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Chapter Author: James M. Poterba, David A. Wise

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9 Individual Financial Decisions in Retirement Saving Plans and the Provision of Resources for Retirement

James M. Poterba and David A. Wise

Two important design features in proposals to supplement or replace the current social security system with a system of individual saving accounts are the degree of individual autonomy that would be allowed with respect to the investment of accumulating assets and with respect to the distribution of accumulated assets. At one extreme are proposals that would mandate the allocation of assets between stocks, bonds, and other investment categories during the accumulation phase and require the purchase of a government-provided annuity at retirement. At the other extreme are plans that would allow substantial individual choice in the investment of assets and in the time profile and method of distributing accumulated assets.[1]

Asset-allocation decisions can have important implications for the rate of return on retirement assets and hence on the degree of retirement security that a given stream of individual contributions during the working life can provide. The standard source of data on long-term returns, Ibbotson Associates (1995), reports that, since 1926, the distribution of returns on a diversified portfolio of corporate stocks has a mean of 9.9 percent per year, compared with a mean of 4.8 percent for a portfolio of long-term bonds and 3.8 percent, barely more than the inflation rate, for a portfolio of short-term Treasury bills. Siegel (1994)

James M. Poterba is the Mitsui Professor of Economics at the Massachusetts Institute of Technology and director of the public economics research program at the National Bureau of Economic Research. David A. Wise is the John F. Stambaugh Professor of Political Economy at the John F. Kennedy School of Government, Harvard University, and director of aging studies at the National Bureau of Economic Research.

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1. Diamond and Valdés-Prieto (1994) and Feldstein (1996) discuss a range of issues that arise in considering social security reform proposals.

presents similar findings using data from 1802–1992: the mean equity return is 8.1 percent, the mean bond return is 4.7 percent, and the mean inflation rate is 1.3 percent. The expected value at retirement of an accumulated retirement fund invested in equities is greater than the expected value of one invested in less risky fixed-income assets, although there is also a greater chance of having sustained losses on such a portfolio.

Mandatory saving plans that provide substantial investment discretion to individual participants have led to discussion of two conflicting concerns regarding individual asset-management choices. One is the possibility that some individuals will invest conservatively, thereby earning low rates of return on their account balances and thus not accumulating sufficient resources to finance retirement consumption. The other concern is that some individuals will invest their accounts recklessly, bearing substantial risk and incurring substantial probability of reaching retirement with a very small account accumulation. It is in principle possible that each of these investment patterns might apply to some part of the population, with the result that the group reaching retirement with low levels of resources would consist of some conservative investors and some plungers.[2] Restricting asset-allocation options provides one way to avoid either of these outcomes.

It is difficult to evaluate the importance of restricting individual investment choice since there has never been a universal system of retirement saving accounts in the United States. A substantial fraction of U.S. households accumulates very little financial wealth (see Poterba, Venti, and Wise 1994b), instead relying primarily on social security and to a lesser extent corporate pensions to sustain retirement consumption. Another group, which does accumulate some financial wealth, tends to hold only fixed-income instruments in their portfolio. It is difficult to gauge how such households would invest their retirement saving assets if they were provided with the chance to do so. A particularly difficult issue is how a potential reduction in the current level of social security benefits, which provide a real annuity "floor" under retirement consumption, would affect asset-allocation choices earlier in the lifetime.

A related set of issues arises with respect to payouts from mandatory saving accounts. One of the risks that is partially insured against by current defined-benefit pension plans (through annuity contracts purchased with the accumulation in defined-contribution pension plans) and by social security is that of outliving one's resources. Mandatory saving plans that require annuitization of accumulated balances at retirement or at a particular age, such as sixty-five, also provide a guarantee that resources will be spread over an individual's remaining lifetime. Such plans also entail tighter restrictions on individual choice than plans that would allow more discretion in asset withdrawal, and

2. The average return to all investors in a cohort might not be affected by the presence of some very conservative, and some risk-loving, investors, but the distribution of wealth at retirement would be affected.

they may involve additional government involvement in the provision of annuities or the oversight of the private annuity market.

At the center of the discussions of both accumulation and withdrawal options are questions of how individuals and couples would behave in a system of mandatory saving accounts. One potential source of information on these issues is the behavior of participants in various targeted retirement saving plans, such as individual retirement accounts (IRAs), salary-reduction arrangements (SRAs), 401(k) plans, and other self-directed defined-contribution pension plans. The growth of such targeted retirement saving plans has expanded the set of individuals with substantial financial asset holdings and some discretion regarding their investment. The participants in these plans tend to have higher incomes than nonparticipants, so there are immediate questions about the degree to which findings based on such groups can be generalized to the population as a whole. Nevertheless, it seems appropriate to examine the behavior of participants in these plans and to extract what information is available about accumulation and distribution behavior.

This paper considers a range of different saving vehicles that provide individuals with some discretion in investment and some opportunity to choose the nature of their payouts, including IRAs, SRAs, 401(k) plans, the TIAA/CREF retirement system for college and university employees, and the federal government's thrift saving plan. It provides evidence on individual financial decisions in these plans.

The paper is divided into five sections. Section 9.1 presents summary information on participation in various retirement saving programs, drawing on data from the 1992 Survey of Consumer Finances and the recently released Health and Retirement Survey. Section 9.2 summarizes asset-allocation decisions in a variety of the existing saving plans. We note that available evidence from 401(k) plan providers suggests that the equity allocation of new contributions to 401(k) plans is greater than that for the existing stock of assets and that there are differences by age and income in the asset-allocation pattern in 401(k) plans. Section 9.3 focuses on both accumulation and withdrawal decisions of TIAA-CREF participants and summarizes the allocation of retirement saving contributions between stocks and fixed-income assets. Section 9.4 considers the demand for annuities among TIAA-CREF participants, relying in particular on a 1988 survey of TIAA-CREF retirees to explore how individual characteristics affect annuity demand. A brief conclusion suggests several issues for further investigation.

9.1 The Growth of Participation in Targeted Retirement Saving Plans

In the last decade and a half, the structure of the private pension system has shifted substantially from defined-benefit to defined-contribution plans, and many individuals have taken advantage of opportunities for tax-deferred saving in targeted retirement saving accounts. The result of these changes has been a

shift, small for those already retired but potentially much greater for those who will retire in the future, toward retirement saving accounts that rely in some way on individual investment decisions.

The first substantial targeted retirement saving plan was the individual retirement account (IRA). IRAs were introduced for most households in 1981 and rose to substantial popularity, with nearly 16 million contributors, before the 1986 Tax Reform Act curtailed the tax benefits for IRA participation by higher-income households. Since 1986, the flow of new contributions to IRAs has been substantially reduced, but total assets in IRAs have continued to grow as a result of rollover contributions from other retirement plans and the increase in value of previously invested assets. By the end of 1995, Bernstein Research (1995) estimates that nearly $1 trillion was held in IRAs.

In contrast to IRAs, a second targeted saving plan, the 401(k) plan (named after the section of the Internal Revenue Code that created it), has expanded rapidly since the early 1980s. Although formally created in 1978, 401(k)s did not gain popularity until after 1981, when the Treasury Department issued clarifying regulations that made it possible for employers to establish such plans. These plans have diffused rapidly through the workplace, first at large employers, then at smaller firms. Participants in 401(k) plans can defer income tax liability on their contributions. Assets in 401(k) accounts accumulate tax free, and income from these plans is taxed when the funds are withdrawn. Prior to 1987, employees could contribute up to $30,000 each year to a 401(k) plan. The Tax Reform Act of 1986 reduced the limit to $7,000 beginning in 1987 and instituted indexation for inflation in subsequent years. The contribution limit was $9,235 for the 1995 tax year. Many employers match employee contributions to 401(k) plans, often at rates between 50 and 100 percent (see Poterba, Venti, and Wise 1994a). The number of participants in 401(k) plans has increased from 7.5 million in 1984, to 15.2 million in 1988, to 22.4 million in 1992, the most recent year for which the U.S. Department of Labor (1996) has released detailed information from IRS form 5500 filings. Bernstein Research (1995) estimates that the market value of assets in 401(k) plans was approximately $650 billion at the end of 1995 and that these assets will increase rapidly in the future. Contributions to IRAs and 401(k) plans now exceed contributions to traditional employer-provided defined-benefit pension plans.

Both IRAs and 401(k)s provide individuals with opportunities to make financial decisions about the investment of retirement plan assets and about the distribution of these assets after retirement age. Individuals have substantially the greatest discretion in investing IRA assets. Although some assets, such as gold and silver coins and hedge funds, could not be held in IRAs until recently, these restrictions are unlikely to constrain the investment choices of many IRA participants. IRA assets can be withdrawn in various ways, including lump sum payouts at any age (although such payouts before age 59½ incur a 10 percent penalty tax on withdrawal), according to a schedule of participant age-specific minimum distributions determined by the IRS, or by purchasing an annuity.

Participants in 401(k) plans face less discretion than IRA investors with respect to asset allocation. The available investment options are plan specific and as such are determined by the employer's arrangement with the 401(k) provider. Since 1993, however, Department of Labor guidelines have required that most 401(k) plans offer at least three investment options, including a broadly based equity fund, a bond fund, and a money market fund. Many 401(k) plans offer a more diverse range of investment options. Assets can be withdrawn from 401(k) plans at any time, although lump sum withdrawals before age 59½ that are not rolled over into other tax-deferred retirement saving plans incur the same 10 percent penalty tax as withdrawals from IRAs. Some 401(k) plans offer annuitization options, while others can be annuitized only if the individual participant purchases an annuity in the private insurance market.

To provide some information on the characteristics of current participants in IRAs and 401(k) plans, table 9.1 presents information on the age-specific prevalence of IRA ownership and the rate of 401(k) participation in 1991. These patterns are important background information given the data that will be presented below on the asset allocation of IRA and 401(k) participants. The data in the upper panel show that IRA participation rises with income and also with age. More than 40 percent of those between the ages of fifty-five and sixty-five have individual retirement accounts, while only one-quarter of those in a cohort twenty years younger have such accounts. The prevalence of IRAs is also sharply rising with income. The data on IRAs indicate only that a respondent has an account, not that contributions to such accounts were made in the survey year (1991). Thus, it is possible that many of the participants opened these accounts before 1986 and have continued to hold the accounts without making contributions.[3] Between 1986 and 1989, IRA contributions fell by roughly 75 percent. Some IRA holders are also likely to have created these accounts as vehicles into which to roll over distributions from other tax-qualified retirement saving plans.

The center panel of table 9.1 shows the probability of participating in a 401(k) plan. These probabilities vary relatively little by age but once again rise substantially as income increases. As the data in the lower panel of table 9.1 show, most of the income dependence in 401(k) participation rates arises from varying rates of 401(k) eligibility, not from variation in participation rates conditional on eligibility. The 401(k) take-up rate for all eligibles was 70.8 percent in 1991, substantially higher than the IRA participation rate for all but the highest income categories. It is possible that some of the participation in 401(k)s at lower income levels reflects employer "helper" contributions that are made to include these employees in the plan and thereby to satisfy nondiscrimination rules for plan qualification.

