DO IRAS AND KEOGHS INCREASE SAVING?**

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ABSTRACT

Government retirement saving policies influence household saving. This paper considers the impact on household saving of tax-favored individual retirement savings plans—Keogh accounts and Individual Retirement Accounts (IRAs). One presumption behind the change in policy toward a more liberalized tax treatment of individual retirement saving is that higher net rates of return will encourage saving. Here, the focus is on the extent to which access to higher net rates of return afforded by IRAs and Keoghs leads to increased saving. As a basis for analysis, an extended life-cycle model of saving is used; the model is estimated using cross-section data. The results indicate that contributions to IRAs and Keogh plans stimulate saving and that the increase depends positively on the marginal tax rate, implying an interest sensitivity of saving.

Introduction

ASSURING the adequacy of retirement savings has been a leading concern of public policy for almost fifty years. Government retirement saving policies can influence the pattern of individual or household wealth accumulation. Analyzing that influence is important for determining the impact of the policies on total savings and on the funds available for capital formation. The object of this paper is to examine the evidence on the impact of one particular intervention on individual saving behavior, namely tax-favored individual retirement savings plans, Keogh accounts and Individual Retirement Accounts (IRAs).[1]

One presumption behind the change in policy toward a more liberalized tax treatment of individual retirement saving is that higher net rates of return will encourage more saving. Because they represent a tax-free saving alternative, the response to individual retirement saving plans provides a potential laboratory for examining the sensitivity of saving to changes in the net rate of return. How saving in IRAs or Keoghs responds to higher rates of return is a complex question. Because of contribution ceilings and restrictions on withdrawal, the response of saving in such plans to a change in the real net rate of return cannot by itself be used to measure the interest sensitivity of saving.

The paper presents some new empirical evidence on the impact of individual retirement saving plans on individual saving. Household data are used to determine whether, *ceteris paribus*, participants in IRAs or Keogh plans save more than non-participants. The results are consistent with both the hypothesis of a substantial interest sensitivity of saving and the hypothesis that much of the contributed funds represent marginal saving.

Individual Retirement Saving Plans

A. *Legislative Background and Participation*

Within the past twenty years, changes in the tax law have allowed advantages for those who are self-employed or who are not covered by qualified private pension plans. The first legislative provision (The Self-Employed Individuals Tax Retirement Act of 1962) authorized the so-called "Keogh plans," enabling self-employed persons to establish retirement plans to deduct their contributions from current taxable income. The 1962 act limited annual tax-deductible contributions to the lesser of $2,500 or 10 percent of earned income.

In addition to its provisions for supervision of private pension plans, the Employee Retirement Income Security Act of 1974 (ERISA) modified the tax treatment

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of individual retirement savings. Contribution ceilings (for income tax purposes) to Keogh plans were raised to the lesser of 15 percent of income or $7,500 per year. Even more significantly, ERISA authorized Individual Retirement Accounts (or IRAs). Beginning the next year, an IRA could be set up with tax-deductible contributions equal to 15 percent of income up to maximum of $1,500 by persons covered by neither an employer pension plan or a Keogh plan.

In recent years, contribution limits to Keoghs and IRAs have been extended. The limit for IRAs was raised in 1977 to $1,750 for participants with an eligible nonemployed spouse. Dramatic liberalizations occurred under the Economic Recovery Tax Act of 1981 (ERTA). Effective on January 1, 1982, the maximum deductible contributions for Keoghs doubled to $15,000. Moreover, eligibility for IRAs was expanded to include all workers (even those covered by employer pension plans) and the contribution limit was raised to $2,000 (up to 100 percent of income). The allowed contribution for eligible spouses rose from $1,750 to $2,250.

IRA and Keogh plans have attracted a large flow of funds.[2] The growth in funds contributed to individual retirement savings plans is not interesting per se. Economic and policy analysis of the effectiveness of IRAs and Keoghs in stimulating individual retirement savings must focus on the extent to which contributions constitute saving at the margin and not just a reshuffling of existing assets for tax purposes.

Contributions to IRAs and Keoghs have both discrete and continuous choice components. As a first step, an individual must decide whether or not to adopt a plan (given that he is eligible); second, he must decide how much to contribute. Evidence on the first point has been mixed and largely anecodotal.[3] The analysis of the level of contributions is not as straightforward as it might seem *a priori* (i.e., either zero or the maximum allowable deductible amount), because of fluctuations in current income or differences across individuals in access to institutional retirement saving. An analysis of the extent to which individual retirement saving plans increase saving must focus on the change in perceived net returns (including liquidity considerations) induced by those plans.

