Retirement Saving over the Long Term: Evidence from a Panel of Taxpayers

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Abstract: The decline in defined-benefit pension plans and uncertainty over Social Security have put increasing pressure on households to provide for their own retirement needs through a lifetime of saving. Yet little is known about how households save for retirement over time. This paper uses a large new panel of tax returns to investigate IRA behavior from 1987 to 1996, a period following a restriction in the ability to deduct IRA contributions. About 26 million individuals made IRA contributions at some time during the ten-year period. About two-thirds participated in fewer than half of the years they were in the sample, while 10 percent participated in every year they were observed. About three-quarters of IRA participants made the maximum contribution at least once, and more than half did so in every year they participated. A random-effects probit model is used to investigate the effects of the tax deduction, effective tax price, and income volatility on participation and contributions in a longitudinal context, conditional on unobserved savings preferences. The deduction is associated with a 7.5 percentage point increase in participation, and the tax-price elasticity is found to be relatively large at –1.7. The income-volatility elasticity is found to be modestly negative at –0.04. The results show a relatively large role for unobserved savings preferences, with a random-effect persistence parameter of 0.606.

The analysis in this paper was conducted while at the Dept. of Treasury. The views represented are my own and do not necessarily represent the views of the Dept. of Treasury or the Federal Reserve Board. I would like to thank participants in a workshop at the Federal Reserve Board for helpful comments.

I. Introduction

The traditional "three-legged stool" of retirement savings – Social Security, employer pensions, and individual saving – looks very different for current workers than it did twenty years ago. Social Security is generally the most important leg for most workers,[1] yet is widely known to be fiscally unsustainable under current rules.[2] The heavy politicization of reform proposals has delayed reform and made it unlikely that participants will know what type of reforms will be made for at least several years.[3]

Meanwhile, the employer pension leg has changed dramatically from one based on defined-benefit (DB) plans to one based on defined-contribution (DC) plans. In a DB plan, workers accrue annual increments to a promised annuity upon retirement. Employers fund the obligation upon accrual and bear the investment risk for the fund. In a DC plan, workers and/or employers make annual contributions to a personal retirement account, and workers bear the investment risk. Many DC plans are 401(k) plans, in which employees choose whether to participate, how much of their salary to contribute (on a pre-tax basis), and how to invest the contributions.[4]

Between 1985 and 1998, the number of private-sector DB plans fell 67 percent, while the number of private-sector DC plans increased 46 percent (DOL, 2002). At the

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[1] For example, in 2000, three-fifths of individuals over 65 received at least half their income from Social Security (Social Security Administration, 2002a).

[2] Unless reformed, Social Security is projected to be able to cover only 73 percent of program costs by 2041 (SSA, 2002b).

[3] It is generally expected that reforms must include lower benefits and/or higher taxes, at least for younger workers. It is highly uncertain whether reforms will also include some type of personal savings account.

[4] In 1998, 45 percent of DC plans were 401(k) plans (Department of Labor, 2002). However, 401(k)s made up three-quarters of DC plan assets, and four-fifths of DC plan contributions. Most 401(k) plans also include employer matching contributions. For simplicity, I am using the designation "401(k) plan" to include similar types of plans.

same time, DC plan assets nearly quintupled from $427 billion in 1985 to $2.1 trillion in 1998.

The rise of 401(k) plans may have also reduced households' focus on individual saving, the third leg of the stool. For example, participation in Individual Retirement Accounts (IRAs) has fallen as 401(k) participation has skyrocketed.[5] Declining IRA participation has also coincided with restrictions on the ability to deduct IRA contributions, declining real contribution limits, and increasing complexity in IRA rules.[6]

The shift from DB to DC plans and the uncertainty over Social Security puts new pressure on individuals to provide for their own retirement income needs through a long-term program of saving.[7, 8] To ensure an adequate stock of assets to finance retirement, households need to make responsible decisions regarding participation, contribution levels, and investment allocation. While this development has been widely recognized,[9] little is known about the retirement savings patterns of households over time, in part due to a lack of longitudinal data that captures retirement savings behavior.

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[5] 401(k) plans offer similar tax treatment but several advantages over IRAs, including significantly larger contribution limits ($12,000 in 2003; $14,000 for participants age 50 and older), employer matches, and payroll deduction. However, IRAs offer some advantages over 401(k)s, such as (generally) more flexible investment options, and potentially lower fees.

[6] See Smith (2002) for a discussion of complexity.

[7] If Social Security is reformed to include personal retirement accounts, this pressure will be even stronger.

[8] The effect of declining DB coverage on the need to save is significant, but should not be overstated. Since DB accruals are heavily weighted toward later working years, a smaller number of years of service can result in a significantly smaller DB annuity. Yakoboski (1998) argues that lifetime jobs never existed for most workers, citing a statistic that only about a third of older workers in 1978 had at least 20 years on the same job. Thus, many workers never realized the full promise of DB plans. This is consistent with the fact that in 2000, 90 percent of individuals 65 or older received less than a fifth of their income from pensions (SSA 2002a).

[9] For example, see Engen, Gale and Uccello (2001), Even and Macpherson (1998), Holden and VanDerhei (2002), Moore and Mitchell (1997), Poterba, Venti and Wise (2001), Samwick and Skinner (2001) and Scholz (2001).

This paper begins to address the question by using a large new panel of tax returns to examine IRA participation and contribution behavior over a ten-year period from 1987 to 1996. The longitudinal nature of the data allows a focus on multi-year patterns of contribution behavior, including the influence of income volatility. In addition, the panel data allow for random-effect specifications that condition on unobserved individual heterogeneity, including preferences for savings. This is important because much of the literature on retirement savings is confounded by the inability to identify treatment effects separately from unobserved preferences for saving (see below).[10]

To preview the findings, about 26 million individuals made IRA contributions at some time during the ten-year period, despite a restriction in the ability to deduct contributions. This represents 14 percent of the sample, and stands in contrast to single-year measures of participation, which never exceed 8.5 percent. About two-thirds participated in fewer than half of the years they were in the sample, while 10 percent participated in every year they were observed. About three-quarters of IRA participants made the maximum contribution at least once, and more than half did so in every year they participated. Results from a random-effects probit specification show that the deduction is associated with a 7.5 percentage point increase in participation, and the tax-price elasticity (conditional on deductibility) is found to be relatively large at –1.7. The income-volatility elasticity is found to be modestly negative at –0.04. The results show a relatively large role for unobserved savings preferences, with a random-effect persistence parameter of 0.606.

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[10] I focus on IRA participation because the data I use contain very good information on IRA contributions. The data also include more limited information on 401(k) contributions, as discussed later.

II. Retirement Plans and Saving

There is a voluminous literature on retirement plans and saving, with a particular focus on whether IRA and 401(k) contributions represent new saving (in the sense of an induced reduction in consumption) or savings that would have occurred even in the absence of the programs.[11] Another literature examines the correlates of participation in retirement savings programs, with the general finding that participation and contributions increase with age, income, employer size, and marginal tax rate.[12] However, fewer studies have studied retirement savings in a longitudinal context. Feenberg and Skinner (1989), Skinner (1991), and Joines and Manegold (1991) use a panel of about 6,000 tax returns to examine IRA behavior from 1982 to 1986. These studies find strong persistence in IRA participation: over 80 percent of participants in a given year also participated the following year, and about 50 to 60 percent of IRA participants contributed in every year observed.[13]

These studies shed some light on patterns of IRA participation in a longitudinal context. However, the much larger, much richer, longer and more recent panel of tax returns used here shows much less persistence in IRA contribution behavior over time.

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[11] For example, see Poterba, Venti, and Wise (1995, 1996, 1998), Gale and Scholz (1994), Engen, Gale, and Scholz (1994, 1996), Engen and Gale (1997, 2000), Benjamin (forthcoming), Engelhardt (2001), and Pence (2002a, 2002b). This literature has not reached a consensus on whether retirement contributions represent new savings.

[12] See O'Neil and Thompson (1987, 1988), Collins and Wycoff (1988), Long (1988, 1990), Bassett, Fleming and Rodrigues (1998), Joulfaian and Richardson (2001).

[13] Despite using the same data, Feenberg and Skinner (1989) and Joines and Manegold (1991) come to opposite conclusions on the question of whether IRA contributions represent new saving.

III. A Brief History of IRAs

Figure 1 illustrates the evolution of the IRA program from 1975 to 1996. IRAs were established in 1974 to provide consumption-tax-type treatment for individual retirement savings for workers under age 70½ without pension plans. Consistent with consumption taxation, the accounts featured tax-deductible contributions (subject to an annual limit of the lesser of $1,500 or 15% of compensation) and tax-free account earnings. Withdrawals (including earnings) were taxable as ordinary income, and, if taken before age 59½, potentially subject to an additional 10% excise tax penalty. In 1975, the first available year, 1.2 million tax returns claimed $1.5 billion in deductions.[14]

In 1981 eligibility was extended to all workers (regardless of pension coverage) and the contribution limit increased to the lesser of $2,000 or 100% of compensation. In the following year participation more than tripled and contributions increased by a factor of six. By 1985, 16 million tax returns claimed $38 billion in IRA deductions.

