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Behavioral Aspects of Retirement Savings: How do 401(K) Plans Affect Household Asset Accumulation?

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BEHAVIORAL ASPECTS OF RETIREMENT SAVINGS: HOW DO 401(K) PLANS AFFECT HOUSEHOLD ASSET ACCUMULATION?

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Dedication

For my parents.

Acknowledgment

Getting to this point has required the help and patience of many people to whom I owe a great deal of thanks. First, my parents who greatly supported my efforts to obtain this degree. I would not be the person I am today without them. Next my sisters and brothers have been very encouraging and supportive. I also owe a great deal of thanks to Dr. Gerald Whitney for agreeing to chair this dissertation. I have learned a great deal under his supervision and very much am thankful for his patience and understanding as I fumbled my way along this path. I have also learned much from my co-chair, Dr. Arja Turunen-Red, in particular an appreciation for the abstract and for helping me see that I need not be afraid to put forth my best efforts. I also appreciate the efforts of my committee: Elton Daal, Neal Maroney, and David Tufte. Thanks also to the many excellent faculty members at UNO from whom I have learned much. Lastly, for my many friends in the graduate program and not in the graduate program. I appreciate all the conversation and laughs.

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Abstract

The nature of employee retirement plans has changed dramatically over the past fifteen years as employers have been replacing traditional defined benefit retirement plans with defined contribution plans like the 401(k) plan. This dissertation is focused on the impact that 401(k) plan have on household asset accumulation. The first essay looks at how much asset accumulation can be attributed to 401(k) plans as opposed to other factors such as demographics and saver type characteristics. Overall, the conclusions are consistent with recent research that says these plans induce a reshuffling of assets rather than being funded through a reduction in consumption. Controlling for cohort effects reduces the amount of wealth attributable to 401(k) eligibility to a negligible (and statistically insignificant) amount. The second essay considers the impact that borrowing against the assets in 401(k) plan might have on household asset accumulation. Most personal finance advice warns against borrowing against a retirement plan because of the potential negative impact on retirement wealth. This is especially true for borrowers who are also undisciplined savers and do not or cannot maintain their retirement plan contributions during loan period or who separate from their employers before the loan is repaid. For good savers a retirement plan loan only has a modest impact on retirement wealth. Only modest make-up contributions would need to be made to mitigate the impact of a retirement plan loan. It seems that many borrowers may be using retirement loans because they are in financial difficulty. It also appears that borrowers are trying to maintain their retirement savings, but their asset accumulation within broader measures of wealth is below that of households that do not have outstanding 401(k) loans

Introduction

Retirement planners think of retirement security as a three-legged stool, with the legs being income received from Social Security, a reliance on private savings, and finally income from employer provided pension. Over the past fifteen years the employer provided leg has been undergoing a dramatic change with the responsibility for this leg shifting from employers to employees. When we think of an employer provided pension we generally think of a defined benefit plan. In a defined benefit plan an employee receives a monthly payment whose amount is calculated using a formula based on their length of service and final salary (or an average of the last years' salaries). By the mid 1990s, much attention was focused on a different kind of retirement plan in which employees made contributions to their own private account, about which they could make the investment decisions, with the expectation that this account would become their own retirement nest egg. These accounts are called defined contribution plans and the 401(k) plan, named after the relevant section of the tax code, is the most common kind of plan.[1]

There are several reasons for this shift from defined benefit to defined contribution plans. Regulatory burden is an important reason. As regulators sought to provide greater protections to employees' retirement income, companies became less willing to provide these defined benefit plans. In addition, the manufacturing industry, most certainly because of high labor union concentration, is a large provider of defined benefit pension coverage. As the percentage of the labor force that is employed in manufacturing has decreased, so has defined benefit pension coverage.

The largest implication of this shift from defined benefit to defined contribution plans is that the responsibility and risks for the employer provided leg increasingly rests with the employee. Among these responsibility and risks are participation decisions, investment

[1] Public employees have a similar kind of plan called a 403(b) plan. From an employees point of view there is little difference between a 401(k) and 403(b) plan.

decisions, return risks, and longevity risks. There is generally no participation decision with regards to defined benefit plans. This pension coverage is included as part of an employee's contract. However, participation in a 401(k) plan does require an active decision to participate by the employee. It is interesting to note that according to the Federal Reserve's Survey of Consumer Finances (SCF) about 25 to 30 percent of households eligible for a 401(k) plan do, in fact, decline participation. Employees also must decide how much to contribute to their 401(k) plans and in which investment options to place them. In defined benefit plan it is the responsibility of the employer to set aside enough funds and invest them wisely enough so that the plan is able to meet the financial obligations to its current and future retirees; that is, that the plan is not "underfunded". In a 401(k) plan, an employee has no recourse should they fail to make contributions enough to provide for an adequate retirement. Nor is there any recourse should the investment decisions made by an employee result in poor returns. Recently this has led some to question whether 401(k) plans are the panacea they were perceived to be during the late 1990s when employees saw their 401(k) plan balances grow due to an ever increasing stock market. Finally, the holder of 401(k) plan has no protection against longevity risk should they outlive the assets in the plan, while the obligation of a defined benefit plan is to provide the monthly payments for the life of the retiree.

This dissertation is concerned with the employer provided pension leg of the retirement security stool. Specifically, it examines two issues of interest with respect to 401(k) plans: whether the plans are achieving their policy goal of increasing household saving and the determinants and impact of borrowing against the assets in a 401(k) plan.

The first essay examines the extent to which the assets in a 401(k) plan could be considered new savings rather than a reshuffling of existing household assets. While households are making use of these plans (the average balance in 2001 in a 401(k) plan among households that are eligible for a plan was $38,145), it is possible to offset these funds by reducing other savings (i.e. by not making contributions to a savings account). The literature has reached

varying conclusions. Some of the early literature found a very definite new savings effect while later attempts that challenged the methodology found much less of an effect. The first essay examines the new savings issue using recent high quality wealth data and controls for lifecycle effects. The extent to which households accumulate assets as they age is an important determinant of saving that has not been previously addressed in this literature. After controlling for these lifecycle effects I find an almost negligible effect that the plans have on household asset accumulation.

An intriguing feature of many 401(k) plans is the ability to borrow the funds for use before retirement. This is generally against the advice of almost any financial planner because of the potential to undermine retirement wealth. In the second essay, I examine three issues with regards to borrowing. First, I examine the characteristics of households that have an outstanding loan against their 401(k) plan; then I examine the impact that borrowing could have on retirement wealth; finally, I compare asset accumulation of households with outstanding loans with those that do not. The conclusions from this essay are that households with outstanding loans appear to be in worse financial shape and worse savers than households without loans, that borrowing could have only a small impact on retirement wealth if the household continues to make contributions to the plan while repaying the loan, and that households with loans appear to be maintaining their retirement assets, however their overall wealth may be worsening over time.

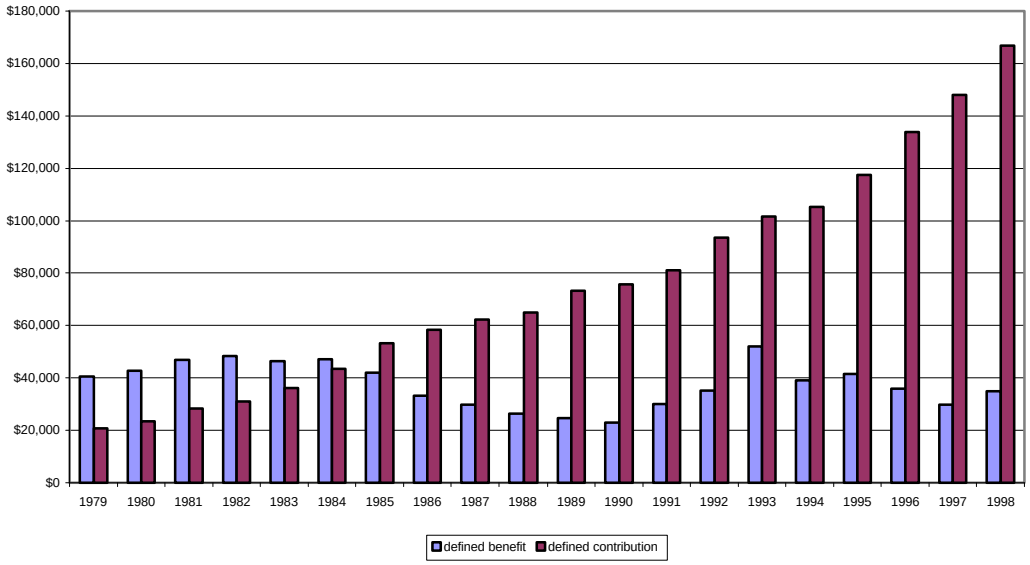
Chapter 1: 401(k) plans and (No) New Savings: Evidence from Recent Survey Data Using Cohort Analysis

Introduction

Whether or not the baby boom generation will have accumulated enough assets to provide for an adequate retirement has become an increasingly important concern. While most workers will receive social security benefits in their retirement, it's not certain that they are saving enough in other forms. One reason for this focus on non-social security wealth is the trend in employer-sponsored pensions that has occurred in the past twenty years. Fewer and fewer employers are offering the traditional employer funded defined benefit retirement plan where employees receive a set amount each month based on their length of service and final salary. Instead employers have been offering defined contribution plans, where an individual employee's (and—sometimes—their employer's) contributions are accumulated in an account that accrues investment returns until retirement. The account is then used as a source of retirement income. According to the Pension and Welfare Benefits Administration (US Department of Labor (2001-2002)) in 1983, defined contribution plans accounted for 70.95 percent of all pension plans. Fifteen years later defined contribution plans accounted for 92.27 percent of pension plans. As figure one shows, twenty years ago contributions to defined benefit plans were slightly greater than contributions to defined contribution plans; since then contributions to defined contribution plan have grown at an annual rate of 5.89 percent so that in 1998 defined contribution plan contributions were nearly four times greater than in 1984 while defined benefit plan contributions were seventy five percent of their 1984 level. The 401(k)[2] plan is the most common defined contribution plan, accounting for approximately 70 percent of all account type plans. 401(k) plans are provided by the private sector; employees in the public sector have access to 403(b) plans, which are very similar to the 401(k) and are included with 401(k) plans in the analysis in this paper.

[2] Named after the relevant section in the tax code.

Figure one: Contributions to defined benefit and defined contribution plans (millions of dollars)



There are several implications of this shift in pension coverage.[3] Most importantly in defined contribution plans the burden and risk of ensuring retirement income rest with individual employees who have the responsibility for making decisions about participation and the amount of contributions to the plan, choosing among investment options, bearing investment risk in case of poor asset returns, and bearing the longevity risk in case they outlive the assets in the plan.[4] In contrast, in defined benefit plans the employer bears all of these burdens.[5]

401(k) plans have several features that make them attractive programs for saving for retirement. When firms offer a 401(k) plan they must make them available to most employees—and not just highly compensated ones—in order to receive favorable tax treatment. Secondly, employee contributions are made with pre-tax earnings, so income tax is deferred until withdrawal, presumably at a lower tax rate in retirement; in addition, the employer often

[3] See William G. Gale and Joseph M. Milano (1998) for a discussion of the implications of the shift from defined benefit to defined contribution plans.
[4] Retirees can insure against longevity risk by purchasing an annuity.
[5] The most important issue in defined benefit plans seems to be the underfunding that exists if the present value of its future pension obligations is greater than the plan's assets. These arouse concern especially during market downturns. See Simon Kwan (2003) or Russell W. Cooper and Thomas W. Ross (2002) for more information.

voluntarily matches a portion of the employee contributions.[6] Third, the IRS imposes a 10 percent penalty for withdrawals made before the age of 59 ½ in order to discourage the use of retirement funds for pre-retirement consumption. Because of these features these plans are sometimes referred to as "savings incentive plans" and have recently been expanded to include other reasons for savings such as a child's education (education IRA) or for future medical expenses.[7] During the boom years of the 1990s 401(k) plans achieved almost mythical status as participants saw their account balances grow in line with large stock market returns. The subsequent downturn and horror stories of employees in failed corporations such as Enron losing much of their nest egg gave rise to magazine articles with titles such as "Can We Fix the 401(?)" (Money, April 2003). This somewhat tempered the enthusiasm for these plans. Given the risks noted above and the regulatory burden of administrating these plans, employers are unlikely to return to offering defined benefit plans.

Clearly 401(k) plans will continue to play an increasingly important role in Americans' retirement savings plans. A recent Gallup poll (Gallup, 2004) finds that 57 percent of non-retired Americans are very or moderately worried about their retirement income. While only 20 percent of currently retired individuals surveyed use their 401(k), IRA or other retirement account as a major source of retirement income, 54 percent of non-retired Americans expect their 401(k) plans to be a major source of retirement income. An important and unresolved empirical question is whether 401(k) plans do achieve their stated goal of encouraging savings. While total assets in defined contribution plans increased from $280 billion (or $9,600 per participant) in 1983 to $2 trillion (or $36,000 per participant) in 1998 (US Department of Labor, 2001-2002), judging the effectiveness of the plans needs to consider whether these assets

[6] The tax reforms of 2000 increased the contribution limit to $11,000 in 2002 rising to $15,000 in 2006; it also allowed for "make-up" contributions for individuals older than 50 years old.

[7] It seems that every few years there are proposals in Congress to change the tax code to better help people save. A cynic might note that while the proposals generally decrease an individual's lifetime tax liability they likely trigger a short-term increase in government revenue as taxes usually need to be paid on roll-overs of assets from old saving plans to the new plans.

are a result of shifting from non-401(k) assets and represent savings that would have occurred in the absence of the plan or whether they are indeed new savings. For example, as a direct way of substitution households could simply save less in their regular savings or brokerage accounts in amounts equal to their retirement plan contributions. A more subtle way of substitution would be to take on more debt than otherwise would be the case in the absence of the program. For example, a household could increase their 401(k) balance by $1000, purchase an automobile, see they have don't have as much in their checking accounts as before, and reduce their down payment by adding a thousand dollars to the car note. Both transactions increase 401(k) balances; the first leaves net financial assets and net worth unchanged, while the second would show an increase in net financial assets but leave net worth unchanged. These scenarios highlight the importance of checking a number of assets classes for possible sources of substitution. Overall, the evidence is contradictory, with some research indicating that 401(k) plans have increased savings, while other research finds little or no evidence to support this conclusion. This paper wades into the controversy and offers another perspective. I hope to advance the literature in several respects. First, I use recent and high quality data. Much of the research uses data from the 1980s and early 1990s, about the time that defined contribution plans began experiencing their dramatic growth. Secondly, I track age cohorts; that is, I follow over time groups that were the same age in a particular year. This allows me to take into account lifecycle savings effects that may not have been fully controlled for in prior research. The conclusions of this essay are broadly consistent with the "substitution" camp as there is little evidence, especially in the cohort analysis, that 401(k) plans lead to new savings. Other factors likely explain the instances where patterns of asset accumulation may suggest 401(k) plans result in new savings.

The paper proceeds as follows. In the next section, I review the literature relevant to the "new savings or substitution" issue. Then, I describe the methodology and data used. Third, I describe some recent trends in retirement savings and 401(k) plans, then present results that

would be considered an update to a recent paper (Karen Pence, 2001) closely related to this paper. I also examine the results for a sample of households with less than one million dollars of net worth. Then I examine the results of tracking cohorts for my full sample. Finally, I offer a concluding discussion.

Literature Review

In this section, I first look at the most relevant literature—the substitution versus new savings issue—then I briefly consider how retirement savings relate to the broader savings literature.

The primary fit of this essay is within the literature that considers whether tax incentive savings plans such as IRAs and 401(k) plans increase household savings or are a substitute for other forms of savings. The results are inconclusive as one group of researchers favors the substitution argument and another group finds evidence of a "new savings" effect. The earliest work focuses on Individual Retirement Accounts (IRAs) as these were more widespread earlier than 401(k) plans. Although both IRAs and 401(k) plans were authorized in the 1970s, the tax reforms of 1982 caused a large increase in the use of IRAs while the 401(k) plan gained widespread use later in the 1980s and early 1990s. An example of the work on IRA plans is Steven F. Venti and David A. Wise (1990)[8] who argue that increasing the limit on IRA contributions in the 1980s would have resulted in substantial increases in IRA contributions, two-thirds coming from reductions in consumption with very little from reductions in other assets. William G. Gale and John Karl Scholz (1994)[9] find the opposite to be true as most IRA savers tend to already have substantial non-IRA assets or are older than age 59 and do not face the penalty for early withdrawal. To determine if IRA savings represent new savings means determining if the IRA contributions would have been made in absence of the IRA program; households with large amounts of financial assets may find it easier to shuffle assets to IRAs. Gale and Scholz also note the importance of controlling for unobservable differences of saver

[8] Along with James Porterba these are the primary "new savings" camp researchers.

type. For example, two people may be alike in observable aspects like age, education, and income yet one may be inclined to save more than the other. If the inclination to save more is not accounted for then higher balances for participants in a savings program could wrongly be attributed to the savings program and not the saver type.

In the late 1980s households began contributing more to 401(k) plans than to IRAs. James Porterba, Steven Venti, and David Wise (1995) attempt to determine if 401(k) contributions are substitutes and they avoid the saver heterogeneity issue by comparing the change in asset balances among "like savers". They divide the sample based on 401(k) eligibility and IRA contributor status. Using a series of cross sections from 1984 to 1991, they examine the changes in assets of these homogeneous saver groups by comparing, for example, asset balances of a typical 40 year old in 1984, 1987, and 1991. An important assumption in these comparisons is that the only difference between a 40 year old in each of these of these years is that the 1987 group had three more years (and the 1991 group six more years) of exposure to 401(k) plans than the 1984 group and the 1991 group had six more. If 401(k) plans were substituting for other forms of saving then they would expect non-401(k) savings of eligible families to have declined between 1984 and 1991. For households eligible for 401(k) plans their median total financial assets were 17 percent larger in 1991 compared to 1987 while the non-IRA-401(k) financial assets remained nearly unchanged. For families not eligible for 401(k) accounts their median financial assets were also nearly unchanged for the same four-year time period.

In a comment to a paper by Eric M. Engen, William G. Gale, and John Karl Scholz (1994) B. Douglas Bernheim (pages 152 – 166) offers several comments on the attempt to determine the substitutability of saving incentive programs. The early work on IRA and 401(k) plans uses data from the early 1980s until 1991 during which the use of IRAs and 401(k) plans expanded considerably. Bernheim notes that it is likely that the types of individuals using these accounts had also changed. For example, the first owners of 401(k) plans may have been very good savers

[9] These are the primary "savings incentive plans are substitutes" authors.

while the later participants may have been lesser savers. If true, this makes comparing asset balances over this time span problematic because the saver types in the later group may be much different than the earlier groups. This criticism may be countered by using more recent data, after 401(k) plans were well established in workplaces. Some recent efforts, such as Karen Pence (2001), and this paper, use recently available data where 401(k) eligibles and other saver groups are more likely to be homogeneous over time. Another concern is that the Venti and Wise (1990) and Poterba, Venti, and Wise (1995) studies examine only net financial assets. If 401(k) plans are being funded from non-financial assets then financial assets would increase leaving the impression of new savings, when they are, in fact, being offset by some other, illiquid, asset. More recent research (Engen and Gale (2000) and Pence (2001)) emphasize this point and draw conclusions based on net worth as well as net financial assets. Finally, the tax deductibility of contributions means that national savings is lowered. An important policy implication is that even if these plans raise personal savings their overall impact could also be judged by how much—if at all—they raise national savings. Addressing this issue Daniel J. Benjamin (2003) concludes that about 25 percent of 401(k) balances in 1991 represent new national savings while also finding that about half of the balances are new private savings.

In principle, there should be no reason to focus on retirement savings versus other forms of savings. In classical savings models[10] agents engage save in order to smooth consumption over time. The work of Robert Hall (1978), Angus Deaton (1991), and Christopher D. Carroll (1997) introduces income uncertainty so that a precautionary savings motive arises in order to have a "buffer-stock" of savings in case of negative income shocks. In these models, households with higher income uncertainty should have higher savings.[11] Most models of savings behavior have not included an explicit retirement period (David I. Laibson, Andrea Repetto, and Jeremy Tobacman (1998) and Ian Irvine and Susheng Wang (2001) are recent exceptions) so it is not

[10] There are many descriptions of such models. John Muellbauer and Lattimore (1995) or Christian Gollier (2000) chapters 15 and 16 are two examples.
[11] See Christopher D. Carroll and Andrew A. Samwick (1997) for empirical support of this idea.

certain how retirement might affect savings behavior except to say that households need to accumulate assets for retirement.[12]

Households often say that they are saving inadequately for retirement and feel they lack the discipline required for good savings habits. This presents a difficulty for classical models. Unless households experience frequent negative income shocks their savings should be enough for a known period of zero income in the future. Recent work in behavioral economics, such as David Laibson's (1997) widely cited Golden Eggs model, considers the difficulty households have in long term planning. These models adjust the discount function so that the distant future is discounted more heavily than the near future, which leads to preference reversals. For example, agents may say they want to begin saving more for retirement "tomorrow" yet when tomorrow arrives, they spend rather than save promising to begin saving the "next tomorrow". Such hyperbolic discounters[13] look for mechanisms to bind their future behavior. For example, Richard Thaler and Sholomo Benartzi (2001) describe a saving plan they have implemented in which employees choose to have a portion of future pay increases and bonuses automatically placed in a savings account in order to remove the temptation to spend it. Likewise, retirement savings plans such as IRAs and 401(k) plans should help participants commit to a savings course of action by providing either incentives for maintaining or penalties for deviating from a prior plan. Most plans also take away the paycheck-to-paycheck savings decision by providing automatic payroll deduction of employee designated contributions. Even in the absence of penalties and incentives the plans could act as mental accounts in the Hersh M. Shefrin and Richard H. Thaler (1988) sense. While 401(k) programs should help households have more savings, there are reasons to think that this may not always be the case. A General Accounting Office (1997) reports that households may be reluctant to participate in such savings programs if

[12] There are empirical studies of how retirement affects the portfolio choices of households. See James M Poterba, John B. Shoven, and Clemens Sialm (2004) or John Y. Campbell, Joao F. Cocco, Francisco J. Gomes, and Pascal J. Maenhoutt (1999).

they do not have access to their funds. This highlights the importance of plan design: features such as the penalty for early withdrawal, and the ability to borrow or access the funds prior to retirement may encourage participation or savings in one household but do the opposite for another.[14] In addition, if households are optimally saving to reach a wealth goal then tax incentive savings plans allow them make the same pre-tax contributions and reach their goal earlier or save less and still achieve their savings goal.

Data and Methodology

The Survey of Consumer Finances (SCF) is a triennial survey conducted on behalf of the Board of Governors of the Federal Reserve, the most recently available was conducted from March to October of 2001. The SCF collects very detailed information on US household finances, such as types of assets owned and their values, amount and types of debt and loans owed, detailed demographic information on household members, and a number of opinion variables that can proxy for saver type in data analysis. Surveys prior to 1995 have a less accurate definition of 401(k) plan eligibility, so I use the three most recent surveys: 1995, 1998, and 2001. Each survey interviews different sets of households so there are three separate cross sections rather than one panel data set; each wave of the SCF could be thought of as a balance sheet of American household finances. The SCF is also considered to be among the highest quality of wealth data available (Richard T Curtin, F. Thomas Juster and James N. Morgan (1989)). As table one indicates approximately about 4,300 are interviewed in each survey with almost half being included in my sample of households where either the head of the household is less than 64 years old in 1995, 67 in 1998, or 70 in 2001, and the head or the spouse is working for someone else and neither is self-employed.[15]

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[13] Compared with the more usual exponential discount function. See Choice Over Time (1992), Laibson (1997), and Laibson, Repetto and Tobbacman (1998) for more details regarding how the hyperbolic discount function leads to preference reversals.

[14] See James J. Choi, David Laibson, and Brigitte C. Madrian (2004) for a survey of plan design issues.

[15] The self-employed have separate savings incentive programs and are excluded from the samples of the related research mentioned earlier. See Laura Power and Mark Rider (2002) for a discussion of the impact of these programs on the self-employed.

Table One: Sample Descriptive statistics

	1995 SCF	1998 SCF	2001 SCF
Number of households questioned in SCF	4,299	4,305	4,442
(Unweighted) number of households in sample (Head or spouse working, neither self-employed, not older than 64 in 1995)	1990	1940	1950
Weighted percentage of dataset in sample	55.89%	56.35%	53.04%
Percentage in sample that is eligible for 401(k) plan	46.26%	54.33%	53.04%
Percentage of eligibles that participate in 401(k) plan	68.29%	76.65%	76.15%

This essay follows previous literature by examining the difference-in-differences (see Jeffrey M. Wooldridge (2000, chapter 13) for a discussion and example of this approach and Engen and Gale's (2000) work for a derivation of the equation for estimating savings behavior within income groups). The essence of this approach is to compare changes between households eligible for 401(k) plans with those that are ineligible. If the assets for households that are eligible for 401(k) plans are increasing faster over time than ineligible households, then this is taken as evidence in support of 401(k) plans increasing savings. Following Poterba, Venti and Wise's (1995) eligibility experiment, the literature compares eligible and ineligible households, rather than participating and non-participating households. Since employees choose participation and firms choose eligibility Benjamin (2003) notes it is more plausible that eligibility—given observed household characteristics—is conditionally random than participation is.