B. *IRAs and Keoghs as Saving Incentives*

Contributions to individual retirement savings plans are then really the product of three factors—(1) whether or not one is eligible to participate, (2) the probability of participating given eligibility, and (3) the amount contributed. Federal policy influences all three elements of the decision, through eligibility requirements, a penalty for withdrawing funds before retirement, and a ceiling on tax-deductible contributions. Those policies affect the change in the real net return perceived by an individual.

The most basic instrument at the government's disposal with respect to individual retirement saving plans is the eligibility requirement. Changes in the eligible population affect both the discrete and continuous choice dimensions by their impact on the parameters of the probability of early withdrawal (given a penalty rate). For example, broadening eligibility requirements to include workers with high and stable earnings significantly increases the chance for ultimate participation. The changes brought forth by ERTA included all workers under the IRA umbrella. Data from the post-ERTA period would provide the clearest test of whether the availability of IRAs and Keoghs increases saving.

A second restriction on the use of IRAs or Keoghs is a fixed penalty for early withdrawal. Given a penalty for early withdrawal from an account (expressed as a fixed fraction k of principal), whether or not the IRA or Keogh plan's "tax-free" return provides an increase in the net return (inducing new saving) depends on how long the funds are expected to remain in the account.[4] Let τ and r_G represent the marginal tax rate and nominal gross rate of return, respectively. Ignoring inflation, if we let τ_i, r_G, and k be constant, the total net return on saving in unrestricted vehicles after j periods is

$$[(1 + (1 - \tau_i) r_G)^j - 1].$$

Taxes are collected on nominal gross return each period. At the end of j periods, the net return on savings in the individual retirement plan is

$$[(1 - \tau_i)(1 + r_G)^j - 1) - k_i(j)],$$

where $k_i(j) = k$ if an individual is not yet at retirement age and $k_i(j) = 0$ if he is. Under the IRA/Keogh option, taxes are paid only at distribution.[5]

When will an individual perceive an increase in the net return from an available retirement saving plan? Given withdrawal after j periods, the net return is higher under the IRA/Keogh option if

$$[(1 - \tau_i)((1 + r_G)^j - 1) - k_i(j)] > [(1 + (1 - \tau_i) r_G)^j - 1]. \quad (1)$$

Determining the number of periods contributions would have to remain in an IRA or Keogh to realize a higher net rate return depends on the values of τ, r_G, and k. As an example, assuming withdrawal before retirement, if $\tau = 0.40$, $r_G = 0.10$, and $k = 0.10$, only after six years is the return on the "sheltered" saving higher than on "ordinary" saving.

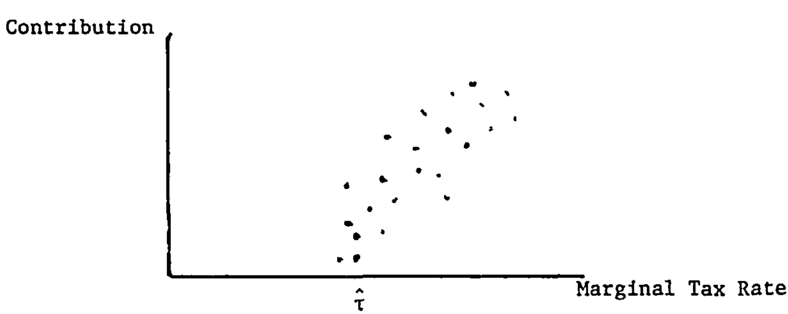
In general, individual retirement saving plans lead to an increase in the effective net return when (a) the individual has a high marginal tax rate, (b) the probability of withdrawing the contribution before retirement is low, or (c) the penalty for early withdrawal is low.

Because it plays an important role in determining the net return and because it is an indicator of current income, the marginal tax rate is a convenient summary statistic to use in evaluating the desirability of contributions. In the absence of a ceiling on tax-deductible contributions, one could consider the discrete and continuous choice dimensions of contributing to IRA/Keogh plans as a function of the marginal tax rate. Examining the scatter diagram below, for the eligible population we might observe contribution as an increasing function of the marginal tax rate after some critical rate $\hat{\tau}$, at which condition (1) is satisfied and below which no contributions occur. Hence the marginal tax rate determines both the desirability of contributing at all and the optimal contribution.

