

**The Relative Impacts of Adaptive Expectations and Economic Constructs on Savings
Behavior: Evidence from IRAs**

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Abstract

We examined the association between economic, savings, and psychological factors on participation in traditional IRAs (1983-1985). The data were panels of tax returns representing households qualifying for the maximum IRA contribution and whose only sources of income were employment and investments. Along with traditional economic variables, the Tobit regressions also included psychological factors such as testing for framing effects using reference points based on adaptive expectations. Although both economic and psychological constructs were important in explaining savings behavior, the latter were shown as more salient. Households having less favorable than expected withholding positions increased IRA participation, a finding corroborating prior research on framing effects. Savings propensity and past participation were the most important factors linked to IRAs. Unexpected investment income was significantly related to IRA participation, providing evidence that deductible IRA contributions represent new savings rather than reshuffled old savings. The policy implications of our study suggest that plans to redesign regimes to encourage greater retirement savings increase contribution caps and include tax benefits that are in temporal proximity to the desired savings behavior.

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INTRODUCTION

This study examines determinants of participation in Individual Retirement Accounts (IRAs) by examining effects of psychological and savings variables while controlling for traditional economic factors (price, income, and wealth). Previous empirical studies of IRA participation have been unable to resolve whether IRAs truly increase savings or are used simply to reshuffle savings to reap tax benefits. These earlier studies placed an over-reliance on the life-cycle models of savings that emphasize economic and demographic variables while failing to adequately incorporate psychological factors.

Given the historically low rate of savings in the United States and the small magnitude of liquid assets most households have for retirement, it is important to understand the extent to which tax benefits spur new savings. Despite past research efforts, a clear answer still eludes us. If psychological factors are more effective and less costly than proposed tax subsidies in motivating individuals to save for retirement, then this knowledge could possibly assist policy-makers in their efforts to redesign savings incentives that are less costly to the Treasury and more effective in motivating new savings (Ernst and Young, 2005).

This study's Statistics of Income (SOI) data were drawn from the Panel of Individual Returns for years 1982-1985 when restrictions on IRA participation were at a minimum. We estimated a series of two-stage upper-limit Tobit regressions with IRA contributions as the dependent variable. We obtained independent variables by deriving proxies for the economic, psychological, and savings variables from tax return data.

Our work attempts to make several contributions to the literature. First, we corroborate the findings of prior work that has dealt with savings and framing effects on IRA participation. We used an adaptive expectation approach to psychological framing to add to our knowledge in this area. Second, we decompose the parameters estimated from our Tobit regressions to obtain insights into the

effect of annual caps on IRA contributions. Finally, we address the importance of psychological constructs relative to traditional economic factors in motivating IRA contributions and whether such represents new savings or recycled old savings.

The remainder of the paper is organized as follows: the Background section discusses issues related to IRAs and savings and the motivation for and description of the psychological factors. The Method section describes the construction of the panels, the two-stage upper-limit Tobit regressions, and the decomposition and interpretation of the parameters estimated using these models. The Results section presents the empirical findings, and finally, the Conclusion section summarizes the findings and implications.

BACKGROUND

Savings and Tax Incentives

Individual Retirement Accounts (IRAs) were created as incentives for taxpayers to save for retirement and to increase overall savings in the U.S. economy. Concerns over the low rate of personal savings have been well documented in economic literature (Kotlikoff, 1992). Furthermore, a disturbing number of households enter their retirement years with little or no liquid assets (Poterba et al., 1998). Evidence from past research on the extent to which deductible IRAs are associated with new savings is inconclusive. Poterba et al. (1998) provides strong evidence that tax incentives are instrumental in encouraging substantial amounts of new savings. In contrast, the earlier work of Gale and Scholtz (1994), Burman et al. (1990), and Engen et al. (1994) reached the opposite conclusion. Also, Kotlikoff (1990) alleged that tax incentives fail to shift funds from consumption to savings because incentives allow the achievement of savings targets with less sacrifice in consumption.

Prior studies of taxation and IRA participation have focused on traditional economic analysis whereby IRA contributions are explained in terms of life-cycles, wealth effects, price (1- the marginal tax rate), and income elasticity while controlling for salient demographic variables (see, e.g., O'Neil and Thompson, 1987; Gale and Scholz, 1994; Diamond and Hausman, 1984; Hubbard, 1984; Long,

1990). Such models are grounded in expected utility theory whereby individuals code outcomes as final wealth states. According to Thaler (1994), the inability to link tax incentives and retirement savings in prior empirical work can be attributed to the failure of life-cycle models of household savings to incorporate psychological factors that describe of how individuals frame economic decisions. Life-cycle models assume that households behave as if they solve dynamic multi-period optimization problems in determining the savings component of their budget sets. Although such behavior is consistent with expected utility theory, it fails to describe how people actually approach saving for retirement.

Past studies have documented savings propensity and past IRA participation as important factors related to the choice to contribute to IRAs as well as the amounts of such contributions (Burman et al., 1990; O'Neil and Thompson, 1987; Gale and Scholz, 1994; Venti and Wise, 1988; Frischmann et al., 1998). The interesting issue is whether households that tend to save use IRAs as vehicles to increase savings or as mechanisms to reap tax benefits from savings that would have occurred anyway. Past research has regarded amounts transferred from currently taxable investments (e.g., mutual funds, savings accounts, certificates of deposit, etc.) to IRAs as no net savings (Thaler, 1994). Such shifting would defer investment income from current to future tax returns when IRA distributions are taken. This study estimates an amount of investment income for households if no IRA contributions were made. This estimate is compared with actual investment income to arrive at unexpected investment income. A negative association between unexpected investment income and IRA participation would suggest that investment assets were shifted from direct holdings to IRA accounts, resulting in no net savings. Hence, we state the following two-tail hypothesis in alternative form:

H1a: A positive association exists between unexpected investment income and IRA contributions, suggesting that IRA participants simultaneously increase IRA and non-IRA investments, thus indicating that IRA contributions represent new savings.

H1b: A negative association exists between unexpected investment income and IRA contributions, suggesting that IRA participants shift investments from non-IRA to IRA holdings, thus indicating that IRA contributions represent old savings.

We also analyze the extent to which the unexpected investment income is associated with psychological factors relative to traditional economic factors while controlling for overall savings propensity and IRA participation.

Individual Retirement Accounts

The focus of this study is on traditional IRAs. During the time of our study (1982-1985), each individual could contribute up to the lower of \$2,000 or the amount of his/her earned income to an IRA and receive a deduction for adjusted gross income (AGI) for the amount of the contribution. Thus, the tax advantage occurred at the time of contribution. As a result, deductible IRAs have a zero basis, and all amounts distributed are taxed as ordinary income. Effective for 1987, the Tax Reform Act of 1986 (TRA86) (U.S. Congress, 1986) restricted the full deductibility of contributions to traditional IRAs to those that are not active participants in qualified pension plans and phased-out deductions for others based on AGI.

Studies analyzing retirement savings vehicles typically use computational models based on alternative values of factors such as present versus future tax rates, the number of years until retirement, etc. (see, e.g., Burman et al., 2001; Hulse, 2003; and Seida and Stern, 1998). The objective of such models is to maximize the after-tax future value of the retirement nest-egg. Although these models are accurate from a rationale economic perspective, they ignore psychological factors that potentially make deductible IRAs appear attractive (Thaler, 1994). The purpose of the present study is not on determining the optimum retirement savings strategy, but to determine the advantage of including in models of savings behavior the psychological factors that are asserted to motivate taxpayers to participate in deductible IRAs. The extent to which psychological factors are perceived as favorable relative to tax subsidies offers policy-makers potentially less costly features to incorporate in the design of savings incentives.

One of these psychological factors involves taxpayers that face the specter of having to pay the Internal Revenue Service (IRS) more than expected along with a possible underpayment penalty. Such taxpayers are more prone to risk illegal tax evasion. Taxpayers do not discover underpayment problems until their returns are prepared after the year has ended. The ability to make deductible contributions to IRAs for the year that has just ended offers a legal means to reduce amounts owed to the IRS. Two-thirds of all IRA contributions are made between January 1 and April 15 (Boynton, 1984; Summers, 1986). Although taxpayers can make IRA contributions during the first quarter that can count for either the current year or the prior year, the disproportional frequency of contributions during this period is likely attributable to saving taxes for the year just ended. The extent to which taxpayers choose to make deductible IRA contributions rather than to understate income as a means to reduce payments to the IRS is likely to improve retirement savings and taxpayer compliance. According to Thaler (1994), the temporal proximity of the tax deduction with the IRA contribution can be perceived as an immediate reward for saving. Such perceptions regarding the relative attractiveness of investment choices have been attributed to framing effects.

Psychological Framing

Framing effects were first derived from Kahneman and Tversky's (1979) Prospect theory whereby individuals who have experienced losses are purported to have a value function that increases at an increasing rate and thus prefer riskier alternatives than those who have experienced gains (Fishchoff, 1983). Most research involving prospect theory and taxpayer behavior focuses on gain and loss frames formulated from reference points attached to withholding positions; i.e., the amount of refunds that taxpayers will collect or the amount of additional taxes that taxpayers will owe. Prospect theory predicts that a risky choice is more likely to be made from a loss (under-withheld) than from a gain (over-withheld) reference point.

The construct of psychological framing has been extended beyond the original risky-choice studies (Levin et al., 1998; McCaffery and Baron, 2003). For example, Levin et al. (2002) have identified "risky outcome," "attribute," and "goal" as variations of framing effects. McCaffery and

Baron (2003) linked framing effects to the theory of mental accounts in their study of the disaggregation bias. According to Thaler (1990), individuals keep separate mental accounts when making financial judgments related to savings. For example, although income is fungible, people have a lesser tendency to save income from wages and a greater tendency to save income from asset appreciation. An extension of this concept would be the disaggregation of tax return variables into mental accounts based on deductions, exemptions, and credits. Reductions in tax benefits in separate mental accounts would create loss frames. Thus, this study examines loss frames based on mental accounts as well as those based on withholding positions. Both frames are consistent with the reluctance of individuals to realize losses (Odean, 1998).

Mental Accounts

Individuals tend to disaggregate fungible amounts into separate "mental accounts" upon which gain or loss frames are formulated (Read et al., 1999; Thaler 1985; Thaler and Shefrin, 1981; McCaffery and Baron, 2004). This "disaggregation bias" appears within the tax context when taxpayers attach gain or loss frames to segments of their tax situation rather than focusing on their overall tax burden. For example, losing an exemption allowance or no longer qualifying for a deduction may be regarded as more salient than an actual reduction in tax liability. McCaffery and Baron (2003) offer experimental evidence that when evaluating the federal tax regime's fairness, individuals disaggregate payroll and income taxes. For example, taxpayers in their experiment did not perceive the earned income tax credit as mitigating the regressiveness of social security taxes.

Exemption allowances and home mortgage interest deductions are analyzed in the present study to examine whether households disaggregate these tax return variables into "mental accounts" for creating loss frames that influence IRA participation. As children grow older and become self-supporting, households lose deductions from exemption allowances. Also, as debt is retired on home mortgages, taxpayers realize lower interest deductions. In both cases, the reference points for establishing loss frames are deductions claimed in the prior year. Households that frame or disaggregate these events as losses in separate "mental accounts" would be expected to seek IRA

deductions to compensate for these perceived losses. Thus, we state the following one-tail hypotheses in alternative form:

- H2: A negative association exists between changes in home mortgage interest deductions and IRA contributions, suggesting that taxpayers perceive this tax benefit as a separate “mental account” and frame reductions in this deduction as losses which are compensated for by increasing IRA participation.
- H3: A negative association exists between the number of exemption allowances and IRA contributions, suggesting that taxpayers perceive these allowances as a separate “mental account” and frame reductions in this tax benefit as losses which are compensated for by increasing IRA participation.

