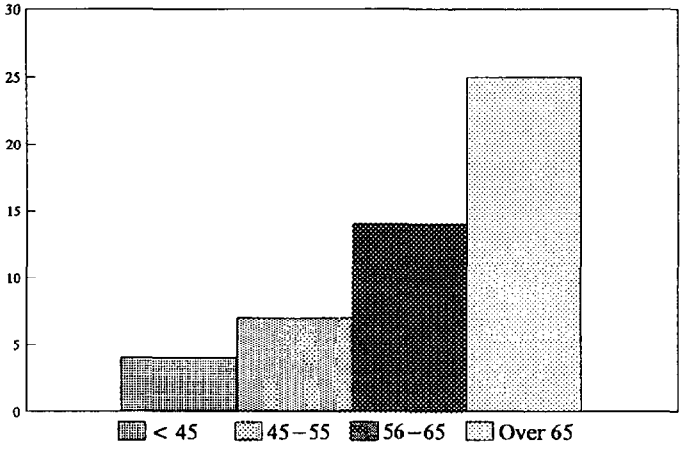


1989



Median Pension Asset Stock, By Age of Household Head

1983



1989

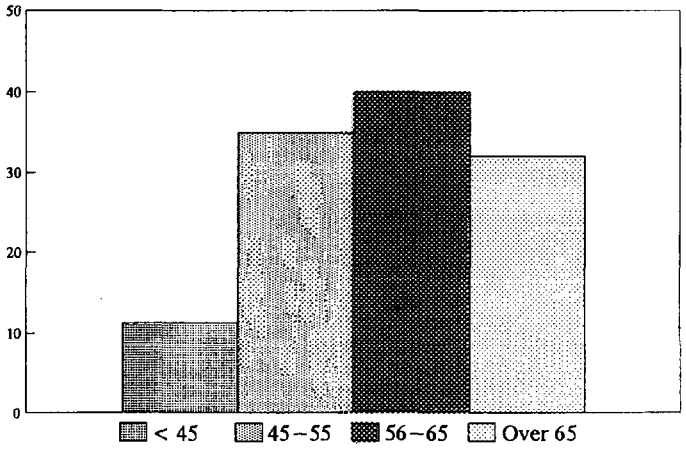
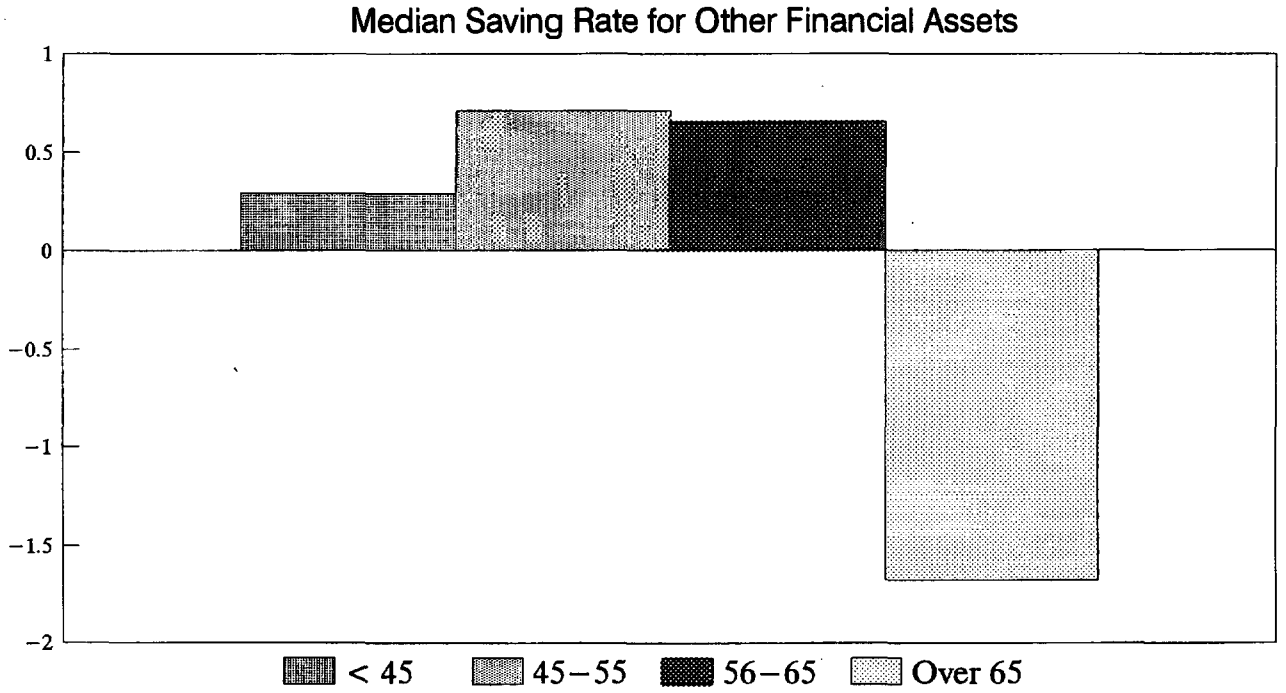
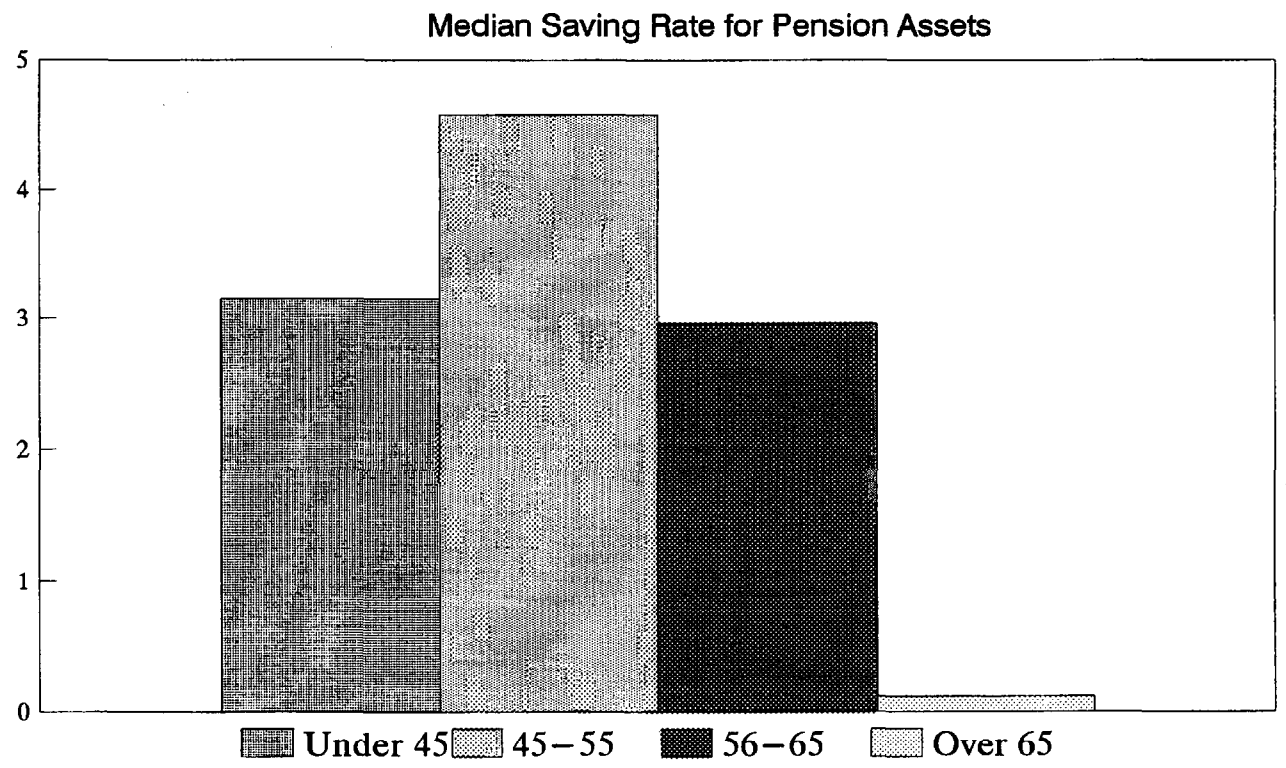