Given expected withdrawal after j periods, the change in the net return for the i^{th} individual as a result of the introduction of IRA/Keogh plans is

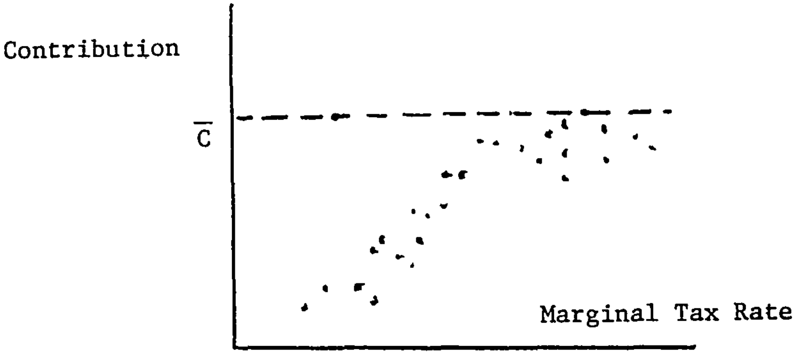
$$\max (0, (1 - \tau_i)((1 + r_G)^j - 1) - p_i(j)k_i(j) - (1 + (1 - \tau_i) r_G)^j + 1),$$

where $p_i(j)$ is the probability of needing to withdraw the funds in period j. If the individual's marginal tax rate is such that the IRA/Keogh plan offers a lower return than unrestricted vehicles, he will save only through those traditional instruments. Knowing τ_i, we can solve for the desired contribution.[6] While the size



of the contribution is determined, the mix between new saving and wealth reallocation is not.[7]

The problem becomes more complex in the presence of a ceiling on tax-deductible contributions. Given an annual ceiling $\bar{C}$, the scatter diagram above looks like



The impact of a ceiling is to make the actual contribution to the IRA or Keogh equal to

$$\min(\bar{C}, C^*),$$

where C^* is the desired contribution outlined earlier. Given an individual's characteristics and the particular penalty structure, interior solutions (contributions below the ceiling) are certainly possible. The contribution ceiling also serves to limit additions more nearly to new saving. Without such a limit, wealthy individuals with low probabilities of withdrawal over the near term could obtain large inframarginal benefits by reshuffling their existing portfolio.

Therein lies the crux of the policy problem. A proper examination of the contributions to individual retirement savings plans must address two policy questions. First, is wealth accumulation sensitive to the net return? Second, to what extent are the contributions to the plans truly marginal (saving)?

Modeling the Impact of Individual Retirement Saving Plans on Saving

Government retirement saving policies (with respect to social security, qualified private pension plans, or individual retirement saving plans) operate on individual wealth accumulation by influencing both desired wealth at retirement and the process of achieving that goal. One test of the impact of individual retirement saving plans on individual saving is to examine whether participants in plans, *ceteris paribus*, have higher net worth.

Most analyses of savings behavior use some version of the "life-cycle" theory of consumption and saving. The basic life-cycle model suggests a "humped" pattern in age of the ratio of net worth to (average, or permanent) income. Under perfect certainty, the theory assumes that individuals determine their consumption-saving choice for their (known) lifetimes by maximizing lifetime utility subject to a lifetime budget constraint.

Following that approach, we assume that an individual has a desired stock of wealth W^* relative to his average earnings (permanent income) Y^* to finance retirement consumption. The ratio of W^* to Y^* is a function of, among other things, anticipated pension benefits (from social security, SSW, and qualified private plans, PPW) relative to permanent income and permanent income itself. The former are evaluated in present value form and are included to measure the extent to which an individual's certain entitlement to pension benefits reduces saving; the latter provides a test of whether saving rates rise with (permanent) income.

The relationship between observed wealth W and desired wealth to permanent income depend on age and temporary influences on wealth accumulation (such as temporary unemployment) or individual characteristics. Those characteristics include whether the unit is a farm family, whether the head of the household is unemployed, whether the head is self-employed, and the number of children under age eighteen.

The details of and results of the estimated model along with a description of the construction of the variables can be found in the Appendix or in Hubbard (1983a). Net worth is the sum of financial and nonfinancial assets less total liabilities. The effects of age on wealth accumulation are tested by examining rates of wealth accumulation across age brackets (AGE1–AGE6 in Table 1A, the construction of which is delineated in the Appendix). Permanent income is also introduced in brackets (Y*1–Y*3 in Table 1A, which are described in the Appendix) to test for different saving rates by earnings levels.

