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Author: James M. Poterba, Steven F. Venti

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The Transition to Personal Accounts and Increasing Retirement Wealth
Macro- and Microevidence

James M. Poterba, Steven F. Venti, and David A. Wise

The transition from employer managed defined benefit pensions to retirement saving plans that are largely managed and controlled by employees has been the most striking change in retirement saving over the last two decades. Individual managed and controlled retirement accounts, particularly 401(k) plans but also 403(b) plans for nonprofit organizations, 457 plans for state and local employees, the Thrift Savings Plan for federal employees, Keogh plans for self-employed workers, and Individual Retirement Accounts (IRAs), have grown enormously. Employer-provided defined benefit (DB) pension plans have declined in importance. In 1980, 92 percent of private retirement saving contributions were to employer-based plans; 64 percent of these contributions were to DB plans. In 1999, about 85 percent of private contributions were to accounts in which individuals

James M. Poterba is the Mitsui Professor of Economics and associate head of the economics department at the Massachusetts Institute of Technology, and the director of the Public Economics Research Program at the National Bureau of Economic Research. Steven F. Venti is the DeWalt Ankeny Professor of Economic Policy at Dartmouth College and a research associate 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 the director for Health and Retirement Programs at the National Bureau of Economic Research.

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controlled how much to contribute to the plan, how to invest plan assets, and how and when to withdraw money from the plans.

We consider the changes in the magnitude and the composition of saving for retirement over the last two decades. We begin with an analysis of aggregate data on retirement plan contributions. We then turn to microdata, describe patterns in these data, and try to reconcile these patterns with the aggregate data. We document the changes in aggregate retirement saving over the past twenty-five years and describe how these changes are related to the shift from employer-sponsored defined benefit plans to individual-controlled retirement saving. We then investigate whether the shift toward individual retirement saving, and the accumulation of retirement assets in these accounts, has been offset by a reduction in the assets in other retirement saving plans.

In a series of earlier papers, summarized in Poterba, Venti, and Wise (hereafter PVW, 1996, 1998b), we found large net saving effects of IRAs and 401(k)s. We emphasized the potential offsets between saving in self-directed retirement accounts, other forms of financial asset saving, and the accumulation of home equity. On balance we found little, if any, offset in these cases. More recently, Benjamin (2003) and Pence (2001) have also found little or no offset between 401(k) contributions and non-401(k) financial asset saving, although the latter study also found little evidence that 401(k)s increased total wealth. Recent work by Engen and Gale (2000) finds little offset among low earners, but more substantial offsets among high earners.

Much less attention has been directed to the possible offset of personal retirement assets by a reduction in the assets in DB pension plans. Engen, Gale, and Scholz (1994) found a negative relationship between participation in DB pension plans and 401(k) plan assets in the 1987 and 1991 Surveys of Income and Program Participation (SIPP). Papke (1999) concluded that between 1985 and 1992 about one-fifth of ongoing sponsors of DB plans terminated their plans and adopted or retained a conventional defined contribution (DC) or a 401(k) plan. It is not clear from her analysis, however, whether the growth in 401(k) plans displaced DB plans. Papke, Petersen, and Poterba (1996) surveyed firms with 401(k)s and found that very few had terminated a preexisting DB plan when they instituted their 401(k) plan. Their sample, however, may not have been representative of the broader population of firms.

More recently, Ippolito and Thompson (2000) combined Form 5500 data with information from the Pension Benefit Guarantee Corporation (PBGC) to study within-firm changes in plans over time. They found little firm-level displacement of DB plans by 401(k) plans, and concluded that the replacement of a DB plan by a 401(k) is rare. Engelhardt (2000), basing his findings on data from the Health and Retirement Study (HRS), concludes that households eligible for a 401(k) have higher non-DB assets than

households not eligible for a 401(k), but have the same level of assets when DB wealth is included. He interprets this as evidence of firm-level substitution of 401(k)s for DB pensions. However, as we explain later, the HRS does not allow accurate categorization of individuals into 401(k) eligible and noneligible status.

Most recently, LeBlanc (2001) has estimated the reduction in contributions to the Registered Retirement Saving Program (RRSP) in Canada when persons are newly covered by an employer-provided DB plan. Based on a longitudinal panel of individual tax data, and using a difference-in-difference estimation procedure, he finds that for a dollar of DB plan saving, RRSP contributions are reduced by only about $0.15.

Our analysis of these issues is divided into six sections. In section 1.1 we consider aggregate data on the total stock of retirement wealth. The very large increase in total retirement assets relative to income over the past twenty-five years strongly suggests that the enormous growth in individual retirement assets has more than offset any displacement of asset growth in traditional DB pension plans.

In section 1.2 we show that the "retirement plan contribution rate" is much greater than the personal saving rate reported in the National Income and Product Accounts (NIPA) in recent years. Our retirement plan contribution rate is determined by the retirement saving of current employees. The NIPA saving rate, in contrast, depends on the saving and consumption patterns of retirees as well as those who are currently working. We document the substantial growth over time in contributions to self-directed retirement saving programs, such as 401(k) plans. We also suggest that the retirement plan contribution rate was reduced by legislation restricting contributions to DB pension plans, as well as by the strong stock market performance of the late 1980s and 1990s and the associated reduction in required DB plan contributions.

In section 1.3, we distinguish between retirement saving from the standpoint of an employee, and employer contributions to retirement saving plans. We argue that from the perspective of the employee, 401(k) retirement saving is likely to be much greater than traditional DB plan saving at most ages. We use data on accruing DB plan liabilities to compare 401(k) and DB plan saving rates, and conclude that the saving rate under a typical 401(k) plan is about twice that under a typical DB plan.