A concern in tracking savings behavior over time is to properly account for lifecycle effects. In typical lifecycle models (see Martin Browning and Thomas F. Crossley (2001) or Christopher D. Carroll (2001) for discussions of lifecycle models of saving and consumption) households borrow when young, repay this debt and accumulate assets when middle-aged, and

draw down these assets when old. Analysis that does not properly account for these lifecycle effects may wrongly attribute asset growth to a 401(k) plan savings effect instead of to the lifecycle effect. A unique feature of this paper is that the savings behavior of cohorts—groups of people born in the same calendar year—are tracked over successive cross-sections of data in order to disentangle lifecycle from 401(k) savings effects.[16] An advantage of using panel data is that an individual's behavior can be tracked over time. This is not possible using cross-sectional data like the SCF since different households participate in each survey. However, cohort analysis does allow me to examine life-cycle effects. For example, I can follow asset accumulation of 30 year olds in 1995, 33 year olds in 1998, and 36 year olds in 2001. As long as the characteristics of the cohorts do not change in successive cross sections then inferences can be made based on the behavior of cohorts. This should not be a concern in a nationally representative survey like the SCF since the changes in cohort characteristics reflect changes in the underlying population. In this paper I define eight cohorts as follows. The less than 30 cohort contains households where the head of the household was less than 30 years old in 1995, less than 33 years old in 1998, and less than 36 years old in 2001. The 30 – 34 cohort consists of households where the head was 30 to 34 years old in 1995, 33 to 37 years old in 1998, and 36 to 39 years old in 2001. The other six cohorts are similarly defined in five-year increments based on their age in 1995: 35 – 39, 40 – 44, 45 – 49, 50 – 54, 55 – 59, and 60 – 64[17].

I have two estimating equations. The first does not account for lifecycle effects while the second tracks the savings behavior of cohorts. The jth household's wealth is estimated as

$$\begin{aligned} W_j = {} & a_I + (a_E - a_I) * ELIGIBLE_j + b_I * X + (b_E - b_I) * (X * ELIGIBLE_j) + \\ & d_I * SCF98_j + g_I * SCF01_j + \\ & (d_E - d_I) * (SCF98_j * ELIGIBLE_j) + (g_E - g_I)(SCF01_j * ELIGIBLE_j) + e \end{aligned} \quad (1)$$

[16] I thank Dr. Neal Maroney for suggesting the cohort analysis.

[17] Using fewer than five-year increments does not allow enough observations for each of the cohorts. Also, I wanted to make sure that a cohort did not span age 59 ½since the effect of not facing the penalty on early withdrawals may affect asset accumulation around this age.

where W_j is a measure of wealth (net financial assets, non-housing net worth, net worth), *ELIGIBLE* is a dichotomous variable that takes the value of one if a household is eligible for a 401(k) plan and zero otherwise, *SCF98* and *SCF01* equal one if a household is in the 1998 or 2001 survey and zero otherwise, and X is a matrix of explanatory variables thought to be related to savings behavior. The explanatory variables include demographic variables found in most studies of savings behavior such as education, income, marital status, and number of household members. Also included are a number of variables thought to be related to saver type. One of the problems in studying savings behavior is that there may be selection bias: people who are good savers will be attracted to 401(k) plans and will save more, but the savings effect may be attributed to the retirement program and not the fact that good savers save more. Fortunately, the SCF asks a number of questions to help identify saver type. These variables include the primary reasons for savings (i.e. retirement, emergencies, education), length of savings horizon, whether a household has an Individual Retirement Account (IRA), bequest motives, and tolerance for risk. I discuss the demographic and saver type variables in greater detail in the following section that discusses recent trends in retirement savings behavior. This estimation is similar to Pence's except that 1) I use the 2001 survey in addition to the 1995 and 1998 surveys and 2) I include an $X * Eligibility$ matrix of explanatory variables, where Pence does not[18].

For the savings effect within cohorts I estimate

$$
\begin{aligned}
W_j = {} & a_I + (a_E - a_I)ELIGIBLE_j + B_I X + (B_E - B_I)X * ELIGIBLE_j + \\
& \sum_{k=2}^{8} f_{I,k} * C_{j,k} + \sum_{k=2}^{8} (f_{I,k} - f_{I,k}) * C_{j,k} * ELIGIBLE_j + \\
& \sum_{k=1}^{8} d_{I,k} * C_{j,k} * SCF98_j + \sum_{k=1}^{8} g_{I,k} * C_{j,k} SCF01_j + \\
& \sum_{k=1}^{8} (d_{E,k} - d_{I,k}) * C_{j,k} * SCF98_j * ELIGIBLE_j + \\
& \sum_{k=1}^{8} (g_{E,k} - g_{I,k}) * C_{j,k} SCF01_j * ELIGIBLE_j + e
\end{aligned}
\qquad (2)
$$

[18] It seems that Pence implicitly assumes these coefficients are equal to zero although they may be important in

where W_i, ELIGIBLE, SCF98, SCF01, and X are defined as for (1) and C_k indicates equals one if the head of the household is in the k^{th} cohort and zero otherwise. The key coefficients in (1) and (2) are $(d_E - d_I)$ and $(g_E - g_I)$, which indicate the extent to which eligible households' wealth accumulation differs from ineligibles. If eligibles are saving more than ineligibles then both coefficients should be positive with $(g_E - g_I)$ greater than $(d_E - d_I)$; that is, eligible households' wealth would have been increasing from 1995 to 1998 relative to ineligible households and the additional contributions suggest that wealth in 2001 would be higher than in 1995 and 1998. In (1) $(g_E - g_I)$ indicates the wealth accumulation for the entire sample, while in (2) the wealth accumulation is within each of the eight cohorts.

Given the richness of the SCF there are a large number of explanatory variables that could be included in the estimation, with many of the variables likely to be highly correlated. Using a large number of correlated explanatory variables is likely to lead to parameter estimates that are of the wrong sign and / or have large standard errors that may lead to many insignificant parameter estimates (see R. Carter Hill and Lee C. Adkins (2001) and Peter Kennedy (1998, chapter 11) for a more complete discussion of the effects of using collinear explanatory variables). In an effort to avoid including too many collinear variables and to ensure a parsimonious model specification I use a testing down (also known as general-to-specific) methodology advocated by Kennedy (1998, chapter 5) or David F. Hendry (1993). I begin with a general model that includes a large number of explanatory variables then eliminate the variable with the least statistical significance from this general model; this model is tested against the general model. If this more specific model is not rejected as being different from the general model the next least significant variable is eliminated and this model is tested against the general model. The process of eliminating variables continues until a model is significantly different from the general model; this specific model is then used for the analysis.

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explaining eligible households' asset accumulation.

As noted previously and discussed in greater detail in Angus Deaton (1997), wealth data is very skewed. Out of concern for this potential source of heteroskedasticity ordinary least squares regressions have not been considered appropriate by researchers examining the savings impact of retirement plans. Instead robust estimation techniques may be more appropriate when the underlying assumptions of the classical regression do not hold—homoskedastic errors, most importantly in this case. In addition, when data is not normally distributed the mean may not be the best measure of central tendency as it can be very sensitive to outliers. As the median is less sensitive to outliers most research on the effect of retirement plans uses median regression (also called least absolute value (LAV) regression; that is, finding the best fit through the median, rather than the mean, of the data.[19, 20]

It is also common to transform a variable when it is not normally distributed. As is evident from the descriptive statistics to be discussed later, the distribution of wealth among US households is highly skewed which can result in a problem of heteroskedastic errors if the dependent variable in regressions is a measure of wealth. Taking the natural logarithm of the dependent variable—a common procedure for dealing with heteroskedasticity—is not desirable if there are many negative observations. In the present case as approximately ten percent of the

[19] See David Birkes and Yadolah Dodge (1993) or Anthony Atkinson and Marco Riani (2000) for further discussion of robust estimation and analysis.

[20] Median regression is just one of several robust estimation techniques. Peter Huber (1964) introduces the idea of M-estimation. Birkes and Dodge (1993) describe M-estimation as taking advantage of least squares regression when there are no outliers and median regression when there are. What the three techniques share is that they are minimizing some error term function, $r(e)$, where $e = y_i - (a + bx_i)$. Looking at this function for each of these techniques, you can see how M-estimation falls in between least squares and median regressions. Least squares minimizes the sum of squared error terms, $r(e) = e^2$, median estimation minimizes the sum of absolute deviations, $r(e) = |e|$, and Huber m-estimation minimizes $r(e)=\begin{cases} e^2 & \text{if } -k \le e \le k \\ 2k|e|-k^2 & \text{if } e < -k \text{ or } k < e \end{cases}$ where k = 1.5* $\hat{s}^2$, and $\hat{s}^2$ = 1.483 * MAD, and MAD is the median of the absolute deviations. The size of the error term determines how the error is handled by $r(e)$. M-estimation behaves like least squares for small errors and median regression for large errors. The value of k is at the researcher's discretion; for large values of k the m-estimate is very close to the least squares estimate. For very small values of k the m-estimate is very close to the median regression estimate. Originally, I had planned on using the Huber estimation but I found that the parameter estimates generally fall between the OLS and LAV coefficients and add little to the analysis**.** In addition, the interpretation of the estimates is not as clear as OLS (the effect on the conditional mean) and LAV (the effect on the conditional median). For comparison, the OLS, Huber, and LAV estimates are presented in table six for the level of net financial assets specification; for all other specifications I present and focus on the LAV estimates only.

net worth observations are non-positive. An alternative transformation is the inverse hyperbolic sine (IHS) transformation described by John B. Burbidge, Lonnie Magee, and A. Leslie Robb (1988) and used by Pence (2001), Arthur Kennickell (2000), and Christopher D. Carroll, Karen E. Dynan, and Spencer D. Krane (1999) with SCF data. The IHS transformation of a variable, w, is

$$q^{-1}\ln(q\,w+\sqrt{(q^2w^2+1)}) \qquad (3)$$

where q is a scaling parameter. Figure two depicts the distribution of level of net financial assets while figure three shows the IHS transformation of net financial assets, which creates an approximately normal distribution of the skewed variable.

Figure two: Level of Net Financial Assets

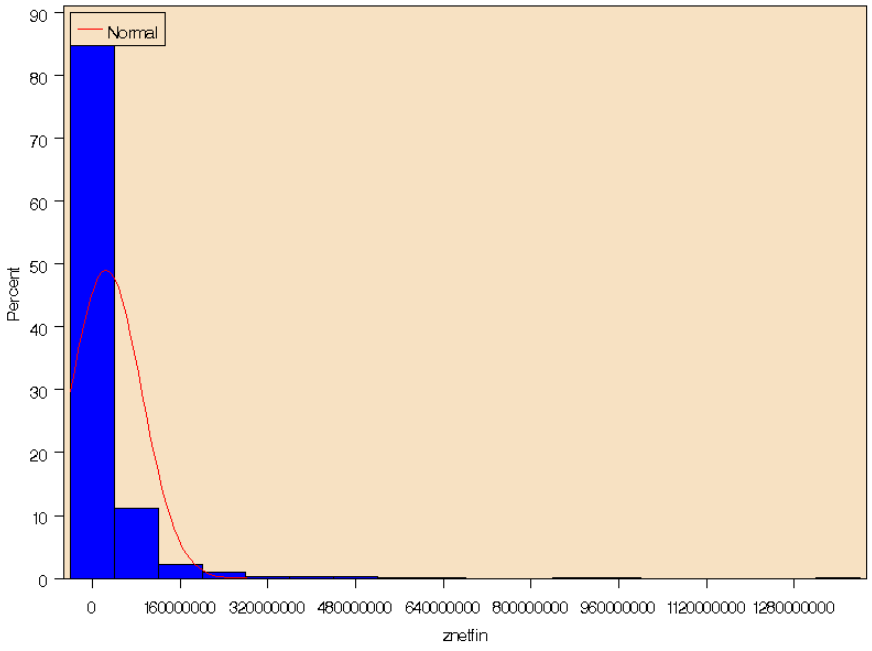
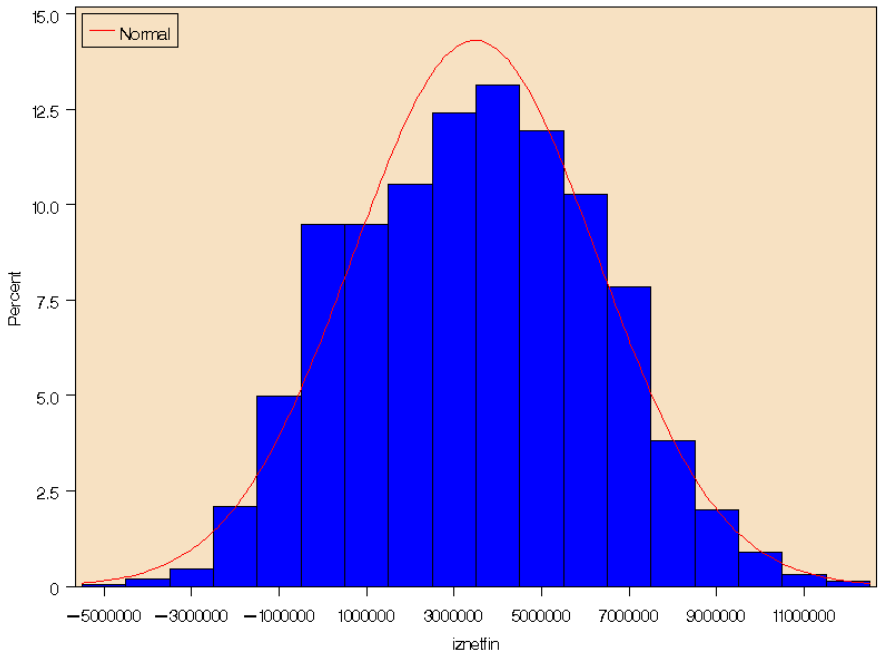


Figure three: Inverse Hyperbolic Sine Transformation Net Financial Assets (θ =.0000006)



I follow Burbridge, Magee, and Robb in conducting a grid search over the concentrated log-likelihood function for positive values of q to find its optimal value. In the estimations I use both the level and transformed values for the dependent variables. The coefficients of the IHS specifications cannot be interpreted as marginal effects so I follow Carroll, Dynan, and Krane and report the change in an independent variable, x, on a dependent variable, w, as $b * (q^2 w^2 + 1)^{1/2}$, where b is the coefficient from the IHS specification, q, is the optimal scaling parameter, and w is evaluated at its median value.[21] The IHS—like the log—transformation also helps avoid the problem of higher asset accumulation resulting from higher initial wealth levels rather than from contributions. This is a concern in the 401(k) savings literature because as table two will indicate eligible households begin with more wealth, so an equal return on assets causes eligible households to have more end of period wealth, which might be misattributed to 401(k) contributions.

[21] The optimal theta is very small in my specifications so the marginal value is similar to the actual IHS coefficient. I report the marginal value to allow for direct comparison with the levels specification coefficients.

Since the distribution of wealth in the US is highly skewed a true random sample of US households would include many households with relatively little wealth and would likely have little information on the nature of most of the assets held by households. In order to get a good feel for asset holdings among US households the SCF over samples wealthy households so that there are "too many" wealthy households in the survey relative to the US population. In order to make data analysis applicable to the US population the survey data includes a variable for weighting the households' observations so that results are applicable to the US population. Analysis that does not weight the observations will have estimates that are not representative of the US population. All of the results reported in this paper are weighted so as to be representative of the US population.

A related issue concerns the bootstrapping of standard errors for the regression parameter estimates. Bootstrapping involves resampling a data set to create a (large) number of datasets with the same number of observations, *n*, as the original dataset but with observations included zero, one, two, or more times with each of the observations from the original dataset having a $\frac{1}{n}$ chance of being included in each of the resamples.[22] Since the SCF is not a random sample the standard bootstrapping procedure is not applicable. In anticipation of this difficulty the SCF includes a file of 999 bootstrap resamples for each of the survey years. The file contains a replicate weight and multiplicity factor for each observation that are used to create each of the bootstrap resamples. The weights and multiplicity factors are computed for the first implicate only. In computing bootstrapped standard errors of parameter estimates, I follow Pence who computes the bootstrap standard errors for the first implicate then adjusts this standard error for the imputation variance as described in the appendix. I follow Pence in using Moshe Buchinsky's (1995) design matrix bootstrap estimator, using the average of the parameter estimates in the bootstrap resamples as the pivotal vector in calculating the variance-covariance

[22] Christopher Z. Mooney and Robert D. Duval (1993) is a very readable introduction to bootstrapping.

matrix. Finally, all of the dollars values are reported in 2001 dollars, adjusted using the "current methods" Consumer Price Index (CPI). This is the series used by Federal Reserve in examining the SCF, see Ana M. Aizcorbe, Arthur B. Kennickell, and Kevin B. Moore (2003).

Trends in retirement savings from 1995 to 2001

Table two presents the mean and median of the financial variables by eligibility and year. Not surprisingly, ineligible households have no 401(k) assets, although the median of retirement assets is also $0 for ineligible households. A striking difference between households eligible for 401(k) plans and those that are ineligible is that the mean and median of every wealth measure is greater for eligibles than for ineligibles. These differences between eligibles and ineligibles are greater than the differences in 401(k) and retirement assets, suggesting that eligibles are better savers than ineligibles. The skewness of the wealth distribution within US households is also apparent, as within eligible and ineligible categories the mean is substantially larger than the median for all wealth measures. A final point worth noting is that the growth in 401(k) asset slowed somewhat from 1998 to 2001 compared the 1995 to 1998 period. The median (mean) 401(k) balance grew by 157 (60) percent from 1995 to 1998 and by 22 (14) percent from 1998 to 2001. In general, it's useful to keep in mind that there are a number of reasons for 401(k) growth besides contributions. These include increased eligibility, increased participation rates by eligibles, and returns on existing assets in these plans.

Table two: Financial characteristics by eligibility status

		1995		1998		2001	
		Ineligible	Eligible	Ineligible	Eligible	Ineligible	Eligible
Financial Assets	Mean	$52,504	$103,965	$65,791	$144,055	$93,408	$167,559
	Median	$5,432	$28,549	$6,126	$40,547	$6,900	$44,000
Net Financial Assets	Mean	$44,149	$93,370	$53,152	$121,121	$84,931	$153,852
	Median	$925	$19,360	$1,121	$25,906	$1,920	$32,510
Non-housing Net Worth	Mean	$77,557	$138,048	$92,926	$171,339	$128,668	$212,539
	Median	$12,888	$42,592	$11,581	$52,638	$14,680	$57,890

Table two continued

		1995		1998		2001	
		Ineligible	Eligible	Ineligible	Eligible	Ineligible	Eligible
Net Worth	Mean	$113,270	$185,321	$132,907	$221,275	$176,439	$281,829
	Median	$32,063	$78,862	$33,242	$91,323	$35,300	$112,700
401(k) assets	Mean	$0	$20,943	$0	$33,478	$0	$38,145
	Median	$0	$2,543	$0	$6,531	$0	$8,000
Retirement Assets (incl. 401(k))	Mean	$16,677	$48,539	$17,057	$55,762	$28,090	$71,030
	Median	$0	$9,940	$0	$15,239	$0	$18,000

Table three shows recent trends in 401(k) plan eligibility both within categories and across time. These statistics confirm eligibility trends found in previously cited literature, such as eligibility increasing in both income and education, and among households where the head is white. Eligibility rates are quite low for low-income households (i.e. about 30 percent for households earning between 10 and 30 thousand dollars versus more than 70 percent for earning more than 80 thousand dollars). Eligibility is also increasing in education. Households with an undergraduate or graduate degree had eligibility rates more than 10 percentage points higher than households that did not finish college. Among the variables that help identify saver type, eligibility follows an expected pattern. Good savers, such as households that also have defined benefit pension coverage, indicate that retirement is their primary reason for saving, or have savings horizons greater than 10 years have higher eligibility rates than those that don't. It's interesting to note that while eligibility rates are increasing in savings horizon the gap in eligibility between short term and long term savers has narrowed considerably since 1995 (decreasing from 27 to 11 percent). This is encouraging because if savings horizon reflects willingness to save for the future then the message about individuals needing to save more for retirement may be sinking in. Eligibility rates are highest for workers in manufacturing industries (perhaps reflecting labor union concentration) and in finance, insurance, real estate, and repair services (perhaps reflecting the more professional nature of these occupations or the

necessity of having a college degree). Eligibility is lowest among agriculture and mining and construction workers, with agriculture workers showing a marked increase in eligibility from 19 percent in 1995 to 34 percent in 2001.

Table three: Eligibility status for selected sample characteristics

	1995 SCF	1998 SCF	2001 SCF
Income: < $10k	8.79%	22.93%	9.53%
Income: $10k - $30k	26.02%	34.23%	31.76%
Income: 30k – 50k	47.29%	53.35%	54.67%
Income: 50k – 80k	56.91%	64.11%	66.43%
Income: 80k – 150k	64.32%	74.13%	77.26%
Income: > 150k	76.79%	69.69%	77.47%
Finished high school	44.19%	52.33%	56.83%
Some college	45.72%	57.91%	54.97%
Finished college	56.51%	61.64%	67.77%
Graduate school	54.55%	60.50%	70.58%
Cohort < 30	41.62%	50.24%	55.98%
Cohort 30 - 34	48.04%	56.33%	61.28%
Cohort 35 – 39	49.05%	59.23%	62.96%
Cohort 40 – 44	50.79%	56.81%	60.30%
Cohort 45 – 49	51.09%	51.59%	60.10%
Cohort 50 – 54	47.33%	57.39%	52.07%
Cohort 55 – 59	39.93%	55.28%	45.71%
Cohort 60 – 64	29.34%	39.90%	29.72%
Married	52.64%	58.95%	63.35%
Not Married	37.51%	48.19%	50.36%
Both head and spouse work	58.45%	67.68%	71.58%
Only head of household works	37.76%	45.40%	47.32%
Head of household is not white	37.39%	41.29%	48.69%
Head of household is white	49.14%	58.62%	60.87%
Household also has defined benefit plan	59.08%	67.25%	66.23%
Household does not have defined benefit plan	41.47%	50.05%	54.76%
Child's education is main reason for saving	52.36%	50.53%	61.92%
Retirement is main reason for saving	57.56%	65.77%	65.82%
Precautionary motive is main reason for saving	43.46%	48.86%	50.18%
Does not anticipate major expense in next 5 to 10 years	42.60%	51.15%	53.70%
Sees child's education as a major expense	54.32%	58.11%	63.31%
See bad health as a major expense	36.97%	43.32%	38.22%

Table three, continued

	1995 SCF	1998 SCF	2001 SCF
Savings horizon less than one year	30.85%	45.11%	52.88%
Savings horizon 1 to 10 years	47.98%	54.14%	56.73%
Savings horizon greater than 10 years	57.86%	64.80%	64.47%
Expects to receive a bequest	52.95%	62.08%	68.18%
Does not expect to receive a bequest	44.89%	52.92%	56.00%
Leaving a bequest is very important	45.74%	50.48%	58.13%
Leaving a bequest is somewhat important	45.84%	55.43%	59.27%
Leaving a bequest is not important	44.89%	52.92%	56.00%
Willing to take substantial investment risk	44.90%	65.47%	64.64%
Willing to take above average investment risk	58.29%	67.56%	69.04%
Willing to take average investment risk	52.91%	56.20%	63.91%
Not willing to take any investment risk	33.77%	40.17%	42.40%
Expects economy to perform worse in the next five years	38.96%	52.99%	59.36%
Does not expect economy to perform worse in the next five years	48.47%	54.83%	56.95%
Industry: Agriculture	19.73%	27.54%	34.00%
Industry: Mining and construction	43.85%	43.50%	42.94%
Industry: Manufacturing	58.51%	63.20%	70.67%
Industry: Wholesale and retail trade	38.40%	45.27%	51.09%
Industry: Finance, insurance, real estate, repair services	50.24%	57.25%	60.58%
Industry: Transportation, communication, utilities, entertainment	42.11%	54.99%	56.18%
Industry: Public administration, military	46.45%	50.80%	55.04%

Across time, eligibility increased for most variables from 1995 to 1998, with the increase quite large among households earning less than $150,000, those having some college education, the youngest and oldest cohorts, and unmarried households. This is consistent with Pence's discussion of eligibility trends in the 1990's. Not as many variables showed increases in eligibility from 1998 to 2001 as they did from 1995 to 1998. In addition, where there are increases, they are generally not as large as from 1998 to 2001. For example, eligibility increased by six to nine percentage points for households earning between $30,000 and $150,000 from 1995 to 1998, but only by one to three percentage points from 1998 to 2001. A possible explanation is that the soft economy beginning in 2000 may have led some firms to save

resources by scaling back retirement benefits. It's also possible that eligibility rates have been slowing because they have been approaching some natural limit, especially in the absence of government mandated employer provided pension coverage. The consistent differences between eligible and ineligible households when looking at saver type and the measures of wealth (whether for the entire sample in tables two and three or by cohorts in table four) suggests the importance of controlling for saver type that the SCF—but few other datasets—affords.

Among cohorts, eligibility increases with the three youngest cohorts (the less than 30, 30 – 34, and 35 – 39 year olds), is steady for the next two, then decreases for the older than 50 cohorts. Older workers likely began their careers before 401(k) plans became widespread through the 1990s and some of them may not have been grand fathered into the plan at the place of employment. It is encouraging to see in figure four that for the three youngest cohorts (until age 40) eligibility increases both in these cohorts and from 1995 to 2001. Eligibility remains steady for the 40- and 45-year-old cohorts then declines for the older cohorts.