To estimate the model of wealth accumulation and test its sensitivity to the inclusion of individual retirement saving plans, household data from a 1979 survey of assets and income performed for the U.S. President's Commission on Pension Policy were used. The commission contracted for a household pension survey primarily for the purpose of examining the impacts of social security and private pensions on saving behavior. To satisfy this goal, the analysis required demographic, employment, pension, social security, wealth, and income data for family units. Hence the resulting data base is rich and has many applications. The sample used in this study contained 3084 observations.

Results for the basic saving model (with no role for IRAs and Keoghs) are reported in the first column of Table 1A. The ratio of wealth to permanent income increases with age until old age, during which some "dissaving" occurs. As found in other recent studies (Diamond and Hausman, 1982; King and Dicks-Mireaux, 1982), wealth decumulation in old age is much slower than the basic life-cycle model would predict.[8] Households whose head is currently unemployed have lower net worth, *ceteris paribus*. Farm families and families headed by self-employed individuals possess significantly greater net worth than the rest of the sample (by 85 and 35 percent, respectively, for the same income), reflecting a more uncertain pattern of earnings and the recent increases in farm land values.

The social security and private pension variables have the expected negative effect on saving. Evaluated at sample means, the results in the first column of Table 1A imply that an increase in the present value of social security benefits of one dollar reduces net worth by 33 cents, while an increase in the present value of private pension benefits reduces net worth by about 16 cents.

A simple proportional relationship between savings and permanent income is rejected by the data; the saving rate out of permanent income rises with permanent income, though at a decreasing rate.[9] One problem in isolating a relationship between rates of wealth accumulation and earnings is that price effects may be present as well (e.g., a correlation between earnings and after-tax financial returns). Government retirement saving policy can bring about these price effects, most notably through the tax-favored treatment of IRAs and Keogh plans. It is to this issue that we now turn.

Constraints on data availability make modeling the impact of IRAs and Keoghs on saving difficult. The data in the President's Commission on Pension Policy survey do not contain precise information on contributions to IRAs or Keogh plans. There is, however, information for each household on the number of IRAs and Keoghs, on whether or not there was a contribution, and on the accumulated asset values of the plans.

Given the ceiling on contributions, the choice of whether to contribute at all may be just as important as the continuous choice of the amount of the contribution given a decision to contribute. Any observed contribution is just the product of these discrete and continuous choices. As the survey does not contain data on contributions, proxies must be constructed. The first step is to estimate the probability of contributing to an IRA ($\hat{\pi}_I$) or to a Keogh ($\hat{\pi}_K$) as a function of a set of individual characteristics. Given that there is a decision to contribute, the contribution then depends on the unit's marginal tax rate.

The proxy for the contribution is just the product of the estimated probability and the marginal tax rate (RATE). That variable is entered in three pieces according to whether the marginal tax rate is less than 0.25 ($\hat{\pi}$ RATE1), between 0.25 and 0.40 ($\hat{\pi}$ RATE2), or greater than 0.40 ($\hat{\pi}$ RATE3). The marginal tax rate is constructed from the TAXSIM model of the National Bureau of Economic Research given the data on income and other characteristics from the sample.

To estimate models of the probability of contributing to an IRA or to a Keogh plan, the sample was first divided into groups according to eligibility. Probit models were estimated to determine probabilities of contributing to IRAs or to Keogh plans conditional on being eligible to participate. Explanatory variables in determining whether or not to participate included age, number of children under eighteen years of age, permanent income, education, and the ratio of current earnings to permanent income (as a proxy for the ability to contribute). Occupational dummy variables for whether the potential contributor held a "managerial" or a "professional" position were added to the list above to compose the list of explanatory variables for the IRA model. Results of the estimated probit models can be found in Table 2A of the Appendix.

The addition of the IRA and Keogh variables to the basic model produces some interesting results, which are contained in the second column of Table 1A. The estimated profile of the wealth-to-income ratio with respect to age is much the same as before. Wealth is built up until retirement, at which point some dissaving takes place; the estimated value of the rate of dissaving is not significantly different from zero, however, at any reasonable confidence level. The ratio of net worth to permanent income increases with permanent income, but to a lesser extent than before. While there is still evidence that farmers and the self-employed save more than the general population, that impact is now reduced. This is most probably due to the presence of Keogh contributions in the model; self-employed individuals had greater access to tax-deferred savings options. Social security and private pension benefits still reduce saving, though the implied offsets are slightly smaller than before.