In section 1.4 we begin to explore the possible substitution between different types of retirement plans. We use data from both the Department of Labor Form 5500 filings, and from the SIPP. We find no evidence of strong substitution patterns between 401(k) participation and other retirement plans. Section 1.5 shows that further analysis of substitution, using data from the HRS, supports the results in section 1.4.

A brief conclusion summarizes our findings.

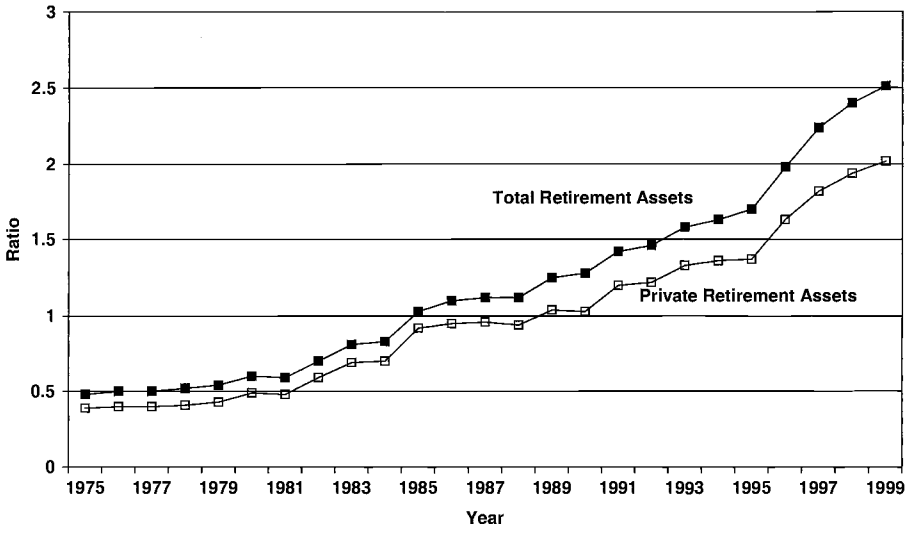

Fig. 1.1 Ratio of private and total retirement assets to wage and salary earnings

1.1 Aggregate Data on Assets in Retirement Saving Plans

1.1.1 Retirement Account Assets

While it is not possible to link particular assets with particular motives for saving, for many households assets in retirement saving accounts are the best single indicator of the amount that they have saved for retirement. A number of factors are likely to contribute to variation in retirement assets. For example, one would expect that households with higher earnings would have more retirement assets. For a given level of aggregate earnings, a larger share of the working population near retirement age is likely to be associated with greater retirement assets. Variation in life expectancy and in the typical retirement age can also affect the stock of retirement assets. The "adequacy" of any given level of assets depends on the years of support the assets are expected to provide.

Our analysis begins with measures of aggregate retirement assets that are not adjusted for demographic trends. We then explain the likely effect of adjustment for demographic changes. Figure 1.1 shows the ratio of assets in all private retirement accounts—including DB plans, 401(k), other DC plans, IRAs, 403(b) plans, and Keogh plans—to private wage and salary earnings.[1] This ratio increased more than fivefold between 1975 and 1998, from 0.39 to 2.02. The figure shows modest growth in the ratio of re-

1. Appendix A describes all of our data sources.

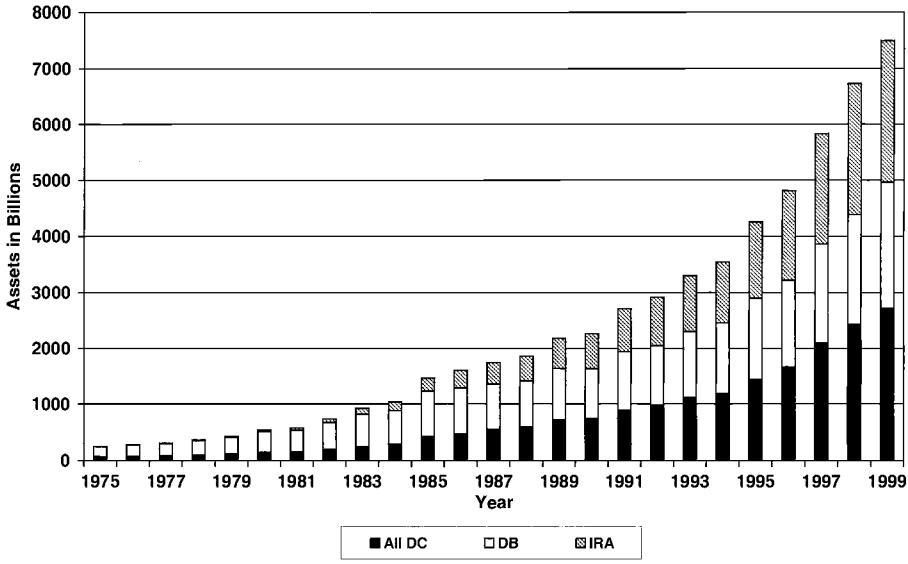

Fig. 1.2 Private retirement assets

tirement assets to earnings through 1981; more rapid growth between 1982 and 1994, after the introduction of IRAs and 401(k) plans and during a period of positive stock market returns; and rapidly accelerated growth beginning in 1995, corresponding to large increases in equity market returns. Figure 1.1 also shows the ratio of assets in all retirement plans, the private plans as well as public sector plans, to wages and salaries. The trend is very similar to that for private plan assets alone.