We should point out that within the context of this study, linking IRA participation to framing and/or “mental accounts” does not necessarily reflect biased or irrational behavior. One would be hard pressed to argue that saving for retirement is not a rational economic choice. For example, each payment on a home mortgage results in more (less) of a fixed cash payment being allocated to principal (interest) and hence gradually reducing the home mortgage interest deduction. If this deduction is framed as a separate mental account, we would expect an increase in IRA contributions. Such behavior is not irrational. The psychological construct of “mental accounts” is reflected in the notion that the economic motivation to contribute to an IRA should not be affected by the amount of the home mortgage interest deduction. Ours is the first study to attempt to extract “mental account” variables from tax return data.

Withholding Positions and Expectations

According to expected utility theory, the risk-return choice associated with IRA participation is independent of withholding position. The decision to hold assets in an IRA does not alter the before-tax return on the investment. That is, the before-tax return on an investment such as a mutual fund is not affected by whether the fund is held inside or outside an IRA. The additional risk that taxpayers face is the probability of sustaining penalties from early withdrawals or the additional risk associated with debt used to fund IRAs.¹ It should be emphasized that this study does not assert that the

¹ Taxpayers that are not subject to the liquidity risk of contributing to an IRA, such as those over age 59 1/2 or those with substantial liquid assets, nevertheless face the attribute framing effects associated with an unfavorable

advantages of IRAs fail to compensate for risk. The focus of this study is on the extent to which withholding positions affect IRA participation when such should be irrelevant from an economic perspective. In a process-tracing study involving expert financial planners and novice taxpayers, forty-three variables were identified as relevant to the decision of whether a hypothetical family should have an IRA. None of these variables was related to withholding position (see Hershey et al., 1990). On the other hand, according to prospect theory, tax savings from deducting IRA contributions appear more (less) salient when such savings reduce (increase) tax payments (refunds).

In prior work linking prospect theory and IRAs, the current cash position was used as the reference point (see, e.g., Feenberg and Skinner, 1989; Long, 1990; and Frischmann et al., 1998). In contrast, this study will use an adaptive expectations approach to establish taxpayer reference points. Under the current cash position reference point, a refund of \$100 would be framed as a gain. However, if this taxpayer were expecting a much larger refund, she would be disappointed and thus frame this outcome as a loss. For example, assume that a taxpayer made a \$1,000 IRA contribution and received a \$500 refund for 1982. Under the adaptive expectations approach, she will plan on a \$1,000 contribution and also expect to receive a \$500 refund for 1983. However, if this taxpayer discovers that the refund will be only \$200, then based on the expected \$500 refund as the reference point, she will frame this initial withholding position as a \$300 loss. This taxpayer is predicted to extend her 1983 IRA contribution beyond \$1,000 before the filing deadline in an attempt to mitigate this perceived loss. This script is symmetrical with respect to payments. In short, withholding positions are framed as gains when refunds (payments) are larger (smaller) than expected based on last year's withholding position and IRA participation.

A study by Carroll (1992) offers strong support for the adaptive expectations reference point as relevant in framing withholding positions as gains or losses. Carroll (1992) studied taxpaying attitudes of 100 households in the Boston area during the 1988 tax season. He found that satisfactions

withholding position, such as the psychic cost of writing a check to the IRS (see Feenberg and Skinner, 1989; Krishna and Slemrod, 2003; Levin et al., 1998).

with withholding positions depended upon not whether taxpayers received refunds or had to pay additional taxes, but the extent to which such withholding positions were favorable or unfavorable relative to expectations. The most well-educated and sophisticated taxpayers that participated in his study realized that a tax refund was an interest-free loan to the government and thus planned their withholding positions so that they would have taxes owed. Even these taxpayers expressed dissatisfaction when their taxes owed were greater than expected. The prior year's withholding position was the most important factor in establishing expectations among participants in his study.

The current cash position as a reference point has problems in spite of strong support reported in prior research. Approximately 75 percent of individuals receive tax refunds. It is difficult to presume that all of these refunds are framed as gains. The minority who make tax payments to the IRS are not necessarily dissatisfied with their withholding positions. Carroll (1992) identified such individuals as sophisticated tax planners who wished to avoid interest-free loans to the government. These more sophisticated taxpayers may also have been IRA contributors. In other words, tax planning sophistication level may have been an omitted variable correlated with both tax payments and IRA participation, thus supporting the current cash position reference point reported in other studies (Feenberg and Skinner, 1989; Long, 1990; and Frischmann et al., 1998). Copeland and Cuccia (2002) provide support for the adaptive expectations approach to identifying reference points in their experiment using actual taxpayers as subjects. Here the experimental task involved reporting choices based upon the taxpayers past withholding positions.

Based on the adaptive expectations concept of reference points we state the following one-tail hypothesis in alternative form:

H4: Taxpayers having withholding positions less favorable than expected (loss frames) are more likely to increase their IRA participation to improve their withholding positions.

DATA, METHODOLOGY AND VARIABLES

Data

The data were drawn from the Panel of Individual Returns for years 1982-1985. These are IRS Statistics of Income (SOI) data and are part of the Ernst and Young/University of Michigan Tax

Research Data Base. For detailed discussions of this database, see Crum (1991). Tax years 1982-1985 were years that households had the least legal restrictions on the amount of tax-deductible IRA contributions that could be made.²

To control for income source effects, and to allow for the maximum possible IRA deduction on a tax return, special panels of households were constructed that consisted of married filing joint (MFJ) returns where both spouses were eligible to contribute \$2,000 to their respective IRAs for a maximum IRA deduction of \$4,000 on the return, thus enabling a potential wide range of variability in the dependent variable. Also, the returns selected for the special panels had income from only the following sources: wages and salaries, interest, dividends, and capital gains.

The purpose of these special panels is to study the savings behavior (as represented in IRA participation) of households that derive income primarily from labor and choose either to consume or to save it. For example, it is difficult to disentangle income attributable to labor versus investment when a taxpayer has an interest in a business, farm, or rental property. A farmer that purchases additional livestock instead of contributing to an IRA is not foregoing savings in favor of increased consumption. It is also difficult to determine whether losses from such activities are real reductions in disposable income or are tax sheltered losses with little economic substance. In addition, returns were eliminated that reported adjusted gross income (AGI) of \$200,000 or more, age exemptions, and special tax computations (e.g., income averaging).³ The final panels consisted of households that met these conditions during the period 1982-1985. Table 1 shows how the unbalanced panels were constructed from all returns contained in the SOI panel data to net 788, 840, and 989 observations for

² Although the availability of IRA contributions for 1986 was the same as for 1982-1985, 1986 was not included in the analysis because of the uncertainty that the progress of TRA86 through Congress would have had on taxpayer behavior. For example, many taxpayers may have made contributions to their IRAs in 1986 because it was the last opportunity for those subject to the phase-out provision to obtain a full deduction. In short, 1982-1985 are the only years available for one to do a meaningful study of the behavioral effects of fully deductible IRAs using a panel of tax return data. However, the behavioral phenomena, such as withholding position preferences, are likely robust over time.

³ Returns with AGI of \$200,000 or more were eliminated because state of residence and other important variables were blurred to obscure taxpayer identities. Taxpayers aged 65 and older are dissavers and free of the early withdrawal penalty, and hence have different incentives regarding IRAs. Special tax computations render difficult the determination of combined federal, state, and local income taxes on specified changes in income.

contribution years 1983, 1984, and 1985, respectively. Of these observations, 506 returns meet the specified criteria for the entire 1982-1985 period and thus make up the balanced panel.

Insert Table 1 about here

Constructing special panels to study behavioral economics offers controls similar to laboratory experiments, but without sacrificing reality, in the sense that tax return data are evidence of real economic decisions and not the result of contrived experimental tasks. Furthermore, such panel studies are not subject to demand effects as are laboratory experiments. On the other hand, similar to laboratory experiments, the use of special panels weakens external validity in that extension of the findings beyond the cases chosen for the panels are tenuous.

Model Specification

The panel data were used to estimate ordinary least squares (OLS) and upper-limit Tobit regressions with IRA contributions as the dependent variable. Models constructed using panel data are strong in internal validity because each household acts as its own control across time. As a result, the use of panel data mitigates problems associated with multicollinearity among observed variables and correlation among unobserved variables. Furthermore, panel data allow the use of first difference models to control for individual heterogeneity, three such models using unbalanced panels were estimated: $t=1983, 1984, 1985$, and $t-1=1982, 1983, 1984$, respectively.⁴ In addition, pooled regressions were estimated using a balanced panel that included all taxpayers that met the panel criteria each year from 1982 to 1985. Two versions of the pooled models were estimated: one with a dummy variable indicating the choice to participate in an IRA, and one without this dummy variable. The former version captures the incremental effects of the independent variables on the amount of IRA contributions for those choosing to participate in IRAs, while the later version focuses on the

⁴ The criteria used to construct the unbalanced panels were applied to each of these three models independent of the others. For example, to be included in the $t = 1983$ model, taxpayers had to be included in the SOI data set and meet the criteria for only 1982 and 1983.

aggregate amount of IRA contributions for all taxpayers in the sample. Both versions of the pooled model include year dummy variables.

Upper-limit Tobit regressions were used because IRA contributions (the dependent variable) were restricted to the legal cap.⁵ First-order partial derivatives derived from the Tobit regression coefficients were decomposed to determine the proportional effects of changes in a set of independent variables on changes in the probabilities of IRA contributions being below the cap, as well as changes in contributions that are under the cap (see, e.g., LeClere, 1994; Roncek, 1992; and McDonald and Moffitt, 1980). The sensitivity of IRA contributions to the legal cap has important policy implications given the cap increases enacted by The Economic Growth and Tax Relief Reconciliation Act of 2001 (EGTRRA) (U.S. Congress, 2001).⁶ Details describing the Tobit decomposition and interpretation of such are covered in Appendix A.

The empirical model used in this study is shown in equation [1].

$$\begin{aligned}
 \text{IRA_C}_{it} = & \hat{\beta}_0 + \hat{\beta}_1 \text{PRICE} + \hat{\beta}_2 \text{INCOME} + \hat{\beta}_3 \text{AVGAGI} \\
 & + \hat{\beta}_4 \text{SAVE} + \hat{\beta}_5 \text{UNEXIN} + \hat{\beta}_6 \text{LYIRA} \\
 & + \hat{\beta}_7 \text{CHOMI} + \hat{\beta}_8 \text{HHSIZE} + \hat{\beta}_9 \text{GAIN} \\
 & + \hat{\beta}_{10} \text{LOSS} + \hat{\beta}_{11} \text{PENL} + U
 \end{aligned}
 \tag{1}$$

Where:

- IRA_C_{it} = taxpayer i's IRA contribution for year t.
- PRICE = change in price from year t-1 to year t, where price is the after tax cost of the maximum IRA contribution [$\$4,000 * (1 - \text{composite marginal tax rate})$].
- INCOME = change in disposable income.
- AVGAGI. = average AGI, the wealth proxy.
- SAVE = savings propensity.