The estimated impact of the IRA and Keogh variables indicates that households with access to individual retirement savings plans have higher observed ratios of wealth to permanent income. Because of the contribution ceilings, we would expect the rate of increase of contributions within a tax bracket to diminish as we move toward higher brackets. That pattern is borne out in the results in Table 1A. There is almost no impact on saving for the lowest tax bracket; more substantial (and precisely measured) effects are found for the higher brackets. Consider two individuals who are identical in all respects except that only one is eligible to participate in an individual retirement savings plan. Suppose each has a marginal tax rate in excess of forty percent. The slope estimates imply that a one percentage point increase in the marginal tax rate will be associated with a four percent increase in net worth (relative to permanent income), implying elasticity of the ratio of net worth to permanent income with respect to the marginal tax rate of just under 2.

How should one interpret the results? The estimated impacts of the IRA and Keogh variables represent (jointly) the sensitivity of contributions to tax-induced increases in the net return and the extent to which the contributions add to wealth (as opposed to merely reallocating it). The results are consistent with both the hypothesis of an interest sensitivity of saving and the hypothesis that some of the contributed funds represent marginal saving. Identifying an average measure of the "new saving" component of contributions is not possible without data on the contributions themselves. One can conclude that contributors to individual retirement savings plans have higher ratios of net worth to permanent income than otherwise identical non-contributors and that the proxy for the contributions is sensitive to the marginal tax rate.

Conclusions

Government policy toward retirement savings can have a profound effect on individual wealth accumulation. This paper summarizes some findings on the issue of whether a higher net rate of return brought about by the favorable tax treatment of individual retirement saving plans leads to increased individual saving. To that end, the paper first reviews the development of IRAs and Keogh plans, the restrictions on their use, and the increase in the effective net return which they allow.

Most of the paper reviews some empirical work on the impact of IRAs and Keoghs on household saving. A proper examination of the contributions to individual retirement saving plans must address two related policy questions. Is wealth accumulation sensitive to the net return? To what extent do the contributions to the plans represent marginal saving? To quantify answers to those questions, IRA and Keogh contributions were modeled using recent data from surveys done for the U.S. President's Commission on Pension Policy.

As a first step, a general model of household wealth accumulation was constructed, using the "life-cycle" framework. The results of the basic model are only weakly supportive of the life-cycle hypothesis; the rate of wealth decumulation in old age is much less pronounced than a simple life-cycle model would predict. Increases in social security "wealth" do reduce wealth accumulation, but on average by less than the dollar-for-dollar offset found by some researchers. Saving rates increase with permanent income, though at a decreasing rate.

The next step is to test empirically the impact of individual retirement saving plans on individual (or household) saving. Because of ceiling on tax-deductible contributions and penalties for withdrawing funds prior to retirement, there are two choices—a discrete choice of whether to contribute at all and a continuous choice of how much to contribute. Both choices were modeled. The results provide strong evidence that contributions to IRAs and Keogh plans do increase individual saving and that the increase depends positively on the marginal tax rate, implying a substantial interest elasticity of saving on the margin.

One must interpret the empirical results with caution because of the data constraints. The construction of panel data sets on individual earnings, asset-holding patterns, social security and private pension coverage, and participation in individual retirement savings plans is a necessary step toward more thorough empirical tests of the impacts of retirement saving policies. That empirical evidence will be important for the evaluation of proposals to increase the ceilings on tax-deductible contributions to IRAs or Keogh plans.

Appendix

The basic model to be estimated is of the form

$$\ln\left(\frac{W}{Y^*}\right)_{it} = a_0 - a_1\left(\frac{SSW}{Y^*}\right)_{it} - a_2\left(\frac{PPW}{Y^*}\right)_{it} + j(A_{it}) + g(Y_i^*) + \gamma' Z_{it} + \epsilon_i, \qquad \text{(A1)}$$

where W, Y* PPW, A, and Z represent household net worth, permanent income, present values of social security and private pension benefits, age, and temporary and individual characteristics, respectively. j and g are functions of age and permanent income, respectively. i and t denote the household and time period. Anticipated pension benefits are divided into social security and private pension components to allow for different effects on saving. a_1 and a_2 are coefficients to be estimated. The semilog specification in pension "wealth" allows for the possibility that because benefits are not marketable, the impact of pensions on saving may depend on the level of marketable wealth. Finally, the function g can be specified to test the nonlinearity in earnings of the ratio of net worth to permanent income.