In 1986, the tax deductibility for contributions was restricted to workers without pension plans or whose incomes were below specified limits. For workers participating in a pension plan at work, the IRA deduction was phased out for single filers with modified adjusted gross income (AGI) between $25,000 and $35,000, while for joint filers, the phase-out range was $40,000 to $50,000. Workers not eligible for the full deduction could make nondeductible contributions, which were not subject to tax upon withdrawal.[15] In the following year the number of tax returns showing IRA deductions fell 53 percent, while the amount of deductions fell 63 percent. The statutory income and

[14] IRA participation and deduction data for years prior to 1987 are from SOI (various years).

[15] However account earnings were subject to tax, which is the key distinction between nondeductible IRA contributions and the Roth IRA contributions which would be permitted beginning in 1998.

contribution limits did not change during the period 1987 to 1996; however, in real terms they declined 28 percent.

The income limits were increased beginning in 1998. The phase-out in 2003 is $40,000 to $50,000 for single filers and $60,000 to $70,000 for joint filers, and is scheduled to increase to $50,000 to $60,000 by 2005 for single filers, and to $80,000 to $100,000 by 2007 for joint filers. The 1997 tax act also added Roth IRAs, for which contributions are nondeductible but qualified withdrawals (including account earnings) are tax-free, and increased the contribution limit for nonworking spouses from $250 to $2,000.

The contribution limits were increased to $3,000 beginning in 2002, and $3,500 for participants aged 50 and over. The contribution limits are scheduled to reach $5,000 ($6,000 for those 50 and older) by 2008.[16]

IV. Tax Treatment of IRAs

The introduction of nondeductible IRAs in 1987 and Roth IRAs in 1998 result in three different tax treatments for IRAs. In general, all three offer potential lifetime tax benefits relative to a conventional taxable savings account. To see how the three types of IRAs compare to a taxable account using a simple model of savings, calculate the after-tax value of one dollar invested for *n* years, assuming a constant tax rate *t* and a constant rate of return, *r*. A taxable savings account would yield:

(1) $$T = (1-t)[1+r(1-t)]^n ,$$

[16] Some recent proposals would accelerate the increase in IRA and 401(k) contribution limits to 2003.

which reflects the fact that no tax deduction is available for contributions and account earnings are taxed annually as they accrue.[17] In contrast, a traditional IRA contribution would be worth:

$$(2)\qquad D = (1+r)^n(1-t),$$

reflecting the lack of taxation on the front end (i.e., the deduction), the lack of taxation on annual earnings, and the taxation of the entire amount on the back end. Similarly, a Roth IRA contribution would yield:

$$(3)\qquad R = (1-t)(1+r)^n,$$

reflecting the lack of deduction on the front end, the lack of taxation on annual earnings, and the lack of taxation on the back end. This demonstrates the present-value equivalence (per after-tax dollar contributed) between traditional and Roth IRA tax treatment under the assumption of constant tax rates.[18]

Finally, the nondeductible IRA contribution would be worth:

$$(4)\qquad N = (1-t)[(1+r)^n - t[(1+r)^n - 1]],$$

[17] Note that "conventional taxable savings account" refers to a bank savings account or a money-market mutual fund, rather than a mutual fund investing in assets eligible for capital gains tax treatment.

[18] Since Roth and traditional IRAs have the same statutory contribution limits, Roths allow larger after-tax contributions. The Roth would be more valuable if the tax rate at withdrawal were higher than at contribution, and the traditional IRA would be more valuable in the opposite case. See Burman, Gale and Weiner (2001) for more discussion.

reflecting the lack of deduction on the front end, the lack of taxation on annual earnings, and the taxation of earnings (but not contributions) upon withdrawal.

Comparing T, D, R and N, it is apparent that T represents baseline income-tax treatment, D and R represent consumption-tax treatment (in the sense that capital income is untaxed), and N represents something in between. That is, for $0< t <1$ and $n >1$, D=R>N>T.[19] For example, for $r = .05$, $t = .15$ and $n = 10$, D=R=\$1.38, N=\$1.30, and T=\$1.29, i.e., the deductible and Roth IRAs are worth 7.4 percent more than the taxable account, while the nondeductible IRA is worth 1.2 percent more than the taxable account.

Table 1 shows these relationships for a variety of parameter values; the central result is that the consumption-tax advantage is increasing in *r*, *t* and *n*. Note that the key parameter governing the tax advantage of a nondeductible IRA is time: even at low values of *r* and *t* the advantage of N over T is large if *n* is large; conversely the nondeductible advantage is small even at large values of *r* and *t* if *n* is small.

V. Trends in IRA Participation

The relatively low tax benefit from nondeductible IRAs (except for very long-term savers) suggests that the limitation on deductibility imposed in 1986 could have very large negative effects on IRA participation. Indeed, participation in IRAs has remained well below ten percent of eligible individuals since 1987. This is likely related to a number of concurrent developments, including the imposition of the income limits on deductibility, the declining real value of income and contribution limits, increasing

[19] While it is immediately apparent that D=R, D>T, and D>N, it may not be as apparent (but nonetheless can be shown) that N>T.

participation in employer-sponsored retirement-savings accounts (especially 401(k) plans), and increasing complexity in IRA rules.

Declining IRA participation after 1986 could also be the result of reduced tax rates after the 1986 tax act; if so, subsequent tax increases in 1991 and 1993 should have at least partially offset this decline.[20] It is too early to tell whether recent increases in income and contribution limits will combine with the introduction of Roth IRAs to reverse the decline in IRA participation. However, the longitudinal data used here illustrate the impact of the income limits currently in place on the dynamics of retirement saving through IRAs.

VI. Sample Characteristics

The sample is a large panel of tax returns from 1987 to 1996. The panel was developed as a joint effort between Treasury's Office of Tax Analysis and the IRS's Statistics of Income division.[21] The panel begins with the annual SOI cross-section of tax returns for 1987. The annual SOI cross-sectional samples are large (about 88,000 returns in 1987) and are made up of two components – a purely random component based on the (random) last four digits of the primary filer's Social Security number[22], and a component that is stratified steeply on income, so that it contains a large over-sample of high-income

[20] This suggests the importance of controlling for tax price in subsequent analysis. As will be seen, there is some evidence of an effect of the 1993 tax increase on IRA behavior.

[21] Jim Cilke and Jim Nunns at OTA and Mike Weber, Mike Strudler and Pete Sailor at SOI deserve much of the credit for creating this panel.

[22] The same sets of ending digits are used each year, so this portion of the cross-section can be linked over time to form a panel of tax returns; however, the random-sample component does not include many high or very-high income returns.

and very high-income returns. The components are combined and weighted to represent the population of tax filers.

The panel was constructed by identifying by SSN all primary and secondary filers and dependents that appeared on 1987 sample returns, and then searching the population of tax returns for sample SSNs in subsequent years. The advantage of this method is that it allows individuals to be tracked over time regardless of income changes, marriage, divorce, or establishment of a new tax unit by a former dependent.[23, 24]

The sample includes very rich detail on income, including most of the variables reported on individual income tax returns, plus information from W-2s (including separate earnings and pension coverage for spouses on joint returns),[25] and information matched in from individual-level Social Security records, including date of birth, date of death, sex, and earnings histories.

One of the key advantages of using administrative records such as tax returns is that the sample is not subject to sample attrition bias. The major source of attrition in the panel is attrition from the population of tax filers that occurs when filers experience income drops to levels below the filing thresholds.[26] However, this source of attrition is

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[23] In this sense it is superior to pseudo-panels created from repeat cross-sections of tax filers in which some stratified-sample taxpayers happen to appear in subsequent years. In such "overlap panels," the probability of a stratified-sample taxpayer appearing in a subsequent cross-section is a function of changes in income, and individuals in tax units that change due to marriage or divorce are often not represented.

[24] The panel was not designed to be refreshed each year with new entrants into the filing population. However, after the full ten years were collected, an ex-post refreshment sample was added by including new (generally young) entrants that appeared in the random-sample component of subsequent cross-sections of annual tax returns.

[25] W-2 links were made in 1989 and 1993 through 1996. For the other years, W-2 information was imputed from Social Security earnings records.

[26] In 1987, the filing threshold generally ranged from $4,440 to $10,000, depending on age and filing status. In 1996, the analogous thresholds were $6,550 to $13,400.

significant and non-random – older and lower-income workers are more likely to drop out of the panel than younger and higher-income workers.