⁵ IRA contributions are bunched both at zero and at the maximum legal contributions, prompting some researchers to use a two-limit Tobit maximum likelihood technique (Long, 1990). The upper limit of \$4,000 clearly right censors the dependent variable as the actual desired amount of IRA contributions for those households making the maximum \$4,000 contribution cannot be observed. In contrast, the bunching of contributions at the lower limit of zero is not a true left censoring of the dependent variable as these households selected for the special panels actually choose to make zero contributions in spite of qualifying to make up to the maximum contribution (Maddala, 1991).

⁶ Gradually over the next several years, EGTRRA has increased the IRA contribution cap for those under age 50 to \$5,000 per taxpayer for 2008. This amount is \$10,000 for dual contributors on a joint return. The cap is increased by \$1,000 for those age 50 and older for 2006-2008 (\$500 for 2002-2005). All caps are adjusted for inflation after 2008. The threshold for a complete phase-out of the IRA deduction for qualified employee pension plan participants will be gradually increased to \$60,000 in 2005 for single and head of household taxpayers and to \$100,000 in 2007 for married joint return filers where both spouses participate in qualified employee pension plans.

- UNEXIN = unexpected investment income.
- LYIRA = lagged IRA contributions.
- CHOMI = change in home mortgage interest.
- HHSIZE = change in number of dependents.
- GAIN = the extent to which the withholding position for year t is “more favorable” than that for year t-1 while holding IRA contributions constant.
- LOSS = the extent to which the withholding position for year t is “less favorable” than that for year t-1 while holding IRA contributions constant.
- PENL = the reduction in the amount subject to the under-withholding penalty if the maximum IRA contribution were made.
- $\hat{\beta}_0 \dots \hat{\beta}_{11}$ = estimated regression coefficients.
- U = residual.

Equation [1] is estimated for each of the three contribution years, 1983, 1984, and 1985, using the unbalanced panels. We also estimated equation [1] using balanced panels combining all three years, while adding year dummy variables to the model. We estimated this pooled model with and without a dummy variable indicating IRA participation. The independent variables in equation [1] are grouped into three classes: traditional economic (variables 1-3), savings factors (variables 4-6), and psychological constructs (variables 7-11). We describe each of these variables in detail in the next section.

Independent Variable Descriptions

Traditional Economic Variables

Change in Price. To make PRICE exogenous, it is specified as the difference from year t-1 to year t in the after-tax cost of a household making the maximum \$4,000 IRA contribution taking into consideration federal, state, and local income taxes.⁷ The after-tax cost was estimated by multiplying \$4,000 by one minus the composite federal, state, and local effective marginal tax rates (EMTRs). The federal EMTR was derived by computing the federal tax liability with and without a \$4,000 IRA deduction for AGI and dividing the difference by \$4,000. This approach takes into consideration the effect a deduction for AGI has on other determinants of the tax liability, such as the medical expense deduction, child care, and earned income credits. Appendix B explains how marginal tax rates for state

⁷ The only other IRA study to include state MTRs was Long (1990) who used an instrumental variable approach to identify states with high and low MTRs and found IRA contributions to be greater in high taxed states. The present research is the first study to also incorporate local income taxes.

and local income tax regimes were combined with the federal EMTR to form a composite EMTR. Thus, PRICE (in hundreds of dollars) was specified as a change variable based on the maximum IRA contribution and computed using a composite EMTR. PRICE is expected to have a negative sign because increases in tax savings from IRA deductions occur when EMTRs increase.⁸ In other words, higher EMTRs translate into lower after-tax costs (i.e., lower PRICE) of making the maximum IRA contribution.

Change in Disposable Income. The computations for this change variable (INCOME in hundreds of dollars) for years t-1 and t are obtained by adding back to AGI: (1) all adjustments to income except employee business expenses, (2) net capital losses in excess of the capital loss deduction, and (3) tax free income from the following sources: capital gains, dividends, all-savers interest, social security, pension and unemployment benefits. These amounts for years t-1 and t are then reduced by social security taxes, federal income tax payments, and all state and local tax deductions.⁹ The use of disposable income, as opposed to AGI, as the INCOME variable to estimate income elasticity is less likely to cause multicollinearity problems between INCOME and PRICE (Long, 1990). Theoretically, the coefficients estimated for INCOME are expected to be positive as savings increase with income.¹⁰

Wealth Proxy (Average AGI). The AVGAGI variable is a surrogate measure of household wealth and is the mean AGI (in thousands of dollars) computed over each year a return is in the 1982-1985 data and hence is a level variable. This wealth variable also controls for demographic factors

⁸ Some prior studies used MTRs in place of PRICE. As MTRs and PRICE are inversely related, these studies expected and documented positive associations between MTRs and IRA participation (see O'Neil and Thompson, 1987; Feenberg and Skinner, 1989; Long, 1990; Hubbard, 1984; and Collins and Wyckoff, 1988). Frischmann et al. (1998) found MTRs to positively impact IRA participation of infrequent but not frequent contributors. However, Venti and Wise (1988) found MTRs to have no influence on IRA contributions. Similarly, Eaton (2002) found the effect of MTRs on IRA participation insignificant when taxable income was held constant.

⁹ State and local taxes paid were obtained from schedule A of households that itemized deductions and were estimated using the procedure described in Appendix B for those that claimed the standard deduction. All taxes were increased by additional payments made when returns were filed and reduced by refunds received as a means of estimating changes in disposable income on a cash basis.

¹⁰ This expectation is consistent with the findings of Feenberg and Skinner (1988), Long (1990), Gale and Scholz (1994), Frischmann et al. (1998), and Eaton (2002).

such as age and education that can not be obtained from tax return information and are subject to little variation over time within households. Because AVGAGI for a given taxpayer is the same for each year, it enables the capturing of taxpayer fixed-effects in the pooled regressions. Based on the findings of other studies that included wealth effects, the coefficient estimated for AVGAGI is expected to be positive.¹¹

Savings Variables

Savings propensity. The SAVE variable is average investment income as a percentage of average “non-transitory” disposable income computed over the 1982-1985 period (SAVE is measured in percentage points; e.g., 50%=50). Investment income is the sum of interest, dividends, and capital gains. Non-transitory disposable income is disposable income less capital gains. This level variable controls for differences in preferences and attitudes towards savings that vary across, but not within, households over time.¹² The coefficient for SAVE is expected to be positive.

Unexpected investment income. The UNEXIN variable is the difference between estimated actual and expected investment income for year t as a percentage of average non-transitory disposable income (UNEXIN is measured in percentage points; e.g., 50% = 50). Actual investment income proxies for non-IRA investment and relates to the amount of interest, dividends, and capital gains distributions reported on tax returns.¹³ Using actual reported investment income to proxy for non-IRA investment is problematic in that such is likely endogenous with respect to IRA participation. In other words, taxpayers could have jointly determined IRA and non-IRA investment levels. To mitigate this

¹¹ Gale and Scholz (1994) used the Survey of Consumer Finances to more directly estimate wealth from 1983-1986. They found a positive association between IRA contributions and large amounts of non-IRA financial assets. Frischmann et al. (1998) estimated wealth by capitalizing interest and dividends reported on tax returns and found wealth to influence IRA participation. Eaton (2002) used the actual amounts of interest and dividends as their wealth measure and found a positive relationship between wealth and IRA participation. Other studies reporting a similar relationship between wealth and IRA savings are Feenberg and Skinner (1988), Long (1990), and Hubbard (1984).

¹² Prior studies have documented that households that contribute to IRAs tend to save more overall (see O’Neil and Thompson, 1987; Long, 1988; Feenberg and Skinner, 1988; Gale and Scholz, 1994; Venti and Wise, 1988; and Hubbard, 1984).

¹³ Capital gains distributions represent taxable income that is passed through to mutual fund investors resulting from the trading activities of these institutions. Capital gains from the sale of investments are not included in investment income in this study. Here, investment income is that income that is likely to decline if savings and investments are shifted to IRAs.

problem, predicted instead of actual investment income was used to compute unexpected investment income for year t . Predicted investment income for year t was obtained from first-stage OLS regressions using reported investment income for year $t-1$ and IRA contributions for year t as instruments. These regressions are described in Appendix C.

The expected levels of interest, dividends, and capital gains distributions were estimated separately for years 1983-1985. Expected amounts of each type of investment income were estimated by regressing year t against year $t-1$ amounts for a sample of non-IRA participants that reported such investment income (see Appendix C). Because the observations used to estimate the regression parameters omitted IRA contributors and the SAVE variable controls for overall savings propensity, the UNEXIN variable measures the extent to which IRA contributors increased or decreased non-IRA investments in tandem with making IRA contributions. For example, a significant positive coefficient estimated for UNEXIN would indicate that IRA participants also increase their non-IRA holdings and would be evidence that IRA contributions represent new savings, hence supporting Hypothesis H1a. On the other hand, a significant negative coefficient would be evidence that households shifted investments into IRAs and support for Hypothesis H1b. Returns on assets shifted to IRAs are income deferred to future years that otherwise would be reported contemporaneously. This deferral would cause investment income for the current year to be lower than that expected in the absence of an IRA.

In this study, we examine whether IRA participation represents old versus new savings and how traditional economic and psychological constructs impact taxpayer behavior. In combining these objectives, we analyze the relative importance of these constructs in explaining unexpected investment income while controlling for IRA participation and savings propensity. First, we use the pooled version of equation [1] to estimate a full model whereby we switch UNEXIN and IRA_C, with the former (latter) becoming the dependent (an independent) variable. Next, we estimate two reduced models: one with the economic variables eliminated; the other with the salient psychological variables eliminated. We test the statistical significance of the change in R-square between the full model and each of the two reduced models (McNemar, 1969, p. 321). We then use the Fisher R-square to Z

transformation (Hayes, 1973, pp. 661-64) to test whether the difference between the changes in R-square attributable to each of the two reduced models is statistically significant. If the reduction in R-square attributable to eliminating the economic (psychological) variables is significantly greater than that from eliminating the psychological (economic) variables, then the economic (psychological) variables have a relatively greater impact in explaining unexpected investment income.

Lagged IRA contributions. The LYIRA variable is the amount of the IRA contribution for year t-1 (in hundreds of dollars). A lagged dependent variable such as LYIRA included among the independent variables allows one to model dynamics directly as part of the specification (see Beck and Katz, 1996; and Beck, 2001). Including LYIRA among the independent variables is similar to specifying the dependent variable as a change variable, as can be seen by subtracting $IRA_{C_{i,t-1}}$ (i.e., LYIRA) from both sides of equation [1]. Specifying the lagged dependent variable as an independent variable allows its coefficient to vary from one; such would not be the case if LYIRA were incorporated into a difference variable. A positive sign is expected for LYIRA as prior work has documented persistence among taxpayers in making IRA contributions (see, e.g., Gale and Scholz, 1994; and Frischmann et al., 1998).

Psychological Variables

Change in home mortgage interest. The CHOMI variable is the actual dollar amount of the change in the home mortgage deduction from year t-1 to year t. As households pay off home mortgages, they gradually lose interest deductions. If home mortgage interest is a separate “mental account,” then reductions in this tax benefit are expected to make IRA deductions more attractive.¹⁴ Thus, the estimated sign for the CHOMI variable is expected to be negative and supportive of Hypothesis H2.¹⁵

¹⁴ This interpretation is analogous to the DeAngelo and Masulis (1980) substitution hypothesis found in the corporate tax literature. These researchers theorize that firms lacking depreciation deductions incur greater debt in their capital structure thereby substituting interest deductions for depreciation deductions.