Age plays a prominent role in the wealth accumulation process. Including just the age of the head of the household or some polynomial in age is probably inadequate to capture the nonlinearity of the wealth-age profile; that is, the nonlinearity of the function j in explaining the adjustment of the ratio of wealth to permanent income to its desired level over time. The function j is assumed to be piecewise-linear in age up to retirement age but nonlinear over the post-retirement period. Since we use ln (W/Y*) as the dependent variable, this specification implies that within age brackets there is a constant rate of accumulation. The age brackets are represented by AGE1, AGE2, AGE3, AGE4, AGE5, AGE6, where AGE6 is a quadratic term. To define the age brackets, we use a procedure similar to that employed in King and Dicks-Mireaux (1982). For each household i, there are five assumed age ranges over which the following dummy variables are defined:

$D1 = 1$, if $A_t < 30$ (zero otherwise),

$D2 = 1$, if $30 \leq A_t < 40$ (zero otherwise),

$D3 = 1$, if $40 \leq A_t < 50$ (zero otherwise),

$D4 = 1$, if $50 \leq A_t < 60$ (zero otherwise),

$D5 = 1$, if $60 \leq A_t$ (zero otherwise).

The bracket functions are, then,

$$AGE1 = D1(A_t - 15) + 15 \sum_{k=2}^{5} D_k,$$

$$AGE2 = D2(A_t - 30) + 10 \sum_{k=3}^{5} D_k,$$

$$AGE3 = D3(A_t - 40) + 10 \sum_{k=4}^{5} D_k,$$

$$AGE4 = D4(A_t - 50) + 10\, D5,$$

$$AGE5 = D5(A_t - 60) + 15\, D5,$$

$$AGE6 = D5(A_t - 60)^2 + 225\, D5.$$

The quadratic term for the last bracket permits a test of wealth decumulation in retirement.

Permanent income is entered in a piecewise-linear form. Y*1 represents the sum of the husband's and wife's permanent income (in thousands of dollars). To allow for the possible nonlinearity of the impact of permanent income on wealth accumulation, variables Y*2 and Y*3 were constructed such that the breakpoints for the piecewise-linear function are one standard deviation of Y*1 on either side of its mean in the sample. The methodology for constructing "permanent income" is described in Hubbard (1983).

Individual or temporary characteristics which might influence the observed ratio of net worth to permanent income include whether the unit is a farm family, whether the head is currently unemployed, whether the head is self-employed, and the number of children under eighteen years of age. The number of children of minor age is not a good indicator of a possible bequest motive. The total number of children would be better, but that statistic was not available in the data used.

Also influencing the wealth-to-income ratio are the ratios of the pension wealth variables to permanent income. Details on the construction of household social security and private pension wealth can be found in Hubbard (1983).

To estimate the model of wealth accumulation and test its sensitivity to individual retirement saving plans, we use survey data collected under the auspices of the U.S. President's Commission on Pension Policy. That a nontrivial fraction of the units surveyed have very low net worth indicated the possibility that the sample may be composed of groups with different types of savings behavior. In estimating the regression model outlined earlier, the sample is truncated to include only those households whose net worth is least \$3000. This truncation introduces a problem of sample-selection bias. To correct for the bias, we use the two-stage procedure suggested by Heckman (1979).[10] That is, a first-stage probit model for the probability of being in the truncated sample was estimated on the full sample. The inverse of Mill's ratio (from the estimated probit model) was added as an additional regressor in the wealth accumulation regression. Details on the variables included in and the estimation results of the probit model can be found in Hubbard (1983).

The regression results of the basic model are reported in Table 1A which follows the discussion of the modeling of individual retirement saving plans. Some hypothesis and specification tests were performed. Not all of the individual age coefficients are significantly different from zero at the 95 percent confidence level. An F-test can reject (at the 95 percent confi-

TABLE 1A
MODEL OF WEALTH ACCUMULATION

Dependent Variable: ℓn (Net Worth/Permanent Income)