For this study, I construct individual-level sample records by dividing joint returns into two copies, one for each spouse. I assign individual-level data such as earnings, pension participation, age, sex, and IRA contributions to the appropriate spouse. I make no attempt to allocate return-level data such as total income between the spouses, but rather leave such variables as-is on each record. Thus, my file would over-count income if used to aggregate income across all records; however, it is the appropriate sample to use for analysis of individual-level decision-making.[27]

The data contain very good information on IRA contributions. Deductible contributions are recorded on Form 1040, and nondeductible contributions are recorded on Form 8606. Both types are reported separately for primary and secondary filers.[28] The data on 401(k) contributions are more limited. Such contributions are not reported on any tax form except the W-2. Box 13 records deferred compensation paid by the employer, including, among other things, employee contributions to a 401(k)-type plan. The panel used here contains W-2 links only for certain years, and does not contain the codes needed to break out 401(k) contributions from other forms of deferred compensation. As a result, I focus this paper on IRA contributions, and make use of

[27] For example, a joint return reporting $50,000 of income represents two individuals who live in a household with $50,000 in income. Thus, it is appropriate to create two individual-level records, each with $50,000 of income, rather than try to allocate the $50,000 between the two individuals. However, the individual-level approach does raise the question of whether two individuals in a household make IRA decisions jointly or independently. This analysis implicitly assumes the decisions are independent, except to the extent the unobserved effects of a spouse's behavior are captured in the individual-specific random effect.

[28] Nondeductible IRA contributions that taxpayers fail to report on Form 8606 are not captured. However, taxpayers have an incentive to report such contributions to avoid double taxation of contributions at withdrawal.

401(k) data only to the extent that it indicates who participates in a 401(k) plan.[29]

I restrict the sample to primary and secondary filers with earnings (or spousal earnings) and under age 70. This represents the group of filers eligible for IRA contributions. The sample contains 128,256 observations for 1987, falling to 118,190 by 1996.

Table 2 gives sample characteristics for the first and last years of the panel. The unweighted counts illustrate the over-sampling of high-income individuals.[30] The age distributions show that the ex-post refreshment sample did not prevent the sample from aging somewhat. The median age increased only slightly, from about 39 years to about 42 years, but the distributions show significant loss in the youngest age category.[31]

VII. Annual Measures of IRA Behavior

Of particular interest on Table 2 are the rows at the bottom illustrating changes in pension coverage and IRA status. Pension coverage increased 42 percent over the sample

[29] My measure of 401(k) participation thus indicates any receipt of deferred compensation. Joulfaian and Richardson (2001) use a special tax sample to break out types of W-2 deferred compensation in 1996, finding that 67% of individuals with deferred compensation had 401(k)-type contributions, and that such contributions accounted for nearly 80% of aggregate deferred compensation. There may be ways to make greater use of the limited 401(k) information that is available on the panel file, which I hope to undertake in future work.

[30] For example, 46% of the unweighted sample has total income over $100,000 in 1987, versus 11% of the weighted sample. The income concept used in this paper is total income as reported on the tax return, plus foreign earnings, tax-exempt interest, and deferred compensation, less allowable self-employment deductions.

[31] I have not yet had the opportunity to benchmark this result against the 1996 annual cross-section of tax returns, but I expect the aging of the sample is due at least partially to aging in the population. For example, Census data show that from 1987 to 1996, the share of the population aged 20-29 fell 13 percent, while the share of the population aged 40-49 rose 28 percent (Census, 2001, Table 12). In my sample, the comparable share changes are a decline of 33 percent for the 21-30 age group, and an increase of 29 percent in the 41-50 age group (see Table 2 below). Note the Census figures are for the full population, while my sample only represents working tax filers. The median age in the Census rose from 32 in 1987 to 35 in 1996.

period, and participation in a 401(k)-type plan nearly doubled from 15 to 27 percent of individuals. The share of individuals ineligible for the full IRA deduction nearly doubled from 21 to 39 percent.[32]

The share of individuals making any IRA contribution (deductible or nondeductible) fell by a third, from 8.5 to 5.7 percent. This loss came entirely from a 44 percent drop in deductible contributions, while the share making nondeductible contributions stayed roughly constant over the period. Finally, the share of all IRA contributors who made the maximum contribution increased from about two-thirds to about three-quarters.

Tables 3 shows the increasing importance of the income limits year-by-year, and also by age and income. The table shows the share of taxpayers affected by the income limits, in the sense of being subject to a reduction or elimination of a potential IRA deduction due to income and pension coverage. Ineligibility for the full IRA deduction increases significantly over the time period for all age classes and all but the lowest income class. By the end of the sample, 46 percent of those who made an IRA contribution in the first year of the sample had become ineligible for the full deduction.

Table 4 shows IRA participation rates year-by-year, and also by age and income.[33] This table illustrates the standard positive relationships between participation and age and income. The positive relationship with capital income is particularly strong, perhaps because capital income receipt indicates a preference for savings, availability of

[32] An individual is defined as ineligible if either the individual or the spouse is covered by an employer retirement plan and modified AGI exceeds the start of the phase-out range for their marital status.

[33] Table 4 shows IRA participation among all taxpayers, regardless of eligibility for the deduction. When limiting the analysis to taxpayers eligible for the deduction, participation declines from 9 percent in 1987 to 6 percent in 1991, and then stays at about 6 percent through the end of the sample. Thus, the reduction in participation shown in Table 4 is not simply a mechanical effect due to reductions in eligibility.

liquid assets to contribute to an IRA, and/or lower transactions costs. Participation declines significantly for all but the youngest and lowest-income individuals, who were never participating in large numbers to begin with. By the final year of the sample, only 31 percent of first-year participants were still participating. However, these losses came largely in the first half of the sample – the exit hazard declines (non-monotonically) from 34 percent in 1988 to six percent in 1996.

A persistence measure similar to that used in Skinner (1991) shows a lower year-to-year "survival rate" of 66 to 69 percent in the first half of the sample, but by the end of the second half the survival rate increases to 76 percent, approaching but still under Skinner's finding of greater than 80 percent. This suggests that the combination of income limits and lower tax rates may have combined to reduce IRA participation in the years following 1986, but with waning effects starting 1991 (when the 31 percent tax bracket was added) and 1994 (when the 36 and 39.6 brackets were added).

Table 5 illustrates IRA participation for taxpayers in the phase-out ranges for the IRA deduction. This is of particular interest because of the possibility that either the complexity of calculating a partial deduction or the expectation of higher future income leads to lower IRA participation among taxpayers in the phase-out range.[34] Table 5 shows that the IRA participation rate of this group fell by 60 percent, substantially larger than the one-third decline among all taxpayers.

Since all taxpayers in the phase-out range can make both deductible and nondeductible contributions in the same year, Table 5 shows the breakdown of contributions by deductibility. In 1987, the first year nondeductible IRAs became available, only 20 percent of IRA contributors in the phase-out range took advantage of

[34] See Smith (2002).

them; the other 80 percent simply limited their contribution to the deductible amount.[35] The share reporting nondeductible contributions increased monotonically to 35 percent by 1996.

Table 6 illustrates year-by-year changes in the share of IRA contributors constrained by the contribution limit of the lesser of $2,000 or earnings. This share is quite large, and increases from 68 to 75 percent over the period, likely due in part to the 28 percent decline in the real value of the contribution limit over the period. Interestingly, the increase is concentrated among contributors in households with under $100,000 in total income; the share for higher-income households stayed approximately constant at about 90 percent.

VIII. Income Volatility

Another way to examine retirement savings over time is to look at longitudinal measures such as the share of taxpayers who ever become ineligible for the full deduction, the share who ever participate in an IRA, and the share who ever are constrained by the contribution limit. In addition, longitudinal explanatory variables can be created, such as "permanent income," (as approximated by the average of annual incomes) and measures of income volatility.

Income volatility is an important determinant of savings behavior in models of precautionary saving.[36] In such models, future income uncertainty is a motivation for

[35] As previously noted, an alternative explanation is they failed to report the nondeductible contribution on Form 8606, though there is a disincentive to do so.

[36] For example, see Carroll (1992), Carroll and Samwick (1997, 1998), Deaton (1991), Kimball (1990), Kazarosian (1997), and Browning and Lusardi (1996).

saving, in addition to retirement.[37] IRAs are typically considered to be more appropriate for retirement savings than precautionary savings, because the early withdrawal penalty makes them less liquid than ordinary savings. Thus, in a precautionary savings world, greater income uncertainty might be expected to reduce IRA participation. Hrung (2002) tests this empirically and finds a negative effect of income uncertainty on IRA participation for households over age 50.

However, the essential difference between the precautionary and retirement savings motives is that while retirement savings follows from the *certainty* of declining labor income after retirement, precautionary savings follows from the desire to insure against the *possibility* of pre-retirement income declines. In other words, precautionary savings are needed only probabilistically. In this setting, an IRA may be an appropriate form of precautionary savings, because the *expected* net tax benefit could be positive.[38] Moreover, future income uncertainty could provide a motive for greater saving in all forms, since retirement saving is costlier (in utility terms) to finance out of a reduced income. Hence, the effect of income uncertainty on retirement saving is theoretically ambiguous.