¹⁵ Gale and Scholz (1994) and Joines and Manegold (1995) regarded owner occupied-housing and IRAs to be non-liquid investments with the former crowding out the latter and supported this assertion by documenting a

Change in Number of dependents. The HHSIZE variable is the difference between the number of dependency exemptions reported for year t minus that reported for year t-1. As children cease qualifying as dependents, exemption allowances are lost, creating loss frames and the motivation to compensate for the lost deductions through IRA participation. A significant negative coefficient for HHSIZE would support Hypothesis H3. No psychological theory specifies which components of taxable income are disaggregated into separate “mental accounts.” Therefore, the change variables HHSIZE and CHOMI are used to test whether exemptions and home mortgage interest respectively represent “mental accounts.”

Gain/Loss reference points. The value of the reference point is computed by first determining the withholding position if the amount of the IRA contribution made for year t was the same as that made for year t-1. Next, the absolute value of the difference between this recomputed withholding position for year t and the actual withholding position for year t-1 is calculated to obtain the value of the reference point variable (REFR).¹⁶ If REFR does not exceed \$50, the values for both the GAIN and LOSS variables are zero.¹⁷ If the recomputed refund (balance due) for year t is greater (less) than the actual refund (balance due) for year t-1, or if the recomputed withholding position for year t is a refund and the actual withholding position for year t-1 is a balance due, then $GAIN=REFR$ and $LOSS=0$. On the other hand, if the recomputed refund (balance due) for year t is less (greater) than the actual refund (balance due) for year t-1, or if the recomputed withholding position for year t is a balance due and the actual withholding position for year t-1 is a refund, then $GAIN=0$ and $LOSS=REFR$. The GAIN/LOSS variable is measured in hundreds of dollars. Prospect theory postulates that loss frames provide stronger incentives for individuals to take action than is the case with gain frames. Although we expect a negative sign for the GAIN variable, a significant and positive coefficient on the LOSS variable would support Hypothesis H4.

negative relationship between home mortgage interest and IRA participation. IRAs are non-liquid assets because of the ten percent penalty that applies to withdrawals made before age 59½.

¹⁶ In computing REFR, balance due (refund) amounts take on positive (negative) signs.

¹⁷ The \$50 amount serves as a materiality threshold. Also, allowing households to have zero values for both GAIN and LOSS reference point variables avoids the problem of matrix singularity.

Penalty. When taxpayers are required to pay more than expected to the IRS, a loss frame arises. However, if the balance due exceeds certain statutory thresholds, an underpayment penalty will apply. A contribution to an IRA before the due date of the return will lower the tax liability thereby reducing the balance due and the amount exposed to the penalty.¹⁸ Using IRAs to reduce underpayment penalties has real economic substance and is not the result of a framing bias. Thus, the PENL variable is included in equation [1] to control for increases in IRA contributions that are made to reduce underpayment penalties. The value for PENL (measured in hundreds of dollars) is the extent to which the penalty exposure (if any) is reduced by increasing the IRA contribution for year *t* from the amount made in year *t*-1 to the maximum \$4,000 contribution. A positive sign is expected for PENL.¹⁹

RESULTS

For the three unbalanced panels, Tables 2 and 3 report descriptive statistics and correlation matrices respectively. Table 2 shows a steady increase in mean IRA contributions from 1983 to 1985 in tandem with an increase in the mean value for the LOSS reference point variable. The strongest finding in Table 3 is the persistence effect. Once a household contributes to an IRA, the likelihood of future contributions is greatly increased as seen by the high correlation between IRA contributions for years *t* (IRA_C_{*t*}) and *t*-1 (LYIRA). Furthermore, the high correlation between the dependent variable and the SAVE variable also supports the expectation that those households whose value systems include a strong savings ethic are more likely to participate in IRAs.

¹⁸ The penalty exposure is the amount by which the balance due exceeds the extent to which payments to the IRS (withheld taxes and estimated tax payments) fall short of a statutory threshold. During the period of this study the statutory threshold for year *t* was the lower of: (1) the tax liability for year *t*-1, (2) the tax computed on taxable income for year *t*-1 using the tax rates, exemptions, and credits for year *t*, (3) 80% of the tax liability computed using the tax rates and annualized income for year *t*, and (4) 90% of the actual tax liability for year *t*. Items (2) and (4) do not apply to 1985. Furthermore, there is no penalty if the balance due is less than \$300, \$400, \$500 for 1983, 1984, and 1985 respectively. Also, there is no penalty if gross income is \$10,000 or less or if non-wage income is \$500 or less.

¹⁹ The only other IRA study that included a variable for underpayment penalty was Eaton (2002) who used a dummy variable to indicate the possibility of facing an underpayment penalty. He found a positive association between IRA participation and penalty exposure when taxes owed was measured in dollars and an insignificant relationship when taxes owed was a dummy variable.

Insert Table 2 about here

The multivariate results are reported in Tables 4-6. Table 4 shows the regression parameters for equation [1] estimated using the unbalanced panels. Separate models were run for contribution years 1983, 1984, and 1985. Table 5, Panel A, reports the parameters estimated for equation [1] using the balanced panel; i.e., the same 506 households are represented in each of the three contribution years. The models depicted in Table 5 are pooled; i.e., the regressions were estimated using 1,518 taxpayer-years (506 X 3) as observations. Year dummy variables are included in the versions of equation [1] shown in Table 5. Panel B of Table 5 reports the results where an IRA dummy variable is included in equation [1]. Table 6 compares the relative importance of psychological and traditional economic constructs in explaining savings behavior.

Insert Table 3 about here

Each table reports estimated parameters from OLS as well as from upper-limit Tobit regressions to obtain an indication of the robustness of the results. Tables 4 and 5 show the Tobit first partial derivatives that were obtained from the raw Tobit coefficients estimated for each independent variable. The overall effect of the set of independent variables on IRA contributions for year t in the Tobit regressions were decomposed into two components: (1) that attributed to taxpayers that contributed less than the \$4,000 limit; $P(c < 4k)$, and (2) that attributed to those that contribute at the limit; $P(c = 4k)$. These figures are shown in Tables 4 and 5; for example, approximately 66 (34) percent of the effect on the dependent variable in the 1983 model was attributable to non-limit (limit) participants (Table 4). These figures are very similar to those attributable to the 1984 and 1985 models in Table 4 and the pooled models in Table 5. Also reported for each variable in the Tobit model is the change in the probability that a limit contributor will contribute less than the limit in response to a unit change in the independent variable; $\Delta [PR(c < 4k)]$.

The Tobit decomposition statistics reported in Tables 4 and 5 can be summarized as evidence that the IRA cap substantially restricted the amount of potential retirement savings that otherwise would have occurred, a finding that has not been documented in other studies linking savings behavior and IRA participation. The procedure to estimate and interpret the decomposition of the Tobit parameters is covered in Appendix A.

The discussion of the estimated coefficients from the models in Tables 4 and 5 will group the independent variables into three categories as represented in equation [1]: (1) traditional economic, (2) savings, and (3) psychological.

Traditional Economic Variables

PRICE, INCOME, and AVGAGI attempt to capture price, income, and wealth effects. The former two are change variables, while the latter is a level variable. Although the sign of the estimated coefficient for PRICE was in the expected negative direction in all models, statistical significance was achieved in the pooled model without the IRA dummy variable (Table 5, Panel A). This finding suggests that the PRICE effect (if any) is more associated with the decision to participate in an IRA than with the amount to contribute to an IRA while holding the participation decision constant. The sign for the INCOME variable was generally consistent with expectations but was significant only in the pooled model that included the IRA dummy variable, suggesting an association with the amount of an IRA contribution while controlling for the choice to participate (Table 5, Panel B). AVGAGI proxies for wealth and was significant in the expected positive direction in all but the pooled model containing the IRA dummy variable. Thus, wealth effects were more salient in determining whether an IRA contribution was to be made.

Insert Table 4 about here

Savings Variables

The three savings variables (SAVE, UNEXIN, and LYIRA) have the strongest and most consistent impact on IRA participation found in this study. SAVE and LYIRA are significant at the $p < .001$ level in the expected direction in all models in Tables 4 and 5. These results point to the conclusion that households with a high propensity to save, and have a history of IRA participation, are likely to persist in making IRA contributions. UNEXIN addresses the issue of whether IRA contributions by such savers are new savings or recycled old savings. The estimated coefficients for UNEXIN are positive and significant for all models in Tables 4 and 5 except for the 1984 Tobit regression in Table 4 (here the positive coefficient fails to attain statistical significance). Nevertheless, the important finding is that none of the UNEXIN coefficients was negative, suggesting that IRA participation does not shift old investment income from non-IRA holdings to IRAs. To the contrary, the predominately significant and positive coefficients estimated for UNEXIN, while controlling for savings propensity and past IRA participation, suggest that IRA contributors not only fund IRAs with new savings but also increase their non-IRA investments.²⁰ In short, the first hypothesis (H1) was subjected to a two-tail test and was supported in the positive direction (H1a).

Insert Table 5 about here

Psychological Variables

CHOMI and HHSIZE were intended to capture the extent to which losses of tax benefits associated with these hypothesized “mental accounts” motivate IRA participation. In Table 4, all coefficients estimated for CHOMI were in the expected negative direction. However, only those associated with the 1983 and 1984 regressions were significant. The only evidence in Table 5 supporting expectations was the significant negative coefficient estimated by the OLS specification in

²⁰ We must point out that, although tax-free municipal bond interest is currently reported on tax returns, such was not the case during the period of this study. As noted in the Scholes-Wolfson framework, different tax attributes attract different tax clienteles (Scholes et al., 2005). We are unable to determine the extent to which IRA and municipal bond investors represent the same clientele; i.e., taxpayers with high EMTRs, or whether IRA and municipal bond investments are substitutes. The positive coefficients for the UNEXIN variable indicate that those that increase IRA savings also increase non-IRA savings. Extending this observation suggests that clienteles that are attracted to both IRAs and municipal bonds are likely motivated to increase both investments.

Panel A. Thus, there is only weak support for hypothesis H2. These findings suggest that reductions in the home mortgage “mental account” were somewhat associated with decisions to participate in IRAs but have little or no effect on changes in amounts contribute to IRAs. HHSIZE was not significant in any of the models in Tables 4 and 5, thus failing to support hypothesis H3. Changes in exemption allowances could not be linked to IRA participation.

The findings regarding the withholding position variables were mixed. None of the coefficients for the GAIN variable were significant suggesting that withholding positions that are more “favorable” than expected are unrelated to IRA participation. In contrast, the coefficients for the LOSS variable were consistent with expectations in that all were positive. Except for the 1983 model in Table 4, all coefficients were statistically significant. These results suggest that “unfavorable” withholding positions motivate IRA participation and increased contributions. In short, hypothesis H4 was supported in the specified positive direction.