Figure four: Cohort eligibility by SCF survey year

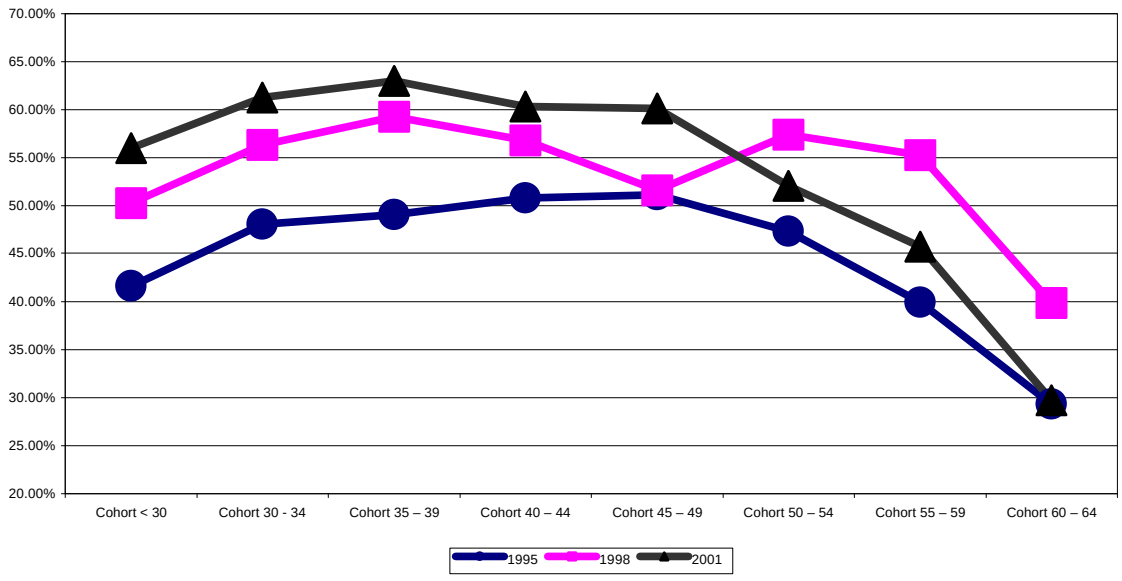


Table four contains cross tabulations of eligibility with income and education. With the exception of the groups that earn less than $10,000 or more than $150,000, eligibility appears

to remain steady or increase slightly for the four youngest cohorts and generally declines for the oldest two or three cohorts. The younger cohorts in the income group earning more than $150,000 have the highest eligibility rates (over 90 percent for the less than 30 cohort), while the lowest eligibility rates are found in the lowest (less than $10,000) income group. The education cross tabulations show those with at least a college degree (bachelor's or graduate) have higher eligibility rates than those without a college degree, with eligibility generally lower for the older cohorts.

Table four: Descriptive statistics within cohorts

		Percentage eligible for 401(k) plan		
	Cohort	1995	1998	2001
Income: < 10K	< 30	7.71%	25.39%	9.40%
	30 – 34	20.24%	42.88%	28.07%
	35 – 39	7.27%	6.30%	0%
	40 – 44	2.95%	6.40%	15.06%
	45 – 49	0%	18.79%	0%
	50 – 54	0%	0%	0%
	55 – 59	0%	0%	0%
	60 – 64	0%	0%	0%
Income: 10k – 30k	< 30	26.97%	29.97%	28.24%
	30 – 34	34.38%	35.94%	30.19%
	35 – 39	28.84%	31.36%	33.03%
	40 – 44	24.31%	38.91%	36.95%
	45 – 49	16.75%	36.05%	35.15%
	50 – 54	19.99%	42.80%	36.61%
	55 – 59	23.01%	47.64%	33.16%
	60 – 64	18.32%	21.76%	28.50%
Income: 30k – 50k	< 30	46.58%	59.59%	55.08%
	30 – 34	47.42%	54.43%	59.64%
	35 – 39	47.33%	56.55%	59.83%
	40 – 44	56.08%	45.21%	57.51%
	45 – 49	47.96%	44.00%	50.12%
	50 – 54	39.95%	56.47%	49.42%
	55 – 59	42.09%	66.55%	43.89%
	60 – 64	39.22%	23.33%	22.29%
Income: 50k – 80k	< 30	66.34%	65.47%	71.33%
	30 – 34	61.70%	65.45%	74.85%
	35 – 39	57.28%	70.14%	74.29%
	40 – 44	54.84%	64.69%	65.05%
	45 – 49	63.70%	52.77%	51.10%
	50 – 54	70.42%	68.64%	58.95%

Table four, continued

	Cohort	Percentage eligible for 401(k) plan 1995	1998	2001
	55 – 59	31.45%	50.60%	53.75%
	60 – 64	32.29%	66.01%	18.18%
	< 30	79.76%	78.88%	81.94%
	30 – 34	70.27%	81.19%	81.27%
	35 – 39	65.08%	80.20%	77.57%
Income: 80k – 150k	40 – 44	72.99%	74.43%	78.30%
	45 – 49	59.89%	71.96%	82.82%
	50 – 54	64.28%	62.26%	63.16%
	55 – 59	59.41%	63.32%	49.59%
	60 – 64	18.30%	62.00%	55.83%
	< 30	94.72%	96.66%	97.31%
	30 – 34	86.01%	81.35%	79.79%
	35 – 39	77.93%	82.93%	75.84%
	40 – 44	84.04%	67.59%	65.33%
Income: > 150k	45 – 49	88.69%	47.55%	82.04%
	50 – 54	58.90%	52.37%	60.12%
	55 – 59	65.76%	62.21%	90.06%
	60 – 64	71.05%	78.34%	45.72%
	< 30	41.70%	47.31%	55.27%
	30 – 34	47.33%	59.70%	61.30%
	35 – 39	52.12%	51.89%	59.88%
Education:	40 – 44	37.07%	54.89%	55.62%
Finished High	45 – 49	54.49%	48.13%	61.71%
School	50 – 54	50.78%	55.68%	52.70%
	55 – 59	39.35%	58.69%	42.47%
	60 – 64	18.43%	30.78%	45.71%
	< 30	33.36%	51.73%	50.19%
	30 – 34	46.76%	55.57%	58.85%
	35 – 39	47.61%	66.72%	61.41%
Education:	40 – 44	58.69%	60.25%	59.43%
Some College	45 – 49	43.43%	60.08%	53.11%
	50 – 54	60.17%	61.80%	51.04%
	55 – 59	29.62%	54.23%	52.91%
	60 – 64	41.97%	36.27%	26.24%
	< 30	54.12%	60.78%	68.43%
	30 – 34	58.66%	58.28%	74.14%
	35 – 39	51.33%	64.16%	76.46%
Education:	40 – 44	62.46%	63.77%	66.64%
Finished College	45 – 49	57.25%	57.63%	60.56%
	50 – 54	61.06%	77.89%	55.41%
	55 – 59	50.72%	54.32%	60.85%
	60 – 64	47.90%	57.55%	14.27%

Table four, continued

		Percentage eligible for 401(k) plan		
	Cohort	1995	1998	2001
	< 30	54.34%	57.25%	73.29%
	30 – 34	49.92%	67.96%	76.92%
	35 – 39	68.52%	81.33%	61.36%
Education:	40 – 44	67.54%	60.33%	71.09%
Graduate School	45 – 49	56.69%	55.50%	73.84%
	50 – 54	40.30%	46.13%	85.48%
	55 – 59	40.95%	40.96%	39.22%
	60 – 64	22.68%	76.81%	40.26%

Table five: Means and medians of selected financial variables within cohorts

		1995		1998		2001	
		Ineligible	Eligible	Ineligible	Eligible	Ineligible	Eligible
Mean (median) of Net Worth by Cohort	Cohort < 30	$28,070 ($6,866)	$47,395 ($21,787)	$19,920 ($4,572)	$71,686 ($25,949)	$71,736 ($9,850)	$114,507 ($52,990)
	Cohort 30 - 34	$42,192 ($13,801)	$69,329 ($49,701)	$64,784 ($15,783)	$157,426 ($66,854)	$72,348 ($19,740)	$165,962 ($91,300)
	Cohort 35 – 39	$67,500 ($25,509)	$133,420 ($78,828)	$110,973 ($37,443)	$203,598 ($91,671)	$160,241 ($47,100)	$224,299 ($121,190)
	Cohort 40 – 44	$90,126 ($48,845)	$189,289 ($78,516)	$140,961 ($54,315)	$241,753 ($127,569)	$179,565 ($72,100)	$305,376 ($124,530)
	Cohort 45 – 49	$143,520 ($65,073)	$282,412 ($141,555)	$243,165 ($92,694)	$296,488 ($154,029)	$332,652 ($110,290)	$559,638 ($206,130)
	Cohort 50 – 54	$225,733 ($77,568)	$361,797 ($208,108)	$277,669 ($90,713)	$368,374 ($144,658)	$386,832 ($99,100)	$515,036 ($211,630)
	Cohort 55 – 59	$265,440 ($109,296)	$341,189 ($118,681)	$245,934 ($199,538)	$398,217 ($193,258)	$240,918 ($91,240)	$660,835 ($290,950)
	Cohort 60 – 64	$294,559 ($129,684)	$441,438 ($230,300)	$293,659 ($86,566)	$565,063 ($199,876)	$318,511 ($120,600)	$719,470 ($139,000)
Mean (median) of Net Financial Assets by Cohort	Cohort < 30	$3,256 -($358)	$18,665 ($2,312)	-$294 -($1,415)	$27,876 ($2,721)	$23,775 ($0)	$50,693 ($8,400)
	Cohort 30 - 34	$14,984 -($116)	$30,193 ($11,188)	$28,054 ($44)	$71,374 ($16,120)	$18,725 ($0)	$76,767 ($30,500)
	Cohort 35 – 39	$21,672 ($1,618)	$50,319 ($8,911)	$48,710 ($2,318)	$101,077 ($34,287)	$64,460 ($1,220)	$109,284 ($36,700)
	Cohort	$28,099	$92,332	$51,734	$130,949	$88,330	$176,921

Table five, continued

Mean (median) of Retirement Assets by Cohort	1995		1998		2001	
	Ineligible	Eligible	Ineligible	Eligible	Ineligible	Eligible
40 – 44	($1,804)	($27,508)	($2,395)	($40,468)	($11,190)	($37,120)
Cohort	$48,907	$154,097	$99,594	$171,471	$198,519	$317,195
45 – 49	($3,132)	($35,484)	($14,422)	($70,206)	($20,500)	($94,280)
Cohort	$92,394	$204,267	$107,845	$222,553	$208,491	$306,173
50 – 54	($8,380)	($75,014)	($14,150)	($52,791)	($9,600)	($100,500)
Cohort	$113,418	$170,955	$113,260	$241,152	$138,390	$435,870
55 – 59	($11,789)	($35,334)	($57,275)	($76,628)	($28,100)	($143,200)
Cohort	$162,559	$254,486	$137,276	$401,334	$144,932	$416,246
60 – 64	($20,343)	($78,134)	($12,104)	($93,608)	($14,150)	($114,000)
Cohort < 30	$2,681 ($0)	$11,499 ($1,849)	$1,533 ($0)	$15,424 ($3,810)	$4,330 ($0)	$22,964 ($7,000)
Cohort 30 - 34	$9,169 ($0)	$19,877 ($5,779)	$6,937 ($0)	$36,142 ($10,885)	$8,282 ($0)	$43,970 ($17,200)
Cohort 35 – 39	$10,983 ($0)	$26,924 ($6,935)	$19,123 ($0)	$48,006 ($19,048)	$20,565 ($0)	$67,279 ($28,500)
Cohort 40 – 44	$13,323 ($0)	$45,565 ($15,604)	$13,441 ($0)	$60,796 ($27,212)	$34,865 ($0)	$69,142 ($18,700)
Cohort 45 – 49	$23,637 ($0)	$83,248 ($23,117)	$21,772 ($0)	$79,263 ($27,212)	$63,115 ($30)	$129,029 ($60,000)
Cohort 50 – 54	$36,141 ($0)	$99,103 ($29,011)	$35,257 ($0)	$99,896 ($32,001)	$47,289 ($0)	$132,669 ($45,000)
Cohort 55 – 59	$33,172 ($0)	$94,148 ($21,961)	$48,832 ($9,796)	$123,186 ($41,362)	$68,858 ($0)	$189,501 ($46,000)
Cohort 60 – 64	$37,321 ($0)	$107,578 ($57,792)	$52,454 ($0)	$109,572 ($40,273)	$64,022 ($0)	$224,660 ($7,700)

Results for Estimation of Full Sample (Without Cohort Effects)

Tables six and seven present the results of equation (1). Table six presents the results for the OLS, Huber M-, and LAV regressions for the level of net financial assets specification and

LAV regression for the IHS specification of net financial assets[23], while table seven contain the results of the LAV estimations for the level and IHS transform of non-housing net worth and net worth including housing equity. There are several general results worth noting: the coefficients are generally of the expected signs and magnitudes, the coefficients are larger as the wealth measure become broader, in addition to the saver type variables some of the *explanatory * eligibility* are important in explaining wealth levels, and once life-cycle effects are accounted for in the cohort analysis the savings effect attributable to 401(k) plans is negligible.

Table six: Comparison of estimation methods for net financial assets specification

	Ordinary Least Squares			Huber M-Estimation			Least Absolute Values				
	Levels			Levels			Levels			IHS Transformation	
	Coeff	Standard Error	T-stat	Coeff	Standard Error	T-stat	Coeff	Standard Error	T-stat	Marginal Effect	T-stat
Intercept	-11,606	9,872	-1.18	-1,078	1,403	-0.77	-136	534	-0.25	235	1.15
Eligibility	-27,610	15,255	-1.81	-7,084	2,106	-3.36	-3,433	1,178	-2.91	-29	-0.07
1998 SCF	-1,749	7,957	-0.22	1,116	1,350	0.83	884	382	2.31	410	2.76
2001 SCF	23,109	10,435	2.21	4,256	1,569	2.71	782	414	1.89	517	2.46
Eligibility * 1998 SCF	43,225	13,603	3.18	9,677	2,125	4.55	3,471	1,200	2.89	1,153	3.94
Eligibility * 2001 SCF	4,884	16,655	0.29	279	2,592	0.11	-451	1,606	-0.28	-313	-0.78
Income: $50k - $80k	26,594	6,138	4.33	14,553	1,459	9.97	8,879	1,236	7.18	4,812	16.89
Income: $80k - $150k	107,307	11,940	8.99	60,434	3,781	15.98	58,756	5,695	10.32	10,441	32.58
Income: > $150k	1,007,071	153,093	6.58	416,869	58,839	7.08	418,093	51,942	8.05	29,844	23.79
Education: Graduate school	43,663	16,860	2.59	15,779	3,295	4.79	11,261	3,429	3.28	1,843	3.97
Married	44,221	9,182	4.82	7,703	1,399	5.51	1,498	483	3.1	756	4.57
Both head and spouse work	-38,022	11,738	-3.24	-9,162	1,569	-5.84	-4,923	1,079	-4.56	-1,220	-3.99
Number of household members	-10,177	2,171	-4.69	-2,179	385	-5.67	-586	177	-3.32	-380	-6.90
Has a defined benefit plan	-31,549	9,150	-3.45	-1,418	1,355	-1.05	-950	892	-1.07	-23	-0.12
Has an IRA	117,939	8,748	13.48	51,574	2,024	25.48	48,973	2,632	18.61	9,657	41.54
Has other account Type pension plan	29,070	15,809	1.84	18,142	2,956	6.14	8,442	1,832	4.61	5,277	10
Leaving a bequest is very important	25,834	10,995	2.35	-849	1,459	-0.58	145	318	0.46	184	0.8
Place of employment	27,183	7,812	3.48	3,481	1,297	2.68	256	494	0.52	354	2.17

[23] Since I report the marginal effect of the IHS transformation I omit the standard errors of this specification; the T-stats are based on the coefficient divided by the standard error.

Table six, continued

	Ordinary Least Squares			Huber M-Estimation			Least Absolute Values				
	Levels			Levels			Levels			IHS Transformation	
	Coeff	Standard Error	T-stat	Coeff	Standard Error	T-stat	Coeff	Standard Error	T-stat	Marginal Effect	T-stat
has greater than 500 employees											
Eligibility * Income: $80k - $150k	-240,489	179,922	-1.34	-81,370	65,910	-1.23	-85,073	59,942	-1.42	-7,618	-5.27
Eligibility * Age 45 – 55 in 1995	40,983	12,593	3.25	18,940	2,328	8.14	14,039	2,229	6.3	3,075	9.83
Eligibility * Both head and spouse work	-77,665	15,993	-4.86	-16,401	2,479	-6.62	-9,040	1,644	-5.5	-3,190	-7.6
Eligibility * Has other account type pension plan	60,107	24,702	2.43	11,413	4,693	2.43	13,841	2,969	4.66	-894	-1.17
Eligibility * Owns home	31,386	9,045	3.47	12,442	1,820	6.84	6,784	1,280	5.3	3,522	12.59
Eligibility * Reason for saving: retirement	29,619	11,357	2.61	17,309	2,696	6.42	13,716	2,007	6.83	2,627	8.41
Eligibility * Leaving a bequest is very important	27,968	18,154	1.54	6,979	2,348	2.97	2,726	1,299	2.1	1,155	3.14

The skewness of wealth data is apparent, as the coefficients in table six are much larger for the OLS regressions than the LAV coefficients, while the Huber estimates are generally between the two. This also reflects that the nature of the estimation techniques as the predicted values in OLS estimations are conditional means while the predicted values in LAV estimations are conditional medians, with the Huber coefficients generally between the two. Also note that tables six and seven are the final estimations from the testing down methodology and indicate that a number of *demographic * eligibility* variables are important in explaining the amount of wealth that households have. This is a difference with Pence's work, which implicitly assumes that the coefficients on the *demographic * eligibility* variables are equal to zero. The final estimations also demonstrate the importance of including variables that proxy for saver type. While a number of saver type variables were included in the initial model, the most important of these appear to be those indicating whether a household has another type of retirement program, such as a defined benefit plan, another account type plan, or an IRA. Having an IRA is

an important proxy for saver type because, unlike employer specific pension coverage, IRA accounts are available to any non-self-employed individual who has positive income. For the three wealth measures the coefficient on *Has IRA* is around five times larger than the coefficients on the "has other pension" variable. Specifically, having an IRA raises median net financial assets by $48,973, non-housing net worth by $61,900, and total net worth by $83,669.

Table seven: Median regression results of effect of 401(k) plan eligibility for full sample of households

Panel A: Dependent variable is non-housing net worth

	Levels Specification			IHS transform	
	Coefficient	Standard Error	T-stat	Marginal Effect	T-stat
Intercept	4,554	625	7.29	5,832	16.94
Eligibility	-2,671	1,565	-1.71	2,432	4.62
1998 SCF	473	485	0.97	-328	-0.81
2001 SCF	807	691	1.17	-37	-0.08
Eligibility * 1998 SCF	8,201	1,982	4.14	2,458	3.60
Eligibility * 2001 SCF	1,963	1,886	1.04	332	0.52
Has a defined benefit plan	1,263	1,200	1.05	971	2.19
Has an IRA	61,900	2,741	22.58	12,765	21.02
Has other account type pension plan	16,313	1,937	8.42	7,879	12.89
Income: $50k - $80k	18,052	1,594	11.33	8,487	19.62
Income: $80k - $150k	83,477	4,730	17.65	15,854	36.92
Income: > $150k	699,511	77,587	9.02	53,220	17.80
Eligibility * Income: $80k - $150k	-176,567	83,536	-2.11	-15,332	-4.33
Married	4,015	626	6.41	3,517	13.67
Number of household members	-1,262	199	-6.35	-938	-11.26
Leaving a bequest is very important	209	640	0.33	820	2.85
Education: Graduate school	14,987	3,745	4.00	2,511	4.46
Eligibility * Has other account type pension plan	9,706	3,811	2.55	-2,743	-3.01
Eligibility * Owns home	15,314	1,783	8.59	5,346	13.51
Eligibility * Age 45 – 55 in 1995	16,696	2,451	6.81	3,620	6.44
Eligibility * Married	5,948	2,108	2.82	42	0.09
Eligibility * Both head and spouse work	-18,002	2,167	-8.31	-5,562	-13.10
Anticipates receiving a substantial bequest	6,891	1,652	4.17	2,028	4.71

Table seven, continued

Panel B: Dependent variable is net worth

	Levels Specification			IHS transform	
	Coefficient	Standard Error	T-stat	Marginal Effect	T-stat
Intercept	2,724	1,288	2.12	4,976	33.85
Eligibility	-4,911	2,193	-2.24	1,495	9.81
1998 SCF	-330	868	-0.38	-777	-4.14
2001 SCF	551	939	0.59	-318	-1.56
Eligibility * 1998 SCF	9,993	2,550	3.92	832	2.81
Eligibility * 2001 SCF	4,620	2,789	1.66	49	0.15
Has a defined benefit plan	6,765	2,063	3.28	541	4.29
Has an IRA	83,669	4,615	18.13	3,775	29.46
Income: $50k - $80k	29,704	4,125	7.20	2,640	15.61
Income: $80k - $150k	126,569	6,342	19.96	4,845	17.57
Income: > $150k	873,598	115,765	7.55	20,702	9.78
Eligibility * Income: $80k - $150k	-195,664	115,906	-1.69	-6,215	-2.68
Married	4,134	1,078	3.84	1,249	8.01
Number of household members	-1,173	377	-3.11	-427	-11.54
Leaving a bequest is very important	940	904	1.04	259	2.76
Education: Graduate school	14,091	4,483	3.14	1,097	3.58
Eligibility * Has other account type pension plan	26,159	4,212	6.21	1,453	5.68
Eligibility * Age 45 – 55 in 1995	36,484	3,903	9.35	1,534	8.20
Eligibility * Married	14,187	3,445	4.12	-408	-1.60
Eligibility * Both head and spouse work	-31,213	3,761	-8.30	-2,318	-9.19
Owns home	50,701	2,538	19.98	7,113	45.99
Anticipates receiving a substantial bequest	7,005	1,950	3.59	639	4.33
Both head and spouse work	-4,128	1,479	-2.79	269	1.82

The income group variables are, as expected, positive and increasing in income. The very large coefficient for the *over $150,000* income group reflects that very wealthy households also have high incomes and that households with high incomes are able to accumulate large amounts of assets over the life cycle. In the regressions that account for cohort effects and those that exclude households with over $1,000,000 of net worth (which I'll discuss later in the paper) the coefficient is still is larger than the $80k - $150k income group, but not nearly as large as in this first regression. I don't have a good explanation as to why the *Eligible * Income Greater than*

$150k coefficient is negative. In fact, in the general regressions that include all of the potential explanatory variables all of the *Eligibility * Income Group* coefficients are negative and decreasing (that is, getting more negative) in income groups. One plausible explanation is that—within a particular income group—perhaps households with a 401(k) plan feel the need to have less wealth at particular point in time than ineligible households in anticipation of faster wealth accumulation in the future because of the retirement plan. Interestingly, the *both head of household and spouse work* and *eligibility * both head of household and spouse work* coefficients are negatively related to wealth holdings. Households that have two earners almost certainly face less income risk than one-earner households and so may need less buffer stock savings to guard against job loss. Also consistent is the explanation suggested above for the negative coefficients on the *eligibility * income group* variables, although the buffer stock explanation strikes me as more plausible.

The savings effects of 401(k) plans is found in the *Eligibility * SCF98* and *Eligibility * SCF01* coefficients. These coefficients indicate the additional wealth accumulated from 1995 to 1998 and from 1995 to 2001 that can be attributed to the retirement savings programs. The coefficients for the three dependent variables are positive, significant, and increasing in broader wealth measures for 1995 to 1998; for the 1995 to 2001 period the coefficient is negative and insignificant for the net financial assets specification and positive and insignificant for the non-housing net worth and net worth specifications. 401(k) eligibility accounts for $3,471 of net financial assets, $8,201 of non-housing net worth, and $9,993 of additional net worth in 1998 compared to 1995. At first this suggests that there was a savings effect over this period. The IHS specification, which reports the marginal effect evaluated at the median of the dependent variable, is also positive and significant over this period, though the effect is much less than for the levels specification ($1,153, $2,458, and $832 for net financial assets, non-housing net worth, and net worth) meaning that much of the increase in the wealth measures is attributable to asset returns rather than contributions to the plans. Interestingly, while the levels of net

worth coefficient is larger than the non-housing net worth coefficient the IHS marginal effect is not. This supports prior research (Engen and Gale (2001), Pence (2001), and Benjamin (2003)) that suggests that at least part of 401(k) savings are a result of substitution from home equity. Another point worth emphasizing is that although the *eligibility * SCF98* is statistically positive and significant for the three wealth measures their economic significance is quite small, especially compared to the observed factors, in particular the wealth attributable to IRA accounts, and other account type pension plans (for net financial assets and non-housing net worth). The effect is also small relative to the contribution limits of 401(k) plans, which were $10,000 per year for much of the time.

While there is some evidence that 401(k) plans resulted in increased savings from 1995 to 1998 the coefficients for the *eligibility * SCF01* are not consistent with a savings effect. For both the levels and IHS specifications the coefficients are insignificantly different from zero and they are also less than the *eligibility * SCF98* coefficients, which indicates that asset accumulation attributable to 401(k) eligibility was less from 1995 to 2001 than from 1995 to 1998. The downturn in the economy beginning in 200o is likely an important reason. Consider that the average closing price from May to October[24] for the Dow Jones Industrial Average was 85 percent higher in 1998 than in 1995, 119 percent higher in 2001 compared to 1995, and 19 percent higher in 2001 compared to 1998.While the Dow Jones was higher in 2001 than 1998, there were no gains after April 1999. Given that much of the enthusiasm for 401(k) plans in the 1990s was associated with the bull market, households may have found themselves less willing to contribute to their 401(k) plans once the market stopped reaching new heights. In addition, if the economic downturn caused households to shift assets to precautionary accounts then saving an equal amount of pre-tax income in a regular savings account versus a tax-advantaged account means that there would be less in contributions to the non tax-advantaged account. Finally, part of the reason for the positive coefficient for 1995 to 1998 period may be because of increased

[24] The SCF interviews are generally conducted from May to October of the year in question.

401(k) eligibility and participation. The savings of new participants will be new savings, assuming that they do not immediately reshuffle their assets. Also, it's easy to suppose that newly participating households may be enthusiastic about the program and save more than households that have been participating for a length of time; consequently the increase in wealth would not be as large for the 1998 to 2001 group that contains fewer new participants.