Intercept	1.893	2.015			
	(0.489)	(0.489)			
AGE1	0.063	0.060			
	(0.013)	(0.014)			
AGE2	0.023	0.024			
	(0.009)	(0.009)			
AGE3	0.001	0.002			
	(0.010)	(0.010)			
AGE4	0.011	0.010		-0.182	-0.173
	(0.011)	(0.011)	SSW/Y^*	(0.064)	(0.064)
AGE5	0.040	0.040		-0.144	-0.124
	(0.019)	(0.020)	PPW/Y^*	(0.028)	(0.028)
AGE6	-0.001	-0.001			-0.128
	(0.001)	(0.001)	$\hat{\pi}_I$RATE1		(0.248)
Y^*1	0.097	0.102			9.313
	(0.032)	(0.032)	$\hat{\pi}_I$RATE2		(4.620)
Y^*2	0.082	0.086			4.009
	(0.032)	(0.032)	$\hat{\pi}_I$RATE3		(1.990)
Y^*3	0.032	0.021			-0.019
	(0.006)	(0.008)	$\hat{\pi}_K$RATE1		(0.069)
Farm Family	0.859	0.850			6.960
	(0.172)	(0.173)	$\hat{\pi}_K$RATE2		(2.609)
			$\hat{\pi}_K$ RATE 3		3.607
					(1.472)
Head Unemployed	-0.028	-0.050	Inverse of Mill's Ratio	-2.230	-2.242
	(0.067)	(0.068)		(0.107)	(0.106)
Self-Employed	0.351	0.156			
	(0.078)	(0.108)	$\bar{R}^2$	0.40	0.39
Number of Kids < 18	-0.056	-0.062			
	(0.0221)	(0.022)	F	61.8	46.9

NOTE: AGE1 - AGE6 and Y^*1 - Y^*3 are as defined in the text of the Appendix.

dence level) the hypothesis that all of the coefficients of the age bracket terms are equal to zero.

The semilog specification implies that pension "offsets" to saving increase with wealth. This effect is robust, however, to the inclusion of higher-order terms in SSW/Y^*, namely $(SSW/Y^*)^2$ and $(SSW/Y^*)^3$.

TABLE 2A
PROBIT MODELS FOR IRA AND KEOGH CONTRIBUTIONS

	IRA	KEOGH
Intercept	-3.251	-2.710
	(0.252)	(0.517)
College Education	0.302	0.912
	(0.291)	(0.431)
Manager	0.351	-
	(0.162)	
Professional	0.068	-
	(0.184)	
Age	0.006	0.021
	(0.004)	(0.008)
Number of Kids < 18	-0.118	0.055
	(0.059)	(0.089)
Permanent Income (000s)	0.025	0.112
	(0.004)	(0.058)
Current Earnings / Permanent Income	0.291	0.182
	(0.148)	(0.229)
Number contributing	65	36
X^2 (7)	69.6	-
X^2 (5)	-	16.6

(Standard errors in parentheses.)

An F-test can reject (at the 95 percent confidence level) the hypothesis that Y^*1, Y^*, and Y^*3 are jointly equal to zero. Because of the ad hoc function of permanent income used, a specification test was conducted to determine the sensitivity of the results. Formally, we use the weighted right-hand side variables X_i/Y_i^* to augment the regression, where the X_i are the explanatory variables from before. That is,

$$\ln\left(\frac{W}{Y^*}\right)_i = X_i\,\beta + \bar{X}_i\,\alpha + \epsilon_i, \qquad \text{(A2)}$$

where $\bar{X}_i = X_i/Y_i^*$. The specification test considers the hypotheses $\alpha = 0$. The null hypothesis cannot be rejected at the 95 percent confidence level.

Constraints on data availability make modeling the impact of IRAs and Keoghs on saving difficult. The data in the President's Commission on Pension Policy survey do not contain precise information on contributions to IRAs or Keogh plans. There is, however, information for each household on the number of IRAs and Keoghs, on whether or not there was a contribution, and on the accumulated asset values of the plans.

Given the ceiling on contributions, the discrete choice (in deciding whether to contribute at all) may be just as important as the continuous choice (the amount of the contribution given a decision to contribute). Any observed contribution is just the product of the discrete and continuous choices. As the survey does not contain data on contributions, proxies must be constructed for those choices. Rather than using a dummy variable for whether or not an individual contributes, to avoid any simultaneity problem, we first estimate the probability of contributing to an IRA or a Keogh as a function of a set of individual characteristics.[11] Given that there is a decision to contribute, the contribution is a function of the unit's marginal tax rate. Thus, the proxy for the (unobserved) contribution is the interaction of the fitted probability of contributing with a function of the marginal tax rate. Contribution proxies are constructed separately for IRAs and for Keoghs and are added as regressors in the wealth accumulation model of the previous section, providing a test of the interest sensitivity of contributions and of the extent to which the contributions are marginal (i.e., lead to a higher saving rate).