We have also explored the prevalence of IRAs and various salary reduction

3. Some individuals may have multiple individual retirement accounts and make contributions in a given year to only one of these accounts.

Table 9.1 **IRA and 401(k) Participation, by Age and Income, 1991 (%)**

Income (thousands)	Age Category				
	25–35	35–45	45–55	55–65	All
	IRA Participation				
< 10	3.8	10.1	6.0	14.8	7.9
10–20	4.8	6.8	12.9	24.1	9.7
20–30	9.3	15.4	24.9	37.6	18.6
30–40	14.8	20.0	31.3	45.7	24.7
40–50	17.9	33.0	47.3	59.5	35.6
50–75	23.6	38.7	50.2	63.4	41.1
> 75	43.2	59.9	66.3	75.5	61.6
All	13.2	26.3	35.3	43.8	27.1
	401(k) Participation				
< 10	4.1	6.6	1.5	6.7	4.5
10–20	9.4	13.6	8.5	9.8	10.5
20–30	21.2	20.7	15.9	10.2	18.4
30–40	29.7	27.3	19.2	26.5	26.2
40–50	28.7	31.6	39.8	25.6	31.8
50–75	39.1	36.3	42.3	43.6	39.4
> 75	44.2	39.5	46.3	31.7	41.3
All	23.0	26.5	25.9	20.9	24.6
	401(k) Participation Given Eligibility				
< 10	79.8	58.4	72.5	85.2	70.8
10–20	63.2	67.7	51.5	68.3	63.0
20–30	70.3	59.8	57.6	49.0	61.7
30–40	74.1	63.7	58.5	72.5	67.3
40–50	73.8	68.7	81.6	67.8	72.9
50–75	76.1	67.2	75.1	84.0	73.3
> 75	86.2	83.8	88.1	85.7	85.8
All	73.5	67.7	72.3	72.3	70.8

Source: Poterba, Venti, and Wise (1995). Tabulations are based on 1991 SIPP.

plans in the Health and Retirement Survey (HRS), an ongoing survey of 12,600 individuals between the ages of fifty-one and sixty-one in 1992.[4] The HRS questionnaire does not ask the same questions as the SIPP (Survey of Income and Program Participation) survey instrument, but it is nevertheless possible to estimate the prevalence of IRAs, defined-contribution plans at the respondent's current job and from former jobs, and other tax-deferred saving vehicles such as 401(k)s and 403(b)s. The results are shown in table 9.2.

The HRS findings are broadly consistent with those from the SIPP. For

4. Poterba, Venti, and Wise (1998) analyzed the HRS data in studying the utilization of lump sum distributions from defined-contribution plans.

Table 9.2 **Prevalence of Retirement Saving Arrangements in HRS Population (%)**

Income (thousands)	IRA Only	401(k) Only	DC Only	IRA and 401(k)	Other Multiple	None
< 10	23.6	2.0	3.9	2.7	3.2	64.7
10–20	19.3	5.3	6.4	2.4	2.6	63.1
20–30	24.2	5.3	7.2	5.9	6.0	51.4
30–40	28.4	6.6	7.2	7.4	6.6	43.9
40–50	31.3	8.0	7.2	7.3	9.1	37.0
50–75	33.6	6.6	6.1	11.4	12.8	29.6
> 75	42.7	4.1	4.4	15.8	19.0	14.0
All categories	28.7	5.3	6.0	7.4	8.4	44.4

Note: Authors' calculations using Health and Retirement Survey database. Income is defined as the sum of wage income, professional practice income, and income from a second job; it is essentially a labor income concept. The unit of measurement is the household. DC = defined contribution.

IRAs, the HRS data suggest that 36.1 percent of respondents have an IRA or an IRA and a 401(k) plan. Of the 8.4 percent of the respondents who are shown as *other multiple* in table 9.2, 7.7 percent report having an IRA, so the total IRA participation is 43.8 percent for the HRS respondents. This compares with 35.3 percent for the forty-five to fifty-four age group and 43.8 percent for the fifty-five to sixty-four age group in the SIPP data shown in table 9.1 above. With respect to 401(k) plans, the HRS data suggest that 14.8 percent of respondents participate; this percentage is somewhat lower than in the SIPP sample.

The SIPP and HRS data suggest that IRA and 401(k) participation is not randomly distributed across the income distribution but tends to increase with age and income.[5] The sample of participants in these plans will therefore provide more information on the investment decisions of older, higher-income groups that are more likely to participate in these plans than on younger, low-income workers who are not. We address these issues in our subsequent analysis by stratifying households by age and income where possible.

9.2 Asset-Allocation Patterns in Retirement Saving Plans

This section presents information on the asset allocation of retirement saving plans. We begin by presenting survey-based information from the 1992 Survey of Consumer Finances, which asked respondents about investment patterns in IRAs, salary-reduction arrangements (SRAs) such as employer thrift plans, and 401(k) and traditional defined-contribution pension plans. We then present information from other sources, such as industry association tabulations on asset-allocation decisions in IRAs and 401(k) plans or specialized

5. This is why studies of the saving effects of these retirement saving plans, such as Poterba, Venti, and Wise (1995), stratify households by income level in carrying out saving comparisons.

tabulations on asset allocation in the federal government's Thrift Savings Plan. Each of these different methods of obtaining information provides some evidence on current patterns of household asset allocation.

9.2.1 Summary Information from the Survey of Consumer Finances

The Survey of Consumer Finances (SCF) is a stratified random sample of U.S. households administered by the Federal Reserve Board. It is designed to gather detailed information on assets, liabilities, and demographic characteristics. To collect useful information on asset holdings, in light of the skewed distributions of many types of financial and real assets, each survey oversamples high-income households. Each SCF contains an area-probability sample, which is a stratified random sample of households chosen from the population at large, and a stratified random sample of households drawn from a set of high-income tax returns. Both samples are surveyed using the same questionnaire, but missing value imputations in the public release versions are typically done separately. We use the most recent publicly available survey, the 1992 SCF, to provide some information on asset-allocation patterns in IRAs, 401(k) and 403(b) plans and other supplemental retirement accounts, and traditional defined-contribution pension plans. The latter category in the SCF includes profit-sharing or thrift plans and employee stock ownership plans (ESOPs).[6]

Table 9.3 presents data on the fraction of assets in each of these retirement saving vehicles that are held in the form of corporate stock or mutual funds that invest primarily in corporate equities.[7] The data are stratified by age in each case. The results show that approximately half the assets in each of these accounts are held in corporate equities. At least for the individuals who are currently participating in these plans, it therefore appears that equity investment is viewed as an important aspect of accumulating assets for retirement. There are apparent differences in age-specific rates of equity ownership, with those over the age of sixty-five showing a lower equity fraction of IRA and SRA assets than comparable, but younger, individuals.

One difficulty in evaluating results such as those in table 9.3 is that it is not clear what it is that "theory" suggests we should find. There is no presumption that households of different ages should allocate the same fraction of their portfolio to equities. Bodie, Merton, and Samuelson (1992) develop an argument for reducing equity exposure as households age, and Samuelson (1989, 1990) discusses arguments for age-related variation in equity holding.[8] Simi-

6. The critical limitation of the SCF for studying this question, and a limitation of most survey data on retirement saving plan asset allocation, is that we do not know whether the retirement plan is self-directed. In some plans, the plan sponsor may restrict asset-allocation choices, e.g., by allocating all employer contributions to a pension plan to an account that holds only company stock.

7. Related discussion and data summary may be found in U.S. General Accounting Office (1996).

8. Even if households reduce equity exposure as they age, they may still want to hold equities after retirement because of the long life expectancy of many couples at retirement age.

Table 9.3 **Share of IRA, SRA, or Defined-Contribution Pension Assets in Equities, 1992 (%)**

	IRAs	401(k)s and 403(b)s	Traditional DC Plans
Age group:			
< 35	50.5	44.7	47.9
35–44	50.4	44.5	46.4
45–54	51.7	49.3	50.8
55–64	51.7	45.4	49.1
> 65	33.0	39.8	49.6
Income group (thousands):			
< 30	32.4	37.5	45.4
30–50	41.4	41.8	47.7
50–100	47.2	38.1	49.2
> 100	52.2	56.0	50.0
Total	46.5	46.8	49.1

Source: Authors' tabulations from 1992 Survey of Consumer Finances. SCF respondents with IRAs are asked whether their assets are held in various asset categories, such as "bank accounts, CDs, and money market funds," "stocks," "bonds," "a combination of stocks and bonds," etc. The fraction holding stocks is computed by adding together all holdings of those who report that they hold stocks and $1/N$ times the holdings of those who report investing in combinations of N assets, one of which is stocks. For example, half the assets of individuals reporting "a combination of stocks and bonds" is added to the equity total. For 401(k), 403(b), and other defined-contribution (DC) pension fund investments, the options are "mostly in stocks," "mostly in bonds," and "split between." We add those assets that are held mostly in stocks to half the assets that are "split between" to compute the total equity investment in these accounts. The 401(k) and 403(b) category also includes assets in supplemental retirement accounts; the traditional defined-contribution pension plan entries include ESOPs and profit-sharing plans.

larly, if households view their retirement accounts as part of a broader portfolio selection problem, one must analyze their overall investment decisions rather than allocation choices in these accounts alone. For individuals who face high marginal tax rates on interest income, for example, holding bonds rather than equities in their tax-favored retirement accounts may provide higher after-tax portfolio returns than alternative portfolio profiles.

9.2.2 Other Sources of Information on IRA and 401(k) Asset-Allocation Patterns

In addition to survey information like that contained in the SCF, it is also possible to obtain data on asset allocation in IRAs and some other categories of retirement saving accounts from financial industry sources that monitor aggregate trends. Information of this type is presented for IRAs in table 9.4, which shows data for 1989 and 1994. These data are disaggregated by the type of financial institution holding the IRA, but this provides a reasonable guide as to the assets held in the account. In 1989, commercial banks, credit unions, and thrift institutions accounted for 49.1 percent of all IRA assets. IRAs with these institutions were presumably invested in various fixed-income securities.

Table 9.4 **Distribution of IRA Assets, 1989 and 1994 (%)**

Intermediary or Asset	1989	1994
Commercial bank	21.8	14.5
Thrifts	21.5	8.0
Life insurance companies	8.3	8.2
Credit unions	5.8	3.5
Mutual funds	24.6	31.1
Equity funds	11.5	16.7
Money market funds	5.6	8.7
Bond and income funds	7.5	5.6
Other self-directed	18.1	34.6

Source: Investment Company Institute (1995).