Figure 1.2 shows private retirement assets disaggregated into several components. It shows that assets in DB plans continued to grow after the introduction of 401(k) and IRA plans, but that the bulk of the gain was in individual accounts. In this figure, 401(k) assets are included with other DC plans. There is no evidence of a decline in the assets in conventional employer-provided plans during the time period when assets in individual accounts were growing most rapidly.

The foregoing data alone cannot rule out the possibility of substitution, because we do not have data on the time path that other retirement plan assets would have followed in the absence of the growth in DC assets. To place the growth in DC assets into perspective, however, we note that if *all* contributions to personal retirement accounts between 1985 and 1998 had come at the expense of DB contributions, DB assets would have grown by a factor of 8.4 instead of 2.7.

The private retirement assets in figure 1.2 exclude assets in federal, state,

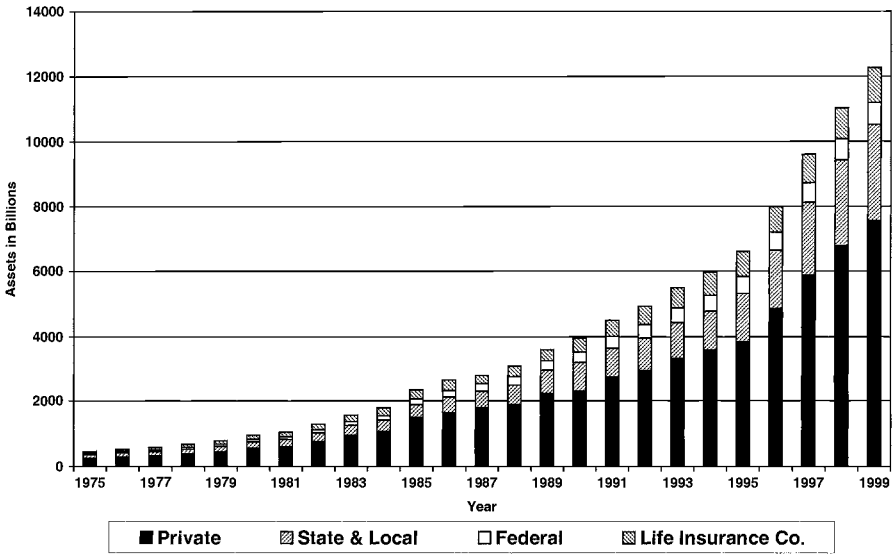

Fig. 1.3 Public and private retirement assets

and local retirement plans, and assets held by life insurance companies in retirement plans that are also part of the retirement asset pool.[2] Figure 1.3 shows the assets in private plans as well as the assets in these other plans. In 1999, about 40 percent of all retirement assets were in federal, state, and local and insurance plan funds.

Retirement account assets support current retirees as well as future retirees. Although we are unable to distinguish the assets held by current retirees from those held by the working-age population, we suspect that the increase in these assets represents a large upward trend in the assets of future retirees.

1.1.2 Housing and Other Nonretirement Assets

Aside from promised Social Security benefits, housing equity is the most important asset of a large fraction of Americans. Unlike the increase in retirement account assets, however, there has been no increase in housing equity relative to income over the past two and one-half decades. Figure 1.4 shows housing equity as a fraction of disposable income from 1975 to 1998. The ratio increased about 25 percent between 1975 and 1989, but by 1999 it was essentially at the same level as in 1975. The figure also shows non-

2. The Flow of Funds Accounts (FFA) defines the latter series as including "assets of private pension plans held at life insurance companies, such as guaranteed investment contracts and variable annuity plans, that are managed for the benefit of individuals who are not separately identified to the insurance companies."

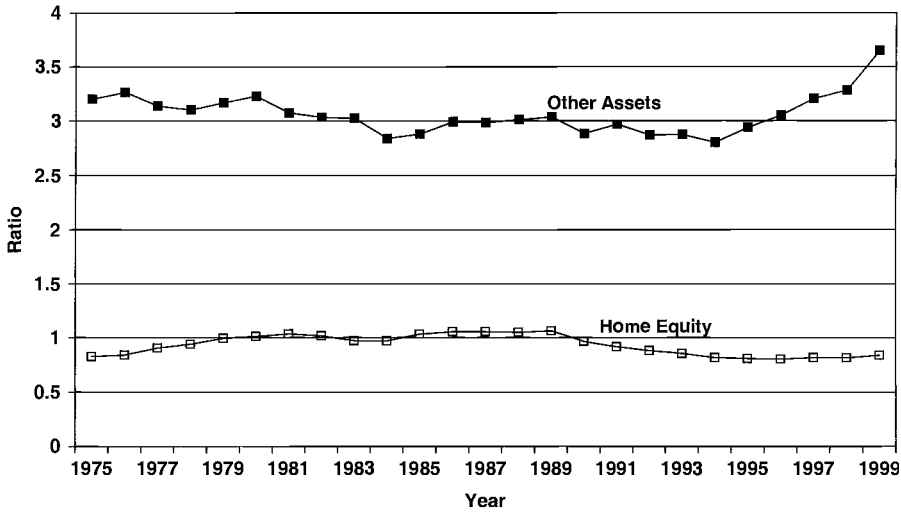

Fig. 1.4 Ratio of home equity and other assets to disposable income

retirement, nonhome equity net worth as a share of disposable income. This ratio decreased and then increased between 1985 and 1999. The increase between 1975 and 1999, 27 percent, was not nearly as great as the increase in retirement assets over this period.

1.1.3 Retirement Assets and Demographic Trends

The growth of retirement assets relative to income may be explained by a number of changes. These include the advent of new retirement saving vehicles as well as other factors, such as demographic change. Changes in three features of the population—demographic composition, mortality rates, and labor force participation—have likely contributed to the rise in retirement assets relative to income. We describe each of these changes, although we do not attempt a formal adjustment of retirement wealth to correct for these changes.