The PENL variable, although based upon withholding position, is not a psychological variable. The PENL variable was intended to prevent the confounding of penalty avoidance and loss framing effects. However, PENL was not significant in the expected positive direction in any of the models in Tables 4 and 5. However, this variable was significant in the opposite direction in the 1985 model (Table 4). Such weak and mixed evidence is largely attributed to the relatively few taxpayers in the panels that had the opportunity to reduce their exposure to an underpayment penalty through IRA participation. Furthermore, taxpayers facing such penalties may lack liquidity to fund IRAs.

Unexpected Investment Income: Economic and Psychological Constructs

The analysis reported in Table 6 is intended to compare the relative importance of traditional economic and psychological constructs in explaining unexpected savings while controlling for savings propensity and IRA participation. We used the balanced panel and the pooled OLS specification in this analysis with UNEXIN as the dependent variable. Model (1) in Table 6 is the “full model” which contains the control variables (IRA participation and savings propensity), three economic variables (price, income, and wealth), three psychological variables (the home mortgage “mental account,” gain,

and loss frames), and the year dummy variables. We did not use HHSIZE because of its consistent insignificance and to keep the same number of economic and psychological variables in the model. Model (2) is the same as Model (1), except that we omitted the three psychological variables. In Model (3), we eliminated the three economic variables. The reductions in R-square statistics from Model (1) to Model (2) (.0333, $F=7.14$) and from Model (1) to Model (3) (.0124, $F=2.66$) were both statistically significant, indicating that both sets of constructs are relevant in explaining savings behavior.

Insert Table 6 about here

To ascertain which set of variables had the greater explanatory power, we used the Fisher transformation to convert the R-square statistics for Models (2) and (3) to Z scores. The Z score for Model (2) was significantly greater than that for Model (3) ($t=11.58$, $p<.001$). In other words, the elimination of the economic variables was less costly in explanatory power than the elimination of the psychological variables, suggesting a greater association between the latter variables and unexpected investment income. These results point to the importance of including psychological factors along with traditional economic variables in models of savings behavior.

IRA participation and savings propensity were highly significant ($p<.001$) in the expected direction in all three models in Table 6. The negative sign for SAVE was expected because savings propensity is an indication of expected savings (holding IRA participation constant), while the dependent variable was unexpected investment income. These results suggest that not only are IRA contributions unlikely to be “reshuffled” old savings, but funds contributed to IRAs also come from “new savers” as well as from those with a propensity to save.

CONCLUSION

This paper presents an analysis of certain factors that are purported to be linked to participation in traditional IRAs during the 1983-1985 period. The primary results of this study affirm the findings of prior research that have shown that savings propensity and past IRA participation are

strong determinants of IRA contributions (see, e.g., O'Neil and Thompson, 1987; Burman et al., 1990; Gale and Scholz, 1994; Venti and Wise, 1988; Frischmann et al., 1998). Another important result of this study points to the linkage between unexpected investment income and IRA participation while controlling for savings propensity and past IRA investments. This finding suggests that the availability of deductions for IRA contributions encouraged taxpayers to increase rather than reshuffle savings into IRAs. This result supports the work of Poterba et al. (1998) which concluded that tax incentives encourage substantial amounts of new savings.

The strong association between savings behavior and IRA participation documented in this study is a widely accepted phenomenon. However, additional insights into the significant findings of this study are provided by the Tobit decomposition explained in Appendix A. An inspection of the $P(c=4k)$ figures from Tables 4 and 5 show that approximately between 32 and 34 percent of the effect of the independent variable set on IRA participation was attributed to those households that contribute at the limit. These results suggest that the increased IRA contribution caps and phase-out thresholds enacted by EGTRRA should lead to substantial increases in IRA participation. Furthermore, the results reported in Table 6 suggest that potential new contributors as well as present IRA participants are likely to be the source of such increases in IRA savings.

The results also support the notion that withholding position is an important determinant of IRA participation in spite of such being irrelevant from an expected utility perspective (see, e.g., Feenberg and Skinner, 1989; Frischmann et al., 1998). Here our findings support the adaptive expectations approach used in the human subjects studies of Carroll (1992) and Copeland and Cuccia (2002) in deriving gain and loss frames based on withholding positions.

The use of deductible IRA contributions to improve withholding positions has important policy implications. If the objective of IRA tax incentives is to increase savings for retirement, then an upfront deduction is a desirable feature of an IRA regime if such a benefit is, according to Thaler (1994), perceived as an immediate reward for savings, and consequently result in IRA contributions that otherwise would not happen. Roth IRAs, an attractive alternative to deductible IRAs, did not exist

at the time of our study. The tax advantage of Roth IRAs takes place when tax-free distributions are taken, typically after taxpayers turn age 59 ½. Thus, the “tax rewards” associated with Roth IRAs are not contemporaneous with contributions because such are not deductible. Roth IRAs even in situations in which they are more economically favorable than deductible IRAs do not offer inducements to improve withholding positions. Because persistence is an important determinant of IRA participation, taxpayers that are induced to contribute to IRAs to improve withholding positions are likely to continue participation in subsequent years. Furthermore, such IRA contributions are a compliant alternative to improving withholding position. It must be emphasized that we are not advocating that deductible IRAs are superior to Roth IRAs. To the contrary, the reduction in the top tax rate on dividends to 15 percent by the Jobs and Growth Tax Relief Reconciliation Act of 2003 (U.S. Congress, 2003) has significantly increased the superiority of Roth over traditional IRAs (Craig and Toolson, 2005). However, we are advocating that plans to simplify and revamp retirement and other savings plans currently in the tax code include tax benefits that are contemporaneous with the desired savings behavior (Matthews, 2005; Ernst and Young, 2005).

This study produced scant evidence that taxpayers disaggregate components of taxable income into separate “mental accounts.” Taxpayers did not look to IRA participation to make up for lost exemption allowances. Only weak evidence was provided to support the notion that investment in owner-occupied housing and in IRAs are substitutes with the former crowding out the latter as suggested by Gale and Scholz (1994), and Joines and Manegold (1995).

To sum up, this study reaffirms the associations between savings propensity, past, and contemporaneous IRA contributions. The IRA participation documented in this study appeared to be new as opposed to reshuffled old savings, an issue that has been largely unresolved in prior work. We also provided some evidence to show that deductible IRAs can motivate some taxpayers to save who otherwise would not. Furthermore, we observed that withholding positions less favorable than expected had an important role in determining IRA participation. We also documented the importance of including psychological constructs as embodied in withholding position along with traditional

economic variables in models of savings behavior. Future research should attempt to determine what factors explain why certain households have a high propensity to save while others do not, and why do spenders spend. Also, more research is needed to determine those factors that motivate non-savers to become savers. The findings of this study were derived from analyzing special panels; thus caution should be exercised in extrapolating the results beyond the type of households and time periods chosen to construct these panels.

APPENDIX A

TOBIT DECOMPOSITION

The decomposition technique used in this study is similar to that demonstrated by LeClere (1994) in interpreting the upper-limit Tobit regressions used in Long (1990). This technique begins with the derivation of first order partial derivatives from the raw Tobit regression coefficients using equation [1a].

$$\beta'_j = \hat{\beta}_j * F(Z) \quad [1a]$$

Where:

- β'_j = the first order partial derivative for independent variable X_j . This measures the overall change in IRA contributions given a unit change in X_j .
- $\hat{\beta}_j$ = the Tobit regression coefficient estimated for X_j . This measures the potential change in IRA contributions in the absence of the cap given a unit change in X_j .
- $F(Z)$ = the percentage of households that made IRA contributions < \$4,000 for year t. This represents the cumulative standard normal distribution associated with the portion of households that contributed less than the legal cap.

Next, equation [2a] determines that portion of β'_j that captures the effect of a change in the independent variable on the IRA contributions of those households that contribute under the \$4,000 limit.

$$P(c < 4k) = 1 - Z * \frac{f(Z)}{F(Z)} - \frac{f(Z)^2}{F(Z)^2} \quad [2a]$$

- $P(c < 4k)$ = the proportionate effect of β'_j on households that make IRA contributions < \$4,000.
- Z = the Z- score for an area under the normal curve equal to $F(Z)$.
- $f(Z)$ = the value of the normal density associated with $F(Z)$.²¹

Equation [3a] is the compliment of equation [2a].

²¹ The relationships among the Z , $F(Z)$, and $f(Z)$ terms in equations [1a] and [2a] reflect the properties of the standard normal curve, the area under which is equal to one. For example, the Z-score at the mid-point of the curve is zero with Z-scores to the left (right) of the mid-point taking on negative (positive) values. Furthermore, the area under the curve to the left of the mid-point is half of the area under the curve; hence $F(Z) = .5$ when $Z=0$. Also, at the mid-point, the height of the standard normal curve is at its maximum value of .39884; hence $f(Z) = .39884$ when $Z=0$.

$$P(c = 4k) = 1 - P(c < 4k) \quad [3a]$$

Where:

$P(c = 4k)$ = portion of β'_j that pertains to limit contributors.

The actual desired amount of IRA participation of upper-limit contributors cannot be observed. However, the Tobit technique allows the estimation of changes in the probability of upper-limit contributors making contributions below the \$4,000 cap, see equation [4a].

$$[\Delta PR(C < 4,000 | \Delta X_j)] = -\hat{\beta}_j * \frac{f(Z) * SD(X_j)}{VAR(U)} \quad [4a]$$

Where:

$[\Delta PR(C < 4,000 | \Delta X_j)]$ = the change in the probability of an upper-limit household making an IRA contribution < \$4,000 for year t given a one unit change in X_j .

$SD(X_j)$ = the standard deviation of X_j .

$VAR(U)$ = the variance of the error term from the Tobit regression.

In summary, the decomposition technique separates out two components that account for changes in a set of independent variables. For example, a positive value for $\hat{\beta}_j$ suggests that an increase in X_j results in an increase in c . This increase stems from: (1) greater contributions from below-the-limit households, and (2) a decrease in the probability of upper-limit participants making a contribution less than \$4,000; i.e., a negative value for equation [4a]. The latter component can be interpreted as an increase in IRA contributions resulting from the likelihood of below-limit households becoming limit contributors; $P(c = 4k)$ is that fraction of β'_j that accounts for such an increase.

The coefficients for the LOSS variable in the pooled model (without the IRA dummy variable) will be used to illustrate the interpretations of the Tobit parameters (Table 5). Here, the Tobit first partial derivative is 13.42. Holding all other variables constant, a one hundred dollar increase in the extent to which withholding positions for year t were less favorable relative to year t-1 resulted in an

average increase in IRA contributions of \$13.42. Dividing \$13.42 by $F(Z)$ of .8748 results in a raw Tobit regression coefficient of \$15.34, representing the desired contribution increase in the absence of the \$4,000 cap. Multiplying the \$13.42 amount by $P(c < 4k)$ of .6738 results in \$9.04, representing the change in IRA contribution per one hundred dollar change in the LOSS variable by those households that persisted in making contributions below the \$4,000 cap. This \$9.04 is an average that is brought down by the fact that 62.8 percent of the households in the pooled model failed to make IRA contributions in any of the 1983-1985 contribution years. Multiplying \$13.42 by $P(c = 4k)$ of .3262 results in \$4.38, representing the contribution increase per one hundred dollar increase in the loss variable for those households that were formerly non-limit contributors that become more likely to contribute at the limit. This component of the Tobit first partial derivative stems from the reported $\Delta [PR(c < 4k)]$ of -.0194 indicating that a one hundred dollar increase in the LOSS variable reduces the probability by 1.94 percent of a limit contributor making a contribution less than \$4,000. Although this reduction in probability appears small, it accounts for 32.62 percent of the effect of the LOSS frame on IRA contributions for the 1983-1985 pooled model in Table 5.