To estimate models of the probability of contributing to an IRA or to a Keogh plan, the sample was partitioned into subsample according to eligibility. The probabilities of contribution are conditional on being eligible to participate. Explanatory variables in determining whether or not to contribute to a Keogh include whether the potential contributor has a college education, age, number of children under eighteen years of age, permanent income, and the ratio of current earnings to permanent income (as a proxy for whether the unit is able to contribute). Occupational dummy variables for whether the potential contributor held a "managerial" or a "professional" position are added to the list above to compose the list of explanatory variables for the IRA model. Maximum-likelihood estimates of the two probit models can be found in Table 2A.

For the continuous choice dimension, we consider the following piecewise-linear function of the marginal tax rate. Let

$$DT1 = 1 \text{ if } 0.15 < \tau \leq 0.25, \text{ zero otherwise;}$$

$$DT2 = 1 \text{ if } 0.25 < \tau \leq 0.40, \text{ zero otherwise;}$$

$$DT3 = 1 \text{ if } \tau > 0.40, \text{ zero otherwise.}$$

Then,

$$RATE1 = DT1 \times \tau,$$

$$RATE2 = DT2 \times \tau,$$

$$RATE3 = DT3 \times \tau.$$

The products of the fitted probabilities (conditional on eligibility) on contributing to an IRA ($\hat{\pi}_I$) or to a Keogh plan ($\hat{\pi}_K$) and the tax brackets (RATE1, RATE2, and RATE3) are added as right-hand-side variables to the wealth accumulation model outlined earlier.

Table 1A contains the results for estimating the model for the determination of (the log of) the ratio of net worth to permanent income for those in the sample with net worths of at least $3,000. The inverse of Mill's ratio (from the probit model for low wealth) is included as an additional regressor. The first column contains the estimated coefficients and standard errors for the basic model; the second contains the estimated coefficients and standard errors for the model augmented by the proxies for contributions to individual retirement saving plans.

FOOTNOTES

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[1]A more detailed description of the results reported herein can be found in R. G. Hubbard, "Individual Retirement Saving Plans and Individual Wealth Accumulation," mimeograph, Harvard University, May 1983.

[2]In 1977 (the last year for which information is available on Keogh utilization), there were 649,456 Keogh plans with 907,403 participants and $6.5 billion in assets. Based on IRS computations for 1980, $3.4 billion was contributed to 2.6 million IRA accounts.

[3]For example, in 1977, only 11 percent of the 50 million workers eligible to contribute to IRAs actually did so. As has been discussed elsewhere (see Schieber, 1982), such a statement can be misleading. The 1982 expansion of IRA availability to workers covered by a pension plan completely changes the economic and demographic characteristics of the eligible population. An analysis of adoption data by the President's Commission on Pension Policy (1981) reveals that adoption rates are an increasing function of earnings. A more sanguine view on IRA participation is put forth in a recent study by the Life Insurance Marketing and Research Association (1982) which found that 60 percent of those opening an account intended to fund it from current income.

[4]Technically, the law requires a 10 percent penalty on principal for funds withdrawn before an individual reaches the age of 59-1/2.

[5]Another variation over time is that in the marginal tax rate. In reality, an individual's marginal tax rate is likely to be lower in retirement, further improving the advantage of the IRA/Keogh option if funds are held until retirement. In addition, a temporarily low marginal tax rate might encourage an individual to withdraw his contribution.

[6]A more general analysis of the problem would focus on the probabilities of withdrawal in given periods. If the probability of withdrawal is a function of, *inter alia*, the size of the contribution (relative to, say, permanent income), by stating (1) as an equality, we can still solve for the desired contribution.

[7]Strictly speaking, the choice is even broader. It is also possible under certain provisions to borrow funds to contribute to the plans. The interest paid on the borrowed money is tax-deductible. Thus, intertemporal wealth reallocation as well as reallocation at a given time, is possible.

[8]I have addressed this problem elsewhere (see Hubbard, 1983b) in the context of the life-cycle model when lifetime is uncertain.

[9]This finding corroborates the empirical evidence in Diamond and Hausman (1982). For a discussion of the result in terms of the structure of the social security system in an "uncertain lifetimes" model, see Hubbard (1983b).

[10]Heckman's method does not yield consistent standard errors, and moreover, as Greene (1981) points out, it is impossible to state whether the reported "conventional" standard error is a lower bound or an upper bound of the "true" standard error.

[11]The potential simultaneity problem surfaces because of the need to distinguish marginal from inframarginal contributions. Whether one contributes might be determined in part by one's stock of wealth (to be reallocated toward a higher net return).

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