The increase in life expectancy at retirement age is the first substantial change that may have contributed to rising retirement assets. In 1975, life expectancy for a U.S. man at age sixty-two was 15.5 years, while that for a woman was 20.3 years. By 1997, male life expectancy at age sixty-two had increased to 17.6 years, while female life expectancy had risen to 21.4 years. For men, this implies a 13.5 percent increase in the number of years that need to be supported with retirement resources, beginning at age sixty-two. For women, the change was 5.4 percent. These proportional changes provide a crude measure—crude, because they do not reflect the potential role of risk and the prospect of drawing down resources too quickly—of the increase in retirement resources that would be needed to offset improved

longevity. These changes might account for an increase in resources of roughly 10 percent, much less than the actual growth of retirement assets relative to income.

The second important demographic change that might have contributed to rising retirement assets was the aging of the labor force. Translating information on the age structure of the population into predictions about the wealth-income ratio requires detailed information on saving by age, yet there is no agreement on the relative importance of life-cycle, precautionary, and other factors in saving decisions. In 1975, the average age of those over the age of twenty in the U.S. population was 44.6 years. For men, the average age was 43.9 years. Between 1975 and 1985, the average age of those over twenty actually declined to 44.3 years for the entire population and 43.5 years for the male population. This reflected the entry of the "baby boom" cohorts into the 20-plus age group. By 1998, the working age population had grown older, the average age of all 20-plus persons was 45.5 years, and that of 20-plus men was 44.8 years. Thus between 1985 and 1998, the average age of the adult population rose by just over one year. Similarly, the average age of those in the labor force in 1985 was 38.5 years, whereas in 1998, it was 40.3 years.

These data on the population and labor force age structure suggest that by the late 1990s, those who were in their earning years were older and had fewer remaining years of work to accumulate assets for retirement than those in the working population in the 1970s and early 1980s. This also may have induced a rise in retirement assets.

The final change that may have affected retirement assets is the shifting age of retirement in the U.S. population. During the 1980s and 1990s, these changes were modest by comparison to earlier decades. Burtless and Quinn (2000) present detailed information on age-specific labor force participation rates for U.S. men in 1970, 1984–85, and 1998–89. Their data show a sharp decline in labor force participation rates between 1970 and 1984–85, but relatively little decline subsequently. The participation rates for 1998–99 were virtually identical to those in 1984–85. At ages above sixty-five, the labor force participation rate in the late 1990s was greater than that in the mid-1980s. There is no systematic difference in labor force participation rates at younger ages. Labor force participation rates for women in their early sixties increased between the mid-1980s and the late 1990s as cohorts of women with greater labor force participation rates when they were younger entered the retirement-age cohort.

Changes in retirement ages are therefore not likely to account for substantial changes in retirement wealth relative to income during the last two decades. Demographic factors—shifting age structure and lengthening life expectancy—seem likely to account for modest increases in retirement assets, but are unlikely to account for more than a small fraction of the large changes we observe.

1.2 Plan Contributions and the Retirement Plan Contribution Rate

The accumulation of retirement assets depends on the inflow of contributions, the payout of benefits, and the return on invested assets. Panel A of figure 1.5 shows private pension plan contributions, which increased almost sixfold between 1975 and 1999, while panel B of figure 1.5 shows con-