Results Within Lower Wealth Households

A concern with the results is that the increases in asset accumulation may be a result of saving by wealthy households. Karen E. Dynan, Jonathan Skinner, and Stephen P. Zeldes (2004) indicate that wealthy households do indeed have higher propensities to save. While it is important for all households to save, a major policy concern is that less wealthy households adequately save for retirement. When households are inadequately prepared for retirement then the burden may fall to the government to provide income in old age. To address this concern, table eight reports the LAV estimations for households that have net worth of less than $1,000,000 (I sometimes refer to these as low wealth households). As might be expected the coefficients are not as large for this group compared to the sample that includes high wealth households. The effect on the *greater than $150,000 income group*, mentioned earlier, is most striking. Other noticeable differences include the effect of having an IRA, which is about ten to fifteen thousand dollars less than the higher wealth group; I was expecting that this difference might be larger. The effect of having another account type pension plan on net financial assets is larger for the group that excludes wealthy households (11,913 vs. 8,442) though the effect is similar for non-housing net worth. It is interesting to note that the testing down methodology includes some variables in the low wealth specification that are not significant in the group that includes households with more than one million dollars of net worth. For example, eligible households that have retirement as their primary savings motive is an important determination of wealth for this low wealth group; these households have $9,303 more of net financial assets, $17,545 of non-housing net worth, and $18,518 of net worth compared to households with

households that report a different primary savings motive. Length of savings horizon is also important for these lower wealth households. Although none of these saver type coefficients is as large as the IRA coefficient which suggests that controlling for IRA status is perhaps a very important proxy for saver type.[25]

Table eight: Effect of 401(k) eligibility for sample of households with less than $1,000,000 of net worth

Panel A: Dependent variable is net financial assets

	Coefficient	Standard Error	T-stat	Marginal Effect	T-stat
Intercept	-4,822	980	-4.92	-2,117	-5.50
Eligibility	-3,995	1,887	-2.12	810	1.80
1998 SCF	1,112	474	2.35	565	3.71
2001 SCF	316	586	0.54	18	0.07
Eligibility * 1998 SCF	1,882	1,367	1.38	813	2.95
Eligibility * 2001 SCF	-219	2,147	-0.10	476	1.02
Income: $50k - $80k	6,936	1,152	6.02	4,505	16.53
Income: $80k - $150k	49,877	5,853	8.52	9,299	25.55
Income: > $150k	147,664	12,264	12.04	15,055	23.35
Age: 45 – 55 in 1995	2,276	646	3.52	1,493	5.99
Education: Graduate school	9,134	2,294	3.98	1,950	5.54
Married	848	515	1.65	547	2.63
Both head and spouse work	-3,969	955	-4.16	-1,079	-3.23
Number of household members	-184	181	-1.02	-290	-5.58
Has an IRA	39,230	2,381	16.48	8,533	37.65
Has other account type pension plan	11,913	1,830	6.51	4,621	17.02
Retirement is main reason for saving	1,386	680	2.04	1,739	5.54
Does not anticipate major expense in next 5 to 10 years	2,074	526	3.94	1,056	5.11
Savings horizon between 1 and 10 years	1,765	501	3.52	1,235	6.06
Savings horizon greater than 10 years	2,647	730	3.63	2,432	6.01
Expects to receive a bequest	3,291	985	3.34	1,413	6.90
Industry: Manufacturing	1,154	534	2.16	819	4.47
Industry: Public administration, military	-2,207	1,250	-1.77	-326	-1.05
Eligibility * Age 45 – 55 in 1995	10,882	2,184	4.98	1,334	3.02
Eligibility * Both head and spouse work	-3,553	1,901	-1.87	-2,354	-5.50
Eligibility * Owns home	6,487	1,236	5.25	3,268	10.24
Eligibility * Reason for saving: retirement	9,303	2,548	3.65	351	0.95
Eligibility * Does not anticipate major expense in next 5 to 10 years	44	1,640	0.03	-631	-1.75

[25] Poterba et.al and Benjamin use IRA status to identify good saver.

Table eight, continued

Eligibility * See bad health as a major expense	4,622	3,999	1.16	1,870	2.66
Eligibility * Savings horizon is greater than 10 years	461	2,131	0.22	-1,426	-3.58
Eligibility * Leaving a bequest is somewhat important	-921	1,567	-0.59	-425	-1.76
Eligibility * Willing to take above average investment risk	10,377	2,375	4.37	1,238	4.88
Eligibility * Place of employment has greater than 500 employees	3,589	1,470	2.44	1,129	3.53

Panel B: Dependent variable is non-housing net worth

	Coefficient	Standard Error	T-stat	Marginal Effect	T-stat
Intercept	-3,145	943	-3.34	1,656	5.43
Eligibility	-204	2,401	-0.09	2,995	5.06
1998 SCF	390	622	0.63	-189	-0.55
2001 SCF	-983	741	-1.33	-532	-1.86
Eligibility * 1998 SCF	3,780	2,221	1.70	1,454	2.20
Eligibility * 2001 SCF	1,627	2,445	0.67	598	1.01
Income: $30k - $50k	4,239	1,028	4.12	4,141	7.99
Income: $50k - $80k	18,910	2,075	9.11	9,295	12.57
Income: $80k - $150k	80,591	8,664	9.30	19,302	17.60
Income: > $150k	203,756	11,972	17.02	24,702	18.29
Age: 45 – 55 in 1995	3,889	1,066	3.65	2,090	5.29
Education: Graduate school	8,713	2,206	3.95	2,520	5.00
Married	3,529	696	5.07	1,665	5.68
Both head and spouse work	-1,883	1,217	-1.55	-209	-0.49
Number of household members	-432	244	-1.77	-441	-5.12
Head of household is not white	-1,559	589	-2.65	-1,431	-5.80
Has an IRA	48,258	2,469	19.55	9,735	26.43
Has other account type pension plan	15,842	1,929	8.21	5,165	12.70
Owns home	7,259	737	9.85	4,572	15.66
Does not anticipate major expense in next 5 to 10 years	3,547	647	5.48	879	2.83
Sees child's education as a major expense	2,485	1,050	2.37	700	2.07
Savings horizon greater than 10 years	3,523	1,090	3.23	2,398	4.84
Expects to receive a bequest	5,027	1,381	3.64	1,613	4.82
Leaving a bequest is very important	1,108	581	1.91	500	2.22
Willing to take substantial investment risk	1,799	1,893	0.95	899	1.76
Willing to take average investment risk	2,922	658	4.44	1,714	5.15
Industry: Public administration, military	-720	1,581	-0.46	153	0.31
Eligibility * Income: $80k - $150k	-6,765	10,425	-0.65	-4,149	-5.08
Eligibility * Age 45 – 55 in 1995	14,006	2,514	5.57	1,579	2.28
Eligibility * Education: Some College	1,117	1,993	0.56	848	2.27
Eligibility * Divorced	-5,006	1,935	-2.59	-1,017	-2.52

Table eight, continued

	Coefficient	Standard Error	T-stat	Marginal Effect	T-stat
Eligibility * Both head and spouse work	-8,054	2,389	-3.37	-3,268	-7.20
Eligibility * Reason for saving: retirement	17,545	2,512	6.98	3,270	9.04
Eligibility * See bad health as a major expense	3,842	4,092	0.94	1,194	1.64
Eligibility * Savings horizon greater than 10 years	-3,799	2,276	-1.67	-2,775	-4.79
Eligibility * Leaving a bequest is somewhat important	-457	1,652	-0.28	-610	-2.22
Eligibility * Willing to take above average investment risk	11,578	2,713	4.27	2,826	8.52
Eligibility * Expects economy to perform worse in the next five years	5,268	1,823	2.89	848	1.73
Eligibility * Place of employment has greater than 500 employees	1,959	1,538	1.27	372	0.76

Panel C: Dependent variable is net worth

	Coefficient	Standard Error	T-stat	Marginal Effect	T-stat
Intercept	-8,581	1,800	-4.77	3,096	8.09
Eligibility	646	3,596	0.18	1,362	2.81
1998 SCF	-1,075	1,213	-0.89	-838	-2.63
2001 SCF	-2,592	1,508	-1.72	-1,074	-3.21
Eligibility * 1998 SCF	5,142	2,832	1.82	731	1.41
Eligibility * 2001 SCF	1,265	3,316	0.38	606	1.15
Income: $30k - $50k	4,677	1,496	3.13	2,163	8.67
Income: $50k - $80k	27,447	3,498	7.85	3,677	9.48
Income: $80k - $150k	138,341	11,392	12.14	6,460	9.25
Income: > $150k	280,553	35,137	7.98	8,978	7.18
Age: 45 – 55 in 1995	8,773	1,664	5.27	1,910	5.72
Education: Graduate school	9,269	4,692	1.98	906	1.46
Married	5,887	1,187	4.96	529	1.89
Both head and spouse work	-6,810	2,232	-3.05	-67	-0.21
Number of household members	-155	399	-0.39	-207	-2.46
Head of household is not white	-1,822	1,010	-1.80	-881	-3.22
Has an IRA	66,634	4,272	15.60	2,928	8.99
Has other account type pension plan	14,432	2,513	5.74	1,407	4.80
Owns home	46,749	2,356	19.84	6,414	20.01
Does not anticipate major expense in next 5 to 10 years	5,656	1,163	4.86	78	0.32
Sees child's education as a major expense	1,199	1,440	0.83	108	0.36
Savings horizon between 1 and 10 years	3,236	1,178	2.75	1,017	3.86
Savings horizon greater than 10 years	6,153	2,087	2.95	1,710	3.44
Expects to receive a bequest	5,365	1,653	3.25	515	1.63
Willing to take above average investment risk	5,924	2,220	2.67	589	1.86

Table eight, continued

	Coefficient	Standard Error	T-stat	Marginal Effect	T-stat
Willing to take average investment risk	2,979	1,079	2.76	427	2.00
Expects economy to perform worse in the next five years	849	1,129	0.75	17	0.05
Industry: Finance, insurance, real estate, repair services	3,496	1,453	2.41	445	1.40
Eligibility * Income: $80k - $150k	-36,199	14,579	-2.48	-1,191	-1.71
Eligibility * Age 45 – 55 in 1995	25,534	4,747	5.38	-268	-0.59
Eligibility * Education: Finished High School	1,083	2,796	0.39	23	0.07
Eligibility * Education: Some College	5,368	3,115	1.72	349	0.95
Eligibility * Education: Graduate School	5,454	8,313	0.66	-284	-0.37
Eligibility * Divorced	-4,520	3,574	-1.26	-268	-0.55
Eligibility * Both head and spouse work	-10,878	3,325	-3.27	-1,359	-3.10
Eligibility * Reason for saving: retirement	18,578	4,058	4.58	834	2.49
Eligibility * See bad health as a major expense	4,125	5,281	0.78	-167	-0.23
Eligibility * Savings horizon greater than 10 years	-8,575	5,293	-1.62	-1,369	-2.30
Eligibility * Leaving a bequest is somewhat important	-4,228	2,515	-1.68	-308	-1.11
Eligibility * Expects economy to perform worse in the next five years	4,133	4,008	1.03	607	1.30
Eligibility * Place of employment has greater than 500 employees	653	2,092	0.31	-103	-0.34

The savings effect attributable to 401(k) eligibility is also much less for this lower wealth group. The coefficients for the levels specifications of the 1995 to 1998 effect are about half as large as for the group that includes high net worth households (1,882 versus 3,471 for net financial assets, 3,780 versus 8,201 for non-housing net worth, and 5,142 versus 9,993 for net worth). As was the case before, the wealth attributable to 401(k) eligibility is small relative to other explanatory variables, especially IRA status. Both the levels and IHS specifications indicate that there is little or no effect from 1995 to 2001 as the coefficients are insignificantly different from zero. A final point worth noting is that the coefficient for the effect on net worth in the IHS specification is smaller than the effect on non-housing net worth. This suggests that, as with the sample including high wealth households, that housing equity may be the source of at least some of the substitution to 401(k) assets.

Savings Effects Within Cohorts

The savings effect might also be a result of increased asset accumulation as a result of households going through the lifecycle. Tables nine and ten report the demographic and cohort coefficients from equation (2) within the five-year cohorts described earlier. Table nine reports the demographic and cohort coefficients for the level and IHS transformation of net financial assets and for conciseness reports only the key eligibility coefficients: *Eligibility * Cohort * SCFyear* for non-housing net worth and net worth. The demographic and saver type variables that are in both estimations[26] have the same signs and similar magnitudes. For example, having an IRA increases net financial asset by $46,802 in the cohort estimations compared with $48,973 non-cohort estimations. The positive, significant, and increasing coefficients on the cohort variables demonstrate the importance of accounting for the cohort effects. These coefficients range from 6,124 for the 30 – 34 cohort to 29,836 for the 60 – 64 cohort. What is surprising is just how miniscule the savings effects of 401(k) plans are within most of the cohorts. Most of the coefficients are highly insignificantly different from zero as the standard errors are very large relative to the point estimates. The 60 – 64 cohort for the level of non-housing net worth specification and, with the exception of the 30 – 34 cohort, all of the level of net worth cohort are the only coefficients that are greater than 1,000. In fact, the net worth coefficients follow a similar pattern as the regressions in previous section in that the levels coefficients indicate that there may be a 401(k) plan savings effect as the *eligibility * SCF01* coefficients are larger than the *eligibility * SCF98* coefficients but the coefficients for IHS transformation of net worth are very small, indicating that much of the growth in net worth attributable to 401(k) plans is a result of asset appreciation and not increased contributions. This is not surprising as one of the features of the economy in recent years has been the very strong housing market.

[26] I conducted the testing down methodology a second for the cohort specifications which resulted in a slightly different mix of explanatory variables.

Table nine: Results of estimating equation (2). Full set of coefficients for the effect within cohorts of 401(k) eligibility on net financial assets

	Coefficient	Standard Error	T-stat	Marginal Effect	T-stat
Intercept	-9,925	995	-9.97	-6,621	-15.95
Eligibility	16,626	3,048	5.46	12,760	12.92
Income: $80k - $150k	50,822	4,407	11.53	7,615	25.60
Income: > $150k	413,467	51,551	8.02	25,316	14.41
Education: Graduate school	14,979	3,260	4.60	3,029	7.10
Has a defined benefit plan	-1,301	724	-1.80	-196	-0.83
Has an IRA	46,802	2,725	17.18	9,162	45.80
Has other account type pension plan	8,637	1,861	4.64	5,374	13.73
Anticipates receiving a bequest	4,715	1,265	3.73	2,145	7.39
Leaving a bequest is very important	1,539	666	2.31	842	4.33
Place of employment has greater than 500 employees	1,418	829	1.71	943	5.62
Eligibility * Income: $80k - $150k	-94,597	58,767	-1.61	-7,539	-4.05
Eligibility * Both head and spouse work	-10,471	1,717	-6.10	-2,923	-9.82
Eligibility * Has other account type pension plan	15,044	3,927	3.83	-1,311	-2.03
Eligibility * Owns home	9,516	1,558	6.11	5,346	14.21
Eligibility * Reason for saving: retirement	13,342	2,343	5.69	3,148	9.77
Cohort 30 - 34	6,124	1,345	4.55	4,732	5.60
Cohort 35 – 39	6,448	2,190	2.94	5,883	11.86
Cohort 40 – 44	9,384	1,863	5.04	7,327	15.32
Cohort 45 – 49	9,709	1,237	7.85	8,388	11.70
Cohort 50 – 54	11,629	2,605	4.46	11,556	10.42
Cohort 55 – 59	10,622	1,979	5.37	8,676	6.23
Cohort 60 – 64	29,836	4,154	7.18	15,709	15.60
Eligibility * Cohort 30 - 34	-254	2,653	-0.10	-139	-0.16
Eligibility * Cohort 35 – 39	-288	2,899	-0.10	-166	-0.25
Eligibility * Cohort 40 – 44	-211	3,894	-0.05	-150	-0.21
Eligibility * Cohort 45 – 49	-273	3,250	-0.08	-186	-0.24
Eligibility * Cohort 50 – 54	4	10,802	0.00	-177	-0.16
Eligibility * Cohort 55 – 59	-175	5,732	-0.03	-157	-0.15
Eligibility * Cohort 60 – 64	-106	20,914	-0.01	-214	-0.15
Cohort < 30 * Year 1998	32	800	0.04	35	0.06
Cohort < 30 * Year 2001	95	662	0.14	66	0.17
Cohort 30 – 34 * Year 1998	-7	1,421	0.00	2	0.00
Cohort 30 – 34 * Year 2001	0	1,019	0.00	4	0.01
Cohort 35 – 39 * Year 1998	40	2,109	0.02	9	0.03
Cohort 35 – 39 * Year 2001	29	2,061	0.01	1	0.00
Cohort 40 – 44 * Year 1998	-12	1,579	-0.01	-10	-0.02
Cohort 40 – 44 * Year 2001	10	1,406	0.01	4	0.01
Cohort 45 – 49 * Year 1998	25	1,348	0.02	16	0.03

Table nine, continued

	Coefficient	Standard Error	T-stat	Marginal Effect	T-stat
Cohort 45 – 49 * Year 2001	21	2,389	0.01	14	0.02
Cohort 50 – 54 * Year 1998	23	3,317	0.01	-29	-0.03
Cohort 50 – 54 * Year 2001	-9	1,433	-0.01	-35	-0.04
Cohort 55 – 59 * Year 1998	397	8,476	0.05	48	0.05
Cohort 55 – 59 * Year 2001	171	8,745	0.02	58	0.06
Cohort 60 – 64 * Year 1998	-117	8,923	-0.01	-47	-0.05
Cohort 60 – 64 * Year 2001	-204	15,751	-0.01	-74	-0.06
Eligibility * Cohort < 30 * Year 1998	-206	1,803	-0.11	-137	-0.18
Eligibility * Cohort < 30 * Year 2001	-284	1,910	-0.15	-170	-0.29
Eligibility * Cohort 30 – 34 * Year 1998	37	3,194	0.01	-10	-0.01
Eligibility * Cohort 30 – 34 * Year 2001	58	2,906	0.02	5	0.01
Eligibility * Cohort 35 – 39 * Year 1998	68	4,138	0.02	39	0.06
Eligibility * Cohort 35 – 39 * Year 2001	129	3,276	0.04	40	0.07
Eligibility * Cohort 40 – 44 * Year 1998	49	5,154	0.01	15	0.02
Eligibility * Cohort 40 – 44 * Year 2001	85	4,998	0.02	9	0.01
Eligibility * Cohort 45 – 49 * Year 1998	275	8,350	0.03	38	0.04
Eligibility * Cohort 45 – 49 * Year 2001	101	7,585	0.01	5	0.01
Eligibility * Cohort 50 – 54 * Year 1998	-125	14,943	-0.01	30	0.02
Eligibility * Cohort 50 – 54 * Year 2001	168	22,666	0.01	40	0.03
Eligibility * Cohort 55 – 59 * Year 1998	-211	14,721	-0.01	-33	-0.03
Eligibility * Cohort 55 – 59 * Year 2001	747	43,200	0.02	6	0.00
Eligibility * Cohort 60 – 64 * Year 1998	447	43,168	0.01	45	0.02
Eligibility * Cohort 60 – 64 * Year 2001	567	88,135	0.01	101	0.04

Table ten: Key coefficients from estimation of equation (2): Eligibility effect within cohorts for non-housing net worth and net worth

		Non-Housing Net Worth					Net Worth				
		Level			IHS Transformation		Level			IHS Transformation	
		Coeff	Std. Error	T-Stat	Marginal Effect	T-Stat	Coeff	Std. Error	T-Stat	Marginal Effect	T-Stat
Cohort < 30	Eligibility * SCF98	-337	1,910	-0.18	-194	-0.18	9,555	2,797	3.42	-122	-0.28
	Eligibility * SCF01	-374	2,154	-0.17	-226	-0.29	12,781	3,688	3.47	-145	-0.39
Cohort 30 – 34	Eligibility * SCF98	117	3,158	0.04	51	-0.01	870	5,317	0.16	14	0.03
	Eligibility * SCF01	159	3,446	0.05	60	0.01	983	5,811	0.17	11	0.02
Cohort 35 – 39	Eligibility * SCF98	151	4,593	0.03	66	0.06	1,608	5,960	0.27	19	0.04
	Eligibility * SCF01	146	3,655	0.04	59	0.07	1,762	9,503	0.19	17	0.03

Table ten, continued

		Non-Housing Net Worth					Net Worth				
		Level			IHS Transformation		Level			IHS Transformation	
Cohort 40 – 44	Eligibility * SCF98	79	6,159	0.01	30	0.02	2,334	10,491	0.22	16	0.03
	Eligibility * SCF01	97	5,929	0.02	39	0.01	1,864	8,796	0.21	20	0.04
Cohort 45 – 49	Eligibility * SCF98	489	9,327	0.05	104	0.04	3,099	17,891	0.17	36	0.06
	Eligibility * SCF01	137	10,844	0.01	52	0.01	2,988	16,381	0.18	11	0.02
Cohort 50 – 54	Eligibility * SCF98	-40	16,943	0	25	0.02	4,786	23,651	0.2	31	0.04
	Eligibility * SCF01	47	22,497	0	17	0.03	5,456	25,907	0.21	22	0.03
Cohort 55 – 59	Eligibility * SCF98	-34	16,339	0	-34	-0.03	8,461	38,015	0.22	11	0.01
	Eligibility * SCF01	1,175	34,181	0.03	71	0	11,260	42,392	0.27	32	0.04
Cohort 60 – 64	Eligibility * SCF98	1,009	49,665	0.02	149	0.02	8,161	61,883	0.13	28	0.02
	Eligibility * SCF01	1,020	96,112	0.01	81	0.04	17,384	127,360	0.14	55	0.04

The less than 30 cohort, at least in the levels specification, indicates increased asset accumulation. This almost certainly a result of this group's first time eligibility and participation in 401(k) plans, perhaps in their first full-time career employment. The effect is quite large, however with $9,555 (from 1995 to 1998) and $12,781 (from 1995 to 2001) of additional net worth attributable to 401(k) plans which is larger than any other cohort other than the 60 – 64 group (which likely faces retirement in the very near future). It may be that this youngest cohort is receiving the message about the need to rely on one's own savings for retirement and the benefits of beginning to save early in the lifecycle. This is only speculation at this point, but it will be interesting to see if there continues to be asset accumulation for this group when the results of the 2004 survey are released in 2005, allowing for direct comparison.

Collinearity

The main reason using the testing down methodology for variable selection is to reach a parsimonious model specification. Given the richness of the SCF there are many potential

variables to include as explanatory variables and including them all would certainly result in over fitting the model with many highly correlated variables potentially causing harmful collinearity. This was indeed the case with an earlier draft of this paper. I examine the impact of collinearity using two diagnostic tools: the variance decomposition of D.A. Belsley, E. Kuh, and R.E. Welsch (BKW) (1980) as described in R. Carter Hill and Lee C. Adkins (2001) and the more well-known variance inflation factors as described in chapter eleven of Peter Kennedy (1998). The variance decomposition of BKW involves examining the proportion of the variance of each least squares coefficient contributed by each eigenvalue. There are several steps to the BKW diagnostic procedure. The first step is to determine the condition index, which is the square root of the ratio of the largest to smallest eigenvalue of the cross-product (X'X) matrix. A high condition index reflects the presence of multicollinearity, with the recommendation that condition indices greater than 30 are deserving of closer inspection. For each explanatory variable, the proportion of the variance of each parameter associated with each eigenvalue can be examined to identify the variables affected by the collinearity. If the variance proportion is less than 50 percent the variable is not adversely affected by collinearity. The more well-known variance inflation factor is given by $(1-R_i^2)^{-1}$ where R_i^2 is the R-squared measure from regressing the *i*th independent variable on all the other independent variables. Kennedy (1998, p. 190) suggests using a VIF greater than ten as an indication of harmful collinearity. The VIF's have a high degree of correlation with the BKW method. In contrast to the first draft of this paper that did not use the testing down approach, there appears to be no harmful collinearity in the final estimations. For example, in the net financial asset regressions that do not account for cohort effects the largest condition index is 15.79 and only the intercept and eligibility indicator have VIF's larger than ten. In the cohort effect estimations there is some collinearity as a result of my decision to include all of the cohort variables, although the largest condition index is 24.65, which is less than the recommended cut off point of 30. Only the intercept and eligibility indicator have proportions of variance associated with the largest eigenvalue greater than fifty

percent; the VIFs are also larger than 10 for these variables and for the *Cohort 30 – 34 * eligibility* and the *Cohort 35 – 39 * eligibility* variables. There is no harmful collinearity present in either the demographic and saver type variables and in the 401(k) savings effect within cohort variables.[27] In addition, the coefficients that indicate the savings effects of 401(k) plans within the cohorts are so small that it is unlikely that efforts at reducing their standard errors would be make these coefficients significant.

Concluding Discussion

This paper finds little evidence that the assets of 401(k) plans represent new savings and so these results fit in broadly with the substitution camp of the issue. Any savings effect that the data initially reveals is eliminated once lifecycle savings effects are accounted for. What appears to be happening is that good savers are attracted to firms that have 401(k) plans, which seems to support Richard A. Ippolito's (1997) notions of retirement benefits playing a sorting role where low discounters (good savers) are attracted to firms with pension plans. What seems likely is that good savers are making use of 401(k) plans but many households are either not using them or are not are not using them as policy makers envisioned. Asset substitution is a very real concern because of the tax breaks that 401(k) contributions receive as well as the possible use of 401(k) plans as a model for the private accounts currently being discussed in Social Security reform proposals. The point of the 401(k) tax benefit and employer match is to increase the return on savings which should encourage households to save more. If much of the recent evidence, including this paper, is correct and households are not using the plans to increase their savings then it could be the case that they are increasing their consumption. This is possible in a setting where households have a target savings level and so can achieve their future savings goal while giving up less consumption. Given the evidence that people say they are worried about their retirement security this strikes me as not so plausible. More likely seems to be that the preference for current consumption is so great that it swamps the desire to save for

[27] I have omitted the collinearity diagnostics tables, but they are available on request.

future consumption—this lends some credence to the myopic models that are currently receiving attention in the behavioral finance literature. If true, then one implication is that the marginal utility of wealth is very low for 401(k) eligible households. Perhaps implausibly low, since 401(k) eligible households are thought to be have low discount rates (high marginal utility of wealth) relative to ineligible households, suggesting that ineligible households have extremely low marginal utilities of wealth. With regards to the private accounts in Social Security, this research suggests caution in applying the 401(k) model. Mandatory private accounts would cover workers with higher savings propensities, like 401(k) eligible workers, but also workers with lower savings propensities, with perhaps unforeseen consequences. It is possible to make the case that mandatory private accounts for all workers would increase savings rates, but that does not seem the most likely outcome.