An important finding in this study relates to the importance of the UNEXIN variable in explaining IRA contributions. We will interpret the Tobit parameters for this variable that are found in the pooled model in Table 5 that includes the IRA dummy variable. The UNEXIN variable is measured as the percentage of unexplained investment to permanent disposable income. The first partial derivative for UNEXIN is 60.01, indicating that a one percentage point increase in UNEXIN is associated with an expected average increase in IRA contributions of \$60.01 while holding constant the choice to contribute to an IRA. Dividing by $F(Z)$ of .8748 results in a raw Tobit regression coefficient of \$68.60, representing the desired contribution increase in the absence of the \$4,000 cap. Multiplying \$60.01 by $P(c < 4k)$ of .6738 results in \$40.43, representing the change in IRA contribution per one percentage point change in the UNEXIN variable by those households that persisted in making contributions below the \$4,000 cap. Multiplying \$60.01 by $P(c = 4k)$ of .3262 results in \$19.58, representing the contribution increase per one percentage point increase in the UNEXIN variable for

those households that were formerly non-limit contributors that become more likely to contribute at the limit. This component of the first partial derivative resulted from the $\Delta [PR(c<4k)]$ of $-.0263$, indicating that a one percentage point increase in UNEXIN reduces the probability by 2.63 percent of a limit contributor making a contribution less than \$4,000.

APPENDIX B

COMPOSITE MARGINAL TAX RATES

An exogenous PRICE variable must be determined largely independent of IRA participation. This requirement was satisfied using the maximum IRA contribution rather than the first dollar marginal tax rate because IRA deductions tend to shelter income that otherwise would be taxed at more than one marginal rate. Also, financial institutions often impose restrictions and fees that discourage very small contributions that would affect just one bracket. Furthermore, because PRICE is a difference variable based on \$4,000 contributions for both years t and $t-1$, it will not be biased against taxpayers making less than the maximum contribution and is correlated with differences in one minus the estimated marginal tax rates for these years.

Values for the PRICE variable were based on combining federal effective marginal tax rates (EMTRs), as specified in the text, with state and local (S&L) marginal tax rates. State income tax liabilities and marginal tax rates (MTRs) were estimated by inserting figures from federal returns into state income tax models for states that imposed taxes and allowed IRA deductions. Formulas for models that estimated taxable incomes, tax liabilities, and MTRs for states allowing IRA deductions for 1982-1985 were based on information contained in the Commercial Clearing House State Tax Reporter (CCHSTR). Information concerning the manner in which (if any) federal and state regimes were coupled during this period was obtained from Ferguson and Hurston (1985). Taxpayers that resided in states that coupled their income tax bases to federal AGI (i.e., AGI-states) were able to save S&L income taxes as well as federal income taxes from making IRA contributions. On the other hand, taxpayers residing in states with no individual income tax regime or had regimes not allowing

deductions for IRA contributions could only save federal income taxes; hence, only federal EMTRs entered into computing PRICE for these taxpayers.

Local income taxes were obtained by subtracting estimated state income taxes (based on CCHSTR models) from deductions for S&L income taxes (net of refunds). Dividing these differences by federal AGI produced our estimates of local MTRs. Taxpayers that claimed the standard deduction were assigned local MTRs to match those estimated for itemizers that resided in the same state and had similar AGI.

Next, estimates for S&L MTRs were combined with federal EMTRs to obtain composite marginal tax rates. Combining federal EMTRs with the sum of the S&L MTRs was driven by the manner in which (if any) state regimes were coupled with the federal regime, and whether taxpayers itemized deductions. If taxpayers do not itemize, $T_c = T_{fe} + T_{sl}$, where T_c is the composite EMTR, T_{fe} is the federal EMTR, and T_{sl} is the S&L MTR. For taxpayers that itemized deductions for S&L income taxes paid, $T_c = T_{fe} + (1 - T_{fs})T_{sl}$, where T_{fs} is the statutory federal MTR. When federal taxes are deductible on state returns, $T_c = T_{fe} + T_{fs} - ((T_{fs} + T_{sl} - 2T_{fs}T_{sl}) / (1 - T_{fs}T_{sl}))$.

We will now illustrate the procedure for estimating composite MTRs using a specific example: the 1984 tax return for Taxpayer No. 30,158, a couple residing in Michigan. Federal taxable incomes would have been \$31,490 and \$27,490 given that IRA contributions would have been \$0 and \$4,000 respectively. The difference in taxable incomes is \$4,000 because no medical deductions were claimed, thus changes in AGI flowed through to taxable income dollar for dollar. This taxpayer also claimed no dependent care or earned income credits; thus, differences in tax liabilities are solely attributed to differences in taxes computed on taxable incomes (i.e., \$5,235-\$4,184=\$1,051). Next, we divided the \$1,051 difference in tax liability by \$4,000 to obtain the federal EMTR of 26.28 percent.

To derive the state MTR, we convert federal to state taxable income. According to CCHSTR, Michigan is an AGI-state with a flat rate, and hence an MTR of 4.6 percent. However, we nevertheless must compute the Michigan tax liability as such is needed to estimate the local MTR. To get Michigan taxable income, we took the reported federal AGI of \$32,620 and subtracted the state refund (\$288),

non-tax itemized deductions (\$2,355), and the Michigan exemption allowance (2 exemptions * 2,100=\$4,200) to obtain \$25,777. The Michigan tax liability was \$1,186 ($25,777 \times 4.6\%$). On their 1984 federal return, this couple deducted \$1,693 for state and local income taxes paid. We use the \$288 state refund included in federal AGI as an estimate of the 1984 overpayment of state and local taxes. Thus, we estimate \$1,405 ($\$1,693 - \288) as the combined state and local tax liability for 1984. Of this amount, \$1,186 is state taxes, leaving \$219 as the local tax liability ($\$1,405 - \$1,186$). Dividing the local tax liability by federal AGI provides our estimate of the local MTR of 0.67 percent ($\$219 / \$32,620$). The combined state and local MTR is 5.27 percent ($4.6\% + 0.67\%$). We multiply this rate by one minus the statutory federal MTR based on reported taxable income of \$27,490 to obtain 3.95 percent [$0.0527 \times (1 - .25)$]. This figure captures the deductibility of state and local taxes on the federal return. The final composite federal, state, and local EMTR is 30.23 percent ($26.28\% + 3.95\%$).

The purpose of using an EMTR that includes estimated S&L MTRs is to obtain a more comprehensive measure of PRICE. However, the estimation procedure used to incorporate local MTRs introduces noise because taxpayers that claim the standard deduction may not live in the same local jurisdictions as those itemizers that served as matches based on AGI and state of residence. Thus, noise is present to the extent tax rates vary across localities within states. Furthermore, additional measurement error occurs when state income tax deductions reflect payments of prior years' deficiencies or when state refunds vary widely across years. Composite MTRs are not precise figures but are estimates intended to reflect variations in tax rates across taxpayers.

APPENDIX C

ESTIMATING UNEXPECTED INVESTMENT INCOME

The UNEXIN variable is the difference between actual and expected investment income as a percentage of average non-transitory disposable income. Because the amount of investment assets held inside and outside IRAs may be jointly determined, the present study used predicted amounts of investment income in place of that actually reported on tax returns. The predicted values were derived from first stage OLS regression models estimated for each year using the unbalanced panels. Each

model has the same specification as equation [1] in the text except that the dependent variable is reported investment income ($INVST_t$) instead of IRA contributions (IRA_C_t), and the two instruments; lagged investment income ($INVST_{t-1}$) and IRA_C_t replace UNEXIN and LYIRA respectively as independent variables. Table C-1 reports the parameters estimated for the regressions used to obtain predicted values for $INVST_t$.

Insert Table C-1 about here

Unexpected investment income is the difference between the predicted values of $INVST_t$ and the sum of the expected levels of interest, dividends, and capital gains distributions estimated separately for years 1983-1985. These expected levels proxy for the respective income amounts that would be reported in the absence of IRA contributions. We use dividends to illustrate the procedure for estimating expected levels of each of the three categories of investment income. We first drew a panel consisting of all taxpayers with AGI between \$1,000 and \$1,000,000 with pre-exclusion dividends of at least \$25 and who had made no IRA contributions. Next, dividend income for year t was regressed against that for year $t-1$.²² Finally, the parameters from these regressions were used in concert with the dividend income for year $t-1$ to calculate the expected dividend income for year t .

²² The purpose of these regressions is to obtain an aggregate expectation of year t investment income based upon that for year $t-1$ independent of IRA participation. Thus, the “blurring” process to disguise the identity of high income taxpayers does not pose a problem as this process involves aggregating various tax return variables. In short, estimating year t from year $t-1$ investment income does not require taxpayer specific data such as state of residence, actual IRA contributions, and withholding positions as is required of the main analyses in this study.

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Table 1

Reconciliation Between the Number of Observations in the SOI Panel Data and the
Special Unbalanced Panels Constructed for this Study

	<u>1982</u>	<u>Year t=1983</u>		<u>Year t=1984</u>		<u>Year t=1985</u>	
Total number of returns in the SOI panels	9,235	19,120		9,762		20,202	
Married filing jointly, U.S. residents	4,460	8,961		4,605		9,250	
Married filing jointly, U.S. residents in the panels constructed using both year t-1 and year t...		4,113	100.0%	4,184	100.0%	4,280	100.0%
No. of returns eliminated because in year t-1 or in year t ^a							
[1] Adjusted gross income \geq \$200,000		24	0.6%	24	0.6%	32	0.7%
[2] At least 1 spouse age \geq 65		565	13.7%	629	15.0%	675	15.8%
[3] Special tax computations		1,228	29.9%	1,205	28.8%	1,109	25.9%
[4] Income from other than wages or investments		1,823	44.3%	1,830	43.7%	1,757	41.1%
[5] A spouse with earned income $<$ \$2,000		2,730	66.4%	2,700	64.5%	2,524	59.0%
Final unbalanced panels		788	19.2%	840	20.1%	989	23.1%

^aThe reasons for eliminating these returns are explained in the text. Items [1] through [5] are independent of each other. For example, if either in year t-1 or in year t one spouse was age 65 and filed a schedule C and the other spouse had no earned income, the elimination of that return would be counted in items [2], [4], and [5].