Chart 4
Saving Rates By Age of Household Head, 1983–89
(in percent)





65 years of age to roughly minus 2 percent, reflecting the fact that retirees tend to run down their assets. The median saving rates for IRA/401(k) assets are considerably higher, in the range of 3 to 4 3/4 percent for the pre-retirement households and about 1/4 percent for the over 65 age category. 1/

Table 1 further illustrates the heterogeneity of saving behavior between IRA/401(k) pension asset holders and others. 2/ The data indicate that both the wealth and income levels of IRA/401(k) holders are considerably higher than for rest of the sample, but that IRA/401(k) holders are on average six years younger. The lower age level can be explained by the inclusion of pensioners in the sample, many of whom have already exhausted their pension assets; when pensioners are excluded from the sample, the average age of both categories is similar. The household size (i.e., number of persons in the household) of IRA/401(k) and non-IRA/401(k) holders is similar but the education level of those holding IRA/401(k) assets is considerably higher.

Tax-assisted pension holders also appear to be subject to a considerably higher marginal tax rate. 3/ This is likely related to the fact that IRA/401(k) holders have, on average, higher incomes, but may also reflect the fact that households with higher marginal tax rates have a greater incentive to hold tax-sheltered assets. Put differently, the after tax yield on IRA/401(k) assets is a proxy for the relative yield of tax-assisted pension saving versus other forms of saving.