Adding money market mutual funds and bond and income funds to these assets brings the total of fixed-income assets to 62.2 percent. By 1994, the share of assets in these fixed-income categories had declined to 40.3 percent. Equity mutual funds increased from 11.5 to 16.7 percent of IRA assets during this period, but the sharpest increase (from 18.1 to 34.6 percent) was in "other self-directed" assets. The data from the Survey of Consumer Finance suggest that various types of equity investment are likely to account for a substantial share of this category.

The best source of aggregate information on 401(k) plan asset allocation is the annual set of IRS form 5500 filings, most recently published for 1992 data in U.S. Department of Labor (1996). These show 401(k) plan assets of $510.2 billion, with employer securities (presumably company stock) worth $88.2 billion, or 17.3 percent of the total. Identifiable interest-bearing assets, which include interest-bearing cash, CDs, corporate and government debt, and various loans, totaled $60 billion, or 11.2 percent of the total. Common and preferred stock direct holdings totaled $45.7 billion, or 9 percent of all assets. "Indirect investments," which are not identified by the nature of the underlying securities on form 5500, are an important and unallocated category, including $101.9 billion in "interests in master trusts," $47.2 billion in registered investment companies, $75.6 billion in insurance company general accounts, and $26.9 billion in unspecified general investments.

The coarse information on form 5500 has led to a number of private-sector surveys of 401(k) plan asset allocation. Such surveys are based on a subset of existing 401(k) plans, and whether the plans included in each survey are representative of the broader population of plans is difficult to evaluate. Nevertheless, these surveys provide an important source of evidence on the evolving pattern of 401(k) asset allocation. Table 9.5 presents this type of data from two different surveys over the period 1988–95. These surveys, by Access Research and IOMA, have been conducted periodically since the late 1980s or early 1990s. The survey findings suggest that there are some differences in results

Table 9.5 **Asset Allocation in 401(k) Plans (%)**

Asset Category	Access Research (1995) 1991	1993	1995
Corporate equities	11	16	21
Company stock	26	24	22
GICs	31	27	23
Balanced funds	13	13	14
Bonds	5	7	8
Money market funds	9	7	6
Other	6	6	6
	RogersCasey and Institute of Management and Administration (1995)		
	1988	1992	1995
Corporate equities	43	47	55
GICs	44	38	28
Balanced, bonds and cash	13	15	17

Source: Various reports as indicated in references.

across the two surveys, even in a given year, but the trends in the two surveys over time are similar.

There are several noteworthy findings in table 9.5. First, consistent with the Survey of Consumer Finance evidence, approximately half of 401(k) assets are currently invested in equities. However, the data presented here suggest that a higher fraction of 401(k) assets than of other equity assets is invested in shares of the company where an individual works. There is a correspondingly lower investment fraction in diversified national or international equity portfolios. The Access Research findings suggest 43 percent in corporate equities or company stock, with another 14 percent in balanced funds that would include some equity holdings. The IOMA findings suggest 55 percent in corporate equities, without further detail as to breakdown. The data from the form 5500s and the Access Research results suggest that one important feature of 401(k) plans is their substantial holdings of company stock. One reason for the significant level of such holdings is that employers sometimes channel their matching funds into accounts that are limited to holding corporate stock. In such cases, employees may have some discretion in the investment of their own contributions but no control over the investment of employer contributions.[9]

9. How individuals adjust their portfolio holdings to the existence of corporate defined-contribution plan accounts held in company stock is an important unresolved issue. If individuals do recognize the employer's contribution and pursue the imperfect hedging strategy of reducing their holdings of equity in general to offset the holding of employer shares, then the data suggest

The second significant finding in table 9.5 is that the share of 401(k) assets held in equity securities has increased substantially during the last half decade. Both the Access Research and the IOMA data suggest a sharp increase, with an 8 percent increase between 1992 and 1995 in the latter. This trend toward equity investment coincides with a decline in the share of guaranteed investment contracts (GICs). The trend toward greater equity holdings may be the result of several factors: high equity returns raising the relative asset share of these securities, even if 401(k) investors hold fixed their contribution allocation between equities and fixed-income assets; declining nominal long-term interest rates, which have made GICs less attractive in the eyes of some investors; and rising expectations of future equity returns, driven in part by extrapolative expectations and the recent period of strong equity returns.

The 401(k) asset-allocation choice reflects two decisions: one by employers with regard to which investment options to offer and a second by employees with respect to which investments to choose, given the available menu. Broad choice is now the rule, rather than the exception, in 401(k) plans. A recent RogersCasey (1995) survey found that only 1 percent of 401(k) participants worked at firms with only a single investment option; 2 percent had two options, 6 percent three options, 9 percent four options, 18 percent five options, and 74 percent six or more investment options. More than three-quarters of 401(k)s offer an actively managed domestic equity investment vehicle, compared with 62 percent offering a money market fund, 61 percent offering a stable value fund, and 60 percent offering a U.S. balanced fund.

Table 9.6 presents information from the 1994 Access Research (1995) survey that shows both the availability of various investment options and the use of these options given their availability. The data show that roughly 60 percent of individuals make at least some use of equity mutual funds when they are included in the opportunity set. Index funds and international equity funds are somewhat less popular, conditional on availability, than various types of growth funds. The data in table 9.6 shed some light on the role of company stock (shares in the firm that employs the workers who participate in the plan) in 401(k) plans and suggest that some individuals purchase company stock even though they are not required to do so by plan regulations.[10] While less than half the 401(k) participants surveyed had a company stock investment option in their 401(k) plan, nearly 60 percent invested in company stock if this option was available. Company stock, GICs, and various growth-oriented equity mutual funds have the three highest take-up rates conditional on availability.

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that individuals seek to hold roughly half their assets in equities. If they do not consider the employer contributions, however, then it becomes appropriate to subtract this 20 percent of the value of 401(k) assets from both the equity holdings and the total value of these accounts. This suggests an equity share of slightly less than 40 percent.

10. Whether employers exert tacit pressure for purchasing company stock in retirement accounts is an open issue.

Table 9.6 **Investment in 401(k) Asset Categories, by Investment Availability (%)**

Investment Option	Availability	Use Given Available
Equity funds:		
Long-term growth	59.6	60.5
Growth and income	52.1	64.0
Aggressive growth	45.1	59.9
International	27.1	50.1
Index fund	33.7	41.2
Company stock	41.6	59.4
Balanced funds	23.9	58.7
Bond funds:		
High-yield bond	13.6	25.8
Long-term bond	19.0	32.7
Corporate bond	9.2	34.1
U.S. government bond	23.7	29.6
Short-term bond	9.8	22.1
Guaranteed investment contract	42.0	55.4
Money market fund	35.9	36.4
Asset-allocation funds:		
High risk	15.4	44.9
Moderate risk	18.7	43.4
Low risk	14.1	38.6

Source: Access Research (1995).

All the foregoing data focused on aggregate allocation patterns in 401(k) assets, with no information on how individuals in different circumstances choose to allocate their assets. Table 9.7 presents information drawn from Goodfellow and Schieber's (1996) analysis of almost thirty-six thousand participants in twenty-four 401(k) plans.[11] The table shows the fraction of 401(k) plan assets held in each asset category, by age of plan participant.[12] The data show clear asset-allocation differences across age groups. Younger plan participants are more likely to invest their 401(k) assets in stock funds or company stock than are older workers. The fraction of assets in the three equity categories, domestic and international stock funds and company stock, declines from 52.9 percent for those aged twenty-one to thirty to 30.3 percent for those in their fifties and 13.4 percent for those over the age of sixty.[13]

11. The Employee Benefit Research Institute (1996b) presents a related analysis of the asset-allocation choices of investors in three large 401(k) plans. The results are broadly consistent with those from the large sample of plans analyzed by Goodfellow and Schieber (1996).

12. The entries in the total column raise some questions about the comparability of this sample with the 401(k) universe. The share of assets held in company stock is substantially less than that for all 401(k) plans, with a correspondingly greater share of fixed-income investments.

13. Goodfellow and Schieber (1996) also present data on the fraction of 401(k) participants who allocate none of their contributions to equity investments (31.2 percent of the total sample, with some age variation, as suggested by 29.2 percent for those aged twenty-one to thirty, 30.6

Table 9.7 **Allocation of Funds in 401(k) Investment Plans, by Participant Age (%)**

	Age Group					
Investment Category	21–30	31–40	41–50	51–60	> 60	Total
Stock funds	39.1	36.4	29.7	22.0	9.5	25.3
Company stock	11.0	8.9	6.1	5.8	2.7	6.1
International stock funds	2.8	3.1	3.8	2.5	1.2	2.8
Fixed-income funds	41.4	43.4	49.4	61.5	85.2	58.1
Balanced funds	5.7	8.2	11.0	8.3	1.3	7.8

Source: Goodfellow and Schieber (1996).

Table 9.8 presents analogous information with participants disaggregated by income level. Since the analysis is based on 401(k) plan records, income in this context represents wage and salary income from the plan-sponsoring firm, not total family income. As with age, there is a clear pattern in asset allocation by income category. Higher-income earners allocate substantially larger shares of their 401(k) assets to equity securities. For participants with incomes between $15,000 and $25,000, for example, 29.9 percent of 401(k) assets are held in equities, compared with 59.4 percent for those with incomes between $75,000 and $100,000 and 64.5 percent for those with incomes above $100,000. The fraction of assets held in balanced funds also increases with income, while the allocation to fixed-income funds falls roughly in half between the lowest and the highest income categories.

The relation between income and the share of contributions allocated to equities in the Goodfellow and Schieber (1996) data parallels our earlier finding from the Survey of Consumer Finances, but the link between participant age and contribution mix (table 9.6 above) is much stronger than in the Survey of Consumer Finances. This may be due to the difference between the definition of *age* in the SCF and in databases with information on individuals.[14] Because SCF respondents are asked about the financial status of their household, participation in a 401(k) means that someone in the household has a 401(k) account. Household age is determined by the age of the household head, which is a noisy measure of the age of actual participants. This could weaken the relation between age and the behavior of participants as measured in the SCF.[15]

percent for those between forty-one and fifty, and 52.3 percent for those over sixty) and the fraction who allocate more than 60 percent of their contributions to equities (36.7 percent for the twenty-one to thirty group, 30.7 percent for those forty-one to fifty, 18.8 percent for those over sixty, and 31.4 percent of the entire sample).

14. Bajtelsmit and VanDerhei (1996) analyze asset-allocation decisions in a single large defined-contribution plan and find some evidence that both younger and older workers are more likely to hold assets in fixed-income instruments than are middle-aged workers. This result may be driven by their use of a quadratic specification in modeling the age dependence of asset holdings or by special characteristics associated with the defined-contribution plan under analysis.

15. Another possibility is that Goodfellow and Schieber's data set reflects an unrepresentative sample of 401(k) participants, but we have no way to address this issue.