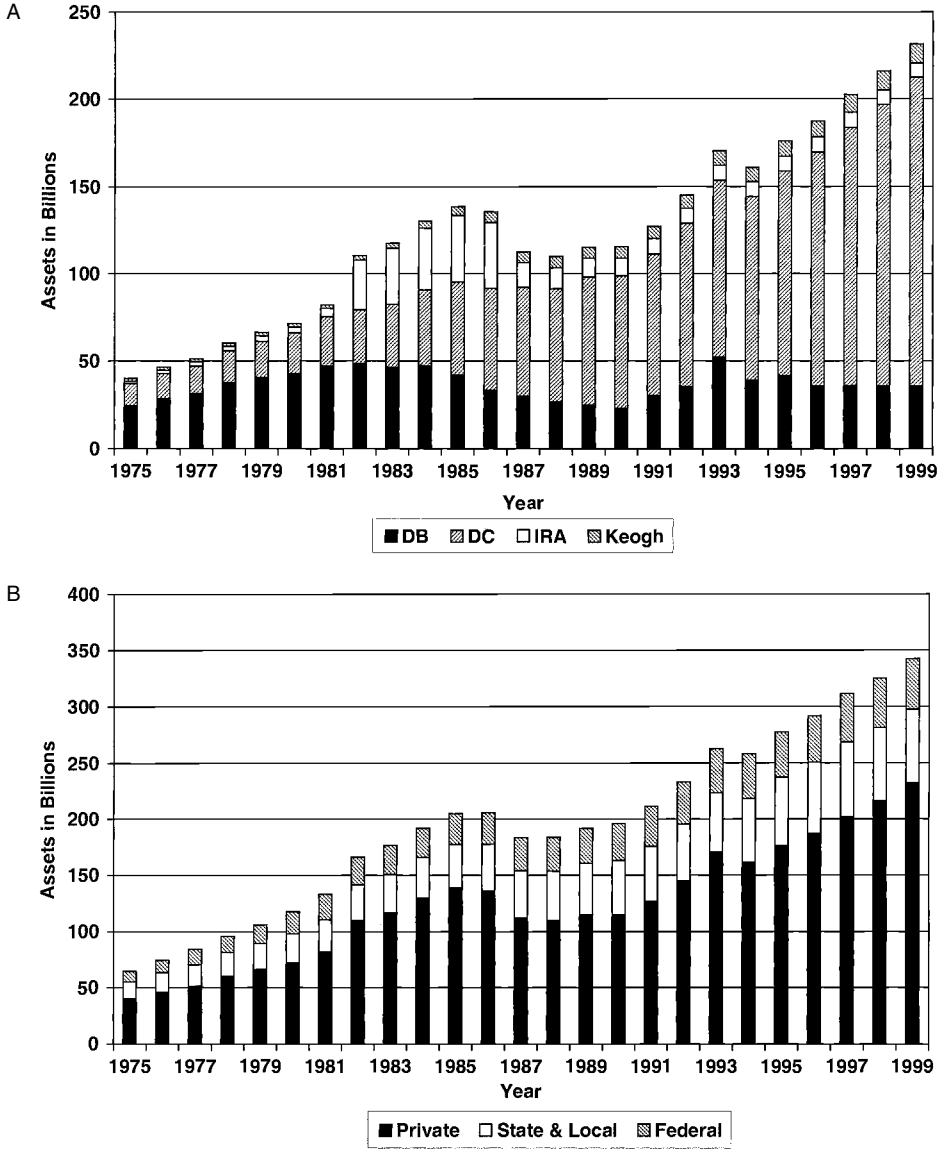

Fig. 1.5 *A,* **Private pension contributions;** *B,* **all pension contributions**

tributions to all retirement plans. Neither of the series includes contributions to privately held pension plans administered by insurance companies, which hold about 9 percent of the assets in all pension plans. Private plans include self-directed plans such as 401(k) plans and IRAs. IRA contributions exclude rollovers, while IRA assets include assets rolled in to these accounts.

The pronounced "hump" in retirement plan contributions between 1982 and 1986 corresponds to the beginning and subsequent retrenchment of the IRA program. The pattern strongly suggests that IRA contributions during this period were not offset by a reduction in other forms of retirement saving. Indeed, the rate of increase of non-IRA retirement saving was the same in the 1982–85 period as in prior years. This pattern suggests that the total pool of assets in retirement plans likely would be much greater today if the IRA program had not been limited in 1986.

Panel A of figure 1.6 shows both private and total retirement plan contributions scaled by disposable income. Panel B of figure 1.6 shows plan contributions over wage and salary earnings. In both figures, private contributions are scaled by private earnings, while all contributions are scaled by all wage and salary earnings. We define these ratios as *retirement plan contribution rates.* They measure the proportion of current earnings that is saved in retirement accounts by current employees. The contribution rates do not account for retirement plan earnings on existing assets, or for withdrawals from these plans. In the following, we compare retirement plan contribution rates to NIPA national saving rates.

Panels A and B of figure 1.6 show that retirement plan contribution rates are remarkably stable over most of the period. Scaled by personal disposable income, the private plan contribution rate was about 3.5 percent in 1975 and in 1999, and the contribution rate for all plans varied between 5 and 6 percent for most of the period. When scaled by private and by all wage and salary earnings, the contribution rates are also stable, although they are greater than the rates scaled by personal disposable income. The retirement plan contribution rate for all plans, including those in the federal and state and local government sector, is near 8 percent for most of the period, or about 2 percentage points higher than the rate for the private sector alone.

The relative stability in the retirement plan contribution rates was broken only by the large increase in the plan contribution rate when the IRA program was initiated, and the decrease when the program was curtailed in 1986. For example, relative to earnings, both the private and the all plan rates are about 2 percentage points higher during the IRA period—over 8 and 10 percent, respectively.

1.2.1 Time Series Changes in the Retirement Plan Contribution Rate

The relative stability of the retirement plan contribution rate conceals fluctuations in some of the factors that affect this rate. Contributions to private DC type plans increased sharply over the 1975–99 period, while DB