1/ The higher saving rate for IRA/401(k) assets appears inconsistent with the fact that liquid asset stocks appeared to be higher for households aged over-65 while IRA/401(k) assets tended to fall. One explanation would be that the liquid assets of retirees grew rapidly in the years just before retirement. These results also accord with the work of Cantor and Yuengert (1995) who analyze the SCF over the period 1983-86. They find that the median personal saving rate reaches a peak for the 45-54 age group and that the saving rate of retirees is negative.

2/ The proportion of IRA/401(k) asset holders in the sample in 1989 is slightly above 50 percent, which is considerably higher than the population estimate. As is noted in the codebook for the 1983-89 SCF panel, the panel's sample characteristics differ from those of the population survey, owing to the need to obtain survey responses from the same households over the six-year period.

3/ The marginal tax rate was estimated using an estimate of taxable income (defined as household income less personal deductions and interest payments) and the 1989 and 1983 tax tables to infer the appropriate tax rate (see the Appendix for details). The calculations assumed that the household takes advantage of mortgage interest, other interest, dependency and standard deductions; deductions for state and local taxes, moving expenses, and unreimbursed employee expenses were ignored, as were the effect of state and local income taxes. The fact that state and local taxes may be correlated with income represents a potential source of bias of the estimates.

A LOGIT analysis was performed on the data in order to gauge the statistical significance of the aforementioned variables in determining the choice of whether or not to hold IRA/401(k) assets. Age and age squared were included in the regression, in order to account for the possibility of a nonlinear relationship between age and the holding of tax sheltered assets. For example, in the previous section it was noted that the relative return on the tax deduction is greatest for relatively young households. Conversely, the risk of incurring early-withdrawal penalties would likely be less for older households (particularly those aged 59 and above).

Variables included in the LOGIT analysis included the number of persons in the household and the number of children not at home (to serve as a proxy for educational and other household expenses), and the number of years of schooling (to proxy for the degree of financial sophistication). A dummy for households whose income in 1989 exceeded $50,000 was included to account for the fact that since 1986 households with income in excess of this amount have been unable to utilize the IRA deduction.

Income and wealth variables also are included; it would be expected that the use of tax-assisted saving vehicles would be more likely for higher income/wealth households, since these households would be less concerned with the illiquidity of these saving vehicles. 1/ In addition, a dummy variable for household participation in a defined-benefit pension plan was included; participation in such plans would be expected to reduce the need to take advantage of other forms of pension saving.

The LOGIT regression indicates that the variables are relatively well able to predict whether households have IRA/401(k) accounts. The regression correctly predicted IRA holdings for 75 percent of households, with the age and tax variables playing the dominant predictive role. The education grade level and the dummy for incomes above $50,000 in 1989 play a significant albeit weaker role.

The age coefficients indicate that the likelihood of owning pension assets is maximized at age 49, in turn suggesting that most saving for retirement takes place when individuals are in the 45-65 age bracket. 2/ The only coefficient with an unexpected sign is the positive coefficient for the 1989 income dummy, suggesting that the dummy proxies something other than the effect of the change in the tax deductibility of IRA contributions in 1986.

1/ Wealth is calculated as the sum of the value of the household's housing assets less outstanding mortgage balances, checking and saving accounts, mutual funds, stocks, bonds and the cash value of life insurance minus loans and credit card debt. Note that in this case wealth includes only net financial assets, and so would not necessarily proxy for permanent income.

2/ This calculation is made by maximizing the estimated quadratic equation relating IRA/401(k) assets to age and age squared.

The significance of the marginal tax rate is noteworthy because it indicates that tax policy has had a noticeable effect on saving choices, even after controlling for income. However, this analysis does not address the issue of whether the tax incentives caused a substitution from other forms of saving or encouraged an increase in total saving. This issue is considered below.

2. The effect of taxes on asset shares

The above analysis provided preliminary evidence that tax considerations affected the decision to hold IRA/401(k) assets. In this section, the hypothesis that tax preferences affected the distribution of wealth between tax-assisted pension saving assets and other assets is explored further. In particular, it is assumed that households' demand for asset i is:

$$A^i = A^i(\text{age}, \text{age}^2, \text{wealth}, \text{income}, \tau, \text{dummy variables})$$

where A^i is the household's holding of asset i (i= IRA/401(k) assets, net housing wealth, and other financial assets) as a share of total wealth. 1/ As discussed above, the variables assumed to affect asset shares are the age of the head of the household, household financial wealth (the sum of the three asset classes), household income, and a measure of the household's marginal tax rate τ.

The equations were estimated using ordinary least squares with data from the 1983 and 1989 surveys (Tables 2 and 3). The equation for the tax-assisted assets was also estimated using TOBIT, owing to the large number of respondents indicating that they had no IRA or 401(k) assets.

The data from the 1983 survey suggested that age affected asset demand in a nonlinear fashion; the share of tax-assisted assets tended to rise with age until age 80, falling thereafter, and the share of assets invested in housing tended to rise with age until age 58 and fall thereafter. Conversely, the share of other financial assets tended to fall with age until age 62 and rise thereafter. In other words, in their early years households tend to have a greater proportion of assets in the form of bank deposits and other investment vehicles. As households begin to invest in retirement savings and housing equity, the share of other financial assets tends to fall.