Table 9.8 **Allocation of Funds in 401(k) Investment Plans**

Investment Category	Income Group (thousands)							
	< 15	15–25	25–35	35–45	45–60	60–75	75–100	100 +
Stock funds	24.6	21.5	19.5	18.6	25.3	42.2	45.4	52.0
Company stock	6.5	7.6	8.2	6.6	7.6	10.6	7.9	2.3
International stock funds	.6	.8	1.7	1.6	2.0	3.9	6.1	10.2
Fixed-income funds	62.1	63.0	61.6	66.7	53.2	32.2	26.0	27.2
Balanced funds	5.9	7.2	9.0	6.5	12.0	11.1	14.7	8.4

Source: Goodfellow and Schieber (1996).

It is difficult to evaluate IRA and 401(k) asset-allocation choices in the absence of a benchmark, derived either from theoretical analysis of the return distributions and consumption needs confronting investors or from other sources. One possible comparison is the current asset mix in these plans relative to that in defined-benefit pension plans. In 1994, Bernstein Research (1995) reports that these plans held 46 percent of their assets in domestic equity, 11 percent in international equities, 28 percent in bonds, 5 percent in GICs, 3 percent in real estate, and 7 percent in other assets. IRA and 401(k) investment patterns thus reflect a much greater holding of GICs and a somewhat lower level of equity investment, but they are not dramatically different from the asset allocations of defined-benefit pension assets.[16]

9.3 Asset Allocation in Two Retirement Saving Systems

The discussion so far has considered asset allocation in individual retirement accounts, which are available (at least in some form) to all individuals with current earned income, and 401(k) plans, which are broadly available in the private sector. In this section, we draw on the experience of two more specialized retirement saving programs, the Thrift Savings Plan for federal government employees and the TIAA-CREF system for employees of educational institutions, to address similar issues of asset allocation.

9.3.1 Asset-Allocation Experience in the Federal Employee Thrift Savings Plan

The federal government's retirement system includes an option for voluntary contributions to the federal Thrift Savings Plan (TSP), which is structured along the lines of most 401(k) plans. In early 1995, the TSP had 2 million participants and nearly $27 billion under management (according to Hinz, McCarthy, and Turner 1996). Employee contributions to the TSP are made on a

16. The merits of this comparison may be questioned on the grounds that defined-benefit plan assets are managed to achieve objectives of an infinitely lived agent, the plan's corporate sponsor, and are insured by a government agency, the Pension Benefit Guaranty Corporation.

pretax basis. The federal government matches, dollar for dollar, employee TSP contributions up to 3 percent of salary and fifty cents on the dollar for the next 2 percent of salary. Contributions to the TSP are constrained by the same contribution limits as 401(k) contributions at private-sector employers, although there are no nondiscrimination rules constraining the distribution of contributions to the TSP.

Table 9.9 shows the percentage of workers choosing to make contributions to the TSP in 1993. In contrast to the private-sector experience with 401(k) plans, where participation in these plans conditional on eligibility exceeds 60 percent even at low income levels (see Poterba, Venti, and Wise 1995), participation in the TSP is below 50 percent at income levels below $20,000 per year and rises to 96 percent at income levels above $70,000. The federal government automatically contributes 1 percent of salary to the TSP for all employees; this is not considered "participation" in this table.

The federal Thrift Savings Plan historically offered more limited investment options than many private 401(k) plans.[17] Until 1987, all TSP contributions had to be invested in a federal government securities fund. This requirement was gradually phased out between 1987 and 1991. Since 1991, TSP assets can be allocated between three different funds, without restriction. Participants are allowed to reallocate assets that have accumulated from pre-1987 contributions as well as to allocate new contributions among three funds: a government securities fund that earns the average market return on marketable Treasury securities with more than four years to maturity; a large-capitalization stock fund that invests in the S&P 500; and a fixed-income fund that invests primarily in a Shearson Lehman Hutton commingled government/corporate bond index fund. The U.S. General Accounting Office (1995) reports that, at the beginning of 1995, 70 percent of the assets in the federal thrift plan were invested in the federal securities fund and that 6 percent were held in a commercial bond fund and 24 percent in the corporate equity fund. The equity fund is currently attracting a higher share of contributions (35 percent in August 1994) than its share of assets, but participants have apparently made little use of a post-1990 provision permitting reallocation of funds that were contributed during the period when all contributions were directed to the government bond fund.

9.3.2 Asset Allocation in TIAA-CREF

TIAA-CREF is the retirement saving system for employees of colleges, universities, and some other nonprofit institutions. It includes university faculty as well as staff. Many TIAA-CREF participants, like employees of the federal government, are better educated than randomly selected individuals in the population, so analysis of their retirement saving behavior may not be completely representative of all who might participate in a mandatory, economy-wide saving system. Nevertheless, one important benefit of analyzing the TIAA-CREF

17. Hinz, McCarthy, and Turner (1996) provide an overview of the federal Thrift Savings Plan.

Table 9.9 **Participation in, and Salary Deferral Rates in, the Federal Employee Retirement System**

Salary Range (thousands)	Percentage of Federal Employees Making Voluntary Contributions	Deferral Rate if Making Voluntary Contribution (%)
10–19	45	4.4
20–29	69	5.2
30–39	81	6.0
40–49	89	6.5
50–59	93	6.9
60–69	93	7.2
70 +	96	7.2
All	73	5.7

Source: U.S. General Accounting Office (1995).

data is that we can obtain individual-level data as well as aggregate information on asset-allocation choices.

Because TIAA-CREF is a financial service provider, individual data records suffer from the same limitations as participant records in 401(k) plans, notably the lack of information on demographic characteristics and household income. However, two special databases, the 1993 Premium Paying Research Panel and the 1988 Participant Survey, have been collected in recent years, and each of these databases has detailed information on individual attributes. Both surveys include a set of questions about participant retirement and financial planning, and they provide valuable information for studying participant decisions. The decision we focus on is the choice between allocating funds to TIAA accounts, which are invested in portfolios of fixed-income instruments, and CREF accounts, most of which are invested in equities.[18]

Table 9.10 presents information on the current asset-allocation choices of TIAA-CREF participants as well as the allocation of existing balances between CREF and TIAA accounts. In 1993, TIAA accounts attracted 38 percent of contributions (contributions to TIAA-CREF are frequently referred to as *premiums*).[19] There is a clear link between age, income, and the fraction of contributions allocated to fixed-income instruments. The TIAA share is 32 percent for those under the age of thirty-five. It rises to 38 percent for those between the ages of forty-five and fifty-four and then to 53 percent for those over the age of sixty-five who are still making contributions to TIAA-CREF. The fraction devoted to TIAA declines by more than 15 percentage points as we move from individuals with incomes under $25,000 to those with incomes over $100,000.

18. Since 1988, CREF has offered a money market account, and, since 1990, CREF has offered a bond market account. When the survey data were collected in 1988, however, virtually all CREF assets were invested in equities.

19. CREF attracted 43 percent of premiums, with the other 19 percent of premiums allocated to hybrid accounts or other specialized accounts.

Table 9.10 **Bonds versus Equity: Current Investment Decisions and Asset Balances of TIAA-CREF Participants**

Age or Income in 1993	Percentage of Contributions in TIAA Accounts	Percentage of Assets in TIAA Accounts
Total	38	44
Age:		
< 35	32	37
35–44	37	44
45–54	38	45
55–64	44	49
65 +	53	57
Income (thousands):		
< 25	50	53
25–34	41	45
35–49	39	46
50–74	39	44
75–99	35	42
> 100	34	40

Source: Unpublished tabulations from the 1993 Premium Paying Research Panel, TIAA/CREF Participants, courtesy of Brett Hammond.

The fraction of total TIAA-CREF assets held in TIAA accounts is remarkably similar to the asset-allocation mix of current contributions. This reflects the combined effect of an increase over time in the share of contributions that participants have allocated to CREF accounts and the greater return on equities than on bonds. The first effect would cause the contribution share going to TIAA to fall below the share of existing assets held in TIAA accounts, while the second effect works in the opposite direction.

9.3.3 Participant-Level Evidence on Allocation Decisions in TIAA-CREF

To further explore the factors that affect asset-allocation choices, we obtained data from the 1988 TIAA-CREF Participant Survey. This unique database has been used by Laitner and Juster (1996) to study the determinants of intergenerational altruism; the data are described in detail in Juster and Laitner (1990). In addition to information on the percentage of TIAA-CREF accumulation held in each type of account, drawn from participant records, the database also includes information on participant and other family income, financial assets and other components of net worth, and various demographic characteristics. We use this information to estimate simple regression equations of the following form:

$$
\begin{aligned}
\%\text{TIAA} = {} & \alpha_0 + \alpha_1 \times \text{AGE} + \alpha_2 \times \text{MARRIED} \\
& + \alpha_3 \times \text{FEMALE} + \alpha_4 \times \text{INCOME} \\
& + \sum \alpha_{5,j} \times \text{EDUC}_j + \sum \alpha_{6,j} \times \text{WEALTH}_j + \varepsilon.
\end{aligned} \tag{1}
$$

$EDUC_j$ denotes a set of indicator variables for particular ranges of education, and $WEALTH_j$ similarly denotes a set of indicator variables for net worth in various categories. *Net worth* is defined as the sum of all financial assets net of debts, plus the reported value of housing, other real estate, boats, autos, life insurance, trusts, and businesses owned. INCOME corresponds to family income, so it includes both income that the TIAA-CREF participant may earn outside the educational institution as well as income earned by others in the household. The median asset share in TIAA for this sample is 43 percent, and the mean is 52 percent. These values are higher than in the 1993 data shown in table 9.9 above, consistent with the view that TIAA-CREF participants have become increasingly equity oriented over time.[20]

Table 9.11 presents the results of estimating these regression models. The table shows three different specifications with respect to education and wealth. The only demographic variable that affects asset allocation in all three specifications is the gender of the respondent; women systematically invest approximately 4 percent more of their accumulation in TIAA accounts.[21] Family income, education, and household net worth are also related to asset-allocation choices. With respect to family income, the only category indicator that enters the equations in a statistically significant fashion is that for family income above $100,000. Participants from such households allocate between 5 and 7 percent less of their TIAA-CREF assets to TIAA than do participants from households with incomes below $50,000 per year. These results are consistent with earlier evidence from 401(k) plans and IRAs suggesting that higher-income households are more likely to choose equity investments. With respect to education, the only important distinction is between those TIAA-CREF participants with twelve or fewer years of schooling and those with more than twelve years of schooling. The former group allocates more than 10 percent more of its portfolio to TIAA than does the combined more highly educated group.