Table 2
Descriptive Statistics

<u>Variables</u>	<u>Mean</u>	<u>Standard Deviation</u>	<u>Minimum</u>	<u>First Quartile</u>	<u>Median</u>	<u>Third Quartile</u>	<u>Maximum</u>
TAX YEAR 1983, N=788:							
IRA_C	699.902	1,410.548	0.000	0.000	0.000	0.000	4,000.000
PRICE	0.520	1.713	-17.503	-0.315	0.489	1.322	11.733
INCOME	19.094	34.445	-158.180	2.765	18.515	35.625	215.190
AVGAGI	34.006	12.717	7.505	24.996	33.279	41.183	95.864
SAVE	2.219	4.805	0.000	0.086	0.477	2.181	49.558
UNEXIN	-0.023	1.199	-13.404	-0.382	0.014	0.330	7.971
LYIRA	6.100	13.308	0.000	0.000	0.000	0.000	40.000
CHOMI	247.982	1,113.460	-6,267.000	-37.000	0.000	0.000	6,881.000
HHSIZE	-0.033	0.469	-3.000	0.000	0.000	0.000	3.000
GAIN	3.335	5.709	0.000	0.000	0.950	4.440	64.240
LOSS	1.923	7.552	0.000	0.000	0.000	1.305	172.920
PENL	0.159	2.556	0.000	0.000	0.000	0.000	20.000
TAX YEAR 1984, N=840:							
IRA_C	711.095	1,386.174	0.000	0.000	0.000	366.000	4,000.000
PRICE	-0.190	1.670	-7.330	-0.893	-0.074	0.530	13.921
INCOME	24.844	44.505	-324.240	6.420	22.690	43.685	252.230
AVGAGI	34.305	13.357	7.505	25.118	33.155	41.348	88.902
SAVE	2.064	4.604	0.000	0.073	0.437	1.813	49.558
UNEXIN	0.106	1.499	-14.574	-0.330	0.030	0.398	22.444
LYIRA	6.015	13.210	0.000	0.000	0.000	0.000	40.000
CHOMI	373.367	1,557.790	-7,929.000	-39.000	0.000	0.000	10,800.000
HHSIZE	-0.019	0.450	-5.000	0.000	0.000	0.000	2.000
GAIN	2.716	5.698	0.000	0.000	0.000	3.005	70.720
LOSS	2.402	5.410	0.000	0.000	0.000	2.890	58.458
PENL	0.032	0.392	0.000	0.000	0.000	0.000	7.962
TAX YEAR 1985, N=989:							
IRA_C	731.658	1,389.918	0.000	0.000	0.000	500.000	4,000.000
PRICE	-0.251	1.627	-8.127	-0.925	-0.167	0.331	8.805
INCOME	20.970	51.276	-240.190	-0.560	17.940	40.360	405.560
AVGAGI	33.644	14.254	6.677	23.569	32.746	40.947	88.902
SAVE	1.910	4.314	0.000	0.060	0.426	1.672	47.630
UNEXIN	-0.029	1.142	-11.724	-0.293	0.035	0.365	11.127
LYIRA	6.632	13.373	0.000	0.000	0.000	1.000	40.000
CHOMI	352.044	1,634.370	-7,605.000	-49.000	0.000	0.000	18,327.000
HHSIZE	0.008	0.499	-3.000	0.000	0.000	0.000	3.000
GAIN	2.900	6.435	0.000	0.000	0.000	3.190	71.190
LOSS	2.850	6.069	0.000	0.000	0.000	2.980	65.700
PENL	0.054	0.915	0.000	0.000	0.000	0.000	20.000

IRA_C = absolute dollar amount of the IRA contribution for year t.

PRICE = change in after tax cost of a \$4,000 IRA contribution from year t-1 to year t in hundreds of dollars.

INCOME = change in disposable income from year t-1 to year t in hundreds of dollars.

AVGAGI = average adjusted gross income computed over years 1982-85^a in thousands of dollars.

SAVE = savings propensity; total investment income (1982-85)^a divided by total permanent disposable income (1982-85)^a in percentage points; i.e., 50%=50.

UNEXIN = unexpected investment income for year t divided by average permanent disposable income (1982-85)^a in percentage points; i.e., 50%=50.

LYIRA = IRA contribution for year t-1 in hundreds of dollars.

CHOMI = change in the deduction for home mortgage interest from year t-1 to year t in absolute dollars.

Table 2 continued

HHSIZE	= change in the number of dependents from year t-1 to year t.
GAIN	= the extent to which the withholding position for year t is "more favorable" than that for year t-1 by \$50 assuming no change in the IRA contribution from year t-1 to year t in hundreds of dollars.
LOSS	= the extent to which the withholding position for year t is "less favorable" than that for year t-1 by \$50 assuming no change in the IRA contribution from year t-1 to year t in hundreds of dollars.
PENL	= the reduction in the amount subject to the under-withholding penalty that would result from changing the IRA contribution from that made in year t-1 to \$4,000 in year t in hundreds of dollars.

^a Amounts computed over 1982-85 (e.g., permanent disposable income) are computed over those years in which a tax return is in the panel for those taxpayers that are not represented in all four years.

Table 3
Pearson Correlation Matrices^a

Variables ^b	PRICE ^c	INCOME ^c	AVGAGI ^d	SAVE ^e	UNEXIN ^e	LYIRA ^c	CHOMI	HHSIZE	GAIN ^c	LOSS ^c	PENL ^c	IRA_C _{it}
TAX YEAR 1983, N=788:												
PRICE	1.000	-0.599	-0.021	0.065	-0.153	0.183	0.079	0.065	0.250	-0.053	0.067	0.075
INCOME		1.000	0.311	-0.001	0.340	0.036	0.104	0.023	-0.240	0.283	0.150	0.122
AVGAGI			1.000	0.120	0.041	0.262	0.050	0.021	0.219	0.237	0.196	0.279
SAVE				1.000	-0.213	0.487	-0.041	0.006	0.070	0.083	0.062	0.504
UNEXIN					1.000	-0.085	-0.018	0.052	-0.069	0.060	-0.071	0.012
LYIRA						1.000	-0.091	-0.005	0.083	0.032	0.014	0.793
CHOMI							1.000	0.005	0.332	-0.041	0.001	-0.120
HHSIZE								1.000	0.103	-0.063	0.002	-0.037
GAIN									1.000	-0.149	-0.035	0.015
LOSS										1.000	0.793	0.103
PENL											1.000	0.043
TAX YEAR 1984, N=840:												
PRICE	1.000	-0.593	-0.025	0.005	-0.097	0.030	0.080	0.002	0.217	-0.163	0.010	-0.015
INCOME		1.000	0.190	-0.006	0.162	0.029	0.083	0.020	-0.216	0.384	-0.027	0.081
AVGAGI			1.000	0.110	0.009	0.297	0.074	-0.035	0.203	0.250	-0.042	0.335
SAVE				1.000	0.064	0.470	-0.042	-0.011	-0.007	0.118	0.079	0.475
UNEXIN					1.000	0.039	-0.093	0.013	-0.217	0.146	0.225	0.091
LYIRA						1.000	-0.088	-0.069	-0.006	0.119	0.029	0.856
CHOMI							1.000	0.076	0.369	-0.031	-0.004	-0.120
HHSIZE								1.000	0.126	-0.069	-0.273	-0.076
GAIN									1.000	-0.212	-0.036	-0.034
LOSS										1.000	0.071	0.201
PENL											1.000	0.048
TAX YEAR 1985, N=989:												
PRICE	1.000	-0.604	0.044	-0.021	-0.096	0.032	0.152	0.083	0.251	-0.166	-0.026	-0.030
INCOME		1.000	0.099	0.074	0.118	0.037	0.064	0.000	-0.274	0.411	0.026	0.115
AVGAGI			1.000	0.124	0.052	0.368	0.118	-0.065	0.241	0.249	-0.010	0.397
SAVE				1.000	-0.384	0.424	0.003	-0.130	0.047	0.089	-0.014	0.404
UNEXIN					1.000	-0.087	0.003	-0.237	-0.184	0.241	0.075	0.051
LYIRA						1.000	-0.014	-0.008	0.121	0.149	-0.022	0.818
CHOMI							1.000	0.051	0.363	-0.155	0.032	-0.025
HHSIZE								1.000	0.097	-0.162	-0.053	-0.059
GAIN									1.000	-0.212	-0.025	0.078
LOSS										1.000	0.160	0.252
PENL											1.000	-0.027

^a Correlation coefficients with absolute values approximately $\geq .07$ (**.09**) are significant at the .05 (**.01**) level.

^b Variables are defined in Table 2 and explained in more detail in the text.

^c Measured in hundreds of dollars.

^d Measured in thousands of dollars.

^e Fraction of average permanent disposable income in percentage points; i.e., 50%=50.

Table 4
 Estimated Regression Parameters for the Determinants of Participation in Individual Retirement Accounts (IRAs)
 1983-1985

Independent Variable ^a	t=TAX YEAR 1983			t=TAX YEAR 1984			t=TAX YEAR 1985			
	OLS Parameters	TOBIT 1st partial Derivatives ^b	Δ [PR(c<4k)] ^c	OLS Parameters	TOBIT 1st partial Derivatives ^b	Δ [PR(c<4k)] ^c	OLS Parameters	TOBIT 1st partial Derivatives ^b	Δ [PR(c<4k)] ^c	
PRICE ^e	-	-15.22 (0.65) ^d	-10.31 [0.20] ^d	0.0049	-10.21 (0.57) ^d	-3.23 [0.03] ^d	0.0017	-17.90 (0.92) ^d	-13.78 [0.51] ^d	0.0063
INCOME ^e	+	0.87 (0.65)	0.90 [0.44]	-0.0086	0.36 (0.48)	0.87 [1.36]	-0.0122	0.52 (0.76)	0.73 [1.07]	-0.0105
AVGAGI ^f	+	7.39 (2.74)**	5.89 [4.94]*	-0.0207	8.20 (4.05)***	6.73 [11.08]***	-0.0283	8.14 (4.21)***	7.11 [13.71]***	-0.0285
SAVE ^g	+	51.16 (7.20)***	69.75 [62.30]***	-0.0929	26.88 (4.57)***	37.59 [26.19]***	-0.0546	41.70 (6.19)***	43.12 [36.10]***	-0.0524
UNEXIN ^g	+/-	105.53 (3.87)***	103.63 [11.09]***	-0.0344	33.62 (1.99)*	14.57 [0.62]	-0.0069	175.83 (7.11)***	157.42 [40.95]***	-0.0506
LYIRA ^e	+	74.05 (27.73)***	74.49 [673.60]***	-0.2748	81.53 (38.20)***	84.00 [1,172.08]***	-0.3499	75.95 (35.91)***	77.05 [1,135.73]***	-0.2901
CHOMI	-	-0.05 (1.70)*	-0.04 [2.41]*	0.0136	-0.04 (2.54)**	-0.04 [6.15]**	0.0199	-0.02 (1.00)	-0.02 [1.04]	0.0079
HHSIZE	-	-100.28 (1.59)	-89.53 [2.17]	0.0116	-29.63 (0.53)	6.95 [0.02]	-0.0010	-3.59 (0.07)	-9.76 [0.04]	0.0014
GAIN ^e	-	-7.58 (1.24)	-7.95 [1.68]	0.0126	0.14 (0.03)	0.66 [0.02]	-0.0012	4.61 (1.04)	4.88 [1.18]	-0.0088
LOSS ^e	+	9.90 (1.46)	9.79 [2.04]	-0.0205	16.27 (3.25)***	16.85 [10.59]***	-0.0287	16.14 (3.31)***	21.26 [15.98]***	-0.0363
PENL ^e	+	-16.12 (0.83)	-18.80 [0.89]	0.0133	22.64 (0.35)	92.17 [1.32]	-0.0114	-45.11 (1.70)*	-47.85 [3.48]*	0.0123
Constant	+/-	-105.19 (1.22)	-109.01 [1.66]		-155.16 (2.32)*	-165.36 [6.31]**		-186.78 (2.97)**	-202.24 [10.62]**	
N		788		840			989			
Adj R-square		0.668		0.755			0.711			
Log-likelihood			-5,704.2700			-5,976.3749			-7,156.2000	
VAR(U)			895.7427			746.1123			818.6794	
F(Z)			0.8668			0.8750			0.8777	
P(c<4k)			0.6625			0.6740			0.6788	
P(c=4k)			0.3375			0.3260			0.3212	

*, **, and *** indicates $p < .05$, $.01$, and $.001$ respectively; one-tail except where (+/-) is indicated.