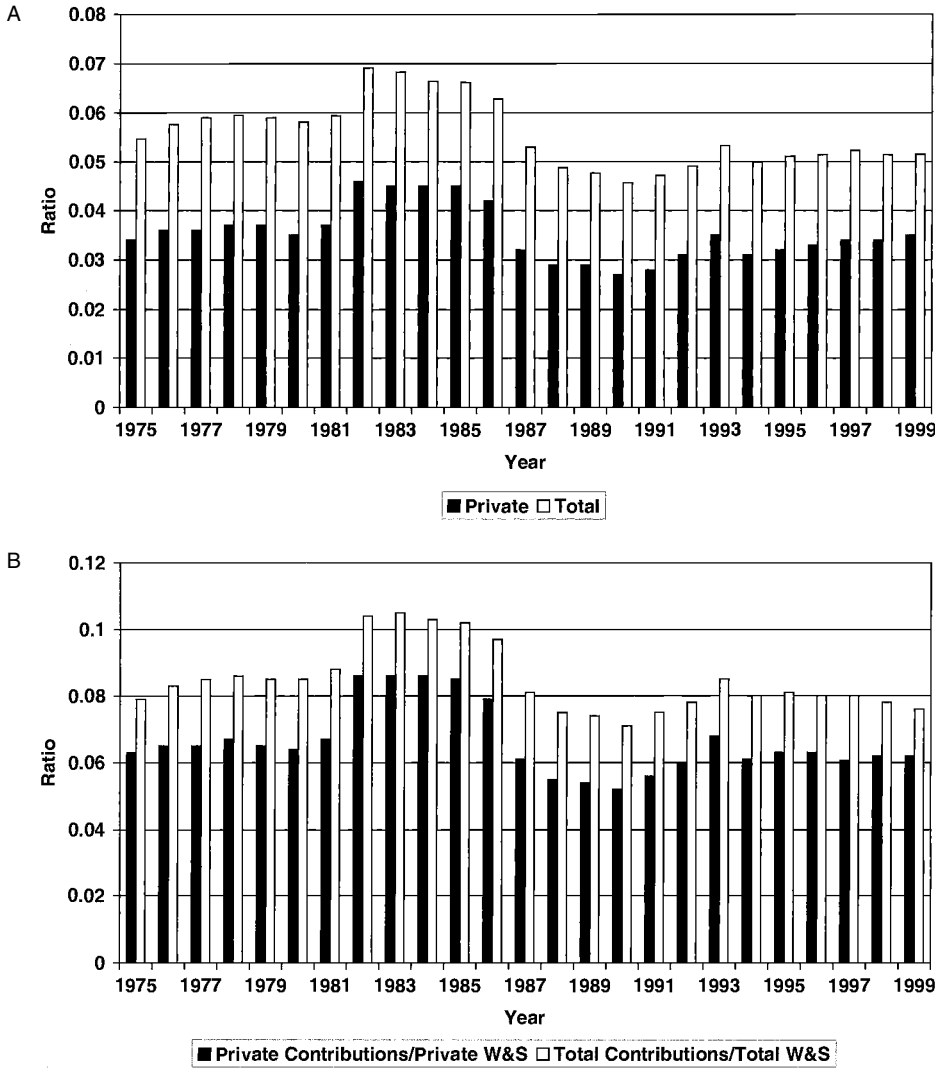

Fig. 1.6 ***A*, Ratio of private and total pension contributions to disposable income; *B*, ratio of private and total pension contributions to wage and salary earnings**

contributions varied widely. At the end of this period, DB plan contributions were only slightly higher than at the beginning.

Retirement plan contributions are the product of the number of participants and the average contribution per participant. Figure 1.7 shows the sum of the number of active participants in all DB and DC plans.[3] It illus-

3. These data, from Form 5500 filings and IRS tabulations of tax returns, show the number of persons participating in each type of retirement saving plan. Many persons participate in

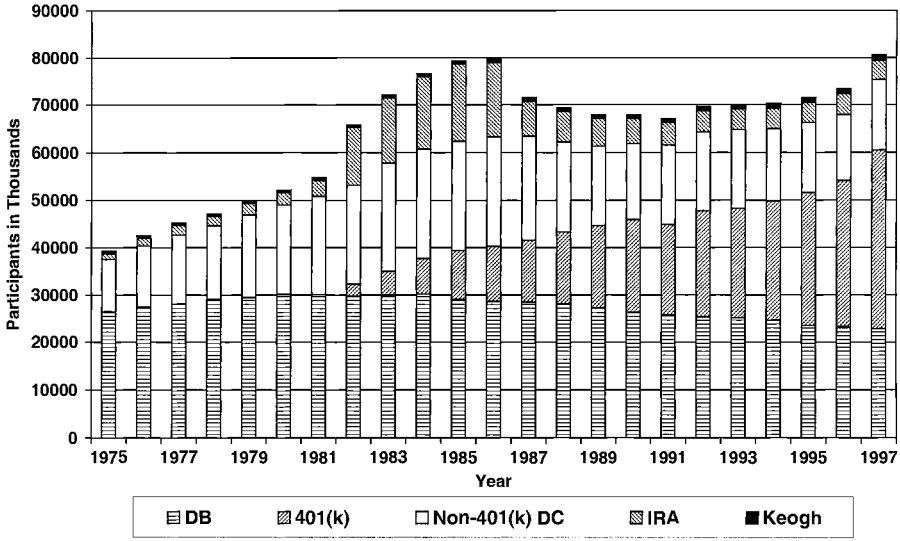

Fig. 1.7 Active participants in private pension plans (with double counting)

trates in particular the rapid growth of 401(k) plans. The number of participants in these plans, which first became available in 1982, grew to almost 38 million by 1997. While 401(k) plan participation grew in the 1980s and 1990s, participation in DB plans declined from about 30 million in 1984 to about 23 million by 1997. Participation in non-401(k) DC plans increased until about 1986 and then declined, ending the period about 30 percent higher than at the beginning. There is a clear "IRA effect" on plan participants, as well as plan contributions, in the early 1980s. In total, the number of plan participants increased from about 39 million in 1975 to over 80 million in 1997.

Panel A of figure 1.8 shows contributions per participant in DB, DC, and 401(k) plans. Panel B of figure 1.8 shows IRA and 401(k) contributions, while panel C of figure 1.8 shows contributions to Keogh plans. DB contributions per participant fluctuated substantially during the last two decades, and they were about 40 percent higher at the end of the period than at the beginning. Non-401(k) DC contributions per participant increased about twofold over the period, and on average were higher than DB contributions. Over the past fifteen years contributions per participant to 401(k) plans were, on average, twice as large as contributions per participant to DB plans. Contributions to 401(k)s increased almost 50 percent

more than one plan, so the total number of participants overstates the number of persons who participate in at least one plan. For 401(k) plans, participants include all persons eligible to contribute, regardless of actual contributions.