9.3.4 Interpretation

Similar asset-allocation patterns emerge with respect to household net worth. Participants from households with net worth above $250,000 allocate approximately 4 percent less of their TIAA-CREF accumulation to TIAA, but there are no statistically significant differences in the asset-allocation patterns of participants from households with net worth below this level. The results in table 9.11 support the evidence from other sources that suggest that high-income, high-net-worth individuals are more likely to allocate retirement sav-

20. Assets in CREF accounts can be transferred into a TIAA account, but, once assets have been placed in a TIAA account, they may not be reallocated to a CREF account. This places constraints on the speed with which the aggregate TIAA-CREF portfolio can shift from bonds to stocks.

21. This finding also appears in other data sets; see, in particular, Hinz, McCarthy, and Turner's (1996) analysis of data from the federal Thrift Savings Plan.

Table 9.11 **Participant-Level Models for Share of TIAA-CREF Assets in TIAA**

Constant	67.33	49.19	62.81
	(6.68)	(4.99)	(6.92)
Age	−.07	.05	.02
	(.08)	(.09)	(.09)
Married	−.05	.88	.28
	(2.02)	(2.02)	(2.03)
Female	4.07	4.76	3.70
	(1.84)	(1.79)	(1.86)
Family income (thousands):			
25–50	2.12	2.02	2.02
	(2.14)	(2.14)	(2.15)
50–100	−1.86	−1.48	−1.11
	(2.12)	(2.14)	(2.15)
> 100	−6.76	−5.92	−5.21
	(2.70)	(2.79)	(2.79)
Education:			
12–16 Years	−10.15		−9.54
	(5.04)		(5.04)
16 Years	−11.97		−10.76
	(4.78)		(4.79)
> 16 Years	−13.88		−12.31
	(4.26)		(4.29)
Net worth (thousands):			
50–100		2.13	2.11
		(3.23)	(3.23)
100–250		.52	.42
		(2.22)	(2.22)
250–500		−4.94	(4.24
		(2.33)	(2.34)
> 500		−5.66	−4.84
		(2.54)	(2.56)
Adjusted R^2	.0275	.0260	.0306

Note: All equations are estimated on a sample of 1,190 observations in the 1988 TIAA-CREF Participant Survey. Standard errors are shown in parentheses.

ing assets to equities than are their counterparts from lower-income, lower-net-worth households.

Our ubiquitous finding that lower-income, less-educated individuals allocate a smaller share of retirement plan assets to equities can be interpreted in either of two ways. First, it is possible that these individuals are more risk averse than higher-income, better-educated individuals and that they are choosing different asset allocations because of this underlying difference in preferences. The second, alternative, interpretation is that these individuals do not correctly perceive the higher expected returns associated with equity investing and that they are making an optimization error by holding too large a share of their portfolio in fixed-income assets.

One way to distinguish between these alternative views might involve studying how participant education affects asset-allocation choices. If 401(k) and other retirement plan participants in low-income classes choose to hold a higher fraction of their assets in equity after they have been exposed to information on portfolio returns, then the optimization-error view may receive some support relative to the risk-aversion explanation. The Employee Benefit Research Institute (1996a) reports that asset allocation is one of the most frequently covered topics in participant education programs at firms with 401(k) plans or similar retirement saving options. The effect of this education on asset choices is an important issue for further investigation.[22]

9.4 Evidence on Annuity Demand

The extent to which individuals would use the proceeds accumulated in mandatory saving accounts to purchase annuities is another important issue in evaluating and designing such plans. Relatively few household surveys explicitly inquire about income received from individual annuity contracts. The Health and Retirement Survey did include such a question, but, since the respondents were typically in their fifties, it is not surprising that the resulting prevalence of annuity income, 1.57 percent, was low.[23] Perhaps more relevant, in the HRS sample only 8.0 percent of respondents who had previously worked for an employer with a defined-contribution plan reported that they had selected an annuity as the method of payout for their accumulated defined-contribution plan assets. Other possible responses to this question included withdrawing the money, rolling it over into an IRA, and allowing it to accumulate.

9.4.1 Would Current Retirees Choose to Purchase More Annuity Coverage?

A more valuable source of information on potential annuity demand is the 1988 TIAA-CREF survey of annuitants, which paralleled the survey of TIAA-CREF contributors discussed above but was administered only to annuity recipients.[24] Annuities are only one of the ways TIAA-CREF participants can withdraw their accumulated account balances. Although rare during the time period corresponding to this survey, participants could also choose lump sum payouts or withdrawals of several substantially equal payments. The 1988 survey focused only on those participants who had reached the distribution phase

22. Milne, VanDerhei, and Yakoboski (1996) present some information on the asset-allocation choices of individuals in 401(k) plans with different types of participant education systems, but they do not report "before and after" asset-allocation patterns.

23. The mean annual annuity payout reported by those who indicate that they receive annuity income is $13,496.

24. The asset-allocation patterns between TIAA and CREF in the participant and annuitant surveys are similar. At the lowest education and net worth levels, there is a pronounced tendency for greater investment in TIAA rather than CREF.

of their saving plan and who had chosen the annuity option.[25] TIAA-CREF offers a variety of potential annuity options, including participating annuities (with a low guaranteed payout rate but historically substantial dividends) for TIAA participants and variable annuities based on a range of different portfolios for CREF participants.

One of the questions on the TIAA-CREF annuitant survey was, "If you unexpectedly received $100,000, what would you do with it?" Just over one-quarter of the respondents, 26.5 percent, indicated that they would purchase an annuity. This fraction did not vary substantially as a function of respondent age. Roughly the same fraction, 24.5 percent, indicated that they would either spend roughly $16,000 per year (which would exhaust the windfall in about eight years) or $10,000 per year (windfall exhausted in about twelve years). Thirty-seven percent of the respondents indicated that they would consume only the income from the windfall, and about 12 percent reported that they would spend less than the annual income from this windfall.

It is important to recognize three features of the TIAA-CREF annuitant group that makes them special for the purpose of analyzing annuity demand. First, all the survey participants have both a real annuity from social security and another annuity payout from TIAA-CREF.[26] Their responses may, consequently, not describe the responses of retired households who do not have annuity coverage beyond social security or the responses that would be observed if the current social security system were pared back. Second, most of the respondents are drawn from the upper quintile of the U.S. income and wealth distributions (see Laitner and Juster 1996), although they are not likely to represent the very highest income and wealth strata of the population. If the demand to bequeath assets is related to lifetime income, then this group may provide a guide to the annuity demands of only a part of the population. Third, the TIAA-CREF participants may have access to annuities on more favorable terms than individuals in the private marketplace and may be assuming that they would purchase additional annuities on such terms.

While recognizing these limitations, we explored the factors that affect the respondent's answer regarding how a windfall would be allocated.[27] Our approach follows the regression strategy that we used above to investigate the share of assets that TIAA-CREF participants hold in TIAA accounts. We now estimate linear probability models for each of the possible responses to the

25. Some participants might have stopped contributing to TIAA-CREF but not yet begun to withdraw their accumulation. They would not be included in the survey.

26. TIAA-CREF participants who purchase standard annuities can choose between simple nominal annuities and "graded" policies in which the stream of payments is backloaded in part to offset the effects of inflation. Thus, TIAA-CREF annuitants are not necessarily holding simple nominal annuities in addition to their social security real annuity.

27. One difficulty with surveys of this type is "surveyor preference bias": respondents attempt to provide what they believe the survey taker believes is the "correct" answer. It is difficult to know how important biases of this type are likely to be in this data set.

questions on windfall use, illustrated, for example, by BUYANNUITY, which equals unity if the respondent indicated that he or she would purchase an annuity with the windfall proceeds:

$$\begin{aligned} \text{BUYANNUITY} &= \beta_0 + \beta_1 \times \text{AGE} + \beta_2 \times \text{MARRIED} \\ &\quad + \beta_3 \times \text{FEMALE} + \beta_4 \times \text{SOCSEC} + \beta_5 \times \text{KIDS} \\ &\quad + \sum \beta_{6,j} \times \text{EDUC}_j + \sum \beta_{7,j} \times \text{WEALTH}_j + \varepsilon. \end{aligned} \tag{2}$$

The family income variable from the earlier specification is now replaced with a variable measuring the household's social security benefits, which proxy for a ranking of lifetime labor income. We also augment the earlier specification with a variable indicating whether the household has children since that may be a proximate determinant of annuity demand.

The results of estimating this equation are shown in table 9.12, and they suggest that it is difficult to find simple patterns in the responses to these questions. The only robust empirical finding is that TIAA-CREF participants with children are less likely to choose an annuity or a rapid "spend-down" plan, and more likely to pursue policies that preserve their capital, than are participants without children. There is some evidence that married respondents are less likely to annuitize a windfall than are other respondents; this may indicate a belief that the question is limited to individual annuities, which terminate at the death of the annuitant (a married couple could also choose a joint and survivor's annuity). There is also weak evidence that respondents in the lower portion of the net-worth distribution are more likely to say that they would spend their windfall than are those in the higher parts of the distribution. One puzzling feature is that the prevalence of spending down among those with the lowest net worth, under $50,000, is lower than among those in the $50,000–$250,000 net-worth range. The estimates in the last column of table 9.12, which correspond to the response that recipients would spend less than the current income from the windfall, do not show any robust patterns.

9.4.2 Current Annuitization Patterns at TIAA-CREF

One issue that TIAA-CREF data can enlighten is the type of annuity contracts that individuals purchase when they do purchase annuities. TIAA-CREF retirement annuity contracts can be written on a single life or two lives (typically to provide for the participant and a spouse), and these contracts can be written as simple annuities, in which the payouts cease when the annuitants die, or as annuities with guarantees that payments will be made for a certain period even if the annuitants do not survive for this period.[28] In a standard life-cycle setting without bequest motives, the simple annuity, which provides a

28. "Years-certain" annuities are life annuities with a guarantee that payments will be made for at least some number of years.

Table 9.12 **TIAA-CREF Annuitant Responses to "How Would You Spend a $100,000 Windfall?"**

	Buy an Annuity	Spend the Amount over 8–12 Years	Annually Consume No More than Income
Constant	.295	.411	.294
	(.265)	(.254)	(.292)
Age	.002	−.002	.0002
	(.004)	(.004)	(.004)
Married	−.096	.171	−.075
	(.071)	(.068)	(.079)
Female	−.049	.116	−.067
	(.064)	(.061)	(.070)
Social security benefit	.025	−.081	.056
receipts (/1,000)	(.067)	(.064)	(.074)
Have kids?	−.095	−.208	.303
	(.071)	(.068)	(.078)
Education:			
12–16 years	.083	−.028	−.054
	(.112)	(.107)	(.123)
16 years	−.022	−.076	.099
	(.115)	(.110)	(.127)
> 16 years	−.011	−.015	.026
	(.102)	(.098)	(.113)
Net worth (thousands):			
50–100	.041	.189	−.231
	(.102)	(.097)	(.112)
100–250	−.059	.164	−.105
	(.073)	(.070)	(.080)
250–500	−.140	.061	.079
	(.080)	(.077)	(.088)
> 500	−.022	.073	−.052
	(.080)	(.076)	(.088)
Adjusted R^2	.0049	.0404	.0590

Note: All equations are estimated on 310 observations with complete data on annuity demand in the 1988 TIAA-CREF Participant Survey. Standard errors are in parentheses.

higher monthly payout in each period when the annuitant is alive than any of the guaranteed options, dominates the other choices.[29]

Table 9.13 presents information on the choice of annuity policy by TIAA-CREF participants who contracted for annuities in 1978 and in 1994. The table shows both single-life and joint-life annuity policies. King (1996) reports that, in 1978, 44 percent of the annuities contracted for by male TIAA-CREF participants were single-life policies, compared with 26 percent of such policies in

29. This assumes that the available annuity policy is actuarially fair for the potential purchaser. In practice, since TIAA-CREF uses a unisex life table to price annuities, it could be the case that policies other than a simple annuity are optimal for some participants.