A likely outcome is the continued use of 401(k) plans to offset other savings or increase current consumption. Using 401(k) plans to finance current consumption may not be a strategy actively pursued by individuals, just as the automobile purchase example from the introduction may not be a conscious choice. However, non-participants to 401(k) plans must be subsidizing some consumption choices of plan participants given the amount of defined contribution plan contributions ($167 billion in 1998) and corresponding lost government revenue. It should be noted that the flip side of the savings / consumption coin—that 401(k) plans lead to higher consumption—has not been established, but it does suggest a possible next step in the investigation.

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Chapter 2: The Relationship Between Saver Characteristics and Asset Accumulation: A Comparison of Households With and Without Outstanding Loans among 401(k) Plan Participants

Introduction

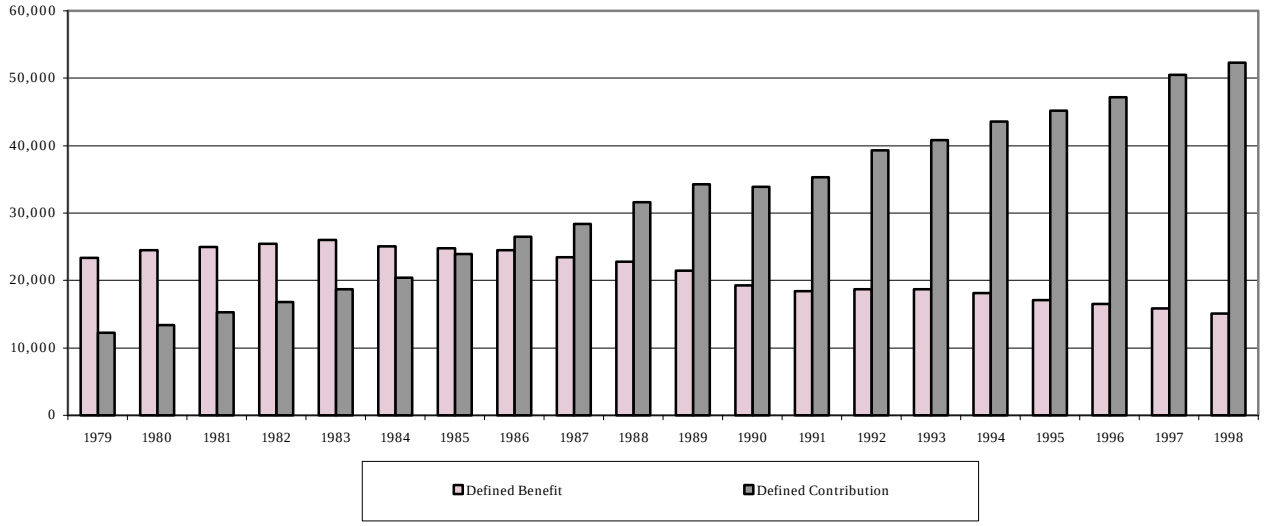
The major trend in saving for retirement over the past twenty years has been the shift from the defined benefit (DB) to defined contribution (DC) pension plans. In the more familiar DB plan an employee is guaranteed a monthly retirement income using a formula based on their wages and length of service. In a defined contribution plan, however, an employee accumulates money in an account that usually receives tax benefits and draws on these funds for retirement income. The most common DC plan is the 401(k) plan, named after the relevant section of the tax code.[28] One of the intriguing features of the 401(k) plans is the ability of the account holder to access the funds before retirement either by borrowing against or making withdrawals from the account. Borrowing is usually the preferred option, as will be explained in the next section; there are generally no provisions for accessing DB assets before retirement. This paper examines several issues concerning borrowing against one's 401(k) plan. After a general discussion of 401(k) plan borrowing and I offer a more extensive analysis of some issues than is available in the relevant, though limited, literature. First, I use a logit regression to estimate the factors in determining whether a household has an outstanding loan against their retirement plan. Then, I simulate the impact that a loan might have on retirement wealth. Finally, I examine whether households that have an outstanding loan save differently from households without an outstanding 401(k) loan. General conclusions from the paper are that households with a current loan may have borrowed because of limited access to other sources funds, they appear to be trying to maintain their retirement savings, although it may be at the expense of other financial assets, and that borrowing could have a relatively minor impact on retirement wealth for disciplined savers, but a potentially major impact for undisciplined savers.

[28] 401(k) plans are for private workforce employees; public employees have 403(b) plans which are similar to 401(k) plans and are included in 401(k) plans for the analysis of this paper.

Borrowing Against a Retirement Plan

There is much concern from both policy makers and the general public regarding the adequacy of savings for retirement, especially as the baby-boom generation begins reaching retirement age. A recent survey by the Gallup Organization (Gallup (2004)) indicates that retirement planning is Americans' leading financial worry. In fact, 57 percent of non-retired individuals are very or moderately worried about having enough money for retirement. Part of the reason for the worry might be attributed to the increasing adoption of defined contribution pension plans by employers. Figure one illustrates this changing nature of employer provided pension plans using data provided by the Pension and Welfare Benefits Administration (2002), a division of the Department of Labor. While DB plans accounted for over sixty-five percent of pension plans with at least 100 participants in 1979, by 1998 less than twenty-four percent of pension plans with 100 participants were of the defined benefit type.

Figure one: Number of Defined Benefit and Defined Contribution Plans with more than 100 participents



While there are many potential explanations for the reason behind this shift of pension provision (see William G. Gale and Joseph M. Milano (1998) or Alicia H. Munnell and Annika

Sunden (2004) for discussions of the implications of and reasons for this shift), for employees one of the most important features of DC accounts is that the employee (account holder) bears the risk and responsibility for maintaining the account. This has both advantages and disadvantages. For example, the employee alone makes the contribution and investment decisions so there usually is no recourse to having a shortfall of assets at retirement, particularly if the shortfall is a result of inadequate contributions or poor investment returns on the plans' assets.[29] On the other hand, the tax advantages and employer contributions allow significant asset accumulation to occur, with the account holder able to transfer the assets to other tax favored accounts upon separation from the current employer; there is no portability of defined benefit plan assets for an employee.

While an employee has no access to the funds in a defined benefit plan, often the account holder can withdraw or borrow funds from a 401(k) plan.[30] Withdrawal is usually the less attractive option because the withdrawn funds are subject to ordinary income taxes and, if the account holder is less than age 59 ½ and the withdraw is not for a "hardship" reason,[31] a 10 percent tax penalty must be paid. The IRS imposes this penalty in order to "discourage the use of pension funds for purposes other than normal retirement" (IRS (2002)). Allowing borrowing from retirement plans allow participants to avoid paying the income taxes and the penalty.

Most conventional advice warns against borrowing from a 401(k) plan. The Wall Street Journal (May 1, 2003, page D1) offers a typical admonition by noting that borrowing against a 401(k) plan is a good way to postpone retirement and that using 401(k) loans for consumer purchases is almost always a bad idea. There are several reasons for this advice. First, borrowed funds do not accumulate market investment returns, leaving the account holder with fewer

[29] The Pension Benefit Guaranty Board insures DB plans in order to protect workers' pension benefit should an employer go bankrupt. DC plans have no such guarantees. Recall the Enron debacle, where many employees' 401(k) plans were nearly worthless because they held large amounts of Enron stock.
[30] Withdrawals, borrowing, and taking a lump sum distribution upon changing jobs are referred to as "leakages" by Alicia H. Munnell and Annika Sunden (2004).
[31] The IRS (publication 575) lists a number of hardship withdraws that are not subject to the 10 percent penalty. These include education and medical expenses, or down payment on a first home.

assets at retirement. Second, to the extent that 401(k) plans represent a commitment mechanism for retirement savings (for example, as a mental account in the Richard H. Thaler and Hersch M. Shefrin's (1981) sense or the illiquid asset in David Laibson's (1997) hyperbolic discounting model of undisciplined savers) allowing early access to retirement funds can undermine dedicated savings behaviors, especially for bad savers who value the limited access to funds that retirement accounts engender. The largest potential negative result of borrowing against a retirement plan occurs if an employee ends their relationship with their employer whether by quitting or lay-off. In this case the loan usually must be repaid immediately or it is considered a withdrawal and subject to the taxes and penalties mentioned earlier.

There are several advantages to borrowing from a 401(k) plan rather than making a withdrawal or borrowing from more conventional sources. The application process is inexpensive[32], involves little paperwork, and loan approval is nearly certain; in addition, there are no credit checks, which can be important for households in financial difficulty. The loan usually has an attractive interest rate of one or two percentage points above the prime rate. In addition, the interest payments are credited to the 401(k) account rather than a lending institution, which reduces the cost of the loan to the difference between the loan interest rate and the returns on the plan assets. Some plans allow the borrower to choose which assets to liquidate for the loan, while other plans reduce all assets held equally, which may require a portfolio rebalancing by the borrower.

Allowing the borrowing of funds may increase 401(k) plan participation and contribution rates— especially among lower wage workers. The General Accounting Office (GAO (1997)), using IRS form 5500 data from 1992, finds that among plans that allow borrowing participation rates are 5.91 percent higher, contribution levels are 36.8 percent higher, and contribution rates are 3.02 percent higher compared with plans that do not allow borrowing. Patrick J. Bayer, B. Douglas Bernheim, and John Karl Scholz (1996) find mixed evidence on the

relationship between participation decisions and borrowing provisions depending on the sample used; there is a negative, though insignificant, relationship for samples of highly compensated or non-highly compensated employees and a positive and insignificant relationship for the full sample of all employees.[33] These results suggest that households may be reluctant to use voluntary retirement accounts if there is no access to the funds, especially in an emergency. Another reason for firms to encourage lower wage workers to participate in the 401(k) plan is that it helps the plan to meet non-discrimination requirements.[34]

Other loan provisions include that, with the exception of borrowing for housing purposes, the funds usually must be repaid within five years. At the plan's discretion housing loans may have up to a 20-year term. Note also that borrowing is allowed only from 401(k) or 403(b) plans and *not* from other tax-advantaged retirement plans such as Individual Retirement Accounts (IRAs), Keogh, or SIMPLE plans.

The impact that borrowing against a 401(k) plan has on the amount of retirement assets at retirement (assumed to be at age 65) depends on several factors. The difference between the loan interest rate and rate of return on the borrowed funds represents the opportunity cost of the borrowed funds; that is, the borrowed assets are not receiving their investment rate of return (i.e. from the mutual fund) but rather the prime plus one or two percent as the loan contract indicates. It's important to note that from the perspective of a household's balance sheet the loan is a reshuffling of assets from the retirement account asset (i.e. mutual fund holding) to the loan, which has a lower return. In fact, one of the key advantages of borrowing from the 401(k) account is that the interest payments are not going to a lending institution, but are accumulated in the retirement account.

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[32] The Profit Sharing Council of America (http://www.401k.org/401kloans.asp) indicates that 70 percent of plans charge a one-time loan fee up to $100 and another 25 percent charge a yearly service fee up to $75.

[33] Their data is based on the KPMG Peat Marwick Retirement Benefits Survey of nearly 600 companies with 401(k) plans which may or may not be representative of all retirement plans.

[34] In order for a defined contribution plan to receive favorable tax treatment it must meet certain IRS tests to ensure that the plan benefits rank and file workers and not just company owners and highly compensated employees. See Stephen J. Butler (1999) for further discussion of testing a plan for non-discrimination.

Another important consideration is whether the household suspends contributions during the loan period; the Survey of Consumer Finances (SCF) indicates that 92 percent of households with a loan continue their 401(k) contributions during the period that the loan is outstanding. However, for the other eight percent, given that the typical loan term is five years, the impact on wealth at retirement is likely to be substantial.

The age of the borrower also has an impact. Younger households likely may be more tempted to borrow against retirement savings for several reasons. These households are probably twenty to thirty years away from retirement so they may lack the imperative to accumulate retirement savings; at this point in their lifecycle they may feel that their savings are better used for a home purchase or may be unwilling to have funds committed to a retirement plan that could not be used for emergency spending.[35] Younger households also have more time to make up for the lost returns or contributions that the borrowing enjoins. A negative aspect is that the longer the household the waits before catching up with their contributions the larger the opportunity cost of the loan is. For example, a 45 year old—planning to retire at age 65—that doesn't increase future contributions to account for the loan loses twenty years of interest while a 35 year old loses thirty years of interest.

Finally, a point that is not widely emphasized, although it is pointed out by Mary Rowland (1998) and David Braze at the Motley Fool website[36], is that because contributions to 401(k) plans are made with pre-tax money the borrowed funds are pre-tax money but are paid back with after tax dollars. This means that a borrower in the 28% tax bracket has to earn $139 pre-tax for every $100 in loan payments.

Very little academic literature appears to be available regarding borrowing against a retirement plan with only two sources directly related to 401(k) plan borrowing (Alicia H. Munnell and Annica Sunden (2004) and the Government Accounting Office (1997)). One reason

[35] While the interest payments on a retirement account loan for a home purchase are *not* tax deductible, it may make sense to use the loan for (part of) the down payment since this is essentially an asset swap.
[36] The Motley Fool (http://www.fool.com) is an online personal finance resource.

is that 401(k) plan loans have only been receiving attention in the past few years as 401(k) plans have become more widespread. A related reason has to do with data availability. It seems that few commonly available data sets have information regarding pension plan loans. However, the Survey of Consumer Finances (SCF), a nationally representative survey conducted on behalf of the Board of Governors of the Federal Reserve, has been collecting detailed information on household pension plans—including loans—since 1995. That data is used here in the empirical analysis that follows.

Data

The Survey of Consumer Finances (SCF) is a triennial survey conducted on behalf of Board of Governors of the Federal Reserve, the most recently available was conducted from March to October of 2001. The SCF collects very detailed information on US household finances, such as types of assets owned and their values, amount and types of debt and loans owed, detailed demographic information on household members, and a number of opinion variables that can proxy for saver type in data analysis. I use the three most recent surveys: 1995, 1998, and 2001. Each survey interviews different sets of households so there are three separate cross sections rather than one panel data set: the SCF could thought of as a balance sheet of American household finances. The SCF is also considered to be among the highest quality of wealth data available (Richard T Curtin, F. Thomas Juster and James N. Morgan (1989). Approximately about 4,300 households are interviewed in each survey with approximately 1,200 of the households having a defined contribution pension plan which they are able to borrow against.

Two important issues with the SCF are the handling of missing values and the over sampling of wealthy households. With regards to missing values, Karen Pence (2001) points out that missing data are a particular problem with wealth data because people may be reluctant to provide information about certain assets or an asset, for example real estate or a business, may be difficult to value. To handle missing values, the SCF uses multiple imputation (MI), developed by Donald Rubin (1987) and explained in detail by Arthur Kennickell (1998). In MI, a

missing value is imputed five times from the estimated conditional distribution of the variable. Essentially, there are five observations for each household, with potentially five different values for data points that were originally missing. For estimation purposes, the usual procedure, explained by Pence or C.P. Montalto and J. Sung (1996), is to run separate regressions over each of the five implicates. The point estimate is the average of the five estimates and the standard error is the average of the five standard errors, with an adjustment made for the imputation variance. In appendix A, the method for adjusting the standard errors is explained. The method raises the standard errors of the point estimates and may lead to insignificant point estimates, although they may be significant without the additional adjustment for the imputation.

The distribution of wealth in the US is highly skewed; that is, a few households hold much of the wealth in the US. A true random sample of US households would include many households with relatively little wealth and would have little information on the nature of most of the assets held by households. In order to get a good feel for asset holdings among US households the SCF over samples wealthy households so that there are “too many” wealthy households in the survey relative to the US population. In order to make data analysis applicable to the US population the survey data includes a variable for weighting the households’ observations so that results are applicable to the US population. Analysis that does not weight the observations will have estimates that are not representative of the US population. All of the results reported in this paper are weighted so as to be representative of the US population. The skewness of wealth data also impacts regression estimates when the dependent variable is a measure of wealth. As explained in the regression section below I apply a transformation similar to the natural logarithm to my dependent variables so they are approximately normally distributed.

Descriptive Statistics

The statistics in table one indicate that 401(k) plan participation rates increase from 67.96 percent in 1995 to 75.58 percent in 1998. The participation rate fell by one-half of one

percent from 1998 to 2001. While 91 to 95 percent of participants are able to make withdrawals from their plan (even if the withdrawal includes a penalty), the percentage of plans allowing borrowing increased from 65.25 percent in 1995 to 74.97 percent in 1998, then to 76.61 percent in 2001. The increase in borrowing ability may have contributed to the increase in participation rates from 1995 to 1998, but the rising stock market and increased media attention on 401(k) plans during that time likely played a larger role. The percentage of households with a loan increased from 13.82 percent to 16.22 percent from 1995 to 1998, then decreased to 13.11 percent in 2001. The loan balances are fairly modest with about 80 percent of loans having an outstanding balance of less than $10,000.[37] Although households can borrow up to 50 percent of their account balance most households seem to be borrowing less than a quarter of their account balances as the outstanding loan balance as a percentage of the 401(k) account balance is about 20 percent. Most of the households that have outstanding loans are where the head of the household is less than 50 years old. This is consistent with Christopher D. Carroll and Andrew A. Samwick (1997) and Christopher D. Carroll (who find that households begin saving for retirement around the age of 50. There are few loans for households where the head of the household is older than 59. On one hand, this is not surprising as there is no penalty for withdrawals after 59 ½; however, since ordinary income taxes must be paid on the withdrawn funds it may be advantageous for this group to borrow rather than make a withdrawal, thereby deferring the taxes until they are retired and, presumably, in a lower tax bracket.

[37] A limitation of using cross-sectional data such as the SCF is that there information about the loan balance at the time of the survey but there is no indication of the amount actually borrowed or when the loan was taken out.

Table one: Descriptive statistics on loan use

	1995	1998	2001
401(k) plan participation rate	67.96%	75.58%	75.07%
Percentage of plans that allow withdrawals, even if withdrawal involves a penalty	91.33%	92.06%	93.90%
Percentage of households participating in 401(k) plan that can borrow against plan	65.25%	74.97%	76.61%
Percentage of households that have a loan against their 401(k) plan, among plans that allow borrowing	13.82%	16.22%	13.11%
Mean loan balance	$4,758	$5,880	$6,499
Median loan balance	$2,312	$3,810	$3,000
Largest loan balance	$57,792	$41,362	$40,000
Ratio of loan balance to 401(k) account balance	.20	.19	.19
Distribution of loan balances			
Less than $1000	19.52%	15.88%	22.54%
$1000 - $2499	30.73%	22.63%	18.60%
$2500 - $4999	24.02%	20.07%	18.88%
$5000 - $9999	10.19%	24.13%	19.08%
$10,000 - $24,999	13.95%	15.15%	14.41%
Greater than $25,000	1.59%	2.14%	6.50%
Age of head of household for borrowers			
Younger than 30	2.04%	16.41%	8.99%
30 – 39	38.79%	30.90%	32.08%
40 – 49	45.19%	35.34%	38.65%
50 – 59	11.34%	17.08%	18.64%
60 –70	2.65%	0.27%	1.63%
70 – 79	0.00%	0.00%	0.00%

As table two indicates, the most common reason for borrowing indicated is for the purchase of a home or vacation property or for living expenses or a loan to family / friends. This highlights a difficulty plan designers and policy makers face. While borrowing to purchase property might be justifiable, as this kind of loan is a swap of long-term assets, borrowing for current consumption or for attorney or medical expenses are more problematic. This will

certainly have a negative effect on wealth at retirement. However, this needs to be balanced against the potentially lower participation rates should loan approval depend on the purpose of the loan. There is also no indication of the household's borrowing decision had the 401(k) loan not been available. Some households may have chosen to borrow from another source, such as home equity or a finance company loan, while other might have not had this option because of poor credit or simply chosen not to borrow at all.

Table two: Stated purpose of loan against 401(k) plan

		Age				
		Less than 30	30 - 39	40 - 49	50 - 59	60 - 69
Reason	Own home or vacation property	19.69%	33.28%	25.58%	19.75%	17.97%
	Home improvements	0.00%	6.15%	11.30%	9.49%	55.12%
	Automobile	4.02%	4.41%	17.91%	9.09%	0.00%
	Appliances or furniture	9.24%	1.97%	2.53%	7.34%	0.00%
	Home electronics / hobbies	0.00%	2.35%	0.00%	0.00%	0.00%
	Recreational vehicles	0.00%	1.71%	0.35%	0.00%	0.00%
	Investments (including business, financial, real estate)	1.12%	2.73%	5.49%	0.81%	0.00%
	Divorce, travel, moving, or wedding expenses	21.09%	6.76%	3.63%	7.88%	0.00%
	Medical, attorney, education expenses	5.98%	6.46%	14.17%	25.46%	0.00%
	Living expenses, loans to family / friends	38.86%	34.19%	19.04%	20.19%	26.91%

Table three contains descriptive statistics for households that can borrow against their 401(k) plan, comparing those that have a loan and those that do not. Panel A contains information on various wealth measures while panel B contains information on differences in demographics and variables related to a household's saver type. The wealth measures show an interesting difference. Both the mean and median borrowers had much larger 401(k) account balances than non-borrowers over the sample period, although the difference in means is very

slight for 1998 and 2001. The mean borrower had over $6,000 more in 401(k) assets in 1995 compared to non-borrowers, but this difference was only $107 and $971 in 1998 and 2001. Median borrowers had $12,000 more in 401(k) assets in 1995, $7,500 more in 1998, and $8,000 more in 2001 compared to non-borrowers. This is likely a result of longer participation in their plan. In 1995, borrowers had three more years of plan participation than non-borrowers, although the difference was less than one year in 1998 and just less than two years in 2001. It's possible that borrowers feel they need to have "enough" in their retirement account before borrowing against the plan. While borrowers had more 401(k) assets, in other measures of wealth non-borrowers generally had larger balances, with the differences increasing from 1995 to 2001. For example, non-borrowers had mean net financial assets $46,000 larger than borrowers in 1995; by 2001, this difference increased to nearly $140,000. Non-borrowers' net worth was also increasing relative to borrowers over the sample period. Non-borrowers had mean (median) net worth $112,495 ($2,207) greater than non-borrowers in 1995, $198,495 ($27,299) in 1998, and $252,586 ($71,430) in 2001. There is evidence besides the differing wealth levels that borrowers are in slightly worse financial condition than non-borrowers. Borrowers have more debt on their household balance sheets as evidenced by the slightly higher debt-to-assets ratio which ranges from three (in 1995) to eleven (in 1998) percentage points higher for borrowers. Related to this is the fact that many more borrowers had been turned down for credit in the five years priors to the survey year.[38]

Table three: Descriptive statistics of households that are able to borrow against their 401(k) plan by borrowing status

Panel A: Financial Statistics

		1995 SCF		1998 SCF		2001 SCF	
		No Loan	Has a Loan	No Loan	Has a Loan	No Loan	Has a Loan
Loan balance	Mean	$0	$4,281	$0	$5,588	$0	$6,302
	Median	$0	$2,312	$0	$3,374	$0	$3,000
401(k) assets	Mean	$39,151	$45,312	$52,541	$52,649	$61,262	$62,233

[38] Unfortunately, there is not enough information in the survey to determine whether the 401(k) loan was taken before or after having been turned down for credit; only that the household was refused credit in the five years prior to the survey and that the household has a 401(k) loan.