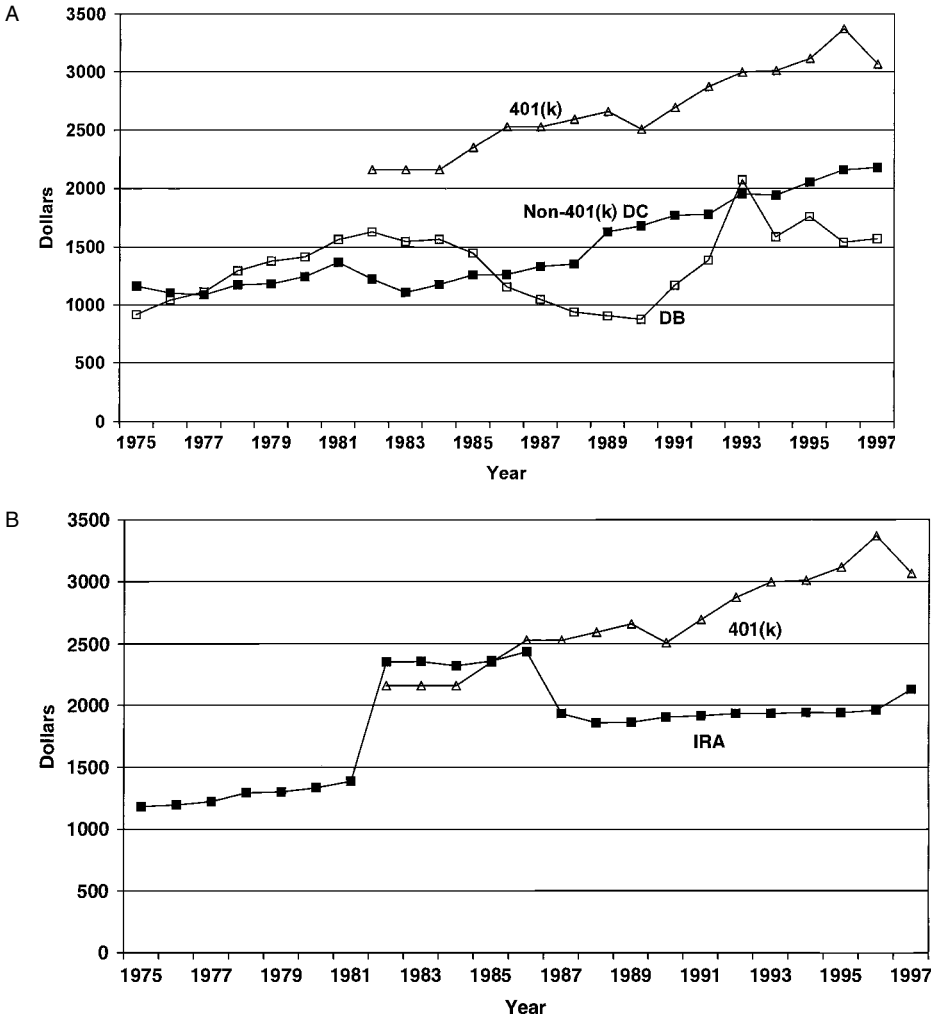

Fig. 1.8 ***A,*** **Contributions per active participant DB, DC, and 401(k);** ***B,*** **contributions per active participant IRA and 401(k);** ***C,*** **contributions per active participant Keogh**

between 1982 and 1996 alone.[4] During the "unrestricted" IRA period, 1982–86, IRA contributions on average were greater than 401(k) contributions.

4. 401(k) contributions are calculated by dividing total contributions to 401(k) plans by the total number of employees *eligible* to contribute, *not the number that actually make contributions.* There is much less change during this period in the participation rate of 401(k) eligibles, conditional on eligibility, than in the eligibility rate. Most of the change in the number of contributors is therefore due to changes in eligibility.

C

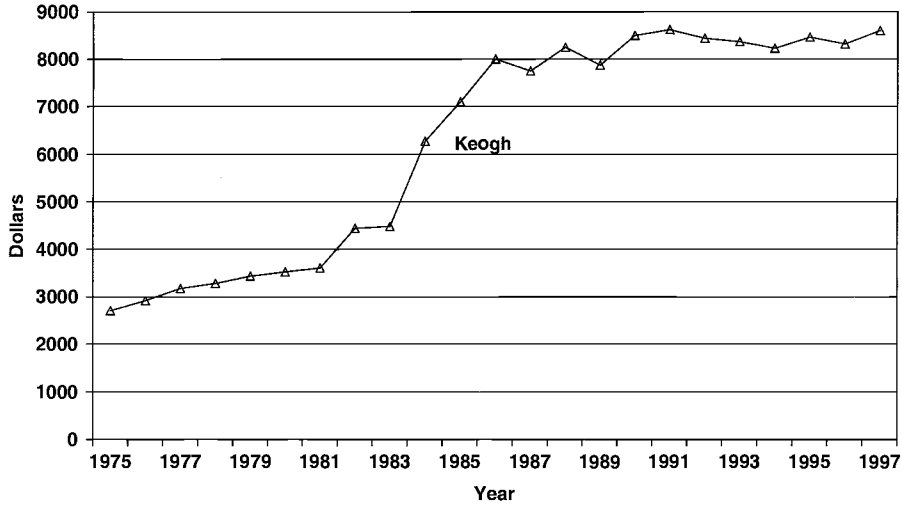

Fig. 1.8 (cont.) *A*, Contributions per active participant DB, DC, and 401(k); *B*, contributions per active participant IRA and 401(k); *C*, contributions per active participant Keogh