To explore the effect of income volatility of IRA participation, I follow Hrung (2002) in using Carroll and Samwick's (1998) measure of income volatility, the relative equivalent precautionary premium (REPP). Intuitively, REPP is a measure of the

[37] Carroll and Samwick (1997, 1998) investigate models of buffer-stock saving, in which households have a target wealth-to-income ratio as a result of the competing motivations of prudence (the precautionary motive) and impatience (the desire to borrow against future income to finance current consumption). They argue that buffer-stock behavior is most important for households under age 50, after which the impatience motive declines and the retirement motive becomes more prominent.

[38] The 10% penalty was calculated to remove the tax incentive to use IRAs for intentional non-retirement saving; however, it may not be sufficient to remove the incentive to use IRAs as insurance against the risk of future pre-retirement income declines.

insurance premium a taxpayer would be willing to pay to receive utility from the (certain) expected value of income rather than the expected utility of uncertain income. A more precise definition of REPP is given in Appendix A.

IX. Longitudinal Measures of IRA Behavior

Table 7 shows descriptive statistics for permanent income, permanent capital income (which includes taxable and tax-exempt interest, dividends, and capital gains), REPP, and pension participation. Compared to the annual measure of total income, significantly more taxpayers are in the lowest permanent income category (43 percent permanent, vs. 33 percent annual in 1987). This suggests that many taxpayers experience temporary changes in income, which could affect savings behavior. However, significantly fewer taxpayers report zero capital income over the entire period than do in any given year, suggesting that many taxpayers sporadically receive capital income.

The distribution of REPP shows that nearly a third of taxpayers face relatively little utility cost from income volatility (less than 5 percent of permanent income). However, 22 percent face a utility cost in excess of 40 percent of permanent income, suggesting a fairly large degree of income volatility among a significant portion of the population.[39]

Table 8 shows longitudinal patterns of the effects of the IRA income limit over the ten-year period. Nearly 99 million people, or 48 percent of the sample, were affected by the income limit at some time over the period. Many of these were affected less than half of their time in the sample; however 12 percent were affected every year they were

[39] Since the REPP calculation is a sample mean, it is possibly affected by a few large outliers. This effect can be particularly important in tax data that includes very high-income returns.

observed. By income, 28 percent of taxpayers with 1987 income below $25,000 eventually hit the income limit, illustrating the fact that even among taxpayers with low incomes in 1987 the income limits might not be irrelevant for very long.

Table 9 illustrates longitudinal measures of IRA participation. About 26 million taxpayers, or 14 percent, make either a deductible or nondeductible contribution to an IRA over the sample period. Most do not do so every year - nearly two-thirds contribute in fewer than half the years; however, 10 percent contribute every year they were observed. Participation shows the standard positive relationships with permanent total income and permanent capital income.

Participation is highest for taxpayers with a REPP of between 5 and 20 percent of permanent income; it then declines for taxpayers with higher utility costs of income volatility. This pattern may correlate with income (since the taxpayers with REPPs of 5 to 20 percent have the highest average total income), so identifying the separate effects of income and REPP requires the regression framework adopted later. IRA participation is highest for those who ever participated in a 401(k) plan, suggesting that both decisions are the result of an unobserved taste for saving.[40] This is further evidence that a random-effects specification that controls for unobserved heterogeneity is important for separately identifying the effects of various determinants of retirement saving.

Table 10 shows longitudinal measures of limit contributions. Nineteen million taxpayers made a limit contribution at some time over the period, accounting for 73 percent of the taxpayers who ever made an IRA contribution. In contrast to the pattern for IRA participation, most limit contributors make limit contributions every year that

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[40] If IRAs and 401(k)s were considered by households to be substitutes, we would expect a negative relationship between IRA and 401(k) participation.

they contribute. Only 7 percent of those who ever made a limit contribution did so in fewer than half the years they contributed, while nearly three-quarters contributed the maximum every year.

X. Random Effects Probit Specification

I employ a random-effects probit specification to investigate IRA participation in a longitudinal context, conditional on an individual-specific random effect. The random effect plays an important role by capturing unobserved sources of heterogeneity, the most important of which are factors that influence tastes for saving. Models of saving are often plagued by the inability to identify the effects of observable variables separately from the effects of unobserved savings preferences; a key advantage of panel data is the ability to use econometric techniques to condition on such unobserved influences.[41]

In this section, a random-effects probit framework is used to model explicitly the correlation between the disturbances of multiple observations on the same taxpayers. Introduced by Butler and Moffitt (1982), the random-effects probit specification is not as commonly used as other models, but the approach allows consistent parameter estimates in a probit model with correlation between an unobserved individual effect and right-hand side variables. As such, it is well suited to longitudinal studies of savings behavior. It also allows the estimation of parameters characterizing the degree of correlation over time in taxpayers' participation decisions. However, it requires an assumption of equal correlation of residuals over time. In addition, it requires the use of numerical estimation techniques to evaluate multiple integrals.[42] Due to the computational burden of estimating this model, the regression sample is a ten-percent random sample of the

[41] In cross-sectional limited-dependent variable models such as probits or logits, unobserved tastes for saving that are correlated with right-hand side variables can lead to inconsistent parameter estimates.

[42] In the case of reported marginal and discrete effects, multiple integrals are also evaluated using simulation techniques. See Appendix B for details.

sample described in Table 2. The full details of the random-effects specification are given in Appendix B.

Table 11 reports the results of a random-effect probit specification in which the dependent variable is IRA participation (i.e., either a deductible or nondeductible contribution to an IRA in a given year). Taxpayers eligible for the deduction are 7.5 percentage points more likely to contribute than taxpayers not eligible for the deduction; a large effect given that the mean of the dependent variable is only 0.046. The effective tax price is defined as one minus the effective tax rate, which is calculated by adding $100 to capital income, re-computing tax liability using Treasury's detailed tax calculator, and dividing the change by 100. The effective tax price is found to have an elasticity of –1.7, which suggests a relatively large responsiveness of IRA participation to tax rates. For example, a ten-percent increase in tax price would be associated with a 17 percent decrease in the probability of participation.[43]

Indicators for taxpayers in or near the phase-out range for the deduction are included to test whether the complexity of making the partial-deduction calculation (or the expectation of future income above the phase-out range) discourages participation. All else equal, being in the phase-out range reduces participation by 1.1 percentage point. Being near the phase-out range (defined as having income within $5,000 of the start of the phase-out range) is found to have no significant effect on participation. These results suggest that complexity and/or expectations of future income growth result in a relatively significant reduction in participation.

The measure of income volatility, REPP, is found to have relatively modest negative effect on participation, with an elasticity of -0.07. This suggests that on net, income volatility discourages IRA participation, though the point estimate is small. There are many confounding factors in interpreting this result. First, the effect of income volatility could vary with age or income, or may be non-monotonic in REPP itself.

[43] Power and Rider (2002) estimated a tax-price elasticity of contributions (rather than participation) of about –2.0 in a study of self-employed retirement savings behavior.

Second, the measure of ex-post income volatility may be a poor proxy for taxpayers' ex-ante expectations of volatility. Third, income volatility could be endogenous in at least two senses – taxpayers could choose to take time out of the labor force, and more risk-averse taxpayers could choose careers that have lower income volatility. Thus, this result should be interpreted with caution.

Pension coverage and sex are found to have no significant effect on participation.[44] Participation increases with total income and age, though it dips a bit for taxpayers older than 60. The slope parameters for total income are relatively modest (i.e., the slope is not very steep above $25,000); the slope of capital income is substantially steeper. All else equal, IRA participation fell significantly from 1987 to 1989, then stayed roughly flat until after1993, when it increased slightly. Figure 2 illustrates these patterns.

Relative to unmarried taxpayers, married taxpayers are less likely to participate (and one-earner couples are less likely than two-earner couples); in addition, participation is decreasing in the number of dependents. The standard deviation of the random effect is estimated to be 1.24, which corresponds to a variance of 1.54, i.e., the error component indexing unobserved individual heterogeneity is about fifty percent more variable than the annual white-noise component (the variance of which is normalized to one). Finally, the results show a relatively large role for unobserved savings preferences, with a random-effect persistence parameter of 0.606. Thus, about 60 percent of unexplained variation in participation behavior is due to individual heterogeneity that is assumed to be constant over time.