^a Variables are defined in Table 2; explanations and expected signs are in the text; dependent variable=IRA contributions for year t (IRA_{C_t}).

^b To obtain values for the raw Tobit coefficients, divide the Tobit partial derivatives by F(Z). Multiply the Tobit partial derivatives by P(c<4k) to obtain values of the partial derivatives that apply to households that contribute less than the \$4,000 limit, and by P(c=4k) to derive these figures that pertain to households that contribute at the limit.

^c The effect of a change in an independent variable on the probability of upper-limit households contributing less than the \$4,000 limit.

^d Absolute values of t statistics are in parentheses; chi-square statistics are in brackets and relate to the raw Tobit coefficients (see note b).

^{e(f)} Measured in hundreds (thousands) of dollars.

^g Fraction of average permanent disposable income in percentage points; i.e., 50%=50.

Table 5
Pooled Regression Parameters: IRA Participation, Balance Panels, 1983-1985

Independent Variable ^a		A: Without IRA Dummy Variable			B: With IRA Dummy Variable		
		OLS Parameters	TOBIT		OLS Parameters	TOBIT	
			1st partial Derivatives ^b	$\Delta [PR(c<4k)]^c$		1st partial Derivatives ^b	$\Delta [PR(c<4k)]^c$
PRICE ^e	-	-40.52 (2.29)* ^d	-36.55 [4.44]* ^d	0.0143	-4.02 (0.33) ^d	-3.55 [0.09] ^d	0.0020
INCOME ^e	+	0.30 (0.46)	0.63 [0.90]	-0.0071	0.79 (1.75)*	0.93 [4.07]*	-0.0150
AVGAGI ^f	+	8.51 (4.61)***	6.69 [13.16]***	-0.0226	0.48 (0.37)	0.06 [0.00]	-0.0003
SAVE ^g	+	47.19 (8.65)***	56.59 [88.94]***	-0.0701	23.14 (6.10)***	27.73 [45.85]***	-0.0493
UNEXIN ^g	+/-	153.28 (7.54)***	163.89 [54.18]***	-0.0500	57.70 (4.08)***	60.01 [15.41]***	-0.0263
IRA_D	+				1,842.69 (40.99)***	1,617.07 [1,947.21]***	-0.2819
LYIRA ^e	+	75.07 (41.88)***	76.23 [1,558.81]***	-0.2800	38.69 (25.48)***	39.70 [635.10]***	-0.2095
CHOMI	-	-0.03 (1.82)*	-0.03 [2.63]	0.0098	0.00 (0.06)	0.00 [0.01]	0.0004
HHSIZE	-	0.12 (0.00)	3.02 [0.00]	-0.0004	19.38 (0.64)	17.84 [0.36]	-0.0033
GAIN ^e	-	-5.02 (1.12)	-4.50 [1.03]	0.0068	-0.08 (0.03)	-0.08 [0.00]	0.0002
LOSS ^e	+	14.88 (3.28)***	13.42 [8.75]**	-0.0194	10.30 (3.30)***	9.57 [9.32]**	-0.0199
PENL ^e	+	28.34 (1.20)	23.64 [1.04]	-0.0057	19.25 (1.19)	18.09 [1.23]	-0.0063
YR84	+/-	-7.26 (0.14)	1.31 [0.00]		-36.71 (1.05)	-30.93 [0.81]	
YR85	+/-	-44.62 (0.87)	-44.66 [0.79]		-53.24 (1.51)	-51.27 [2.17]	
Constant	+/-	-139.80 (2.02)*	-130.57 [3.62]		-75.44 (1.58)	-70.59 [2.22]	
N		1,518			1,518		
Adj R-square		0.689			0.853		
Log-likelihood			-11,021.9500			-10,561.9133	
VAR(U)			861.3377			599.5319	
F(Z)			0.8748			0.8748	
P(c<4k)			0.6738			0.6738	
P(c=4k)			0.3262			0.3262	

*, **, and *** indicates p< .05, .01, and .001 respectively; one-tail except where (+/-) is indicated.

^a Variables are defined in Table 2; explanations and expected signs are in the text; dependent variable=IRA contributions for year t (IRA-C). **IRA_D** is a dummy variable = 1 if the taxpayer participated in an IRA for year t; 0 otherwise.

^b To obtain values for the raw Tobit coefficients, divide the TOBIT partial derivatives by F(Z). Multiply the TOBIT partial derivatives by P(c<4k) to obtain values of the partial derivatives that apply to households that contribute less than the \$4,000 limit, and by P(c=4k) to derive these figures that pertain to households that contribute at the limit.

^c The effect of a change in an independent variable on the probability of upper-limit households contributing less than the \$4,000 limit.

^d Absolute values of t statistics are in parentheses; chi-square statistics are in brackets and relate to the raw TOBIT coefficients (see note b).

^{e(f)} Measured in hundreds (thousands) of dollars.

^g Fraction of average permanent disposable income in percentage points; i.e., 50%=50.

Table 6

OLS Regressions to Determine Changes in R-Square Attributable to Economic and Psychological Variable Sets: Years, 1983-1985 (N=1,518)

Dependent Variable=UNEXIN

Independent Variable		Model (1)	Model (2)	Model (3)
		Full Model	Omitted Variables	
			Psych	Econ
IRA_Ct	+	0.018 (8.59)*** ^a	0.020 (9.35)***	0.019 (9.14)***
SAVE	-	-0.107 (16.97)***	-0.107 (16.67)***	-0.107 (16.92)***
PRICE	-	0.068 (3.10)***	0.057 (2.63)**	
INCOME	+	0.004 (4.87)***	0.006 (8.17)***	
AVGAGI	+	-0.001 (0.63)	-0.003 (1.48)	
CHOMI	+	0.002 (0.72)		0.004 (1.80)*
GAIN	-	-0.028 (5.07)***		-0.032 (6.28)***
LOSS	+	0.028 (5.07)***		0.035 (7.02)***
YR84	+/-	0.147 (2.32)*	0.169 (2.63)**	0.111 (1.78)
YR85	+/-	0.076 (1.19)	0.113 (1.74)	0.015 (0.24)
Constant	+/-	-0.001 (0.02)	-0.030 (0.34)	0.048 (0.97)
R-square		0.2301	0.1968	0.2177
Change in R-square				
Model(1)-Model (2) [F]			.0333 [7.14]***	
Model(1)-Model (3) [F]				.0124 [2.66]*
Fisher Z		12.275	11.113	11.843
Difference in Fisher Z				
Model(3)-Model (2)				0.73 (11.58)***

*, **, and *** indicates $p < .05$, $.01$, and $.001$, respectively; one-tail except where (+/-) is indicated.

^a absolute values of t statistics are in parentheses.

UNEXIN = Unexpected investment income for year t divided by average permanent disposable income (1982-85) in percentage points; i.e., 50%=50.

IRA_Ct = Amount of the IRA contribution for year t in hundreds of dollars.

SAVE = Savings propensity; total investment income (1982-85) divided by permanent disposable income (1982-85) in percentage points; i.e., 50%=50.

PRICE = Change in after tax cost of a \$4,000 IRA contribution from year t-1 to year t in hundreds of dollars.

INCOME = Change in disposable income from year t-1 to year t in hundreds of dollars.

Table 6 continued

- AVGAGI = Average adjusted gross income computed over years 1982-85 in thousands of dollars.
- CHOMI = Change in the deduction for home mortgage interest from year t-1 to year t in hundreds of dollars.
- GAIN = The extent to which the withholding position for year t is "more favorable" than that for year t-1 by \$50 assuming no change in the IRA contribution from year t-1 to year t in hundreds of dollars.
- LOSS = The extent to which the withholding position for year t is "less favorable" than that for year t-1 by \$50 assuming no change in the IRA contribution from year t-1 to year t in hundreds of dollars.
- YR84, YR85 are 1/0 variables=1 for the year indicated; otherwise=0.

Table C-1
 First Stage Regression Coefficients to Obtain Predicted
 Values for $INVST_t$, Unbalanced Panels
 Dependent Variable= $INVST_t$

<u>Independent Variable</u>		<u>t=1983</u>	<u>t=1984</u>	<u>t=1985</u>
INVST _{t-1}	+	0.52 (21.05)*** ^a	0.46 (14.77)***	0.58 (16.31)***
IRA_C _t	+/-	0.03 (2.21)*	0.06 (4.53)***	0.08 (4.01)***
PRICE	+/-	57.62 (4.88)***	13.79 (1.16)	-7.28 (0.41)
INCOME	+	3.33 (5.09)***	0.53 (1.08)	-0.31 (0.50)
AVGAGI	+	3.05 (2.15)*	7.05 (5.10)***	5.05 (2.76)**
SAVE	+	122.31 (15.39)***	157.30 (16.75)***	82.65 (6.98)***
CHOMI	-	-0.03 (2.26)*	-0.01 (0.96)	0.03 (2.24)
HHSIZE	-	22.87 (0.70)	118.43 (3.22)	-73.22 (1.64)*
GAIN	+/-	-0.42 (0.13)	-7.40 (2.26)*	-8.10 (2.04)*
LOSS	+/-	11.76 (3.40)***	6.97 (2.10)*	10.72 (2.46)*
PENL	+/-	-10.60 (1.06)	274.99 (6.54)***	5.51 (0.23)
Constant	+/-	-194.90 (2.02)*	-229.53 (5.02)***	-134.96 (2.27)*
N		788	840	989
Adj R-square		0.921	0.909	0.778

*, **, and *** indicates $p < .05$, $.01$, and $.001$ respectively; one-tail except where (+/-) is indicated.

^a absolute values of t statistics are in parentheses.

- INVST_{t-1} = Lagged value of investment income (interest, dividends, capital gains distributions).
 IRA_C_t = Absolute dollar amount of the IRA contribution for year t.
 PRICE = Change in after tax cost of a \$4,000 IRA contribution from year t to year t-1 in hundreds of dollars.
 INCOME = Change in disposable income from year t-1 to year t in hundreds of dollars.
 AVGAGI = Average adjusted gross income computed over years 1982-85^b in thousands of dollars.
 SAVE = Savings propensity; total investment income (1982-85)^b divided by permanent disposable income (1982-85)^b in percentage points; i.e., 50%=50.
 CHOMI = Change in the deduction for home mortgage interest from year t-1 to year t in absolute dollars.
 HHSIZE = Change in the number of dependents from year t-1 to year t.
 GAIN = The extent to which the withholding position for year t is "more favorable" than that for year t-1 by \$50 assuming no change in the IRA contribution from year t-1 to year t in hundreds of dollars.
 LOSS = The extent to which the withholding position for year t is "less favorable" than that for year t-1 by \$50 assuming no change in the IRA contribution from year t-1 to year t in hundreds of dollars.
 PENL = the reduction in the amount subject to the under withholding penalty that would result from changing the IRA contribution from that made in year t-1 to \$4,000 in year t in hundreds of dollars.

^b Amounts computed over 1982-85 (e.g., permanent disposable income) are computed over those years in which a tax return is in the panel for those taxpayers that are not represented in all four years.