Table three, continued

		1995 SCF		1998 SCF		2001 SCF	
		No Loan	Has a Loan	No Loan	Has a Loan	No Loan	Has a Loan
	Median	$11,558	$24,272	$16,327	$23,946	$19,000	$27,000
Retirement assets excluding 401(k)	Mean	$35,948	$31,716	$31,807	$13,424	$48,575	$12,212
	Median	$1	$0	$0	$0	$900	$0
Financial Assets	Mean	$163,893	$123,934	$225,455	$114,538	$256,716	$125,380
	Median	$45,251	$50,625	$67,616	$48,551	$71,750	$53,200
Net Financial Assets	Mean	$152,590	$105,735	$199,455	$86,756	$242,050	$102,428
	Median	$34,444	$37,449	$53,879	$25,873	$57,640	$38,500
Non-housing net worth	Mean	$254,416	$155,554	$317,100	$140,228	$401,221	$203,153
	Median	$60,681	$56,324	$82,669	$49,286	$102,300	$63,500
Net Worth	Mean	$313,818	$201,323	$381,336	$183,081	$497,427	$244,841
	Median	$96,870	$94,663	$125,446	$98,147	$171,700	$100,270
Debt / Assets	Mean	.40	.43	.38	.49	.38	.44
Debt / Financial Assets	Mean	3.74	2.82	2.65	2.70	3.05	2.90

Panel B: Demographic and Saver Type characteristics

	1995 SCF		1998 SCF		2001 SCF	
	No Loan	Has a Loan	No Loan	Has a Loan	No Loan	Has a Loan
Can also withdrawal from plan (even if includes penalty)	90.78%	94.37%	91.63%	94.16%	94.08%	92.78%
Age: Less than 30	18.59%	2.68%	11.09%	15.74%	11.72%	9.61%
Age: 30 – 39	27.53%	38.58%	32.13%	32.95%	28.21%	32.76%
Age: 40 – 49	32.44%	45.04%	30.72%	34.49%	35.63%	37.84%
Age: 50 – 59	17.15%	11.31%	20.07%	16.57%	19.26%	18.09%
Age: 60 – 69	4.18%	2.39%	5.44%	0.25%	5.09%	1.70%
Age: 70 – 79	0.12%	0.00%	0.33%	0.00%	0.10%	0.01%
Education: Finished high school	27.84%	24.57%	27.21%	33.15%	21.67%	40.42%
Education: Some college	26.82%	28.27%	25.71%	28.85%	24.47%	24.35%
Education: Finished college	25.15%	21.29%	24.27%	17.90%	27.08%	16.69%
Education: Graduate school	15.57%	16.31%	16.14%	12.65%	20.47%	10.60%
Income: < $10k	0.79%	0.00%	1.01%	1.39%	0.29%	0.16%
Income: $10k - $30k	10.71%	2.95%	11.01%	6.63%	8.18%	7.94%
Income: 30k – 50k	24.86%	31.23%	22.69%	24.57%	18.09%	29.55%
Income: 50k – 80k	31.59%	27.93%	33.64%	31.94%	30.40%	32.80%
Income: 80k – 150k	22.27%	30.35%	24.35%	28.77%	31.45%	22.50%
Income: > 150k	9.78%	7.54%	7.29%	6.70%	11.59%	7.05%
Owns home	73.92%	81.77%	77.88%	86.67%	78.97%	79.13%
Does not own home	26.08%	18.23%	22.12%	13.33%	21.03%	20.87%
Head of household is not white	14.66%	22.20%	16.75%	15.16%	22.89%	18.75%
Head of household is white	85.34%	77.80%	83.25%	84.84%	77.11%	81.25%

Table three, continued

	1995 SCF		1998 SCF		2001 SCF	
	No Loan	Has a Loan	No Loan	Has a Loan	No Loan	Has a Loan
Married household	66.65%	75.65%	64.90%	68.09%	67.04%	67.30%
Household has two earners	47.46%	63.57%	46.29%	52.89%	52.11%	49.53%
Years of 401(k) plan participation	5.82	8.96	6.51	7.23	7.14	9.13
Holds mostly stock in 401(k) plan	45.60%	36.45%	49.29%	49.03%	58.81%	61.81%
Has defined benefit plan	26.59%	30.18%	24.90%	29.48%	27.10%	24.84%
Does not have a defined benefit plan	73.41%	69.82%	75.10%	70.52%	72.90%	75.16%
Has other account type pension plan	22.69%	34.22%	13.95%	16.74%	13.58%	13.51%
Has an Individual Retirement Account (IRA)	33.27%	19.63%	38.45%	20.94%	43.69%	18.53%
Has been turned for credit in prior five years	7.88%	15.14%	10.05%	16.33%	9.36%	22.47%
Reason for saving: Child's education	9.09%	11.21%	7.39%	7.26%	8.31%	6.47%
Reason for saving: Precautionary motive	30.33%	19.11%	16.26%	16.25%	20.09%	18.97%
Reason for saving: Retirement	36.11%	44.08%	51.23%	50.53%	44.11%	47.43%
Savings horizon less than one year	8.22%	17.13%	10.39%	21.03%	11.20%	18.86%
Savings horizon between one and ten years	72.56%	61.01%	66.77%	58.89%	62.83%	64.05%
Savings horizon greater than ten years	19.23%	21.86%	22.83%	20.08%	25.97%	17.09%
Willing to take substantial investment risk	4.08%	3.81%	5.98%	16.26%	6.23%	7.37%
Willing to take above average investment risk	27.26%	22.01%	31.79%	36.07%	33.97%	24.47%
Willing to take average investment risk	48.97%	44.58%	46.19%	31.44%	41.42%	47.20%
Not willing to take any investment risk	19.68%	29.59%	16.05%	16.24%	18.38%	20.96%
Expects to receive a bequest	19.90%	16.60%	20.05%	18.91%	20.30%	17.21%
Leaving a bequest is very important	24.78%	29.15%	19.29%	21.08%	25.47%	28.33%
Leaving a bequest is somewhat important	59.28%	48.68%	57.05%	61.64%	54.79%	54.44%
Expects economy to perform worse in the next five years	15.29%	20.26%	25.59%	27.68%	35.24%	32.21%
Industry: Agriculture	0.98%	0.00%	1.01%	0.00%	0.82%	0.02%
Industry: Mining and construction	5.22%	7.18%	8.57%	3.62%	6.39%	6.00%

Table three, continued

	1995 SCF		1998 SCF		2001 SCF	
	No Loan	Has a Loan	No Loan	Has a Loan	No Loan	Has a Loan
Industry: Manufacturing	31.46%	29.23%	26.55%	37.13%	26.18%	41.55%
Industry: Wholesale and retail trade	14.25%	4.61%	10.74%	14.83%	10.98%	13.58%
Industry: Finance, insurance, real estate, repair services	13.90%	17.71%	16.90%	10.35%	18.63%	14.68%
Industry: Transportation, communication, utilities, entertainment	30.89%	34.39%	32.01%	30.80%	32.23%	20.84%
Industry: Public administration, military	3.30%	6.88%	4.22%	3.27%	4.77%	3.34%
Place of employment has less than 20 employees	8.33%	6.62%	12.25%	7.60%	12.29%	5.33%
Place of employment has between 20 and 500 employees	29.81%	18.50%	30.28%	23.59%	31.23%	34.11%
Place of employment has more than 500 employees	60.09%	74.84%	55.30%	65.50%	53.96%	58.64%

With regards to the demographic and saver type variables there are a few—but not many—striking differences between the two groups for the whole sample period. Borrowers are slightly more concentrated in their thirties and forties. Borrowers, especially in 1995 and 1998, are more likely to be homeowners. For example, in 1995 82 percent of borrowers are homeowners compared with 74 percent of non-borrowers. Given the admonitions against 401(k) borrowing it seems that homeowners should first borrow against home equity before retirement savings; given that 33 percent of borrowers in their thirties and 26 percent of borrowers in their forties used the loan proceeds for their home or vacation property it's possible that the loan was used as part of the down payment. With the exception of the length of the savings horizon, borrowers are not very different from non-borrowers with regards to their saver type. The groups are similar with regards to savings motives (children's education, precautionary or retirement motive), attitudes toward risk (with the exception of 1995 when borrowers were more likely to not be willing to take on any financial risk), and attitudes towards bequests and their economic outlook. Non-borrowers have a longer savings horizon, as there is a larger

concentration (between and eight and eleven percent higher) of borrowers that have a savings horizon of less than one year compared to non-borrowers.

Logit Model

In order to estimate a model of the use loans against 401(k) plan assets I use a logit regression:

$$Y = \beta_0 + \beta_1 X_1 + \ldots + \beta_n X_n + \varepsilon \qquad (1)$$

where *Y* is a dichotomous variable that takes the value of one if a household has a loan against their 401(k) plan and zero otherwise, $X_1 \ldots X_n$ is a set of explanatory variables thought to be related to the loan decision such a demographic features and attitudes toward savings, and $\beta_0 \ldots \beta_n$ are a set of parameters to be estimated. Given the richness of the SCF there are a large number of explanatory variables that could be included in the estimation, with many of the variables likely to be highly correlated. Using a large number of correlated explanatory variables is likely to lead to parameter estimates that are of the wrong sign and / or have large standard errors that may lead to many insignificant parameter estimates (see R. Carter Hill and Lee C. Adkins (2001) and Peter Kennedy (1998, chapter 11) for a more complete discussion of the effects of using collinear explanatory variables). In an effort to avoid including too many collinear variables and to ensure a parsimonious model specification I use a testing down (also known as general-to-specific) methodology advocated by Kennedy (1998, chapter 5) or David F. Hendry (1993) and explained in appendix A.

The 48 variables included in the general model and the results of this logit regression are in Panel A of table four. Twenty of these variables have t-statistics less than two. The results of the final, specific, model are reported in Panel B of table four. There are 16 explanatory variables (not including the intercept) in this model.

Table four: Results of logit estimation where the dependent variable is whether or not a household has a loan against their 401(k) plan

Panel A: General Model

Variable	Coefficient	Standard Error	T-stat
Intercept	-3.85	.55	-7.05
Savings horizon greater than 10 years	-.80	.05	-17.79
Has an IRA	-.93	.09	-10.58
Willing to take substantial investment risk	.61	.06	10.28
Was refused credit in previous five year	.84	.08	10.08
Industry: Manufacturing	.79	.08	9.46
Savings horizon 1 to 10 years	-.68	.07	-9.11
Industry: Public administration, military	.66	.09	7.03
Age: 40 - 49	1.52	.23	6.73
Age: 30 - 39	1.68	.30	5.59
Age: 50 - 59	1.27	.23	5.58
Head of household is not white	-.22	.04	-5.47
Income: $10k - $30k	-.69	.13	-5.28
Education: Finished college	-.53	.10	-5.27
Industry: Transportation, communication,	.55	.10	5.20
Own home	.47	.09	5.02
Years of participation in 401(k) plan	.06	.01	4.57
Education: Graduate school	-.42	.09	-4.43
Place of employment greater than 500 employees	.34	.08	4.14
Age: Less than 30	1.29	.32	4.07
Industry: Wholesale and retail trade	.67	.17	4.00
Reason for saving: retirement	.17	.04	3.98
Industry: Finance, insurance, real estate, repair services	.54	.15	3.58
Employer makes contribution to plan	.16	.04	3.48
Education: Some college	-.27	.08	-3.16
In 2001 SCF	-.23	.07	-3.09
Reason for saving: precautionary motive	-.17	.07	-2.64
Employee's contribution	.00	.00	-2.63
Willing to take average investment risk	-.23	.09	-2.63
Has other account type plan	.19	.10	1.95
Leaving a bequest is very important	.12	.10	1.26
Can also make withdrawals from plan	.20	.17	1.20
Income: $50k - $80k	-.21	.18	-1.20
Place of employment between 20 and 500 employees	.14	.12	1.11
Married	.09	.09	1.02
In 1998 SCF	.06	.06	.95
Reason for saving: child's education	-.17	.18	-.95

Table four, continued

Variable	Coefficient	Standard Error	T-stat
Has a defined benefit plan	-.05	.07	-.75
Willing to take above average investment risk	-.06	.08	-.70
Ratio of debt to assets	.00	.00	.68
Ratio of debt to financial assets	$6.72x^{-18}$	$9.94\ x^{-18}$	-.66
Expects to receive a bequest	$-1.16\ x^{-18}$	$1.77\ x^{-18}$	-.63
Leaving a bequest is somewhat important	.06	.10	.61
Income: less than $10k	-.19	.44	-.43
Income: $30k - $50k	.07	.17	.43
Expects economy to perform worse in the next five years	.03	.08	.40
Both head of household and spouse work	-.01	.04	-.28
Income: $80k - $150k	.03	.18	.17
401(k) plan is invested mostly in stock	.00	.03	-.04

Panel B: Specific model

	Coefficient	Standard Error	T-stat	Marginal Effect
Intercept	-3.59	.41	-8.86	
Age < 30	1.21	.30	4.00	
Age: 30 – 39*	1.56	.29	5.29	4.07%
Age: 40 – 49*	1.41	.23	6.24	-1.83%
Age: 50 – 59*	1.12	.23	4.80	-3.10%
Education: four years of college****	-.29	.08	-3.60	-3.06%
Income: 30k – 50k****	.36	.07	4.99	4.26%
Income: 80k – 150k****	.23	.10	2.19	2.60%
Owns home****	.51	.07	7.60	4.99%
Years in 401(k) plan**	.06	.01	6.26	.69%
Has an IRA****	-.89	.06	-13.91	-9.02%
Household has another account type retirement plan****	.29	.11	2.64	3.40%
Has been refused credit in prior five years****	.78	.09	9.12	10.64%
Savings horizon from one to ten years***	-.62	.08	-8.14	-8.19%
Savings horizon is greater than ten years***	-.73	.07	-11.05	-1.21%
Industry: Manufacturing****	.31	.05	6.32	3.54%
Place of employment has greater than 500 employees	.26	.03	8.24	2.78%

* Marginal effect should be read as the change in probability of having a loan as the head of household changes from the 20 to 30 year old age group, the 30 to 40 age group, and the 40 to 50 age group.
* *Marginal effect is approximately the increase in probability of having a loan as the household goes from 8 to 9 years of plan participation.
***Marginal effects should be read as the change in probability of having a loan as the household changes from the base case of a savings horizon of less than one year to a savings horizon of between one and ten years and then as the household changes to a savings horizon greater than ten years.
****Marginal effects should be read as the change in probability as of having an outstanding loan as the households switches from not being in the category to being in the category.

Since the logit model is not a linear model the coefficients cannot be considered marginal effects as in least squares. However the coefficients are easily transformed into probabilities by evaluating the cumulative density function (CDF) $\exp(\mathbf{xb})/[1+\exp(\mathbf{xb})]$ where $\mathbf{b}$ are the estimates of the coefficients and $\mathbf{x}$ is a measure of the explanatory variables, usually the averages. Details of this methodology are included in appendix B.

As a general conclusion it appears that households that might be poor savers, in that it might take a relatively high interest rate to induce them to defer consumption, are more likely to have an outstanding 401(k) plan loan. For example, the probability of having a loan is decreasing in both IRA status and savings horizon, both of which could be considered measures of saver type. For example, James Poterba, Steven F. Venti, and David A. Wise (1995) use IRA status to divide their sample into groups of like savers, the implication being that households that also have an IRA are likely to be better savers. This is a reasonable assumption since IRA participation is strictly voluntary and available to nearly all non-self employed workers. Households with short savings horizons may have a preference for current consumption rather than saving for the future, as suggested by Richard Ippolito (1997). Having an IRA decreases the probability of having an outstanding loan by 9 percent and households that increase their savings horizons from less than one year to between one and ten years decrease their chance of having an outstanding loan by over eight percent. A further increase in savings horizon to greater than ten years decreases the probability by and additional 1.21 percent. In addition, there is 10.64 percent increase in the probability of having a loan if the household had been refused credit in the five years prior to the survey year. Together with the higher debt-to-assets ratio for borrowers noted above in the descriptive statistics (although this ratio had an insignificant effect in the logit regressions), this suggests that households with 401(k) loans use other sources of credit besides to the 401(k) loan to a greater extent than households without such a loan outstanding. Note, however, it is not possible to determine the timing of the credit use i.e. whether or not the 401(k) loan was prior to the credit refusal and other credit use. In

addition, the positive coefficients on the *Years of participation in the 401(k) plan* and the *Has other account type pension plan* indicate that households may be choosing to borrow only after having a certain comfort level with their retirement savings situation, i.e. either sufficient assets needed for a loan.

The *Place of employment has greater than 500 employees* variable has several possible interpretations. One is that the transaction costs associated with 401(k) borrowing is lower in larger firms; Edwin C. Husted (1998) finds that administrative costs of 401(k) plans are lower in larger firms. These lower costs might be passed to potential borrowers. A second interpretation is that employees in smaller firms may have a more personable relationship with people in the human resources department or their fellow employees who may be apt to discourage borrowing.[39] I do not have a ready interpretation of the *Industry: manufacturing* variable expect perhaps as it might be related to the higher concentration of union members manufacturing firms; the administration of these plans may facilitate borrowing. The positive coefficients on the age group variables need to be understood in light of the omitted group being the over sixty age group, which has less than two percent of outstanding plan loans. The marginal effects are more meaningful as they express the change in probabilities as the household moves to an older age group. These probabilities decrease as a household moves from their thirties to forties and especially as a household moves from their forties to fifties. This is consistent with Christopher D. Carroll and Andrew A. Samwick (1997) and Christopher D. Carroll (2001) who find in simulations of consumption and savings behavior that households seem to be more concerned with saving for emergencies until about the age of 50, when the retirement savings motive takes precedence.

The Impact of 401(k) Borrowing on Retirement Wealth

This section examines the impact that taking a loan against 401(k) assets might have on wealth at retirement. As in most of the other literature the assumption is that if the loan is not taken the funds are not obtained from another source, such as a home equity or finance company loan. For a different perspective see Jo Ann Pinto (2003) for an example that compares a 401(k) versus home equity loan decision. To evaluate the impact I compare the retirement wealth of an individual who takes a loan with wealth if a loan is not taken. I do so under a variety of scenarios regarding the loan amount, monthly contributions to the plan, loan interest rate, rate of return on the market, the age of the borrower, as well as considering the impact if the household suspends their regular contribution or not. Both Alicia H. Munnell and Annika Sunden (2004, pages 128 – 131) and the GAO (1997) examine the impact of borrowing only on pension wealth, but in a more limited fashion than here and they assume, as I do, that the funds are not borrowed from another source. For example, Munnell and Sunden consider one loan (at age 40 of half the account balance[40], repaid over five years, with a single loan interest rate and market rate of return for the account assets). Their simulation shows that borrowers lose only one percent of their account balance if they maintain their contributions during the loan and up to 16 or 18 percent of their balance if they suspend contributions during the loan period, although they assume that income grows until retirement so contributions to the plan also grow. The GAO simulation is limited in that they only consider a return of 11 percent on the account balance and a 35-year working life; they do not indicate the amount of the loan, the initial account balance, or the contributions to the pension account. As a percent of the no-loan balance, if the borrower does not suspend contributions the GAO reports notes that borrowers would lose from 6.4 percent of the no-loan account balance if the loan interest rate is

[39] See Esther Duflo and Emmanuel Saez (2002) regarding the influence of colleagues on participation and investment decisions (though the paper does not mention borrowing against a retirement plan).
[40] Their loan is for half the account balance of $353,408, which would be not allowed since loans are limited to the smaller of $50,000 or half the account balance.

6.3 percent to 2.1 percent if the loan interest rate is 9.5 percent. If contributions are suspended during the loan period then the impact is a loss of 27.8 percent of the no-loan balance if the loan interest rate is 6.3 percent and a loss of 23.5 percent if the loan interest rate is 9.5 percent. Jo Ann M. Pinto (2003) finds that a 401(k) loan is slightly advantageous, although a limitation of Pinto's work is that she only considers two interest rate scenarios.

Determining the amount of retirement assets under the no-loan scenario is straightforward: It is the future value (at an assumed retirement age of 65) of initial retirement assets for a 35- or 45-year old plus the future value of contributions to the plan, using rates of return for retirement assets, which I vary from one to eleven percent. To determine retirement assets under to loan scenario, I subtract the loan amount and a $100 set up fee from the initial amount of retirement assets, assume the loan is repaid in equal monthly installments over a five-year term, with a yearly maintenance fee of $50, with the loan repayments credited directly to the account. I also account for the fact that loan proceeds are pre-tax dollars but loan payments are made with post-tax dollars by subtracting the difference between the pre-tax dollars needed for the loan payment and the loan payment[41]; this implicitly assumes that the difference in the pre- and post-tax dollars would have been placed in the retirement account. I vary the return on retirement assets from one to eleven percent and the loan interest rate from one to five percent; since I do not account for inflation these rates could be considered real returns. In addition, I assume no growth in wages so the contribution remains the same until retirement.

The results of the simulation for a variety of scenarios are in table five[42]. Panels A and B report the impact of retirement wealth if the household maintains regular contributions to the

[41] If the monthly loan payment is $LP then the pre-tax dollars needed for the loan payment is $\frac{\$LP}{1-t}$, where t is the tax rate, assumed to be 30 percent.

[42] The limited numbers of scenarios reported here appear to capture the essential points of the effects of borrowing. Results for additional scenarios with regard to initial retirement assets, loan size, and monthly contribution are also available.

retirement account; panels C and D show the impact if the household suspends contributions during the loan term. Panels A and C report for 35 year olds; Panels B and D report on 45 year olds. Under each combination of return on retirement assets and loan interest rates (I've omitted scenarios where the loan interest rate is above the return on retirement assets) the impact of a loan is reported three ways. The first is retirement assets available (having taken out a loan) as a percentage of assets had the loan not been taken out; the second number is the number of years beyond the age of 65 a borrower would have to work and continue making the same dollar contributions to the plan in order to have the same amount of retirement assets had the loan not been taken out; the third number is the dollar amount a borrower would need to increase their monthly contribution after the five-year loan term in order to have the same amount of retirement assets had the loan not been taken. For example, in the first case of Panel A (age 35, maintains contributions during loan term, borrows $5,000, has a $25,000 account balance, with monthly contributions of $200) where the loan interest rate is the same as the return on the household's, retirement assets will only be three percent less than if the loan had not been taken. If the household wished to have the same amount of retirement assets as if there had not been borrowing from the account, then they would need to either work an additional 1.4 years beyond the assumed retirement age of 65, or they could increase their monthly contribution by ten dollars from the age of 40 (when the loan is paid back in full) to 65.[43]

[43] I don't make a distinction between an employee's own contribution or an employer's match.

Table five: Effects of borrowing against 401(k) plan: Row percentages are returns on assets in retirement account; column percentages are interest rates on loan. Under each row percentage is the ratio of retirement assets with a five-year loan to assets without a loan, the additional years of work needed to accumulate the same amount of assets had the loan not been taken, and the additional monthly contribution needed to achieve the account balance under the no-loan scenario

Panel A: Age 35, maintains contributions during loan term

$200 contribution, $25,000 balance, $5,000 loan

	1%			*3%*			*5%*			*7%*			*9%*			*11%*		
	%	***yrs***	***$***	***%***	***yrs***	***$***	***%***	***yrs***	***$***	***%***	***yrs***	***$***	***%***	***yrs***	***$***	***%***	***yrs***	***$***
1%	.97	1.4	$10	.96	2.6	$14	.96	4.5	$20	.95	7.3	$28	.94	10.7	$38	.93	14.1	$51
3%				.97	2.4	$14	.96	4.3	$19	.95	7.1	$27	.94	10.4	$37	.94	13.8	$49
5%							.96	4.1	$18	.95	6.8	$26	.95	10.1	$35	.94	13.5	$47

$200 contribution, $25,000 balance, $10,000 loan

Table five continued

	1%			3%			5%			7%			9%			11%		
1%	.95	2.6	$18	.93	4.7	$27	.92	7.8	$38	.90	11.7	$54	.89	15.6	$73	.87	19.0	$97
3%				.94	4.4	$25	.92	7.5	$36	.91	11.3	$51	.89	15.3	$70	.88	18.7	$93
5%							.93	7.1	$34	.91	10.9	$48	.90	14.9	$66	.88	18.4	$89

$500 contribution, $75,000 balance, $20,000 loan

	1%			3%			5%			7%			9%			11%		
1%	.96	2.0	$35	.95	3.7	$52	.94	6.3	$74	.93	9.8	$104	.92	13.6	$142	.91	17.1	$190
3%				.95	3.5	$49	.94	6.0	$70	.93	9.5	$99	.92	13.3	$136	.92	16.8	$182
5%							.95	5.7	$66	.94	9.1	$94	.93	12.9	$129	.92	16.4	$174

Panel B: Age 45, maintains contributions during loan term

$200 contribution, $25,000 balance, $5,000 loan

	1%			3%			5%			7%			9%			11%		
	%	***yrs***	***$***	***%***	***yrs***	***$***	***%***	***yrs***	***$***	***%***	***yrs***	***$***	***%***	***yrs***	***$***	***%***	***yrs***	***$***
1%	.96	1.3	$16	.96	1.9	$21	.95	2.9	$28	.94	4.1	$36	.94	5.6	$46	.93	7.3	$59
3%				.96	1.8	$20	.95	2.7	$26	.95	4.0	$34	.94	5.5	$44	.93	7.1	$57
5%							.96	2.6	$25	.95	3.8	$33	.94	5.3	$42	.94	6.9	$55

$200 contribution, $25,000 balance, $10,000 loan

	1%			3%			5%			7%			9%			11%		
1%	.93	2.3	$29	.92	3.5	$39	.91	5.1	$52	.89	7.0	$68	.88	9.0	$88	.87	11.0	$113
3%				.92	3.3	$37	.91	4.9	$49	.90	6.7	$65	.89	8.8	$84	.87	10.8	$108
5%							.92	4.6	$47	.90	6.5	$62	.89	8.5	$80	.88	10.5	$104

Table five, continued

\$500 contribution, \$75,000 balance, \$20,000 loan

	1%			3%			5%			7%			9%			11%		
1%	.95	1.8	\$56	.94	2.8	\$76	.93	4.1	\$101	.93	5.7	\$132	.92	7.6	\$172	.91	9.5	\$220
3%				.95	2.6	\$71	.94	3.9	\$95	.93	5.5	\$126	.92	7.3	\$164	.91	9.3	\$211
5%							.94	3.7	\$90	.93	5.2	\$119	.92	7.1	\$156	.92	9.0	\$202

Panel C: Age 35, suspends contributions during loan term

\$200 contribution, \$25,000 balance, \$5,000 loan

	1%			*3%*			*5%*			*7%*			*9%*			*11%*		
	%	***yrs***	***$***	***%***	***yrs***	***$***	***%***	***yrs***	***$***	***%***	***yrs***	***$***	***%***	***yrs***	***$***	***%***	***yrs***	***$***
1%	.84	7.7	\$56	.81	11.7	\$76	.79	16.1	\$100	.77	2	\$129	.75	23.0	\$164	.73	25.2	\$205
3%				.81	11.6	\$75	.79	16.0	\$99	.77	19.9	\$128	.75	23.0	\$162	.74	25.2	\$204
5%							.79	15.9	\$98	.77	19.8	\$126	.75	22.9	\$161	.74	25.1	\$202

\$200 contribution, \$25,000 balance, \$10,000 loan

	1%			3%			5%			7%			9%			11%		
1%	.81	8.8	\$65	.78	13.3	\$88	.75	18.0	\$118	.72	22.0	\$154	.69	24.9	\$199	.67	27.0	\$252
3%				.78	13.1	\$87	.75	17.8	\$116	.72	21.8	\$152	.70	24.8	\$195	.68	26.8	\$248
5%							.76	17.6	\$114	.73	21.6	\$149	.70	24.6	\$192	.68	26.7	\$244

\$500 contribution, \$75,000 balance, \$20,000 loan

	1%			3%			5%			7%			9%			11%		
1%	.83	8.2	\$151	.81	12.6	\$205	.78	17.1	\$272	.76	21.1	\$356	.75	24.1	\$456	.73	26.2	\$576
3%				.81	12.4	\$202	.79	17.0	\$268	.77	20.9	\$350	.75	24.0	\$450	.73	26.1	\$568
5%							.79	16.8	\$264	.77	20.8	\$345	.75	23.8	\$443	.74	26.0	\$560

Panel D: Age 45, suspends contributions during loan term

\$200 contribution, \$25,000 balance, \$5,000 loan

	1%			3%			5%			7%			9%			11%		
	%	***yrs***	***$***	***%***	***yrs***	***$***	***%***	***yrs***	***$***	***%***	***yrs***	***$***	***%***	***yrs***	***$***	***%***	***yrs***	***$***
1%	.79	7.0	\$89	.77	9.1	\$110	.76	11.2	\$135	.75	13.2	\$164	.73	14.9	\$198	.72	16.3	\$238
3%				.78	9.0	\$109	.76	11.1	\$133	.75	13.1	\$162	.74	14.9	\$196	.73	16.2	\$236
5%							.76	11.0	\$132	.75	13.0	\$161	.74	14.8	\$194	.73	16.2	\$234

\$200 contribution, \$25,000 balance, \$10,000 loan

	1%			3%			5%			7%			9%			11%		
1%	.76	8.0	\$103	.74	10.4	\$128	.72	12.7	\$159	.70	14.8	\$196	.68	16.5	\$240	.66	17.9	\$292
3%				.74	10.2	\$126	.72	12.6	\$156	.70	14.7	\$193	.68	16.4	\$236	.67	17.8	\$287
5%							.73	12.4	\$154	.71	14.5	\$189	.69	16.3	\$232	.67	17.6	\$283

Table five, continued

$500 contribution, $75,000 balance, $20,000 loan

	1%			3%			5%			7%			9%			11%		
1%	.79	7.5	$240	.77	9.7	$298	.76	12.0	$368	.74	14.1	$452	.73	15.8	$551	.72	17.2	$668
3%				.78	9.6	$294	.76	11.9	$363	.75	14.0	$446	.74	15.7	$544	.73	17.1	$659
5%							.77	11.7	$358	.75	13.8	$439	.74	15.6	$536	.73	17.0	$650

If a household taking out a loan is able to maintain their monthly contributions during the loan term then the impact on retirement wealth is modest, with households unlikely to lose more than ten percent—less in most scenarios—of their retirement wealth. As would be expected the impact is greatest when the opportunity cost of the funds is greatest; that is, when the difference between the investment returns of the retirement assets and the loan interest rate is greatest. It is somewhat surprising then that percentage of households with an outstanding loan fell between 1998 and 2001, when, as a result of poor financial market performance leading to poor retirement asset performance, this opportunity cost was likely lower than prior to either of the 1995 or 1998 survey.[44] When the opportunity cost of funds is high the impact on retirement assets can require a household more than ten additional years of work to replace the assets lost by taking out the loan. The number of years of additional work should be understood in the context of no make-up contributions being made. However, the scenarios assume either 15 or 25 additional years of employment which leaves the household with plenty of time—assuming they have good savings habits—to replace the funds lost because of the loan.