Finally, Table 12 reports the results of a random-effect probit specification in which the dependent variable is one if the taxpayer makes the maximum contribution to

[44] Note that pension coverage does play a significant role in the form of affecting eligibility for the deduction. The present result is that pension coverage plays no further role than its role in eligibility. 401(k) participation is not included as a regressor due to the endogeneity issues.

an IRA in a given year.[45] Eligibility for the deduction increases the probability of a limit contribution by three percentage points, all else equal. Relative to the tax-price elasticity of IRA participation, the tax-price elasticity of limit contributions is much smaller, at -0.15. Being in the phase-out range reduces the probability of a limit contribution by 25 percentage points, consistent with the fact that many taxpayers contribute only the amount they are eligible to deduct. In contrast, being just below the phase-out range increases the likelihood of a maximum contribution.

Income volatility has a small positive effect on limit contributing, with an elasticity of 0.04. Women and taxpayers with pension coverage are slightly less likely to make the maximum contribution, all else equal. Limit contributions rise with age and income, with a pronounced increase for taxpayers in the top income group. All else equal, the probability of limit contribution fell slightly from 1987 to 1988, stayed roughly flat for three years, and increased sharply from 1991 to 1993. After dropping off in 1994, limit contributions again rose sharply in the final years of the sample. Figure 3 illustrates these patterns. Finally, the random-effect parameters are similar to those from the IRA participation regression.

XI. Conclusions

The empirical evidence on the persistence of retirement savings is mixed. Significantly more taxpayers make IRA contributions at some time over the course of a ten-year period than do in any given year, suggesting both that more taxpayers are affected by IRA policies than is otherwise apparent and that many contributors are sporadic in their savings behavior. Over the time period observed, which was a period of

[45] This model is estimated on the full sample of IRA contributors in any year.

contraction in the IRA program, two-thirds of participants contributed in half or fewer of the years they were observed; only a tenth contributed every year. However, about three-quarters of IRA participants made the maximum contribution at least once, and more than half did so in every year they participated.

Results from a random-effects probit specification show that the ability to deduct contributions is important, with eligibility associated with a 7.5 percentage point increase in participation. The tax-price elasticity (conditional on deductibility) is found to be relatively large at –1.7. Income volatility is found to play a modest role in participation behavior, though several confounding effects impede a clear interpretation of the results. Both IRA participation and limit contributions show at least a small change after top tax rates were increased in 1993. Finally, the results confirm a relatively large role for unobserved savings preferences, with a random-effect persistence parameter of 0.606 indicating that more than half of unexplained variation in participation behavior is due to individual heterogeneity that is assumed to be constant over time. This finding suggests that by enabling researchers to condition on unobserved tastes for savings, panel data are particularly suited to studying saving behavior.

Appendix A: Definition of REPP

To define REPP more precisely, define the equivalent precautionary premium as the value A such that:

$$\text{(A1)} \quad u'(P - A) = E[u'(Y)],$$

where $Y=Pe$ is annual income, P is permanent income, and e is a transitory i.i.d shock. Then A is the certain reduction in mean income that produces the same marginal utility as the mean utility from a stochastic income stream.

Define utility to be CRRA:

$$\text{(A2)} \quad u(Y) = \frac{Y^{1-p}}{1-p},$$

where p is the constant of relative risk aversion, and solve for A:

$$\text{(A3)} \quad A = P[1 - E[e^{-p}]^{-\frac{1}{p}}]$$

REPP is the equivalent precautionary premium relative to permanent income:

$$\text{(A4)} \quad REPP = \frac{A}{P} = 1 - E[e^{-p}]^{-\frac{1}{p}}$$

To implement this measure empirically, define permanent income *P* as:

(A5) $$P = \frac{1}{T}\sum_t Y_t \ ,$$

where *t* indexes years and *T* represents the number of years the individual is in the sample.

Then REPP can be calculated as:

(A6) $$REPP = 1 - \left[\frac{1}{T}\sum_t \left(\frac{Y_t}{P}\right)^{-p}\right]^{-\frac{1}{p}},$$

which can be evaluated at multiple levels of *p*. I use *p*=3; however, *p*=2 and *p*=5 give essentially the same results. In addition, an alternative measure of income volatility, the variance of log income, gives essentially the same results.

Appendix B: Random-Effects Probit Specification

The random-effects probit model is specified:

(B1) $$\Pr(y_{it}=1 \mid x_{it}) = \Phi(x_{it}b + n_i)$$

where Φ represents the cumulative standard normal distribution. Equation (B1) derives from the underlying model:

(B2) $$y_{it}^{*} = x_{it}b + e_{it}$$

$$e_{it} = n_i + u_{it}$$

$$n_i \sim N(0, s_n^2)$$

$$u_{it} \sim N(0,1)$$

$$y_{it} = \begin{cases} 1 \; if \;\; y_{it}^{*} > 0 \\ 0 \; otherwise \end{cases}$$

The error term e_{it} is decomposed into the random effect n_i, which represents unobserved individual heterogeneity that is constant over time for a given taxpayer, and a white-noise disturbance u_{it}, which is assumed to be independent across taxpayers and time (and hence uncorrelated with x_{it} and n_i). Each taxpayer is assumed to receive a single draw of the random effect from a fixed distribution *h*, where *h* is the same for all taxpayers. In this paper, the distribution *h* is assumed to be normal with mean zero and unknown variance (in practice the variance parameter is estimated in the regression), while the white-noise component is assumed to be distributed standard normal. An additional required assumption is that the correlation of the regression errors e_{it} is constant over time. Under these assumptions, the correlation coefficient between any two observations of the same taxpayer is

$$\text{(B3)} \qquad r = \frac{s_n^2}{s_n^2 + s_u^2} = \frac{s_n^2}{s_n^2 + 1}$$

where s_n^2 represents the variance of the random effect and s_u^2 represents the variance of the annual white noise component, which is assumed to be equal to one because u_{it} is assumed to be distributed standard normal. Thus, r measures both the correlation over time of an individual's error term and the contribution of the random effect to total variance.

Since it is unobserved, the random effect cannot be estimated directly, but the parameters b can be estimated by integrating n_i out of the likelihood function, where the shape of the distribution of n_i is assumed. In practice, the mean of n_i is assumed to be zero (without loss of generalization if the model includes a constant), and the variance s_n^2 is a parameter to be estimated.

Making these assumptions, the probability in (B1) becomes

$$\text{(B4)} \qquad \Pr(y_{it} = 1 \mid x_{it}) = \int_{-\infty}^{\infty} \prod_t \Phi(x_{it} b + n_i) h(n_i) \, dn_i$$

where *h* is the distribution of the random effect and the multiplication operator is over the number of observations for individual *i*. The integral cannot be evaluated analytically, so in practice it is usually approximated. Following Butler and Moffitt (1982), I use the Gaussian quadrature approximation:

(B5) $$\int_{-\infty}^{\infty} e^{-Z^2} g(Z)dZ \approx \sum_{m=1}^{G} w_m g(Z_m)$$

which is a polynomial approximation evaluated at a set number of points with appropriate weights.

Various econometric software packages include this routine, including Stata. However, Stata cannot estimate the random-effects probit model with sampling weights. It can estimate the model with what it calls "importance weights", but they are not correctly accounted for in the standard error calculation (i.e., the calculation uses the sample size rather than the sum of weights). As a result, the reported standard errors are Stata's standard errors multiplied by $\frac{\sqrt{W}}{\sqrt{n}}$, where W is the sum of weights and n is the sample size. This adjustment produces the correct standard errors.

Since the probit specification is nonlinear in X, the estimated coefficients are not the slope of the conditional expectation function in (B5). Conditional on the fixed effect, the marginal effect of the *k*th coefficient, (i.e., the slope of the expectation function), can be defined:

(B6) $$\frac{\partial \Phi}{\partial x_k} = f\,(\bar{x}b + n_i)\,b_k$$

However this is more appropriate for continuous than discrete regressors. For discrete regressors, the tables report a discrete effect, defined as:

(B7) $$\frac{\Delta \Phi}{\Delta x_{k \in J}} = \Phi(\bar{x}_1 b + n_i) - \Phi(\bar{x}_0 b + n_i)$$, where

$$\bar{x}_{1k} = \begin{cases} 1 \; if \;\; k = i \\ 0 \; if \;\; k \neq i \; and \; k \in J \\ \bar{x}_k \;\; if \;\; k \neq i \; and \; k \notin J \end{cases}$$, and

$$\bar{x}_{0k} = \begin{Bmatrix} 0 \; if \;\; k \in J \\ \bar{x}_k \; if \;\; k \notin J \end{Bmatrix}$$

Thus, the discrete effect calculates the change in the probability of Y from increasing x_k from zero to one, taking into account the fact that some of the regressors are mutually exclusive indicator variables. Thus, equation (B6) can be used to compute marginal effects for continuous regressors, and equation (B7) can be used to compute discrete effects for discrete regressors.