The coefficient estimates for the 1983 data suggested that increases in income and wealth cause households to substitute from housing or tax-assisted retirement saving toward other financial assets. Not surprisingly,

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1/ Net housing assets are defined as the value of the household's housing assets less outstanding mortgage balances. Other assets are the sum of checking and saving account assets, mutual funds, stocks, bonds and the cash value of life insurance minus loans and credit card debt. Net wealth is defined as the sum of the three asset classes.

larger families tended to have a larger proportion of assets in housing. In addition, better educated households tended to invest a greater proportion of their portfolio in the form of IRA/401(k)s and other financial assets, perhaps reflecting an increased awareness of the advantages of IRAs and 401(k)s. Less easy to explain was the fact that those households participating in an employer-sponsored pension plan tended to invest a greater proportion of assets in tax-assisted pension plans and a lower proportion in other financial assets, since the reverse would be expected. 1/

The coefficient for the marginal tax rate variable τ was significant and positive for tax-assisted pension assets and significantly negative for housing assets; the coefficient was insignificantly different from zero for other financial assets. This suggests that households facing high marginal tax rates tend to increase the share of wealth held in the form of IRAs/401(k)s by reducing their holdings of housing equity. Households appeared to take advantage of tax preferences for pension saving and for housing equity simultaneously by using home equity loans to finance pension saving. 2/

The regressions were repeated for different age classes separately. These tended to confirm the full-sample results that increases in marginal tax rates cause a substitution toward tax-assisted pension assets. Interestingly, however, the results suggested that for households aged 20 to 45 years, the effect of an increase in τ was to cause a substitution to IRA/401(k)s from other financial assets rather than from housing, possibly owing to the fact that the interest costs of consumer credit also was deductible from income prior to 1986 and the fact that younger households tended to have a lower housing stock to borrow against.

Similar regressions were run for data taken from the 1989 survey, but were less encouraging. The explanatory power of the regression equations fell sharply, and the age and income variables no longer appeared to be significant determinants of the asset shares. However, like the 1983 sample, the marginal tax rates seemed to have a significant effect on asset shares. In particular, higher marginal tax rates seemed to be associated with an increased share of wealth in the form of IRAs/401(k)s and a lower share held in the form of housing. However, this result was most evident in the full sample rather than in the subsamples restricted by age. 3/

1/ A possible explanation is that survey respondents mistakenly considered employer sponsored 401(k)s as a "pension plan."

2/ A substantial tax preference is provided for home equity because interest on mortgage debt is deductible from income tax.

3/ The finding of strong substitution between pension and housing wealth is consistent with recent work by Engen and Gale that considers successive waves of the SIPP. They find that 401(k) eligibility raises households' financial assets but this is offset by a corresponding decline in housing equity. Moreover, the rise in financial assets is restricted to homeowners; 401(k) eligibility does not raise the financial assets of renters.

These regressions differed from those for the 1983 data because of the inclusion of the income threshold dummy (set to unity for households with income in excess of $50,000 and at zero otherwise). This variable was intended to account for the effect of the 1986 tax reform, which eliminated the deductibility of IRA contributions for households with income above this limit. However, the income threshold dummy did not appear to be a significant determinant of saving behavior, suggesting that the elimination of the full deductibility of IRAs had a limited effect on asset shares.

3. The effect of taxes on saving

The evidence presented above suggested that the tax treatment of IRA/401(k)s has affected household asset shares. In the analysis below, the effects of the tax treatment of IRA/401(k) assets on saving is examined. This is achieved by estimating saving equations similar to those described above. For example, the saving equation for asset i is specified as follows:

$$S^i = S^i(\text{age}, \text{age}^2, \text{income}, A^p, A^h, A^o, \tau, \text{dummy variables})$$

where S^i is the net contribution to either IRAs/401(k) plans or to other financial assets over the 1983-89 period, expressed as percent of households' 1983 income. A^p, A^h, A^o are the ratios of tax-assisted pension asset balances, net housing assets, and other financial assets as a share of 1983 income. The other variables are as described above. 1/

The inclusion of the marginal tax rate τ and the income threshold dummy enables us to test whether the tax preference for IRA/401(k) assets affected the distribution and the amount of saving. Second, inclusion of the 1983 asset stocks separately in the regression equations also provides an indirect test of whether households "target" their savings. In particular, if households targeted an aggregate asset stock, the coefficients on the three stock variables would be identical. However, if separate asset targets were set or there were some impediments to achieving the desired portfolio mix, then the coefficients on the assets would differ. 2/

Factors that would make assets less than perfect substitutes could include the different risk characteristics of housing versus other financial assets, the penalties for early withdrawal of IRA/401(k) assets, and the

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1/ Since the SCF only includes information on asset stocks, household saving was constructed by taking the difference between 1989 and 1983 stocks, and subtracting an estimate of the income earned over the intervening period (this is essentially the methodology used by Gale and Scholz (1994); see the Appendix for details). An equation explaining net additions to housing wealth was not formulated, because of the considerable difficulties associated with gauging the amount of capital gains and/or reinvestment in housing.