The importance of maintaining contributions during the loan term is highlighted by Panels C and D, which contain the same scenarios as in Panels A and B, but assume that contributions are suspended during the five-year loan term. In most of the cases for the 35 year old (Panel C) and all of the cases for the 45 year old, a household can expect to lose at least twenty, and in some cases more than thirty, percent of their retirement wealth as a result of the loan and suspending contributions. Except when the opportunity cost of funds is low, more than

ten years of additional work is required to have the equivalent no-loan balance. The scope for making up for the lost funds is probably limited as well. Although a household may have 15 or 25 years to rebuild retirement wealth after the loan is repaid, the amount of make-up contributions needed is quite large, ranging from four to five times the amount of make-up contributions under the "maintain contributions" scenarios. Given the likelihood that households that suspend their contributions are in financial difficulty it is probably unrealistic to expect them to able to not only maintain their pre-loan contribution level, but then to also make additional contributions to their retirement accounts. If suspending contributions is a sign of financial difficulty then the figures in Panels C and D might represent a best-case scenario for these borrowers. Failure to make a loan payment would classify the loan as a withdrawal subject to ordinary income takes and, if the borrower is younger than 59 ½, the 10 percent IRS penalty. In this case the impact on retirement would be much greater than presented here, with the household likely losing more than 50 percent of its retirement wealth.

Overall, it appears that the impact that borrowing has on retirement wealth can be quite modest, or even negligible, for individuals who are disciplined savers and have the wherewithal to increase their contributions after the loan is repaid. In fact, conditional on being disciplined about their financial matters, borrowing from a 401(k) plan is not an unwise choice since the loan interest is credited to the borrowers retirement account. However, borrowers who are undisciplined savers or who find themselves in financial difficulty can find themselves in worse financial shape if they take a loan against their retirement plan.

Differences in Asset Accumulation

In order to assess how savings behavior differs between households that have an outstanding loan at the time of the survey and those that do not, I use a difference-in-differences methodology. Eric M. Engen and William G. Gale (2000) and Karen Pence (2001), among

[44] It's possible that the full effects of the downturn were not apparent when the 2001 survey was conducted; it will be interesting to see if the next survey, conducted in 2004, will have an increase in the percentage of households with an outstanding loan.

others, have used this approach to determine whether 401(k) plan assets represent new savings by comparing asset accumulation over time between households eligible and ineligible for 401(k) plans.[45] The difference-in differences approach is well suited for analyzing a series of cross-sectional data such as the SCF and captures two differences: the differences between two groups and the differences across time (in this case borrowers and non-borrowers from 1995 to 1998 and from 1995 to 2001) and is estimated by:

$$W_i = a_{nl} + (a_{hl} - a_{nl}) * HASLOAN_i + b_{nl} * X + (b_{hl} - b_{nl}) * (X * HASLOAN_i) + d_{nl} * SCF98 + g_{nl} * SCF01 + (d_{hl} - d_{nl}) * (SCF98 * HASLOAN) + (g_{hl} - g_{nl})(SCF01 * HASLOAN) + e \quad (2)$$

where W_i is a measure of wealth, the subscripts *hl* refers to households that have an outstanding loan and *nl* refers to households that do not have an outstanding loan, X is matrix of explanatory variables such as demographic features (age, education), pension coverage (defined benefit plan and IRA participation), and saver-type (savings horizon, risk tolerance, primary savings motive), *HASLOAN* is a dichotomous variable that equals one if a household has outstanding loan against their pension plan and zero otherwise, and SCF98 and SCF01 equal one if a household is in the 1998 or 2001 survey and zero otherwise. The key coefficients in (2) are $(d_{hl} - d_{nl})$ and $(g_{hl} - g_{nl})$, which indicate the extent to which current borrowers' wealth accumulation differs from non-borrowers. If current borrowers are saving less (more) than non-borrowers then both coefficients should be negative (positive) with $(g_{hl} - g_{nl})$ less than (greater than) $(d_{hl} - d_{nl})$; that is, borrowers' wealth would have been decreasing (increasing) from 1995 to 1998 relative to non-borrowers and decreasing (increasing) more so from 1995 to 2001.

It is important in comparing the savings behavior of households to fully control for lifecycle effects. Households become wealthier as they become older. Ideally, I would like to able to track the savings behavior of the same individual over time, as in a panel data set. This is not possible using cross-sectional data like the SCF since different households participate in each

[45] See Jeffrey M. Wooldridge (2000, Chapter 13) for a more detailed discussion and examples of this methodology.

survey. However, cohort analysis does allow me to examine life-cycle effects. For example, I can follow asset accumulation of 30 year olds in 1995, 33 year olds in 1998, and 36 year olds in 2001. As long as the characteristics of the cohorts do not change in successive cross sections then inferences can be made based on the behavior of cohorts. This should not be a concern in a nationally representative survey like the SCF since the changes in cohort characteristics reflect changes in the underlying population. I define four cohorts as follows. The less than 30 cohort contains households where the head of the household was less than 30 years old in 1995, less than 33 years old in 1998, and less than 36 years old in 2001. The 30 – 39 cohort consists of households where the cohort was 30 to 39 years old in 1995, 33 to 42 years old in 1998, and 36 to 45 years old in 2001. The other two cohorts are similarly defined in ten-year increments based on their age in 1995: 40 to 49 and 50 to 59 years old[46]. The estimating equation accounting for cohort effects is:

$$
\begin{aligned}
W_i = {} & a_{nl} + (a_{hl} - a_{nl})HASLOAN + B_{nl}X + (B_{hl} - B_{nl})X * HASLOAN + \\
& \sum_{k=2}^{4} f_{nl,k} * C_{j,k} + \sum_{k=2}^{4} (f_{hl,k} - f_{nl,k}) * C_{j,k} * HASLOAN + \\
& \sum_{k=1}^{4} d_{i,k} * C_{j,k} * SCF98 + \sum_{k=1}^{4} g_{hl,k} * C_{j,k} SCF01 + \\
& \sum_{k=1}^{4} (d_{hl,k} - d_{nl,k}) * C_{j,k} * SCF98 * HASLOAN + \\
& \sum_{k=1}^{4} (g_{hl,k} - g_{nl,k}) * C_{j,k} SCF01 * HASLOAN + e
\end{aligned}
\qquad (3)
$$

where $C_{j,k}$ is a dummy variable equaling one if the head of a household is in the kth of the four cohorts, and the other variables are defined as in (2). The key coefficients in (3), as in (2), are $(d_{hl,k} - d_{nl,k})$ and $(g_{hl,k} - g_{nl,k})$ for each of the k cohorts which indicate the extent to which borrowers' wealth is changing over time compared to non-borrowers within the same cohort. As described for the logit estimations, I use the testing down methodology to achieve a

[46] I use ten-year increments so that there are a sufficient number of borrowing households in each cohort; in addition, there are an insufficient number of loans for the 60-year-old cohorts so I exclude this cohort from the analysis.

parsimonious model of explanatory and interaction (***X****HASLOAN*) variables, which should also reduce multi-collinearity problems that can result from using too many independent regressors. For the final estimations I include the *SCFyear* and *SCFyear*HASLOAN* variables in (2) and the *Cohort, Cohort*SCFyear, Cohort*HASLOAN*, and *Cohort*HASLOAN*SCFyear* variables in (3) regardless of whether they are eliminated by the testing down variable selection process. I do this because they are the key variables of interest; while this may result in a slight over fitting of the models it does not introduce bias in the models by including variables whose estimates are insignificantly different from zero.

The dependent variables I use are 401(k) plan assets, retirement assets (401(k) plan and other defined contribution retirement account assets and IRAs), net financial assets (retirement assets plus stocks, bonds, brokerage, savings, and checking accounts) accounts, and net worth (financial assets, plus non-financial assets such as vehicles and more importantly, housing equity). Recall from table three that the means of these variables are much larger than the medians—an indication that a relatively few wealthy households have a large amount of these assets, while most households have much less. Since the distributions of these dependent variables are highly skewed, ordinary least square regressions are likely to suffer from heteroskedasticity. In addition, wealth data likely has several outliers. I take two approaches to these issues. As in much of the literature that investigates the savings effects of 401(k) plans (see James Porterba, Steven Venti, and David Wise (1995), Engen and Gale (2000), Pence (2001), and Daniel J. Benjamin (2003)) I use least absolute value (LAV) regression, a robust estimation procedure that is not as sensitive to outliers as OLS. LAV estimation is also called median regression since the estimates produce conditional medians rather than conditional means as in OLS.[47] Another approach to a skewed dependent variable is to use its natural log. This is not necessarily desirable in this case as there are many non-positive observations for net financial assets and net worth. An alternative transformation is the inverse hyperbolic sine

[47] See David Birkes and Yadolah Dodge (1993) for a more complete description and examples of LAV estimation

transformation (IHS), described by John B. Burbidge, Lonnie Magee, and A. Leslie Robb (1988), and used for SCF data by Arthur Kennickell and Annika Sunden (1997) as well as Karen Pence (2001). This transformation is symmetric around zero and approximates the natural logarithm for values away from zero. The IHS transformation of a variable, x, is

$$q^{-1}\ln(q\,x+\sqrt{(q^{2}x^{2}+1)}) \qquad (4)$$

where q is a scaling parameter, whose optimal value can be found by a grid search of the concentrated log-likelihood function found in Burbidge, Magee, and Robb. Figures two and three show the level and transformed values of net financial assets used in this paper. The IHS transformation creates an approximately normal dependent variable[48]. Standard errors are bootstrapped using the resampling scheme provided by Federal Reserve and, following Pence, calculated using Moshe Buchinsky's (1995) Design Matrix Bootstrap Estimator using the average of the parameter estimates of the bootstrap resamples as the pivotal vector in calculating the variance-covariance matrix.

[48] The optimal θ for net worth is .00000025, net financial assets is.00000057, retirement assets is .00000131, and 401(k) assets is .00000291.

Figure two: Distribution of net financial assets

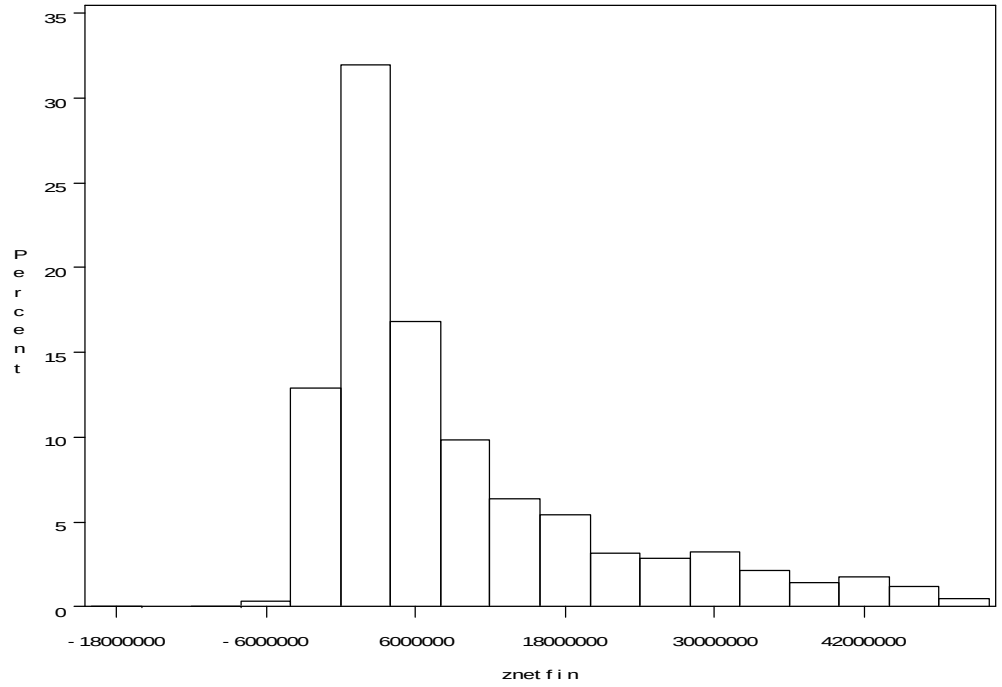
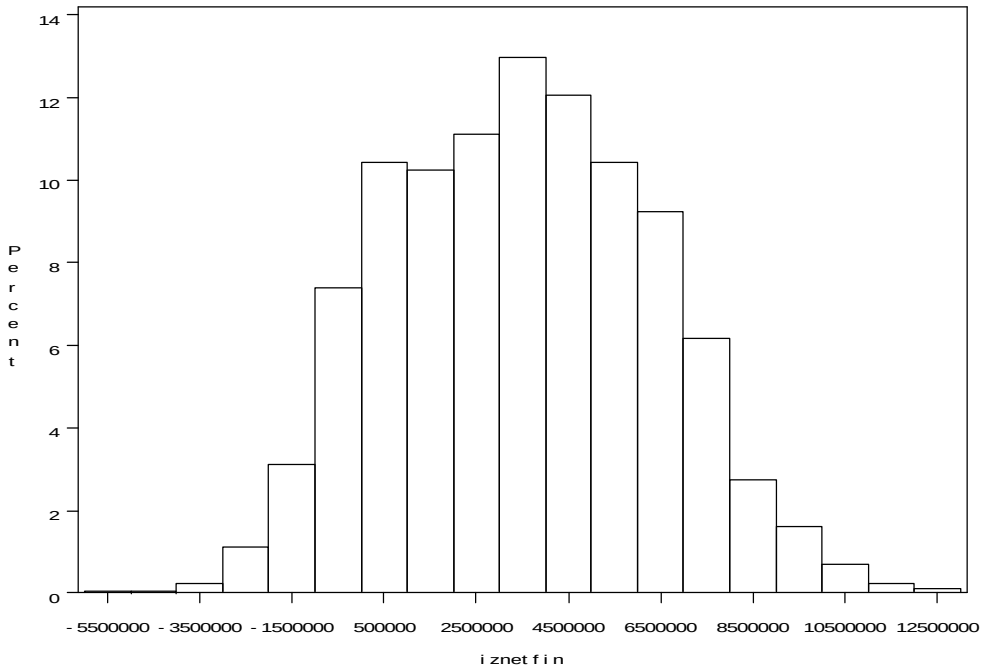


Figure three: Distribution of the inverse hyperbolic sine transformation of net financial assets



Savings Effects on Entire Sample

The LAV parameter estimates are generally of the same sign and statistical significance of the OLS estimates, although the OLS estimates are a larger magnitude, reflecting that the conditional means are larger than the conditional medians. As there are few qualitative differences, in table six I report only the LAV estimates of (2) in order to limit the number of tables. The OLS estimates are available on request. The coefficients are generally larger for broader wealth measures; that is, the coefficients in the 401(k) asset specification are smaller than the in the net worth specification. The demographic and saver type variables generally have the expected signs and magnitudes. For example, all of the wealth measures are increasing in the 30-, 40-, and 50-year-old age groups and in the two highest income groups that appear in the final models[49]. Completing graduate school is a positive and significant factor in determining 401(k) and retirement assets, although not for net financial assets or net worth. Households with two earners have markedly less wealth than households without two earners; the LAV coefficient in the net worth specification is –57,876, which seems quite large considering that median net worth in 2001 was $171,700 for non-borrowers and $100,270 for borrowers. Two possible explanations are that households with less wealth desire the additional consumption a second income provides or that households with two earners are saving less in anticipation of increasing asset accumulation at a later point in the lifecycle. The variables that proxy for saver type also have positive coefficients. For example, being an IRA participant is positive and significant across the specifications, as is years of participation in a 401(k) plan. Households that have their 401(k) assets mostly in stock have a larger amount of 401(k) assets, although this isn't surprising considering the stock market boom that occurred during much of the sample period (1995 to 2001).

[49] The negative signs for the age group variables are because the omitted group is the age-60 group.

Table six: Least Absolute Value regression results for determining the differences in saving behavior between households that have a loan against their 401(k) plan and those that do not

Panel A: Dependent variable is the level and IHS transformation of 401(k) plan assets

	Level of 401(k) plan assets			IHS transform of 401(k) plan assets		
	Coefficient	Standard Error	T-Stat	Coefficient	Standard Error	T-Stat
Intercept	-9,525	4,487	-2.12	1,981	556	3.56
Has loan	-10,691	5,130	-2.08	1,996	946	2.11
In 1998 SCF	2,282	1,409	1.62	144	263	0.55
In 2001 SCF	60	1,479	0.04	-323	326	-0.99
In 1998 SCF * has loan	6,222	3,288	1.89	837	941	0.89
In 2001 SCF * has loan	3,418	3,092	1.11	796	718	1.11
Age: Less than 30	-2,565	4,443	-0.58	-2,198	580	-3.79
Age: 30 – 39	-5,097	4,499	-1.13	-1,566	541	-2.89
Age: 40 – 49	-4,282	4,266	-1.00	-1,220	541	-2.26
Age: 50 – 59	-2,080	4,326	-0.48	-1,392	544	-2.56
Education: Graduate school	5,203	1,194	4.36	1,317	339	3.88
Income: 80k – 150k	9,724	1,360	7.15	3,106	291	10.68
Income: > 150k	57,188	6,464	8.85	9,831	465	21.15
Household has two earners	-2,566	918	-2.79	-1,182	198	-5.98
Savings horizon greater than ten years	2,943	1,114	2.64	784	217	3.61
Willing to take average investment risk	1,918	791	2.43	526	149	3.54
Years of 401(k) plan participation	5,016	258	19.45	827	25	33.52
Holds mostly stock in 401(k) plan	3,414	1,039	3.29	867	136	6.39
Has an IRA	2,065	1,011	2.04	1,157	222	5.21
Place of employment has between 20 and 500 employees	2,677	1,734	1.54	827	272	3.04
Place of employment has more than 500 employees	4,921	1,673	2.94	1,186	274	4.34
Industry: Transportation, communication, utilities, entertainment	-1,528	962	-1.59	-267	215	-1.24
Household has two earners * has loan	7,928	4,352	1.82	433	713	0.61
Years of 401(k) plan participation * has loan	85	725	0.12	-257	63	-4.05

Table six, continued

Panel B: Dependent variable is the level and IHS transformation of retirement assets

	Level of retirement assets			IHS transform of retirement assets		
	Coefficient	Standard Error	T-Stat	Coefficient	Standard Error	T-Stat
Intercept	27,361	24,739	1.11	9,314	1,945	4.79
Has loan	-2,915	6,476	-0.45	3,056	1,211	2.52
In 1998 SCF	2,034	1,656	1.23	221	362	0.61
In 2001 SCF	638	2,168	0.29	-144	520	-0.28
In 1998 SCF * has loan	486	5,339	0.09	-341	1,304	-0.26
In 2001 SCF * has loan	946	5,316	0.18	630	1,167	0.54
Age: Less than 30	-35,440	24,994	-1.42	-7,923	1,839	-4.31
Age: 30 – 39	-40,371	25,126	-1.61	-7,237	1,816	-3.98
Age: 40 – 49	-36,840	25,070	-1.47	-4,881	1,761	-2.77
Age: 50 – 59	-29,814	24,584	-1.21	-4,541	1,699	-2.67
Education: Graduate school	12,276	2,682	4.58	2,955	466	6.34
Income: 80k – 150k	23,689	2,980	7.95	7,232	644	11.22
Income: > 150k	176,212	16,210	10.87	29,629	1,326	22.34
Household has two earners	-3,876	1,536	-2.52	-2,172	368	-5.91
Years of 401(k) plan participation	5,185	535	9.70	1,152	40	28.51
Has other account type pension plan	8,979	686	13.09	3,146	538	5.84
Has an IRA	27,942	2,883	9.69	8,928	343	26.05
Income: > 150k * has loan	-36,670	34,130	-1.07	-11,456	4,570	-2.51
Household has two earners * has loan	8,840	3,151	2.81	769	1,323	0.58
Years of 401(k) plan participation * has loan	-466	891	-0.52	-254	93	-2.74

Panel C: Dependent variable is the level and IHS transformation of net financial assets

	Level of net financial assets			IHS transform of net financial assets		
	Coefficient	Standard Error	T-Stat	Coefficient	Standard Error	T-Stat
Intercept	76,747	39,232	1.96	21,483	3,649	5.89
Has loan	-12,424	6,156	-2.02	-2,569	2,279	-1.13
In 1998 SCF	8,575	3,430	2.50	3,439	1,054	3.26
In 2001 SCF	5,377	3,824	1.41	631	1,149	0.55
In 1998 SCF * has loan	-3,761	10,679	-0.35	-5,742	2,561	-2.24
In 2001 SCF * has loan	-9,871	7,277	-1.36	-1,618	3,319	-0.49
Age: Less than 30	-91,105	39,723	-2.29	-21,481	3,683	-5.83
Age: 30 – 39	-95,568	41,426	-2.31	-18,906	3,680	-5.14
Age: 40 – 49	-88,630	40,515	-2.19	-13,912	3,437	-4.05
Age: 50 – 59	-68,550	44,842	-1.53	-10,339	3,488	-2.96
	47,802	5,749	8.31	19,962	1,514	13.18
Income: 80k – 150k	483,975	39,469	12.26	77,215	4,083	18.91

Table six, continued

	Level of net financial assets			IHS transform of net financial assets		
	Coefficient	Standard Error	T-Stat	Coefficient	Standard Error	T-Stat
Income: > 150k	-16,876	3,545	-4.76	-8,600	1,086	-7.92
Household has two earners	6,524	655	9.96	1,887	82	22.91
Years of 401(k) plan participation	14,800	3,890	3.80	7,456	1,526	4.89
Has other account type pension plan	62,900	6,103	10.31	22,534	1,342	16.79
Has an IRA	-286,412	53,887	-5.32	-21,128	6,782	-3.12
Income: > 150k * has loan	76,747	39,232	1.96	21,483	3,649	5.89

Panel D: Dependent variable is the level and IHS transformation of net worth

	Level of net worth			IHS transform of net worth		
	Coefficient	Standard Error	T-Stat	Coefficient	Standard Error	T-Stat
Intercept	152,328	77,469	1.97	52,522	5,731	9.17
Has loan	-20,136	9,835	-2.05	-9,816	4,435	-2.21
In 1998 SCF	10,252	6,507	1.58	4,292	3,070	1.40
In 2001 SCF	17,289	8,225	2.10	3,776	2,408	1.57
In 1998 SCF * has loan	-3,164	12,860	-0.25	-1,412	6,096	-0.23
In 2001 SCF * has loan	-21,488	15,079	-1.42	-4,646	4,960	-0.94
Age: Less than 30	-160,204	78,021	-2.05	-38,175	5,235	-7.29
Age: 30 – 39	-165,041	78,828	-2.09	-34,487	5,843	-5.90
Age: 40 – 49	-137,678	78,826	-1.75	-19,684	5,140	-3.83
Age: 50 – 59	-101,373	80,353	-1.26	-12,379	5,726	-2.16
Income: 80k – 150k	107,553	8,303	12.95	35,926	2,220	16.18
Income: > 150k	1,082,420	102,078	10.60	180,419	10,506	17.17
Married	49,938	9,928	5.03	19,427	1,878	10.34
Household has two earners	-57,876	11,201	-5.17	-20,246	1,679	-12.06
Leaving a bequest is very important	8,833	4,793	1.84	6,932	1,893	3.66
Years of 401(k) plan participation	8,461	953	8.88	2,781	175	15.91
Has defined benefit pension plan	9,479	7,468	1.27	5,618	2,650	2.12
Has an IRA	109,932	9,206	11.94	35,065	1,789	19.60
Income: > 150k * has loan	-781,541	134,246	-5.82	-93,102	16,587	-5.61

The coefficients on the *SCF98*HASLOAN* and *SCF01*HASLOAN* interaction terms indicate the extent to which borrowers' wealth is changing relative to non-borrowers. With the exception of the IHS transformation of retirement assets for 1998, the signs in the 401(k) and

retirement assets specifications are positive though insignificant, and in no case is the *SCF01*HASLOAN* coefficient larger than the *SCF98*HASLOAN* coefficient. Compared to households that do not have a loan against their retirement borrowers were neither increasing nor decreasing their retirement wealth from 1995 to 2001. Recall that 92 percent of households maintain their contributions during the loan period, so it is perhaps not surprising that households would be maintaining their retirement savings programs. The coefficients in the net financial assets and net worth specifications are negative, though only the coefficient for *SCF98*HASLOAN* in the IHS transformation of net financial assets is significantly different from zero. Except for this case, the *SCF01*HASLOAN* coefficients are less than the *SCF98*HASLOAN* coefficients indicating that borrowers have been decreasing their wealth relative to non-borrowers from 1998 to 2001, although these differences are not large enough to be statistically significant[50].