However, since the random effect is unobserved, it must be integrated out. Thus the marginal effect is defined:

(B8) $$\frac{\partial \Phi}{\partial x_k} = \int_{-\infty}^{\infty} [f\;(\bar{x}b + n_i) b_k] h(n_i) dn_i$$

and the discrete effect is defined:

(B9) $$\frac{\Delta \Phi}{\Delta x_{k \in J}} = \int_{-\infty}^{\infty} \Phi(\bar{x}_1 b + n_i) h(n_i) dn_i - \int_{-\infty}^{\infty} \Phi(\bar{x}_0 b + n_i) h(n_i) dn_i$$

Again, the integrals cannot be evaluated analytically. In this paper, equations (B8) and (B9) are estimated with the simulation estimator:

(B10) $$\frac{1}{r} \sum_{i=1}^{r} g(f(x_i)) \approx \int_{-\infty}^{\infty} g(f(x)) f(x) dx, \text{ for large } r,$$

where x_i represents an independent draw from the distribution *f(x)*, *g* represents a continuous function and *r* represents the number of simulation repetitions. In this case, x_i

represents n_i, $f(x)$ represents $h(n_i)$, and g represents the standard normal CDF. To compute the simulation estimator, equations (B6) and (B7) are evaluated many times, including a new draw from the random-effects distribution in each repetition, and the average is taken. The reported marginal and discrete effects were calculated by this method, with r equal to 1,000.

Elasticities are also reported for continuous regressors such as the effective tax price and REPP. The elasticities are calculated as the slope (either marginal or discrete effect) multiplied by the ratio of the mean of the right-hand side variable to the predicted value of the dependent variable. The predicted value of the dependent variable is calculated at the mean of the right-hand side variables, integrating out the random effect via the simulation method described above.

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Figure 1
Tax Returns with IRA Contributions, 1975 to 1996

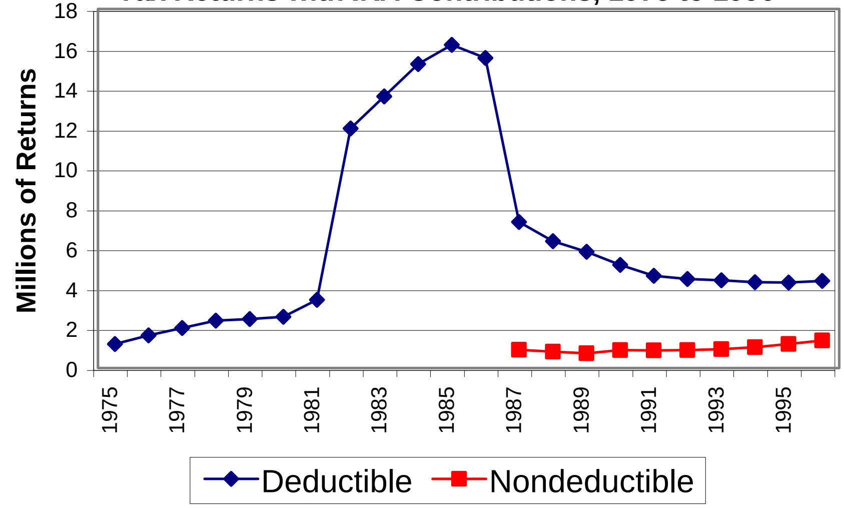


Table 1: After-Tax Values of Deductible, Roth, and Nondeductible IRAs Relative to Taxable Savings Accounts

	t=.10			
	r=.05		r=.10	
	n=5	n=40	n=5	n=40
D=R	1.15	6.34	1.45	40.73
N	1.12	5.79	1.39	36.75
T	1.12	5.23	1.38	28.27
(D-T)/T	2%	21%	5%	44%
(N-T)/T	0%	11%	1%	30%

	t=.35			
	r=.05		r=.10	
	n=5	n=40	n=5	n=40
D=R	0.83	4.58	1.05	29.42
N	0.77	3.20	0.91	19.35
T	0.76	2.34	0.89	8.07
(D-T)/T	9%	96%	18%	265%
(N-T)/T	1%	37%	2%	140%

Table 2
Sample Characteristics

	1987		1996	
	Unweighted Individuals	Weighted Percent	Unweighted Individuals	Weighted Percent
Total Sample Size	128,256	100%	118,190	100%
Age				
21 to 30	18,259	27	8,981	18
31 to 40	34,387	29	24,382	29
41 to 50	34,775	21	36,695	27
51 to 60	26,010	15	31,012	18
61 to 70	12,827	7	16,426	8
Total HH Income (1996 $)				
< $25,000	23,506	33	23,456	36
$25,000 - $50,000	19,360	29	21,931	28
$50,000 - $100,000	26,978	27	27,364	25
> $100,000	58,412	11	45,439	12
HH Capital Income (1996 $)				
none	19,174	33	21,354	37
< $250	19,579	26	22,598	27
$250 - $5,000	33,565	30	29,364	25
> $5,000	55,938	12	44,874	12
Gender				
Male	64,932	53	58,059	55
Female	62,983	47	59,884	45
Filing Status				
Non-Joint	22,247	33	24,730	40
One-Earner Joint	66,899	34	51,646	26
Two-Earner Joint	39,110	32	41,814	34
Dependents				
None	53,830	48	59,102	50
One	25,682	21	22,483	21
Two or more	48,744	32	36,605	29
Pension Status				
None	93,946	69	72,378	56
Any Retirement Plan	34,310	31	45,812	44
401(k)-type Participant	16,598	15	27,696	27
IRA Status				
Ineligible for full deduction	31,594	21	46,222	39
Any IRA Contribution	15,044	8.5	10,689	5.7
Deductible Contribution	11,789	7.7	7,155	4.3
Nondeductible Contrib	3,545	1.2	3,698	1.5
At Contribution Limit	12,097	5.8	8,849	4.2

Notes
1/ Sample includes individuals under age 70 who filed federal tax returns with earnings.
2/ "Income" is total income as reported on the tax return, plus foreign earnings, tax-exempt interest and deferred compensation, less allowable self-employment deductions.
3/ "Capital Income" includes taxable and tax-exempt interest, dividends, and capital gains.
4/ "At Contribution Limit" refers to IRA contributions of within $50 of the maximum contribution.

Table 3: Individuals Ineligible for Full IRA Deduction due to Income and Pension

	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996
Total										
Ineligible Individuals (thous)	27,980	31,934	39,290	37,856	38,758	42,826	50,296	52,839	54,519	54,240
Percent Ineligible	21	23	28	27	28	31	36	38	39	39
By Age										
21 to 30	11	12	15	14	15	16	19	19	19	20
31 to 40	25	28	33	32	32	36	41	43	44	43
41 to 50	31	33	40	38	38	42	49	51	52	50
51 to 60	26	28	34	32	33	36	42	44	45	46
61 to 70	13	16	19	19	20	21	25	27	28	29
Total HH Income (1996 $)										
< $25,000	1	1	1	1	1	1	1	1	1	1
$25,000 - $50,000	6	8	12	13	17	22	32	35	38	41
$50,000 - $100,000	51	57	70	68	68	71	80	81	81	84
> $100,000	49	51	58	54	56	62	68	71	71	71
HH Capital Income (1996 $)										
none	6	7	9	9	11	12	16	17	17	18
< $250	21	24	31	31	32	38	46	47	48	48
$250 - $5,000	32	36	42	41	42	45	52	55	56	55
> $5,000	32	34	39	37	38	42	47	50	52	52
Prior IRA Participation										
1987 Participants	0	25	31	31	33	37	43	45	47	46
Prior-Year Participants	n.a.	25	27	24	25	28	31	33	34	33

Table 4: IRA Participation Among All Taxpayers under 70 with Earnings

	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996
Total										
Participating Taxpayers (thous)	11,533	10,218	9,196	8,735	8,117	7,934	7,690	7,711	7,806	7,857
Participation Rate	8.5	7.4	6.6	6.3	5.8	5.7	5.6	5.6	5.6	5.7
By Age										
21 to 30	3	3	2	2	2	2	2	2	3	2
31 to 40	7	6	6	5	5	4	4	4	4	4
41 to 50	10	9	7	7	7	6	6	6	6	7
51 to 60	17	14	12	12	11	10	10	9	9	9
61 to 70	19	17	15	15	14	13	11	12	12	11
Total HH Income (1996 $)										
< $25,000	3	2	2	2	2	2	2	2	2	2
$25,000 - $50,000	9	9	8	7	7	7	7	7	7	7
$50,000 - $100,000	12	10	9	8	7	6	6	6	6	6
> $100,000	15	14	12	13	12	13	12	12	12	12
HH Capital Income (1996 $)										
none	1	1	1	1	1	1	1	1	1	1
< $250	4	4	4	3	3	4	4	3	3	3
$250 - $5,000	15	13	11	10	10	11	11	11	10	10
> $5,000	23	20	18	18	18	18	17	17	17	17
Pension Status										
None	9.1	8.1	7.6	7.2	6.8	6.8	6.9	6.8	7.0	7.0
Any Retirement Plan	7.2	6.0	5.0	4.6	4.2	4.1	3.9	4.0	3.9	4.0
401(k)-type Participant	7.6	6.2	5.1	4.7	4.4	4.1	4.3	4.4	4.3	4.3
Prior IRA Participation										
1987 Participants	100	66	53	47	41	39	35	34	33	31
Prior-Year Participants	n.a.	66	68	69	69	71	72	73	73	76