2/ This issue is addressed in the context of the contribution limits on IRAs in Gale and Scholz (1994).

contribution limits on IRA/401(k)s. In addition, housing assets are usually considered relatively illiquid, notwithstanding the ease of obtaining equity lines of credit, which would affect the substitutability of assets.

The results of this exercise are summarized in Table 4. OLS estimates were obtained first, using heteroscedastic-consistent estimates of standard errors. The estimates suggest that age is a significant determinant of IRA/401(k) saving rate, but not of the saving rate for other financial assets. In particular, the age profile of IRA/401(k) saving is humped shaped; the rate rises until age 58 (roughly the age when the withdrawal penalty no longer applies) and declines thereafter. The point estimates for the equation for other financial assets shows a reverse profile; the saving rate falls until age 40 then begins rising.

The effect of income on the saving rate also differs between IRA/401(k) assets and other financial assets. In particular, the estimates suggest that the IRA/401(k) saving rate declines with an increase in income while the saving rate for other financial assets tends to rise. The effect of a 10 percent increase in income would be to increase the combined IRA/401(k) and other financial asset saving rate by roughly 0.7 percentage point. The IRA/401(k) saving rate rises for higher educated households and for households who participate in an employee-sponsored defined benefit pension plan.

The estimates provided some support for the hypothesis that the tax preference for IRA/401(k)s affects saving behavior. The coefficient on τ in the pension saving rate equation was positive and significantly different from zero at the 10 percent level. This suggests that an increase in the marginal tax rate causes saving in pension assets to rise. Similarly, the coefficient on τ in the saving rate equation for other financial assets was significantly negative indicating that an increase in the marginal tax rate causes saving in other financial assets to decline. However, the hypothesis that the sum of the coefficients is zero, or that an increase in the marginal tax rate has no effect on the aggregate personal saving rate, could not be rejected.

While the estimated coefficient for the income threshold dummy is strongly significant for IRA/401(k) saving, it has the wrong sign. It suggests that households with income in excess of $50,000 tended to save a larger share of income in IRA/401(k)s, in turn suggesting that the income threshold that was introduced in 1986 for IRA contributions did not adversely affect pension saving.

The coefficients on the 1983 asset stocks strongly suggested that households set separate asset targets for the three asset classes. In particular, the tax-assisted pension saving rate tended to be lower the larger the level of IRA/401(k) assets, but to be unaffected by the stock of other assets. Similarly, the saving rate for other financial assets also tended to fall with an increase in the 1983 stock of other financial assets but tended to rise with an increase in IRA/401(k) assets. The hypothesis that the coefficients on the initial IRA/401(k) asset stock were equal in

absolute value in both equations could not be rejected. This suggested that positive shocks to other financial assets tended to reduce overall saving, but that positive shocks to IRA/401(k) assets tended to reduce pension saving but leave the overall saving rate unchanged.

An explanation for the anomalous saving behavior in response to shocks to IRA/401(k) assets is that once individuals reach the age of 70 they must begin retiring assets out of the pension account. Unless the assets are immediately sold for consumption, individuals will use retirements of pension assets to replenish their stock of other financial assets. This type of behavior is hinted at in Chart 1 in which the stock of pension assets declines after retirement whereas the stock of other financial assets increases. This hypothesis was tested by restricting the sample to households headed by someone of working age and found that in this case the saving rate for other financial assets is unaffected by the stock of IRA/401(k) assets (see Table 4). Therefore, for household heads of working age, the overall saving rate declines the larger the initial level of IRA/401(k) assets or other financial assets.

Some doubt was cast on the validity of the OLS results by evidence of nonnormality of the errors. In particular, the hypothesis of normal errors was easily rejected, and estimates of the errors indicated both skewness and leptokurtosis. 1/ One possible source of nonnormality is the fact that the 1983/89 SCF panel is not necessarily representative of the full population cross section, in part owing to the requirements of obtaining responses from households in 1983 and 1989. In order to address this problem, the equations were re-estimated using weighted-OLS and by restricting the sample to household heads of working age. The weights were taken from the SCF and are designed to allow the panel to mimic the population cross-section. Use of weighted-least squares weakened the least squares result that the marginal tax rate had a significant effect on saving behavior but maintained the result of an asymmetric effect of asset stocks on saving.

The hypothesis of nonnormality also could not be rejected in the case of the weighted-least squares results. Since a possible source of nonnormality was the existence of outliers, the equations were re-estimated using the method of Least Absolute Differences (LAD), which has the advantage of reducing the weight placed on extreme observations. 2/ This estimator produced results which were similar to the weighted least-squares estimates insofar as the marginal tax rate was no longer a significant determinant of the saving rates, and the insignificant coefficients on the stocks of 1983 IRA/401(k) and other financial assets in each other's equation suggested limited substitution across assets.