Table 9.13 Annuity Choices of TIAA-CREF Annuitants, 1978 and 1994 (%)

Annuity Type	1978	1994	1978	1994
	Male Single-Life Annuitants		Female Single-Life Annuitants	
Single life:				
Without guarantee	33.6	33.8	46.0	35.0
Ten-year certain	38.2	25.8	30.5	29.8
Fifteen-year certain	.0	16.2	.0	15.0
Twenty-year certain	25.1	23.8	21.0	19.5
Installment refund	3.2	.4	2.6	.7
	Male Primary Annuitants		Female Primary Annuitants	
Joint life:				
Full annuity to survivor:				
Without guarantee	5.6	13.3	2.2	11.7
Ten-year certain	32.3	9.9	30.0	11.1
Fifteen-year-certain	.7	13.0	.0	14.6
Twenty-year certain	63.1	63.8	67.8	62.6
Half annuity to survivor:				
Without guarantee	7.2	14.2	2.4	12.6
Ten-year certain	37.0	8.9	45.9	12.3
Fifteen-year certain	1.0	12.2	.0	22.2
Twenty-year certain	54.7	64.7	51.8	52.9

Source: Personal communication from Francis P. King at TIAA-CREF.

1994. For women, the respective percentages of single-life policies were 81 and 68 percent.

The table shows that simple annuities without guarantee provisions account for only about one-third of all single-annuity policies but less than 15 percent of joint-life policies. Policies with certain payout periods of fifteen years or more account for more than one-third of the single-life annuities chosen by both men and women in 1994 and nearly two-thirds of the two-life policies. Since the guarantee provisions in annuity contracts become operative only when the annuitant dies, in the case of single-life policies, or when *both* annuitants die, in the case of two-life policies, the widespread choice of annuities with guarantees casts doubt on the value of the simple life-cycle model as a starting point for describing household annuity demand.

9.4.3 Theoretical Estimates of the Utility Gain from Annuitization

To provide some perspective on the utility consequences of choosing to annuitize a given amount of wealth, we present illustrative calculations similar to those in Kotlikoff and Spivak (1981) and Friedman and Warshawsky (1990). We consider an individual who derives utility from consumption each month according to a standard isoelastic utility function, $U_t = (C_t^{1-\beta} - 1)/(1 - \beta)$,

where β is the coefficient of relative risk aversion. When $\beta = 1$, this utility function yields the special case of logarithmic utility. We assume that an individual faces a probability of death each month that corresponds to the annual mortality rates reported in the 1996 social security actuary's cohort life table for men born in 1930 (i.e., sixty-five-year-olds in 1995). We assume that no one lives beyond age 115 and that lifetime expected utility for a man aged sixty-five is given by

$$V = \sum_{t=65}^{115} P_t \times (1 + \delta)^{-t} \times U(C_t), \tag{3}$$

where P_t denotes the survival probability (to age t) for a sixty-five-year-old white man, and δ is the individual's time preference rate.

We first compute the expected lifetime utility associated with a "homemade annuitization" policy that involves consuming an amount in each period that equals current wealth divided by life expectancy.[30] This implies that wealth evolves according to

$$W_{t+1} = (1 + r)W_t - (1/L_t) \times W_t, \tag{4}$$

where r is the real rate of return. We assume that an individual has accumulated assets of 100 at age sixty-five and find the value of V (which we denote V_{homemade}) that corresponds to this consumption strategy.

Next, we assume that the individual can purchase an actuarially fair real annuity at age sixty-five. We find the level of wealth at age sixty-five that would generate the same lifetime expected utility as the homemade annuity applied to wealth of 100 at age sixty-five. The ratio of this wealth to 100 indicates how much the wealth of the sixty-five-year-old could be reduced, while leaving him at the same lifetime expected utility level, if he had access to an actuarially fair annuity market. We perform a similar calculation assuming that only nominal annuities are available but again maintaining the assumption that these policies are actuarially fair.

Finally, we consider the effect of allowing for preexisting real annuity policies in this setting. We assume that the sixty-five-year-old man has both 100 in accumulated assets and the claim to a real annuity with an expected present value of 100; that is, half his wealth is annuitized. We then repeat the calculation allowing this individual to purchase a real or nominal annuity and find the

30. This does not represent the optimal consumption policy in the presence of lifetime uncertainty, except in special cases. When period-by-period utility is given by $U = \log c_t$ and the individual's time preference rate is zero, e.g., the optimal consumption profile involves consuming wealth/(life expectancy) in each period. We focus on this consumption rule even in cases when it is not optimal because it is a simple rule, analogous to some withdrawal rules from retirement saving accounts such as IRAs, that individuals might easily implement. In calculations not reported here, we have discovered that there can be substantial differences in the lifetime utility accruing to individuals who follow optimal, and suboptimal, consumption paths. Thus, the current calculations may overstate the gains from annuitization for such optimizers, especially in the case with substantial preannuitized wealth.

reduction in wealth that would lead to the same expected utility level if the annuity market were available.

Table 9.14 presents the results of these calculations. The upper panel considers the case in which real annuities are available in the private market, and the lower panel considers the case of nominal annuities. The first entry, for the log utility ($\beta = 1$) case, shows that with a 3 percent real interest rate and an annual discount rate of 1 percent, with no "preexisting" annuity, an individual would receive the same lifetime expected utility whether he had wealth of 100 and no access to a real annuity market or wealth of 64.0 and access to such a market. A sixty-five-year-old man would be prepared to give up 36 percent of his wealth if he could purchase a real annuity rather than consume according to the reciprocal life expectancy rule. This finding, and the other results in the table for different parameter values, is broadly consistent with the results from the Kotlikoff and Spivak (1981) study. Higher risk aversion values increase the share of wealth that the individual would be prepared to give up to obtain access to an actuarially fair annuity market.[31]

The lower panel of table 9.14 presents results for nominal rather than real annuities. The wealth equivalent results are similar to those for the real annuity case, although individuals would not be prepared to forgo as much wealth if they could purchase nominal annuities as if they could purchase real annuities. The effect of allowing for a preexisting real annuity stream on the wealth equivalent measure is small, as can be seen from the differences between the wealth equivalents in the first and second columns of table 9.14.

While these findings are based on a stylized model, they generally suggest that individuals receive substantial expected utility benefits from purchasing annuity contracts, at least in standard models. They draw attention to the limited fraction of TIAA-CREF annuitants who report that they would use a lump sum windfall to purchase an additional annuity.

9.5 Conclusions and Extensions

More than half of U.S. households between the ages of fifty-one and sixty-one currently participate in some form of self-directed retirement saving account. The financial management decisions of households with these accounts can provide some evidence on the how households might manage funds in a mandatory private saving system. We consider two aspects of financial management: asset allocation between stocks and bonds and demand for annuities. With respect to the choice between stocks and bonds, we find that the aggregate fraction of 401(k) or IRA assets that are held in stocks is smaller, by approximately 10 percentage points, than the equity fraction held by defined-

31. Further analysis of the utility gain from annuitization, along with updated information on the actuarial present discounted value of currently available individual annuity contracts, may be found in Mitchell et al. (1998).

Table 9.14 **Wealth-Equivalent Value of Annuities Compared to "1/Life Expectancy" Consumption Plan**

	No Real Annuity Baseline	Preexisting Real Annuity Equal Half of Net Worth
Annuity market offers real annuities:		
Log utility ($\beta = 1$) case:		
$r = .03, \delta = .01$	.640	.665
$r = .03, \delta = .03$	.666	.684
$r = .05, \delta = .03$	.672	.681
$\beta = 2$ case:		
$r = .03, \delta = .01$	.501	.656
$r = .03, \delta = .03$	.567	.677
$r = .05, \delta = .03$	.618	.677
Annuity market offers nominal annuities, inflation = .03:		
Log utility ($\beta = 1$) case:		
$r = .03, \delta = .01$	.672	.688
$r = .03, \delta = .03$	.679	.689
$r = .05, \delta = .03$	.700	.702
$\beta = 2$ case:		
$r = .03, \delta = .01$	.538	.684
$r = .03, \delta = .03$	.591	.687
$r = .05, \delta = .03$	.659	.703

Note: Each entry shows the wealth required at age 65 to achieve the same expected lifetime utility as in the case without an annuity market, with a wealth at age 65 of 1, and when the individual consumes (wealth/life expectancy) each period.

benefit pension fund managers. One notable feature of 401(k) investment patterns is that they involve more holdings of own-company stock, and less investment in diversified portfolios of common stocks or international equities, than defined-benefit plan portfolios. The share of 401(k) and IRA assets allocated to equities, either via direct stock holding or through investment with intermediaries such as mutual funds, has increased significantly since the late 1980s. There are clear age-related and income-related patterns in asset allocation: higher-income households and younger participants in retirement saving plans tend to hold a higher fraction of their assets in equities.

While these findings provide some evidence on asset allocation, they must be interpreted with caution for two important reasons. First, plan participants do not have complete investment discretion with respect to all assets in 401(k) plans, as they do with assets in individual retirement accounts. Some 401(k) plans involve restrictions on asset choice, such as rules that employer contributions must be invested in employer stock. A related issue may arise in analyzing allocations for TIAA-CREF participants, some of whom face restrictions on the allocation of account inflows. Asset-allocation patterns in IRAs may there-

fore provide a better indicator of unconstrained asset choice than decisions in existing employment-linked retirement saving plans.

A second difficulty in interpreting existing asset-allocation decisions is that these decisions are made in an environment in which individuals expect to receive a real annuity, social security, which provides a floor on their consumption opportunities. Because some mandatory saving plans would scale back at least part of the existing social security system, it is possible that portfolio allocation decisions in such an environment would differ from those under the current system. This is an issue that can be analyzed under specific assumptions about the nature of individuals' utility functions, the distribution of returns available to them, and the nature of social security.