Table 5: IRA Participation Among Taxpayers in the Phase-out Range	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996
Taxpayers in Phase-out Range (th)	10,313	11,179	13,172	11,746	11,453	11,783	13,869	13,982	13,468	12,471
IRA Contributors (th)	1,518	1,262	1,230	1,009	896	879	809	850	765	721
IRA Participation Rate	15	11	9	9	8	7	6	6	6	6
Participants at Limit (thous)	508	366	309	349	295	315	188	203	191	260
Percent at Limit	33	29	25	35	33	36	23	24	25	36
Percent Distribution of Contributors										
Deductible Contribution Only	80	82	81	79	82	84	78	79	73	65
Nondeductible Contribution Only	1	1	2	2	3	2	2	2	2	3
Both Ded and Nonded Contribs	19	17	18	19	16	15	20	20	26	32

Table 6: IRA Participants at the Contribution Limit	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996
Total										
Participants at Limit (thous)	7,840	6,846	6,106	5,997	5,695	5,640	5,407	5,357	5,627	5,852
Percent at Limit	68	67	66	69	70	71	70	70	72	75
By Age										
21 to 30	50	46	51	48	48	46	47	46	50	55
31 to 40	61	61	56	61	61	62	64	61	63	66
41 to 50	69	68	68	69	71	72	70	70	72	75
51 to 60	72	72	72	75	76	77	77	76	79	80
61 to 70	79	78	79	79	82	82	82	78	83	85
Total HH Income (1996 $)										
< $25,000	62	64	60	63	62	62	66	62	64	70
$25,000 - $50,000	63	62	62	61	62	61	59	57	62	64
$50,000 - $100,000	62	61	58	64	67	70	69	70	71	74
> $100,000	91	88	91	90	92	92	91	91	91	91
HH Capital Income (1996 $)										
none	37	34	41	40	38	35	37	34	41	42
< $250	41	41	37	38	44	45	47	47	45	53
$250 - $5,000	67	67	65	69	69	74	73	70	72	75
> $5,000	84	83	85	84	87	87	89	88	89	89
Prior Limit Status										
At Limit in 1987	100	89	86	87	88	87	87	86	86	89
At Limit in Prior Year	n.a.	89	90	92	92	92	93	91	94	95

Table 7
Descriptive Statistics for Longitudinal Variables

	Unweighted Individuals	Weighted Percent Distribution
Total Sample Size	163,828	100%
Permanent Total HH Income (1996 $)		
< $25,000	36,950	43
$25,000 - $50,000	29,089	28
$50,000 - $100,000	32,830	21
> $100,000	64,959	9
Permanent HH Capital Income (1996 $)		
none	18,136	25
< $250	33,347	35
$250 - $5,000	41,006	29
> $5,000	71,339	12
REPP		
< .05	45,774	32
.05 to .20	41,330	28
.20 to .40	26,570	19
> .40	34,514	22
Pension Status		
Never Any	64,216	32
Ever Any	99,612	68
Ever 401(k)-type Participant	58,807	40

Notes
1/ Sample includes all taxpayers ever observed between 1987 and 1996.
2/ Permanent Income measures are averages over all years that an individual appears in the sample.
3/ REPP (Relative Equivalent Precautionary Premium) is a measure of the utility cost of income uncertainty, as defined in the text. This measure assumes a CRRA coefficient of 3.

Table 8
Longitudinal Patterns of Ineligibility for Full IRA Deduction

		Percentage Distribution: % of Years Inelig., if Ever		
		<=50%	50-99%	100%
Total				
Ever Ineligible (thous)	88,558			
Percent Ever Ineligible	48	45	42	12
Percent Ever Ineligible, by:				
1987 Age				
21 to 30	59	52	42	6
31 to 40	70	39	46	15
41 to 50	68	37	44	19
51 to 60	43	45	42	13
1987 HH Income (1996 $)				
< $25,000	28	76	24	0
$25,000 - $50,000	60	55	42	2
$50,000 - $100,000	89	27	51	22
> $100,000	84	33	43	23
Perm. Total HH Inc. (1996 $)				
< $25,000	9	93	7	1
$25,000 - $50,000	65	69	29	2
$50,000 - $100,000	92	20	61	19
> $100,000	84	30	44	26
Perm. HH Capital Inc. (1996 $)				
none	12	76	21	4
< $250	52	52	41	7
$250 - $5,000	67	36	47	17
> $5,000	66	43	41	16
REPP				
< .05	49	26	47	27
.05 to .20	56	45	45	10
.20 to .40	47	56	40	4
> .40	41	66	33	1
Pension Status				
Never Any	17	54	36	11
Ever Any Retirement Plan	63	44	43	13
Ever 401(k)-type Participant	71	38	47	16

Table 9
Longitudinal Patterns of IRA Participation Among All Taxpayers

		Percentage Distribution: % of Years Partic, if Ever		
		<=50%	50-99%	100%
Total				
Ever Participate (thous)	26,238			
Percent Ever Participate	14	64	26	10
Percent Ever Participate by:				
1987 Age				
21 to 30	11	79	18	2
31 to 40	17	72	23	5
41 to 50	21	66	27	7
51 to 60	28	55	34	12
1987 HH Income (1996 $)				
< $25,000	9	70	22	7
$25,000 - $50,000	19	63	27	10
$50,000 - $100,000	23	66	26	8
> $100,000	29	58	31	12
Perm. Total HH Inc. (1996 $)				
< $25,000	5	67	22	11
$25,000 - $50,000	18	63	27	10
$50,000 - $100,000	23	68	25	7
> $100,000	29	59	30	11
Perm. HH Capital Inc. (1996 $)				
none	1	76	17	7
< $250	8	83	14	3
$250 - $5,000	25	65	26	9
> $5,000	36	51	34	16
REPP				
< .05	12	56	26	18
.05 to .20	17	64	28	8
.20 to .40	15	67	26	7
> .40	12	72	24	3
Pension Status				
Never Any	13	49	31	20
Ever Any Retirement Plan	15	71	24	5
Ever 401(k)-type Participant	16	74	22	4

Table 10
Longitudinal Patterns of Maximum IRA Contribution

		Percentage Distribution: % of Years Max, if Ever		
		<=50%	50-99%	100%
Total				
Ever Max (thous)	19,062			
Percent Ever Max	10	7	20	73
Percent Ever Max by:				
1987 Age				
21 to 30	6	10	23	67
31 to 40	12	8	21	72
41 to 50	16	7	21	72
51 to 60	23	7	21	72
1987 HH Income (1996 $)				
< $25,000	6	7	20	73
$25,000 - $50,000	13	10	25	65
$50,000 - $100,000	17	8	24	68
> $100,000	27	2	10	87
Perm. Total HH Inc. (1996 $)				
< $25,000	3	6	19	75
$25,000 - $50,000	12	10	25	65
$50,000 - $100,000	16	8	24	69
> $100,000	27	2	10	88
Perm. HH Capital Inc. (1996 $)				
none	0	11	12	77
< $250	4	13	21	66
$250 - $5,000	19	8	23	69
> $5,000	32	4	16	81
REPP				
< .05	8	9	22	69
.05 to .20	13	8	22	71
.20 to .40	11	6	20	74
> .40	10	5	17	78
Pension Status				
Never Any	11	5	16	79
Ever Any Retirement Plan	10	8	22	70
Ever 401(k)-type Participant	10	10	22	69

Table 11
Results of Random-Effects Probit Regression
IRA Participation

	Coeff	Std Err	Slope*	Elasticity
Eligible for Deduction	**1.395**	0.048	0.075	
Effective Tax Price	**-2.310**	0.196	-0.162	-1.74
Phaseout Range				
In Phaseout	**-0.159**	0.044	-0.011	
Near Phaseout	-0.017	0.053	-0.001	
REPP	**-0.204**	0.102	-0.014	-0.04
Pension Coverage	0.002	0.035	0.000	
Female	-0.056	0.037	-0.004	
Age				
31-40	**0.421**	0.047	0.025	
41-50	**0.535**	0.052	0.034	
51-60	**0.812**	0.052	0.056	
61-70	**0.727**	0.062	0.049	
Total HH Income				
$25,000-$50,000	**0.685**	0.040	0.044	
$50,000-$100,000	**0.774**	0.053	0.051	
over $100,000	**0.817**	0.070	0.055	
HH Capital Income				
0<x<=$250	**0.415**	0.039	0.024	
$250-$5,000	**0.953**	0.039	0.067	
over $5,000	**1.297**	0.054	0.103	
Marital Status				
One-earner Joint	**-0.379**	0.045	-0.025	
Two-earner Joint	**-0.137**	0.041	-0.010	
Dependents				
One	**-0.190**	0.038	-0.014	
Two or More	**-0.307**	0.041	-0.021	