1/ For example, kurtosis was estimated to be 37.3 for the IRA/401(k) saving rate equation, and 58.6 for the liquid asset saving rate equation.

2/ The LAD estimator minimizes the sum of absolute deviations from the mean, which results in an estimator that has a smaller variance than the least-squares estimator.

VI. Conclusion

The effect of the tax treatment of IRAs and 401(k)s was examined above using household survey data from the SCF panel. Besides the use of this data set, the present analysis differed from previous work in the area by the inclusion of an estimate of the marginal tax rate for households to proxy for the return on IRA/401(k) assets relative to taxable financial assets. The results indicated that the tax treatment of IRA/401(k)s influenced the allocation of portfolios across asset classes, but the hypothesis that total saving behavior had been affected could not be confirmed. In particular:

- A LOGIT analysis of household portfolios indicated that households facing higher marginal tax rates were significantly more likely to hold IRA/401(k)s, even after controlling for income.

- Estimates of asset demand equations indicated that a rise in the marginal tax rate tended to cause an increase in IRA/401(k) assets, financed by a reduction in net housing equity. In other words, households tended to take advantage of the deductibility of mortgage interest to finance IRA/401(k) assets.

- Some evidence was found to support the hypothesis that increases in the marginal tax rate tended to increase the flow of savings into IRA/401(k)s and decrease the flow of saving into other financial assets. However, these results did not appear to be very robust to changes in the sample or estimation methodology.

- In none of the above exercises was evidence found to suggest that the reduction in IRA deductibility after 1986 reduced either the stock of, or the flow into, IRA/401(k) assets. In particular, households with incomes above $50,000 were not found to have reduced their IRA/401(k) savings in response to the change in deductibility rules.

In sum, therefore, the results seem to support the results reported by Gale and Scholz (1994) and Engen, Gale, and Scholz (1995) who argue that the tax treatment of IRAs and 401(k)s had a limited effect on total saving.

APPENDIX

Data

Calculation of saving data

The Survey of Consumer Finances reports asset and liability totals for various categories. However, saving flows are not reported. In order to infer an average level of annual saving the following relationship between assets and contributions is used:

$$A_{x89}-A_{x83}(1+r_x)^6 = C_{x84}(1+r_x)^5+C_{x85}(1+r_x)^4+\ldots C_{x89}$$

where A_{x89} is the asset balance in 1989 and C_{x88} is the contribution to the asset balance in 1988. Solving for the average contribution C, assuming that contributions are equal in every year we find:

$$C = [A_{x89}-A_{x83}(1+r_x)^6]/[(1+r_x)^5+(1+r_x)^4+\ldots 1]$$

The rates of return on used to calculate contributions to various assets are the same as those used by Gale and Scholz (1994).

Calculation of marginal tax rates

The marginal tax rates were calculated by comparing households' taxable income against the tax rate schedules for 1983 and 1989, respectively. 1/ Taxable income was proxied by household adjusted gross income (as reported in the survey) less deductions for interest payments and personal exemptions. For the purpose of determining the filing status of survey respondents (and which tax rate schedule to use), those who reported only a single resident were treated as "single taxpayers," unmarried taxpayers who reported more than one household resident were treated as "unmarried heads of households," and married household respondents were treated as "married filing joint returns."

In 1989, interest deductions were assumed to equal interest paid on reported mortgage debt plus 20 percent of interest on reported credit card and other debt. 2/ As survey data was only available on the amount of debt outstanding, rather than on interest payments, the interest rates on mortgage and credit card debt was assumed to be 12 percent and 16 percent, respectively. Personal exemptions in 1989 were based on filing status, and the same criteria described above were used.

1/ The source was Individual Income Tax Returns 1983 and Individual Income Tax Returns 1989, published by Department of the Treasury, Internal Revenue Service.

2/ In 1989, only 20 percent of nonmortgage debt was deductible.

The same procedure was used to calculate the deductions in 1983. However, account was taken of the fact that in 1983 the full amount of mortgage, credit card, and other debt was deductible, and that personal exemptions were not dependent on taxpayers' filing status.

Table 1. Characteristics of IRA/401(k) Asset Holders

Explanatory Variable	Average Sample Characteristics of Households with: Non-Zero IRA/401(k) Balances	Zero IRA/401(k) Balances	LOGIT Coefficients 1/
Wealth in 1983 (median)	$136,3000	$34,400	-0.07 (1.49)
Age	55	61	0.24 (5.87)
Age squared			-0.002 (6.80)
Income in 1983 (median)	$56,000	$19,000	-0.001 (0.004)
Income threshold dummy	0.30	0.04	0.63 (2.70)
Household size	2.7	2.4	-0.00002 (0.0003)
Children not at home	1.9	2.3	-0.06 (1.43)
Years of schooling	14.7	11.8	0.0987 (2.50)
Marginal tax rate	0.31	0.20	8.69 (9.00)
Percent correct predictions			75
Observations	748	648	1,396

1/ The coefficient estimates were from a LOGIT regression that measured the probability of nonzero IRA/401(k) assets in 1989. The absolute value of t-statistics are in parentheses; estimate of constant term not reported. The sample was restricted to those with nonzero income and wealth in 1983 and to those with tax-assisted saving rates between ± 1.