This paper also presents some evidence on the demand for annuities by participants in the TIAA-CREF system, which provides retirement benefits for employees of educational institutions. Roughly one-quarter of TIAA-CREF annuitants in the late 1980s, a group of individuals who already receive income from annuities, indicated that, if they received a $100,000 windfall, they would use these funds to purchase an *additional* annuity. Our analysis of a cross-sectional survey of these TIAA-CREF annuitants reveals few strong correlates of this demand for additional annuities; married individuals are less likely to demand an additional annuity, and there is weak evidence that those with higher levels of net worth would be less likely to annuitize a windfall.

An important issue, one that we have unfortunately been unable to find data to analyze, concerns the choice between annuities and other payout options by individuals who have accumulated assets in retirement saving plans. Participants in the Health and Retirement Survey, who were between the ages of fifty-one and sixty-one, report that, in 8 percent of the cases when they left previous employers who had offered defined-contribution plans, they chose to distribute plan assets by purchasing an annuity. This sample is too young to provide a clear perspective on the decisions made by individuals who reach retirement with substantial assets accumulated in a self-directed retirement saving account.

Even if it were possible accurately to measure the fraction of assets that are annuitized in this way, it is not clear how this information would bear on individual choices under a system of mandatory saving accounts. For precisely the reasons noted above, any proposal that scales back the real annuity associated with the existing social security system may affect individual demand for annuities. It is not clear what model to use in evaluating this issue. In simple life-cycle models, individuals with access to actuarially fair annuity markets should annuitize all their wealth at retirement. However, these models may not provide a realistic guide to individual behavior. In models with bequest motives, private annuity markets that do not offer actuarially fair annuities, and uncertainty regarding future health risks and associated consumption needs, individuals might choose not to annuitize fully. Analyzing how individuals would decide between annuities and other distribution options requires a model that incorpo-

rates these features. In addition, as Diamond (1994) notes, one of the key questions about a system of privately managed saving accounts is what annuity policies will be offered by private insurers in this setting. Considering general equilibrium effects in the annuity market complicates the analysis even further.

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Comment

Jack L. VanDerhei

The paper by Poterba and Wise sheds considerable light (empirical and otherwise) on two of the more vexing policy issues that will be encountered by privatization proposals that contain mandatory private savings accounts: (1) whether restrictions need to be placed on asset-allocation options and (2) the risk of outliving one's resources after retirement.[1]

Jack L. VanDerhei is a professor at Temple University and a fellow of the Employee Benefit Research Institute.

1. Actually, there may also be an interaction that the authors would want to consider, namely, do fixed annuity options force participants to ratchet down their equity allocations as they approach retirement age?

To address the first policy question, the authors provide new regression results as well as a valuable summary of previous literature that analyzed behavior of participants in various participant-directed savings plans. Although they point out that participants generally have higher incomes than nonparticipants, it is quite likely that this will be the only type of data available to answer questions of how individuals would behave in a system of mandatory savings accounts. Although the paper had a considerable discussion of the participation and contribution literature, I am assuming that, under the mandatory savings accounts referred to in this paper, the participants would not have any freedom in determining whether they would contribute and, if so, at what rate. Therefore, in discussing the accumulation phase of the paper, I focus my remarks on asset-allocation results.

Comments are warranted on a few of the points brought up in the first section of the paper since they are crucial to a proper interpretation of the results. First, the authors mention that available investment options in 401(k) plans are plan specific. It should be noted that the effect of this can be enormous. Figure 9C.1 shows the variation in percentage of investors with no GIC (guaranteed investment contract) holdings (among those offering this option) in Goodfellow and Schieber (1997). This suggests that the various options (as well as their relative attractiveness in the case of GICs) may explain a great deal of interplan variation. Figure 9C.2 shows the tremendous difference in three large plans with a total of nearly 200,000 participants that were the focus of a recent EBRI issue brief (Yakoboski and VanDerhei 1996). Plan C was one in which the employer stock investment option was extremely popular.

There are two points of information that need to be corrected in this section. The paper mentions that, since 1993, Department of Labor guidelines require all 401(k) plans to offer at least three investment options. It should be noted that this applies only to those plans seeking 404(c) protection.[2] The paper also implies that assets can be withdrawn from a 401(k) plan at any time; however, in most cases, the 401(k) assets are subject to strict withdrawal constraints.[3]

2. An unfortunate consequence of providing investment flexibility for participants is that, in their capacity as fiduciaries, sponsors could be considered liable for investment "losses" suffered by the participants, even though such losses are a direct result of the participants' own investment choices. However, Section 404(c) of the Employee Retirement Income Security Act of 1974 may allow the sponsor to shift the liability for investment decisions from plan fiduciaries to plan participants.

3. The value of elective contributions in a 401(k) plan may be distributable only on death, disability, separation from service, the termination of the plan (provided no successor plan other than an ESOP [employee stock ownership plan] or a SEP [simplified employee pension] is established), or certain sales of businesses by the employer. Distributions of elective contributions will be permitted after the employee has attained age 59½ or before this age in the case of a hardship. For hardship withdrawals, however, the amount available is limited to the elective contributions themselves; investment income on such contributions can be included only to the extent earned prior to 31 December 1988 (for calendar-year plans). Also, it should be noted that, if employer contributions have been included in the ADP (actual deferral percentage) test, the withdrawal restrictions on these amounts are even greater; any such contributions and any investment income earned on such contributions can be withdrawn for hardship only to the extent made or earned before the end of the last plan year ending before 1 July 1989.

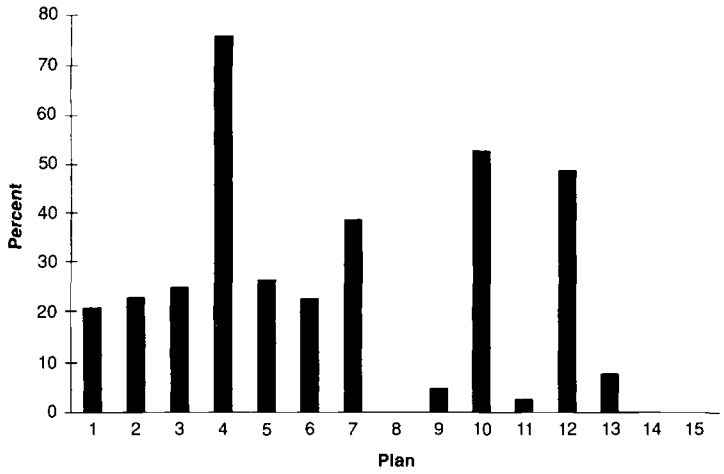

Fig. 9C.1 Percentage of potential investors with zero account balances in GIC funds
Source: Authors' tabulations from Goodfellow and Schieber (1997).

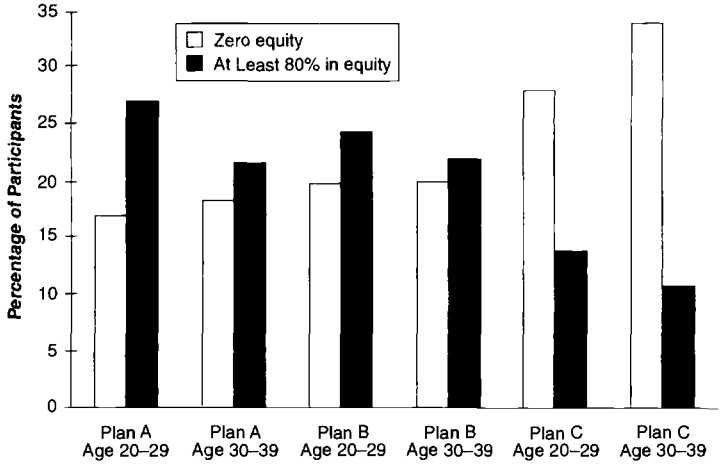

Fig. 9C.2 Equity investment patterns (other than employer securities) among young plan participants
Source: Yakoboski and VanDerhei (1996).

This may be important if employees perceive the constraints as essentially limiting the prospect of withdrawal to termination of employment. Note, however, that loans may be made available, and this may be an important determinant of asset allocation in terms of both plan-specific design (whether loans are offered) and the employees' utilization up to the tax limit.[4]

4. A loan to an employee will be treated as a taxable distribution unless certain requirements are met. These requirements involve the amount of the loan (or accumulated loans) and the time

The next section of the paper provides a useful summary of existing information on the asset allocation of retirement saving plans. However, some points should be considered when interpreting the results. In table 9.3, it is difficult to determine the extent to which the SRA (salary-reduction arrangement) information is participant directed and how employer securities differ from diversified equities. Similarly, table 9.5 provides findings from 401(k) plan data from Access Research and the Institute of Management and Administration showing a substantial percentage of equity in the aggregate, somewhere between 21 and 55 percent, depending on treatment of employer stock and balanced funds.

While I agree with the authors' comments in note 9 on the importance of individuals' adjustments to company stock, it is not clear what the breakdown of participant-directed choices should be. Most important, it is not correct to assume that 100 percent of the employer stock is due to mandatory elections from employer matches.[5]

The authors also note the substantial increase in equities between 1991 and 1995. I believe that they are correct in suggesting that much of this may be due to a run up in the equity markets during that period, especially compared with the alternatives of reallocating contributions or transferring existing account balances. My preliminary research on 401(k) contributions shows that, even though new contributions are far less "sticky" than reallocating existing balances, they show very little movement from year to year. The small use of transfers is consistent with the findings in the federal Thrift Savings Plan discussed in section 9.3 of the paper.

Table 9.6 provides conditional probabilities of use of an investment option. The authors conclude that roughly 60 percent of individuals make at least some use of equity mutual funds when those funds are included in the opportunity set. Although I am not familiar with the report cited, I would suggest that the authors reconsider this conclusion since many plans will provide more than one such fund option; therefore, the probability of at least some use of equity mutual funds will actually be much larger. In fact, the Employee Benefit Research Institute is currently analyzing in excess of one thousand 401(k) plans in a somewhat different way by looking at the percentage of account balance, not simply whether it was used. We are attempting to analyze how the "menu" of investment choices available to the employees affects the percentage of equities in both account balances and asset allocation for current contributions. It

period for repayment. The maximum amounts that can be borrowed without being considered a distribution depend on the amount of the employee's vested interest in his or her account balance. If it is (1) $10,000 or less, the entire vested interest is available; (2) between $10,000 and $20,000, $10,000 is available; (3) between $20,000 and $100,000, 50 percent of the vested interest is available; or (4) $100,000 or more, $50,000 is available. The $50,000 limitation on loans from qualified plans is reduced by the excess of the highest outstanding loan balance during the preceding one-year period over the outstanding balance on the date a new loan is made.

5. For example, more than 40 percent of the participant-directed assets for plan C in Yakoboski and VanDerhei (1996) were invested in employer stock.

is too soon to give definitive results; however, preliminary research reveals a tremendous interactive effect between the equity percentage and whether GICs and/or employer securities have been offered.