Table 11, continued

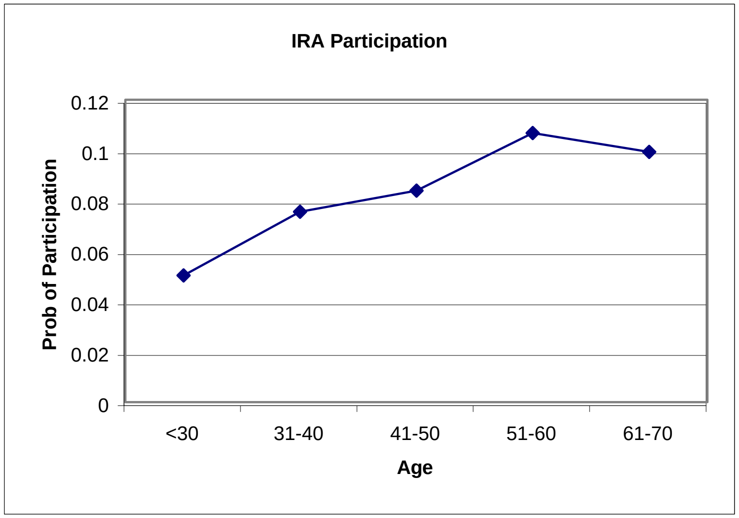
	Coeff	Std Err	Slope*
Year			
1988	**-0.099**	0.040	-0.008
1989	**-0.244**	0.042	-0.018
1990	**-0.236**	0.042	-0.018
1991	**-0.302**	0.043	-0.017
1992	**-0.273**	0.045	-0.022
1993	**-0.182**	0.045	-0.020
1994	**-0.170**	0.045	-0.013
1995	**-0.231**	0.046	-0.017
1996	**-0.192**	0.045	-0.014
Constant	**-2.971**	0.185	-0.208
RE Parameters			
Std Dev	**1.239**	0.015	
Rho	**0.606**	0.006	
mean dependent	0.046		
log likelihood	-17,620,025		
n	103,805		
number of groups	12,754		
sum of weights	138,174,851		

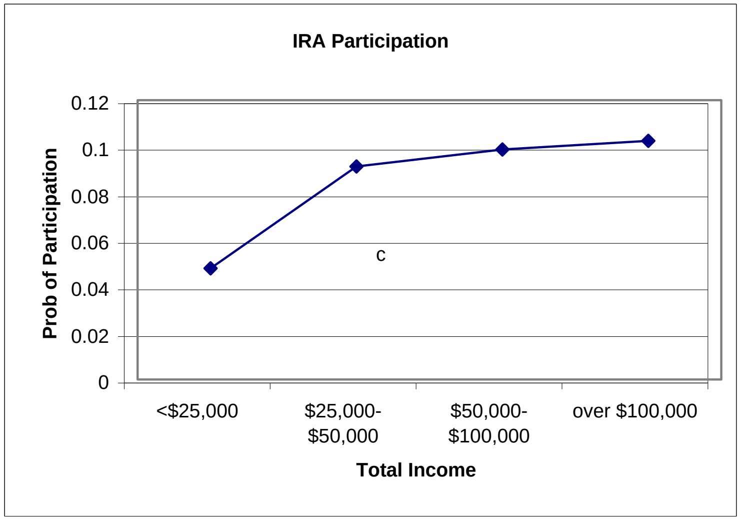
bold = statistically significantly different from zero at the 5% level

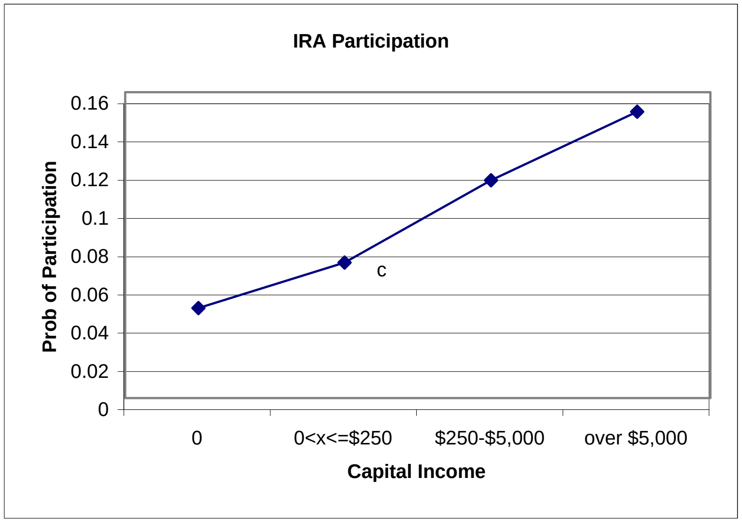
*Slope is the marginal effect for continuous variables and the discrete effect of moving from zero to one for indicator variables.

Figure 2

Results of Random-Effects Probit Regression: Selected Slopes, All Other Variables at Mean Values







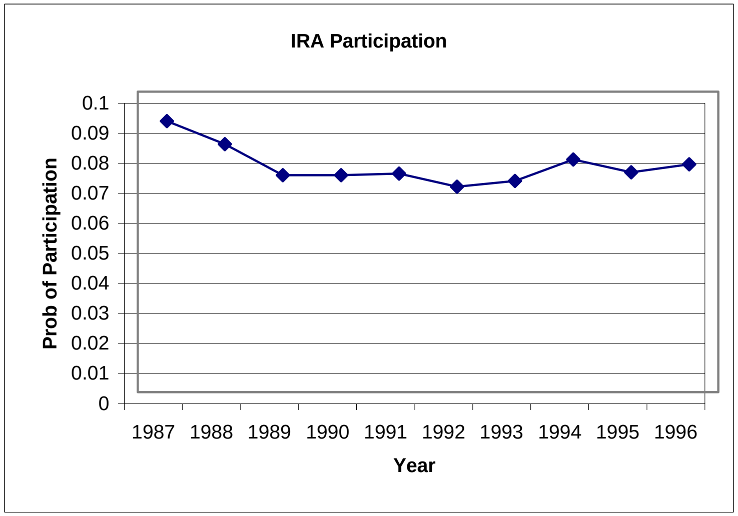


Table 12
Results of Random-Effects Probit Regression
Maximum Contribution

	Coeff	Std Err	Slope*	Elasticity
Eligible for Deduction	**0.170**	0.033	0.030	
Effective Tax Price	**-0.707**	0.136	-0.125	-0.15
Phaseout Range				
In Phaseout	**-1.347**	0.028	-0.251	
Near Phaseout	0.260	0.033	0.045	
REPP	**0.737**	0.055	0.131	0.04
Pension Coverage	-0.150	0.023	-0.027	
Female	-0.109	0.023	-0.019	
Age				
31-40	**0.352**	0.032	0.066	
41-50	**0.617**	0.035	0.115	
51-60	**0.830**	0.035	0.152	
61-70	**1.044**	0.040	0.187	
Total HH Income				
$25,000-$50,000	**0.286**	0.027	0.053	
$50,000-$100,000	**0.431**	0.035	0.080	
over $100,000	**1.281**	0.048	0.218	
HH Capital Income				
0<x<=$250	**-0.188**	0.030	-0.036	
$250-$5,000	**0.444**	0.027	0.081	
over $5,000	**0.772**	0.032	0.137	
Marital Status				
One-earner Joint	**-0.127**	0.030	-0.022	
Two-earner Joint	**-0.333**	0.030	-0.059	
Dependents				
One	**-0.104**	0.025	-0.018	
Two or More	**-0.171**	0.027	-0.030	

Table 12, continued

	Coeff	Std Err	Slope*
Year			
1988	**-0.087**	0.025	-0.016
1989	**-0.088**	0.026	-0.016
1990	**-0.043**	0.027	-0.016
1991	**0.019**	0.028	-0.008
1992	**0.067**	0.029	0.003
1993	**0.075**	0.029	0.012
1994	**0.001**	0.029	0.000
1995	**0.083**	0.030	0.015
1996	**0.207**	0.030	0.036
Constant	**-0.017**	0.124	-0.003
RE Parameters			
Std Dev	**1.290**	0.011	
Rho	**0.625**	0.004	
mean dependent	0.696		
log likelihood	-34,412,573		
n	102,050		
number of groups	28,228		
sum of weights	86,794,310		

bold = statistically significantly different from zero at the 5% level

*Slope is the marginal effect for continuous variables and the discrete effect of moving from zero to one for indicator variables.

Figure 3
Results of Random-Effects Probit Regression: Selected Slopes, All Other Variables at Mean Values