Table 2. 1983 Asset Share Equations 1/

Independent Variable	Dependent Variable: Tax-Assisted Assets TOBIT	Tax-Assisted Assets OLS	Other Financial Assets	Housing Equity
Wealth	-0.014	-0.008	0.037	-0.289
	(2.56)	(3.00)	(5.82)	(4.47)
Age	0.016	0.001	-0.037	0.035
	(2.99)	(0.62)	(6.96)	(6.61)
Age squared	-0.0001	-0.0000	0.0003	-0.0003
	(3.42)	(0.84)	(7.21)	(6.76)
Income	-0.006	-0.003	0.101	-0.098
	(0.20)	(0.16)	(2.41)	(2.31)
Household size	-0.009	-0.005	-0.056	0.066
	(1.36)	(1.62)	(7.32)	(7.91)
Children not at home	-0.005	-0.001	-0.006	0.007
	(1.02)	(0.45)	(1.17)	(1.35)
Education grade	0.014	0.005	0.021	-0.026
	(3.90)	(2.87)	(5.66)	(6.68)
Pension dummy	0.044	0.025	-0.049	0.025
	(2.50)	(2.71)	(2.33)	(1.15)
Marginal tax rate	0.746	0.189	0.049	-0.237
	(9.35)	(5.29)	(0.59)	(2.82)
R^2	...	0.09	0.20	0.22
Obs	1,340	1,340	1,340	1,340
Memorandum items:				
Coefficients on marginal tax rate for sample restricted to households: 2/				
aged 20 to 45	0.858	0.238	-0.415	0.176
	(4.82)	(3.03)	(2.36)	(0.98)
aged 46 to 65	0.652	0.185	0.111	-0.296
	(6.93)	(3.69)	(1.01)	(2.659)
aged over 65	0.590	0.052	0.534	-0.585
	(2.85)	(0.95)	(3.13)	(3.49)

1/ Absolute value of t-statistics in parentheses; estimate of constant term not reported. Tax-assisted asset equation was estimated using TOBIT and OLS; other equations estimated using OLS. Sample was restricted to those with nonzero income and wealth in 1983. The asset shares and the marginal tax rate were expressed as fractions; wealth and income were expressed in million of dollars.

2/ The coefficients estimates for the marginal tax rate (and their t-statistics) were taken from regressions that were identical from those reported for the full sample except that the sample was restricted by the age of the head of household. The number of observations for household heads aged 20 to 45 years old was 434, the number of observations for household heads aged 45 to 65 years old was 653, and the number of observations for households aged over 65 was 253.

Table 3. 1989 Asset Share Equations 1/

Independent Variable	Dependent Variable: Tax-Assisted Assets TOBIT	Tax-Assisted Assets OLS	Other Financial Assets	Housing Equity
Wealth	-0.013	-0.009	0.030	-0.022
	(2.27)	(2.33)	(4.44)	(3.66)
Age	0.051	0.010	-0.010	0.005
	(5.14)	(1.68)	(0.94)	(0.05)
Age squared	-0.0005	-0.0001	0.0001	--
	(5.62)	(1.99)	(1.51)	(0.50)
Income	0.031	0.014	0.007	-0.020
	(1.35)	(0.86)	(0.22)	(0.78)
Income threshold dummy	-0.103	-0.049	0.046	0.003
	(1.99)	(1.32)	(0.68)	(0.05)
Household size	-0.020	-0.013	-0.035	0.048
	(1.49)	(1.44)	(2.15)	(3.34)
Children not at home	-0.004	0.001	-0.032	0.030
	(0.41)	(0.23)	(2.66)	(2.90)
Years of schooling	0.039	0.013	-0.005	-0.008
	(5.80)	(3.09)	(0.64)	(1.16)
Pension dummy	0.247	0.134	-0.079	-0.054
	(5.61)	(4.55)	(1.44)	(1.13)
Marginal tax rate	0.905	0.218	0.562	-0.781
	(3.28)	(1.18)	(1.64)	(2.59)
R^2	...	0.06	0.07	0.07
Obs	1,199	1,199	1,199	1,199
Memorandum items:				
Coefficients on marginal tax rate for sample restricted to households: 2/				
aged 20 to 45	1.507	0.843	-0.059	-0.785
	(1.80)	(1.49)	(0.93)	(1.75)
aged 46 to 65	0.661	0.077	0.566	-0.643
	(1.79)	(0.28)	(1.87)	(2.69)
aged over 65	0.373	0.078	0.893	-0.971
	(1.30)	(0.52)	(0.89)	(1.05)

1/ Absolute value of t-statistics in parentheses; estimate of constant term not reported. Tax-assisted asset equation was estimated using TOBIT and OLS; other equations estimated using OLS. Sample was restricted to those with nonzero income and wealth in 1989. The asset shares and the marginal tax rate were expressed as fractions; wealth and income were expressed in million of dollars.