Results within Cohorts

The results of estimating (3) are in tables seven and eight. I report the median regression parameter estimates for the demographic and saver type variables in table seven and the asset accumulation attributable to having an outstanding loan within the cohorts for both the OLS and LAV estimations in table eight. The signs and magnitudes of the coefficients for the demographic and saver type variables are consistent with the results presented above. For example, the estimates for the savings effect of being in the two highest income groups are both positive with the *over $150,000* coefficient larger than *$80,000 to $150,000 income group* coefficient. As with the earlier results, the coefficients for the same variables are larger for the broader wealth measures. For example, the median household that has an IRA has $1,418 more in 401(k) assets, $28,681 more in retirement assets, $59,587 more of net financial assets, and

[50] The t-statistic for testing whether the *SCF01*HASLOAN and SCF98*HASLOAN* coefficients are significantly different from each other is

$$SCF01*has\ loan\text{-}SCF01*has\ loan \Big/ \sqrt{s^2_{SCF01*has\ loan} + s^2_{SCF98*has\ loan} + 2s^2_{SCF01*has\ loan,SCF98*has\ loan}}$$

where σ^2 indicates the variance or covariance of the parameter estimates.

$103,787 more net worth than the median household without an IRA. As with the sample above that did not use cohort analysis, there are few demographic / saver type interaction terms that appear in the final set of variables in the regressions, suggesting that there are few factors that explain the differences between the wealth of borrowers and non-borrowers. The *Income greater than $150,000 * HASLOAN* interaction term appears in three of the four specifications; the coefficients in the net financial assets and net worth specifications are both negative and significantly different from zero. No other interaction terms appear in the net financial assets or net worth specifications in either the full or cohort estimations.

Table seven: Least Absolute Value regression results for determining the differences in saving behavior between households that currently have a loan against their 401(k) plan and those that do not. Panels A through D contain the demographic and saver type variables. (Note: the key coefficients for determining the savings effect among current borrowers are reported in table eight)

Panel A: Dependent variable is the level and IHS transformation of 401(k) plan assets

	Level of 401(k) plan assets			IHS transform of 401(k) plan assets		
	Coeff.	Standard Error	T-Stat	Coeff.	Standard Error	T-Stat
Intercept	-10,848	15,806	-0.69	1,419	647	2.19
Has loan	-5,649	15,872	-0.36	3,720	1,826	2.04
Education: Finished college	3,557	4,089	0.87	735	243	3.03
Education: Graduate school	6,056	5,347	1.13	1,814	285	6.36
Income: 80k – 150k	9,837	7,751	1.27	2,781	257	10.82
Income: > 150k	55,838	33,725	1.66	9,576	564	16.97
Household has two earners	-1,076	6,470	-0.17	-1,037	200	-5.20
Savings horizon: Greater than 10 years	2,631	5,272	0.50	709	179	3.96
Willing to take average investment risk	1,541	4,402	0.35	457	158	2.89
Years of 401(k) plan participation	5,025	1,869	2.69	804	27	29.31
Holds mostly stock in 401(k) plan	3,089	2,950	1.05	919	172	5.33
Has an IRA	1,418	3,121	0.45	1,297	214	6.06
Place of employment has more than 500 employees	2,873	3,647	0.79	562	163	3.44

Table seven, continued

	Level of 401(k) plan assets			IHS transform of 401(k) plan assets		
	Coeff.	Standard Error	T-Stat	Coeff.	Standard Error	T-Stat
Industry: Transportation, communication, utilities, entertainment	-1,668	5,344	-0.31	-377	176	-2.14
Industry: Public administration, military	-3,117	9,369	-0.33	-1,012	372	-2.72
Years of 401(k) plan participation * has loan	-267	1,243	-0.21	-302	85	-3.53
Has an IRA * has loan	5,421	9,969	0.54	-800	615	-1.30
Industry: Public administration, military * has loan	2,398	36,449	0.07	1,021	958	1.07
Cohort: Less than 30	642	6,747	0.10	-1,498	637	-2.35
Cohort: 30 – 39	-2,658	5,331	-0.50	-756	607	-1.24
Cohort: 40 – 49	-3,080	6,228	-0.49	-61	530	-0.11
Cohort: Less than 30 * has loan	2,881	11,908	0.24	1,514	3,593	0.42
Cohort: 30 – 39 * has loan	1,383	13,211	0.10	-40	1,629	-0.02
Cohort: 40 – 49 * has loan	-1,012	16,646	-0.06	-2,655	1,610	-1.65
Cohort: Less than 30 * SCF98	-830	3,220	-0.26	430	422	1.02
Cohort: Less than 30 * SCF 01	-2,401	4,014	-0.60	530	409	1.30
Cohort: 30 – 39 * SCF98	3,167	3,266	0.97	431	424	1.02
Cohort: 30 – 39 * SCF01	64	3,678	0.02	161	461	0.35
Cohort: 40 – 49 * SCF98	4,635	4,382	1.06	85	374	0.23
Cohort: 40 – 49 * SCF01	3,117	8,221	0.38	-798	564	-1.42
Cohort: 50 – 59 * SCF98	2,778	12,643	0.22	484	545	0.89
Cohort: 50 – 59 * SCF01	1,860	13,946	0.13	-535	838	-0.64

Panel B: Dependent variable is the level and IHS transformation of retirement assets

	Level of Retirement Assets			IHS transform of Retirement assets		
	Coeff.	Standard Error	T-Stat	Coeff.	Standard Error	T-Stat
Intercept	-6,863	11,385	-0.60	5,428	816	6.65
Has loan	-8,513	30,131	-0.28	2,823	1,731	1.63
Education: Graduate school	11,391	7,102	1.60	2,692	637	4.22
Income: 80k – 150k	21,463	10,381	2.07	6,906	448	15.40
Income: > 150k	175,884	41,396	4.25	28,040	1,336	20.98
Household has two earners	-3,091	13,181	-0.23	-2,340	332	-7.06
Foresee child's education as a major expense	3,234	6,359	0.51	752	378	1.99
Expect to receive a bequest	4,912	7,000	0.70	1,336	415	3.22
Years of 401(k) plan participation	5,077	2,059	2.47	1,125	53	21.26

Table seven, continued

	Level of Retirement Assets			IHS transform of Retirement assets		
	Coeff.	Standard Error	T-Stat	Coeff.	Standard Error	T-Stat
Has other account type pension plan	8,543	16,362	0.52	3,184	595	5.35
Has an IRA	28,681	11,455	2.50	8,521	376	22.63
Income: > 150k * has loan	-33,284	49,664	-0.67	-10,165	4,914	-2.07
Household has two earners * has loan	7,442	12,105	0.61	1,260	1,361	0.93
Years of 401(k) plan participation * has loan	-348	1,261	-0.28	-280	103	-2.70
Cohort: Less than 30	-778	21,130	-0.04	-4,822	878	-5.49
Cohort: 30 – 39	-6,423	22,812	-0.28	-4,085	910	-4.49
Cohort: 40 – 49	-4,686	23,888	-0.20	-226	960	-0.24
Cohort: Less than 30 * has loan	10,429	17,271	0.60	7,058	8,800	0.80
Cohort: 30 – 39 * has loan	5,852	36,531	0.16	1,357	1,850	0.73
Cohort: 40 – 49 * has loan	2,329	33,697	0.07	-4,354	2,338	-1.86
Cohort: Less than 30 * SCF98	24	7,145	0.00	1,191	650	1.83
Cohort: Less than 30 * SCF 01	-5,332	5,643	-0.94	1,079	583	1.85
Cohort: 30 – 39 * SCF98	401	5,477	0.07	1,768	721	2.45
Cohort: 30 – 39 * SCF01	-636	6,077	-0.10	1,145	531	2.16
Cohort: 40 – 49 * SCF98	4,766	5,823	0.82	-986	786	-1.25
Cohort: 40 – 49 * SCF01	11,483	16,866	0.68	-997	1,555	-0.64
Cohort: 50 – 59 * SCF98	11,708	16,988	0.69	1,623	1,692	0.96
Cohort: 50 – 59 * SCF01	31,618	25,463	1.24	2,887	2,168	1.33

Panel C: Dependent variable is the level and IHS transformation of net financial assets

	Level of net financial assets			IHS transform of net financial assets		
	Coefficient	Standard Error	T-Stat	Coefficient	Standard Error	T-Stat
Intercept	-1,102	20,657	-0.05	13,561	2,730	4.97
Has loan	-10,485	33,405	-0.31	-2,186	11,422	-0.19
Income: 80k – 150k	48,501	27,237	1.78	19,889	1,314	15.14
Income: > 150k	494,805	174,836	2.83	76,633	4,237	18.09
Household has two earners	-14,154	46,340	-0.31	-7,638	1,073	-7.12
Holds mostly stock in 401(k) plan	6,353	2,908	2.18	1,904	102	18.74
Has an IRA	59,587	32,332	1.84	22,135	1,087	20.36
Income: > 150k * has loan	-290,812	117,479	-2.48	-19,431	6,500	-2.99
Cohort: Less than 30	-8,072	23,295	-0.35	-12,375	3,291	-3.76
Cohort: 30 – 39	-11,385	27,805	-0.41	-13,086	2,677	-4.89

Table seven, continued

	Level of net financial assets			IHS transform of net financial assets		
	Coefficient	Standard Error	T-Stat	Coefficient	Standard Error	T-Stat
Cohort: 40 – 49	-8,396	26,593	-0.32	-4,030	2,474	-1.63
Cohort: Less than 30 * has loan	39,626	51,266	0.77	29,407	15,027	1.96
Cohort: 30 – 39 * has loan	2,323	41,906	0.06	6,762	11,920	0.57
Cohort: 40 – 49 * has loan	-4,999	38,126	-0.13	-5,858	13,347	-0.44
Cohort: Less than 30 * SCF98	2,694	14,825	0.18	2,947	2,487	1.19
Cohort: Less than 30 * SCF 01	-8,160	14,706	-0.55	904	2,159	0.42
Cohort: 30 – 39 * SCF98	6,771	15,444	0.44	9,428	1,847	5.10
Cohort: 30 – 39 * SCF01	2,383	16,959	0.14	4,666	1,603	2.91
Cohort: 40 – 49 * SCF98	15,412	24,755	0.62	3,245	1,633	1.99
Cohort: 40 – 49 * SCF01	21,064	59,179	0.36	-15	2,084	-0.01
Cohort: 50 – 59 * SCF98	33,729	71,100	0.47	3,915	4,572	0.86
Cohort: 50 – 59 * SCF01	125,377	48,463	2.59	10,505	2,992	3.51

Panel D: Dependent variable is the level and IHS transformation of net worth

	Level of 401(k) plan assets			IHS transform of 401(k) plan assets		
	Coefficient	Standard Error	T-Stat	Coefficient	Standard Error	T-Stat
Intercept	55,946	47,005	1.19	47,902	5,559	8.62
Has loan	-60,490	73,992	-0.82	-12,776	14,193	-0.90
Income: 80k – 150k	107,555	52,640	2.04	33,170	1,852	17.91
Income: > 150k	1,096,871	363,834	3.01	173,950	10,255	16.96
Married	50,604	58,724	0.86	18,494	2,038	9.07
Household has two earners	-58,140	116,082	-0.50	-18,620	2,715	-6.86
Leaving a bequest is very important	9,883	78,721	0.13	5,469	1,848	2.96
Years of 401(k) plan participation	8,596	4,537	1.89	2,525	165	15.33
Has a defined benefit plan	9,530	71,745	0.13	4,646	3,652	1.27
Has an IRA	103,787	29,020	3.58	31,753	1,845	17.21
Income: > 150k * has loan	-763,600	218,407	-3.50	-87,119	15,298	-5.69
Cohort: Less than 30	-61,927	46,490	-1.33	-33,380	6,972	-4.79
Cohort: 30 – 39	-72,408	48,697	-1.49	-34,446	7,553	-4.56
Cohort: 40 – 49	-36,339	48,513	-0.75	-6,434	6,844	-0.94
Cohort: Less than 30 * has loan	121,511	91,155	1.33	54,627	25,160	2.17
Cohort: 30 – 39 * has loan	51,761	79,339	0.65	18,166	14,291	1.27
Cohort: 40 – 49 * has loan	10,029	88,151	0.11	-10,284	12,467	-0.82
Cohort: Less than 30 * SCF98	4,082	43,321	0.09	1,583	4,273	0.37
Cohort: Less than 30 * SCF 01	1,338	30,093	0.04	8,239	4,368	1.89

Table seven, continued

Cohort: 30 – 39 * SCF98	20,824	28,473	0.73	17,007	4,582	3.71
Cohort: 30 – 39 * SCF01	24,528	24,741	0.99	13,851	3,474	3.99
Cohort: 40 – 49 * SCF98	21,993	54,212	0.41	3,645	3,775	0.97
Cohort: 40 – 49 * SCF01	45,882	105,765	0.43	4,020	5,190	0.77
Cohort: 50 – 59 * SCF98	12,394	129,981	0.10	-1,958	6,907	-0.28
Cohort: 50 – 59 * SCF01	145,670	170,425	0.85	15,753	4,919	3.20

Table eight: Summary of savings behavior via LAV estimation within cohorts of households with a loan against their 401(k) plan and households without a loan.
*SCF98*HasLoan* (*SCF01*Has Loan)* indicates the amount of assets attributable to borrowing from 1995 to 1998 (2001)

Panel A: Dependent variables: 401(k) and retirement assets

		Level of 401(k) assets			IHS transformation of 401(k) assets			Level of retirement assets			IHS transformation of retirement assets		
		Coeff.	Std. Error	T-Stat	Coeff.	Std. Error	T-Stat	Coeff.	Std. Error	T-Stat	Coeff.	Std. Error	T-Stat
Cohort: < 30	SCF98 * Has loan	1,374	7,128	0.19	-1,992	3,387	-0.59	-13,662	18,364	-0.74	-8,497	8,861	-0.96
	SCF01 * Has loan	-710	6,739	-0.11	-2,203	3,205	-0.69	-3,448	21,212	-0.16	-8,171	9,103	-0.90
Cohort: 30 – 39	SCF98 * Has loan	4,922	9,153	0.54	-476	1,377	-0.35	2,928	14,818	0.20	-949	1,780	-0.53
	SCF01 * Has loan	-2,156	9,368	-0.23	-772	1,336	-0.58	-1,853	15,037	-0.12	509	1,730	0.29
Cohort: 40 – 49	SCF98 * Has loan	13,568	12,219	1.11	2,518	765	3.29	13,401	13,490	0.99	4,183	3,130	1.34
	SCF01 * Has loan	18,817	13,876	1.36	4,007	891	4.50	3,379	18,757	0.18	5,909	3,163	1.87
Cohort: 50 – 59	SCF98 * Has loan	17,669	20,459	0.86	543	1,625	0.33	4,302	33,342	0.13	-51	2,479	-0.02
	SCF01 * Has loan	2,911	120,153	0.02	522	6,118	0.09	-23,054	121,630	-0.19	-2,653	12,636	-0.21

Table eight, continued

Panel B: Dependent Variables: net financial assets and net worth

		Level of net financial assets			IHS Transformation of net financial assets			Level of net worth			IHS transformation of net worth		
		Coeff.	Std. Error	T-Stat	Coeff.	Std. Error	T-Stat	Coeff.	Std. Error	T-Stat	Coeff.	Std. Error	T-Stat
Cohort: < 30	SCF98 * Has loan	-51,703	28,207	-1.83	-33,876	17,678	-1.92	-99,290	52,816	-1.88	-48,353	23,679	-2.04
	SCF01 * Has loan	-34,427	32,667	-1.05	-31,635	16,866	-1.88	-73,444	100,030	-0.73	-55,621	31,420	-1.77
Cohort: 30 – 39	SCF98 * Has loan	-342	29,992	-0.01	-12,407	5,609	-2.21	15,509	37,973	0.41	-6,351	11,021	-0.58
	SCF01 * Has loan	-22,507	30,492	-0.74	-9,418	3,839	-2.45	-45,736	55,105	-0.83	-20,687	6,997	-2.96
Cohort: 40 – 49	SCF98 * Has loan	-7,787	35,732	-0.22	-1,699	7,449	-0.23	14,134	83,004	0.17	10,671	10,026	1.06
	SCF01 * Has loan	-13,121	67,628	-0.19	6,411	5,348	1.20	-9,664	107,462	-0.09	12,610	7,484	1.69
Cohort: 50 – 59	SCF98 * Has loan	-8,752	68,291	-0.13	4,085	14,755	0.28	11,517	123,980	0.09	2,736	17,723	0.15
	SCF01 * Has loan	-125,388	263,199	-0.48	-7,466	24,358	-0.31	-144,928	741,025	-0.20	-12,441	38,237	-0.33

The cohort effects indicate that wealth is highest for the 50 – 60 year old cohort (the omitted group) as both the 40 – 50 and 30 – 40 cohort signs are both negative, with the 40 – 50 cohort coefficient less than 30 – 40 cohort. The main focus of this section are the *Cohort*SCF98*HASLOAN* and the *Cohort*SCF01*HASLOAN* coefficients which indicate the extent to which savings behavior within the four cohorts differs between current borrowers and current non-borrowers from 1995 to 2001 and which can be attributed to a borrowing effect. Specifically, current borrowers are saving more (less) than non-borrowers if the

*Cohort*SCF01*HASLOAN* coefficient is larger (smaller) than the *Cohort*SCF98*HASLOAN* coefficient and both are positive (negative). Most of the pairs of coefficients are inconsistent with increased asset accumulation by one group relative to the other so it is not possible to reach a broad conclusion regarding the savings behavior of borrowers compared to non-borrowers. It appears that households that have an outstanding loan are decreasing their holdings of net financial assets and net worth but are maintaining their 401(k) and retirement assets. In fact, the 40 – 49 cohort of borrowers has been increasing its 401(k) assets relative to the non-borrowers in this cohort since 1995, although none of the differences in the cohort specifications are significantly different from zero, tested using the test statistic explained in footnote 25. This is an important cohort because this is the group that is making the transition from being precautionary to retirement savers. Together with the generally weaker financial condition of current borrowers may mean that this group has an incentive to maintain their retirement saving in order to provide for an adequate retirement. For the other dependent variables, it seems that borrowers are decreasing their holdings of net financial assets and net worth. The LAV estimation with the level of net financial assets as the dependent variable indicates that current borrowers have been decreasing their holdings of net financial assets relative to non-borrowers. Nearly all of the *Cohort*SCFyear*HASLOAN* coefficients in the net financial assets specification and many in the net worth specification are negative; it's just that the *Cohort*SCF01*HASLOAN* coefficient is usually not more negative than the *Cohort*SCF98*HASLOAN* coefficient so it is not possible to make a strong conclusion regarding the savings behaviors of borrowers compared to non-borrowers[51]. Although the evidence is weak at best, it seems that borrowers are trying to maintain good retirement savings behaviors while letting their net financial assets and net worth situations becoming worse over time. It's unclear whether these are conscious or unconscious decisions. As many people feel that financial

[51] Ten of the pairs of coefficients in the net financial assets and net worth specifications are consistent with borrowers' dissaving relative to non-borrowers, while only one pair suggests that borrowers are saving more.

decisions are very complex, it may be that current borrowers understand the conventional wisdom about the dangers of borrowing against their retirement assets as they are trying to maintain their retirement wealth. However, they may be doing so at the expense of the net financial assets and / or housing equity (the major non financial component of net worth). This is probably less of a conscious decision. Given the tax advantages that retirement funds enjoy and the penalty for early withdrawal of assets from retirement accounts this may be a reasonable behavior for households in need of funds but who also have a desire to maintain a retirement savings goals.

CONCLUSIONS

Most personal finance advice warns against borrowing against a retirement plan because of the potential negative impact on retirement wealth. This is especially true for borrowers who are also undisciplined savers and do not or cannot maintain their retirement plan contributions during loan period or who separate from their employers before the loan is repaid. For good savers a retirement plan loan only has a modest impact on retirement wealth. Only modest make-up contributions would need to be made to mitigate the impact of a retirement plan loan. It seems that many borrowers may be using retirement loans because they are in financial difficulty. It also appears that borrowers are trying to maintain their retirement savings, but may be undermining overall savings behavior by not maintaining the financial assets. Retirement plan designers and policy makers face difficult choices regarding whether to allow borrowing from retirement plans. On one hand, allowing access to funds before retirement may increase participation rates, especially for younger savers for whom retirement is 20 or 30 years away. On the other hand, poor savers may find themselves tempted to use retirement savings to fund current consumption expenditures, which can seriously erode their wealth at retirement.

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Appendix A: Missing values in the Survey of Consumer Finances

Karen Pence (2000) and Arthur B. Kennickell (1998) note that missing values in a survey dealing with wealth questions are likely to be substantial. For example, households may be reluctant to provide information on certain assets, or may not know the value of others (i.e. business or real estate investment). The SCF tries to minimize this additional source of error by using Multiple Imputation (MI). See C.P. Montalto and J. Sung (1996) and Donald Rubin (1987) for more details. MI essentially provides an estimate for a missing value based on the conditional expectation of the value using other information provided by the household and by similar households. In addition, each missing value is replicated five times, which provides for five separate observations (implicates) for each household. The mean of any variable or point estimate from a regression is the average of the value from the five implicates. The standard error of an estimate is the average of the standard error for the five implicates, plus an adjustment for the five implications. If β_i is a parameter estimate, S_i is the corresponding standard error of the estimate, and V_i is the variance of the estimate, where i equals 1 to the number of implicates (in this case 5) then the adjustment to the variance equals the variance of the five parameter estimates, $\left(1+\frac{1}{5}\right)\frac{\sum_{i=1}^{5}(B_i-\bar{B})^2}{4}$. The standard error of a parameter estimate is $\sqrt{\left(\sum_{i=1}^{5}\frac{V_i}{5}\right)+\left(1+\frac{1}{5}\right)\frac{\sum_{i=1}^{5}(B_i-\bar{B})^2}{4}}$.

The greater the differences among the parameter estimates for a particular variable are over the five implicates then the larger the standard error of the parameter estimates. An important implication is that there is an increased possibility of a type II error if the imputation variance is not accounted for.

A related issue concerns the bootstrapping of standard errors for the regression parameter estimates. Bootstrapping involves resampling a data set to create a (large) number of

datasets with the same number of observations, n, as the original dataset but with observations included zero, one, two, or more times with each of the observations from the original dataset has a $\frac{1}{n}$ chance of being included in each of the resamples.[52] Since the SCF is not a random sample the standard bootstrapping procedure is not applicable. In anticipation of this difficulty the SCF includes a file of 999 bootstrap resamples for each of the survey years. The file contains a replicate weight and multiplicity factor for each observation that are used to create each of the bootstrap resamples. The weights and multiplicity factors are computed for the first implicate only. In computing bootstrapped standard errors of parameter estimates, I follow Pence who computes the bootstrap standard errors for the first implicate then adjusts this standard error for the imputation variance as described above.

[52] Christopher Z. Mooney and Robert D. Duval (1993) is a very readable introduction to bootstrapping.

Appendix B: General-to-Specific Modeling

I begin with a general model that includes a large number of explanatory variables then eliminate the variable with the least statistical significance from this general model; this model is tested against the general model. If this more specific model is not rejected as being different from the general model the next least significant variable is eliminated and this model is tested against the general model. The process of eliminating variables continues until a model is significantly different from the general model; this specific model is then used for the analysis.

Appendix C: Interpretation of Dichotomous Variables in Logit Estimations

Typically in logit models the marginal effect is the change in probability that the response variable changes from zero to one given an incremental change in the average of the explanatory variable of interest. However, this does not make sense for dichotomous variables, i.e. whether or not a household also has an individual retirement account (IRA). Approximately 36 percent of the sample has an IRA so the usual marginal effect could interpreted as the increase in probability of having a 401(k) loan as the household changes from having 36 percent to having 37 percent of an IRA. Steven B. Caudill and John D. Jackson (1989) suggest reporting the marginal effect as the difference between the probabilities when the variable equals one and when the variable equals zero.

Suppose that there are *n* explanatory variables and x_1 is the binary variable of interest then the change in the probability of participation as the household goes from $x_1 = 0$ to $x_1 = 1$ is

$$\frac{\exp(b_0 + b_1 + b_2\bar{x}_2 + b_n\bar{x}_n)}{1+\exp(b_0 + b_1 + b_2\bar{x}_2 + b_n\bar{x}_n)} - \frac{\exp(b_0 + b_2\bar{x}_2 + b_n\bar{x}_n)}{1+\exp(b_0 + b_2\bar{x}_2 + b_n\bar{x}_n)} \qquad (5)$$

where the averages of the other explanatory variables are used, although the choice is somewhat discretionary.

A further difficulty is with interpreting the categorical dummies: age groups, saving horizon, educational attainment, and income groups. Jeffrey Wooldridge (2000) suggests calculating the marginal effect as the household moves from a lower category to a higher one. For example, the marginal effect for the age 40 – 49 age group would have a more meaningful interpretation if calculated as the change in probability of having a 401(k) loan as the household moves from the 30 – 39 age group to the older group. In this case, in the first term of (2) I set the value for the 40 – 49, 50 – 59, and 60 – 69 age groups equal to zero and the 30 – 39 group equal to one. In the second term I set the values for the 30 – 39, 50 – 59, and 60 – 69 age groups equal to zero and the 40 – 49 age group equal to one. Similarly the savings horizon variables have the

interpretation of the change in probability of having an outstanding 401(k) loan as a household lengthens its savings horizon.[53]

[53] The interpretation of the education and income group marginal effect is complicated somewhat by not having all of the income or education groups in the final model. It's not possible to compute marginal probabilities as described for the age groups; instead these marginal effects should be read as t he change in probability as the household from not being in the group (i.e. the 30k to 50k income group) to being in the group.

Vita

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