Earlier work that I have done (Bajtelsmit and VanDerhei 1997) suggests that there appears to be a great degree of substitution between fixed-income investments and employer securities. This is consistent with the authors' findings in note 12 when they compare Goodfellow and Schieber's findings with those of Access Research. Moreover, for the few plans where information is available, the terms of the GIC and the recent experience of the employer security also have important implications for the overall asset allocation. This should be viewed as a cautionary note with respect to using this type of data to extrapolate to a social security reform proposal, a universe in which neither GICs nor employer securities may be available.

Table 9.7 summarizes the Goodfellow and Schieber study, which shows that younger workers are more likely to invest in equities and employer securities than are older workers. The authors note that this is a much more significant result than is suggested by their Survey of Consumer Finances findings and wonder whether it may be due to an unrepresentative sample of 401(k) participants. Figure 9C.3 compares the age-specific equity allocations (other than employer securities) for three large 401(k) plans with those of Goodfellow and Schieber. It would appear that the Goodfellow and Schieber results are certainly within a range suggested by the three large plan results and indeed very close to company B, the only plan without employer securities.

Table 9.8 illustrates the Goodfellow and Schieber findings that higher-income workers allocate a larger percentage of funds to "stock funds." However, above a threshold level of income ($60,000–$75,000), the increase in stock funds is directly offset by the fact that company stock decreases with higher income. This is probably due to a better appreciation of the merits of diversification plus a higher likelihood of having stock options with the employer.

The third section of the paper analyzes the asset-allocation experience of the TIAA-CREF system. A major advantage of these data is that, in most cases, they are likely to represent the entire employer-sponsored retirement benefit.[6] All three of the large 401(k) plans that I have studied, and probably many of those in the Goodfellow and Schieber study, were secondary plans or at least plans where employees had a defined-benefit plan also.

It is difficult to compare the authors' tabulations of TIAA-CREF experience in table 9.10 with either Goodfellow and Schieber or Yakoboski and VanDerhei, given the lack of information on how the hybrid and specialized account assets are distributed over the various age groups and whether any of them are

6. It is difficult to ascertain whether these data are limited to employees with 100 percent of their account balance in TIAA-CREF, however. To the extent that this is one of a menu of choices, employees may elect TIAA as their "GIC" alternative and put their equity holdings into mutual funds.

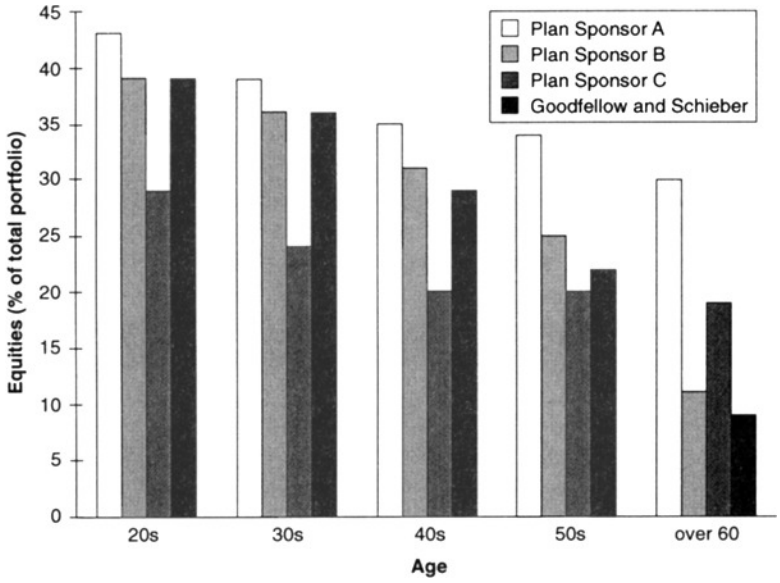

Fig. 9C.3 Percentage of equity funds (other than employer securities) in 401(k) investment plans, by participant age

Source: Authors' tabulations from Goodfellow and Schieber (1997) and Yakoboski and VanDerhei (1996).

invested in equities. Controlling for these uncertainties,[7] and comparing the asset allocations with 401(k) participants also covered by a defined-benefit plan, may provide an initial estimate of the equity allocation expected if the defined-benefit component of the social security program were at least partially replaced with participant-directed individual accounts. Another interesting finding of this experiment would be to determine whether there is a less-pronounced tendency to transfer from equities to a fixed-income investment as individuals approach retirement age, perhaps owing to the availability of variable annuities for TIAA-CREF participants.

In the fourth section of the paper, the authors report some interesting results on the applicability (or lack thereof) of a simple life-cycle model in predicting annuity demand. Unfortunately, it appears that research in this important area is still desperately in need of a database providing participant decisions on the choice of (1) lump sum distributions versus annuitization and (2) consumption (or perhaps distribution) patterns after retirement if a lump sum distribution is chosen. Moreover, it would be very useful if this type of data could be limited to those situations in which the plan is the exclusive (or at least primary) retirement plan provided by the participant's employer.

7. Note that there are constraints on the transfers from TIAA to CREF that may result in lower TIAA contributions than otherwise.

In the conclusion, the authors suggest that asset-allocation patterns in IRAs may provide a better indicator of unconstrained asset choice than decisions in existing employment-linked retirement savings plans. While this may be true, I would suggest that the real question is whether they would better represent the asset-allocation choices made if social security were privatized. I would argue that, to the extent that preretirement withdrawals were effectively eliminated under a reform proposal *and* to the extent that we learn how adequately to control for the effect of employer securities, the 401(k) asset allocation would likely be a better indicator owing to the withdrawal restrictions based on these assets.[8]

The authors acknowledge the difficulty in interpreting existing asset-allocation decisions made in an environment in which individuals expect to receive a real annuity from social security that provides a floor on their consumption opportunities. They state that this issue can be analyzed under specific assumptions about the nature of individuals' utility function, the distribution of returns available to them, and the nature of social security. The ability to simulate participants' results under various reform proposals will be greatly enhanced by such an undertaking.

Although this paper accomplishes its objective of providing evidence on how households might manage funds in a mandatory private saving system, there are several extensions to this paper that would be useful in determining the effect of a privatized social security system on individual asset allocation.

First, one might look at employers' reactions with respect to the qualified retirement plans they sponsor. The entire concept of integrated plans under a partially privatized social security system would need to be reexplored in terms of both the legislative and the regulatory amendments to Internal Revenue Code section 401(l) and the sponsor's reaction to such modifications.[9]

Second, would there be a greater demand for employer-sponsored defined-benefit plans if at least a portion of the current defined-benefit-type social security promise were replaced with an individual account plan? If so, how would asset allocation in social security defined-contribution accounts change in response?

The final set of extensions is empirically based. Obviously, it would be quite useful to integrate a micro-level asset-allocation database from a 401(k) plan

8. It should be noted that, technically, these withdrawal restrictions apply only to certain elective contributions; some contributions to what are generally referred to as 401(k) plans may have less restrictive withdrawal restrictions.

9. A plan will not be discriminatory merely because it uses a benefit formula that provides a larger percentage of benefits for earnings in excess of some amount, such as the social security taxable wage base, than it does for earnings under this amount. However, if the benefit formula is in any way integrated with social security benefits, certain requirements are imposed to prevent discrimination in favor of the highly compensated employees. The basic concept of these requirements is that the benefits from the employer's plan must be dovetailed with social security benefits in such a manner that employees earning over the taxable base will not receive combined benefits under the two programs that are proportionately greater than the combined benefits of employees earning under this amount. For a complete explanation, see Allen et al. (1992, chap. 14).

with household asset-allocation information.[10] Other important limitations would be overcome if longitudinal micro-level data were available from the 401(k) plans. Currently, the best information available is in essence a snapshot of the asset allocation at a particular point in time. If future data are provided in a form that will allow linkages with previous investigations, researchers will eventually be able to explore the following important issues: how asset allocation changes over time; how asset allocation changes as a function of changing market returns; how employees react to a termination/modification of defined-benefit or defined-contribution plan; and how employees react to changes in educational programs.

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Discussion Summary

Jeffrey Liebman and Andrew Samwick

One participant said that the main reason people do not buy annuities is that they are not indexed for inflation. So far they are all nominal. In response, Poterba said that the simulations reported in the paper indicate that the wealth equivalent difference between real and nominal annuities is quite small.

Another participant said that it was puzzling that young investors do not hold a greater share of their portfolios in stocks. He also asked if there is any information on differences in asset allocations between defined-contribution and defined-benefit plans. Poterba responded that, on average, defined-benefit plans hold 5–10 percent more in equities than do defined-contribution plans.

Another participant pointed out that, in looking at people's choices within

10. One of the more troubling aspects of using these data is the potential bias from liquidity or tax effects. For example, what if participants, especially the higher-income employees, prefer to hold their equities outside the qualified plan for capital gains treatment? Alternatively, what if just the opposite happens because they want to hold munis?

401(k) plans, it is important to consider how much time has passed since firms altered the investment options available to their employees. This explains why people still hold lots of GICs (guaranteed investment contracts).

A member of the group suggested that the authors take the data on where people invest and then simulate returns over a lifetime. What is really important, he said, is the performance in the tails, not the means. He also questioned whether the investment choices by the lowest-income 401(k) investors are representative of those who do not have 401(k) accounts.

Another participant pointed out that investors who hold assets both inside and outside tax-favored plans should hold bonds within the plans since bonds are more heavily taxed than stocks (stocks benefit more from the lower tax rate on capital gains). He noted, however, that only a small fraction of investors have significant wealth both inside and outside such plans.

Someone suggested that the data on asset holding from the HRS presented in the paper are not representative of lifetime portfolio choices since people are likely to shift to less risky assets as they approach retirement.

An audience member asked if there are data on the composition of equity holding rather than on the split between equities and bonds. He said that it would be interesting to know whether people are diversified in their equity holdings. It was also pointed out that it is difficult to separate age and cohort effects in asset holdings.

Poterba said that there are two theories of what would happen if a lot of extra money were invested in equities. One is that there is a big world capital market to absorb the additional investments and that therefore there would be little effect. This is what he thinks is most likely. Another theory is that there are segmented capital markets and that there would therefore be large relative price changes between stocks and bonds.

Poterba said that a major difficulty in learning more about retirement portfolio behavior from investment fund providers is that the researcher can see only part of the investor's total portfolio in cases in which the investor has accounts with a number of different providers.

Poterba also argued that, while one view says that equities have little long-term risk, the U.S. experience in the twentieth century may be atypical. Poterba recommended Stephen J. Brown, William N. Goetzmann, and Stephen A. Ross's "Survival" (*Journal of Finance* 50, no. 3 [July]: 853–73) on the survival of stock markets that provides evidence on this issue. An investor in 1900 who invested in a well-diversified global portfolio would have invested in German stocks, Russian stocks, and Argentinean assets. Many of these markets performed poorly or ceased to exist.