2/ The coefficients estimates for the marginal tax rate (and their t-statistics) were taken from regressions that were identical from those reported for the full sample except that the sample was restricted by the age of the head of household. The number of observations for household heads aged 20 to 45 years old was 270, the number of observations for household heads aged 45 to 65 years old was 595, and the number of observations for households aged over 65 was 334.

Table 4. Saving Rate Equations 1/

Independent variable	Dependent Variable: IRA/401(k) OLS	IRA/401(k) Restricted Sample OLS	IRA/401(k) Restricted Sample Weighted OLS	IRA/401(k) Restricted Sample LAD	Other Financial Assets OLS	Other Financial Assets Restricted Sample OLS	Other Financial Assets Restricted Sample Weighted OLS	Other Financial Assets Restricted Sample LAD
Other financial asset ratio	0.004	0.006	0.002	-0.0005	-0.073	-0.079	-0.107	-0.067
	(0.60)	(2.06)	(0.75)	(0.40)	(5.91)	(20.32)	(27.86)	(39.59)
Housing asset ratio	0.004	0.002	0.0001	0.001	-0.003	-0.008	-0.008	0.0003
	(0.88)	(0.28)	(0.03)	(0.45)	(0.36)	(0.85)	(2.35)	(0.08)
IRA/401(k) asset ratio	-0.098	-0.111	-0.086	-0.054	0.071	0.046	0.042	0.023
	(4.67)	(4.37)	(4.12)	(5.30)	(1.93)	(1.32)	(1.58)	(1.63)
Age	1.276	-0.007	-0.008	0.003	-0.967	0.004	0.0006	-0.004
	(3.03)	(0.63)	(1.36)	(0.55)	(1.04))	(0.26)	(0.09)	(0.56)
Age squared	-0.011	0.000	0.0001	-0.0000	0.012	0.0000	0.0000	0.0001
	(2.89)	(0.89)	(1.69)	(0.35)	(1.27)	(0.13)	(0.03)	(0.69)
Log of income	-2.248	-0.030	-0.012	-0.017	9.312	0.088	0.044	0.024
	(2.09)	(1.78)	(0.61)	(2.43)	(3.46)	(3.71)	(1.69)	(2.49)
Income threshold dummy	5.729	0.037	0.053	0.046	7.555	0.061	0.031	0.0005
	(2.47)	(1.18)	(2.89)	(3.06)	(2.20)	(1.38)	(1.33)	(0.026)
Years of schooling	0.617	0.008	0.008	0.004	0.474	0.001	-0.0002	0.001
	(2.43)	(1.62)	(3.13)	(1.76)	(1.02)	(0.18)	(0.07)	(0.41)
Household size	0.882	0.015	0.014	0.002	-0.438	-0.001	0.005	0.003
	(0.95)	(1.73)	(2.59)	(0.59)	(0.45)	(0.12)	(0.73)	(0.45)
Children not at home	0.266	0.002	0.006	0.001	-0.954	-0.013	-0.006	-0.001
	(0.50)	(0.35)	(1.47)	(0.42)	(1.06)	(1.35)	(1.14)	(0.30)
Pension dummy	3.502	0.042	0.037	0.007	2.449	-0.018	-0.040	0.0005
	(2.18)	(1.53)	(2.75)	(0.56)	(0.96)	(0.48)	(2.34)	(0.03)
Marginal tax rate	0.243	0.401	0.017	0.091	-0.591	-0.522	-0.11	-0.022
	(1.74)	(1.70)	(0.09)	(0.88)	(1.88)	(1.60)	(0.46)	(0.15)
Descriptive statistics 2/								
R^2	0.10	0.07	0.10	0.05	0.36	0.43	0.59	0.42
Jarque-Bera	100,326	74,028	81,773	87,291	36,802	44,955	19,243	64,654
White	105	105	...	...	168	168	...	...
Obs	748	596	596	596	748	596	596	596

1/ Absolute value of t-statistics in parentheses; estimate of constant term not reported. The sample was restricted to those respondents with nonzero income and wealth in 1983 and to those respondents that had non-zero tax-assisted saving rates between $\pm$ 1. Estimates were performed using OLS, weighted OLS, and Least Absolute Difference (LAD) estimators. T-statistics for OLS regressions are heteroscedastic consistent. Weights used for weighted OLS are from the SCF.

2/ The Jarque-Bera statistic is the Lagrange Multiplier test for nonnormality, which is distributed chi-squared with two degrees of freedom under the null of normality. The critical value at the 95 percent confidence level is approximately 5.5. The White statistic is White's test for heteroscedasticity related to the regressors, and is distributed under the null of homoscedasticity as chi-squared with ((k+1)k)/2)-1 degrees of freedom, where k is the number of regressors. In the case above, the critical value at the 95 percent confidence level is roughly 95.

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