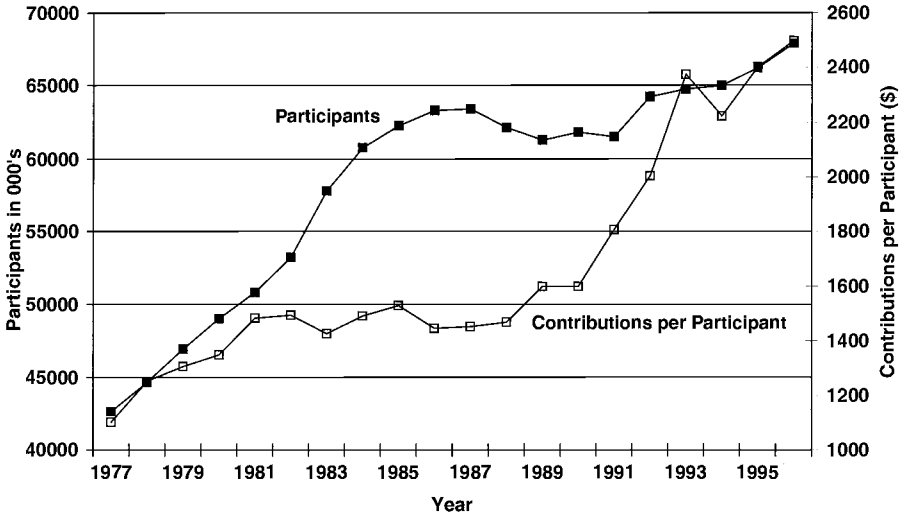

Fig. 1.9 Participants and contributions per participant for all plans

Keogh contributions, although a small proportion of total retirement saving, increased enormously between the early 1980s and late 1990s. There is a rise of more than 200 percent between 1981 and 1986, when the Economic Recovery Tax Act of 1981 raised Keogh contribution limits from $7,500 to $15,000.

Figure 1.9 shows the trend in the number of participants in all plans

combined and the trend in average contributions per participant. These two trends together yield the increase in total contributions previously shown. The participation numbers reflect substantial double counting, because many individuals participate in more than one plan. The increase in average contributions per unique covered employee would be substantially higher than the increase shown in figure 1.9.

1.2.2 Defined Benefit Contributions and the Retirement Plan Contribution Rate

Figure 1.10 shows an index of DB plan contributions per participant. It also shows an index for the number of participants and the flow of contributions to these plans. There are at least three reasons for the erratic variation in contributions to DB plans. The first is the slight rise and then steady decline in the number of active participants (current employees) in DB plans over the 1975–98 period. The number of total participants, including retirees, rose throughout the period.

A second is the link between returns on DB plan assets and current funding decisions. Benefits promised by DB plans are prescribed by a formula, which is typically based on years of service and final salary. The promised benefits are a liability of the firm, and the firm must insure that assets held in the plan are sufficient to cover this liability. Other things being equal, a rise in investment returns increases DB asset balances relative to obligations, thereby reducing the need for additional contributions. Bernheim and Shoven (1988) discuss this feature of DB funding.

A third reason for the fluctuation in DB contributions is the series of legislative changes that limited the level of benefits that could be funded un-

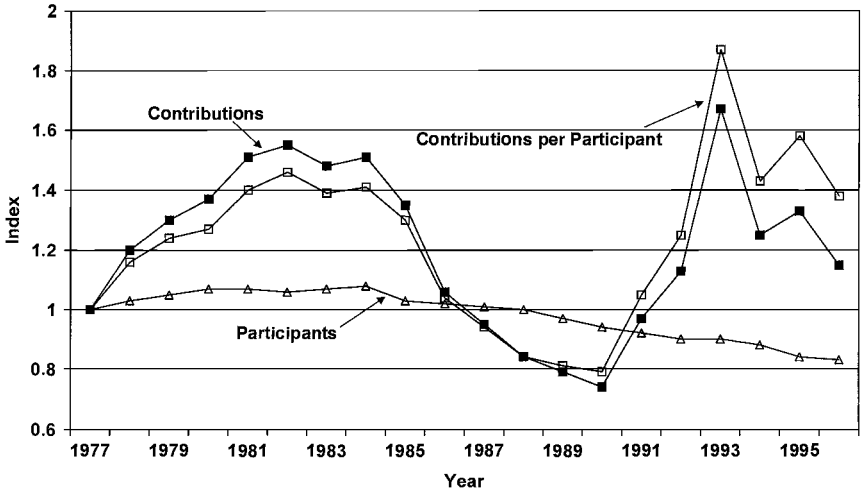

Fig. 1.10 DB contributions, participants, and contributions per participant (index: 1977 = 1)

der DB plans and discouraged firms from overfunding their pension plans. Prior to 1986, firms could fund their DB plans to a level greater than their legal liability. A series of laws beginning with a 10 percent reversion tax, which was part of the Tax Reform Act of 1986, put stricter limits on funding. Ippolito (2001) estimates that in the absence of various funding restrictions, DB pension assets in 1995 would have been 28 percent higher. Schieber and Shoven (1997) report that when the limits on contributions to overfunded plans that were part of the Omnibus Budget Reconciliation Act of 1987 took effect, 48 percent of a sample of large pension plans were precluded from making further contributions.

Our analysis of DB contributions, relative to contributions to other plans, is directed at understanding how fluctuations in DB contributions affect the retirement plan contribution rate. Although developing a precise estimate is an unrealistic target, we try to place a lower bound on the effect of movements in DB plan contributions on the retirement plan contribution rate.

Total DB contributions are the product of the number of DB plan participants and the average contribution per participant. Fluctuations are due largely to movements in the contribution per participant. Figure 1.11 provides information on DB, DC, and Keogh contributions per participant over the 1975–97 period. It shows that the wages of wage and salary workers increased 150 percent over this period. The DC plan contributions per participant increased about 150 percent as well, as one would expect if contributions were a proportion of wage earnings. On the other hand, DB contributions per participant fluctuated substantially and on average fell relative to wages.

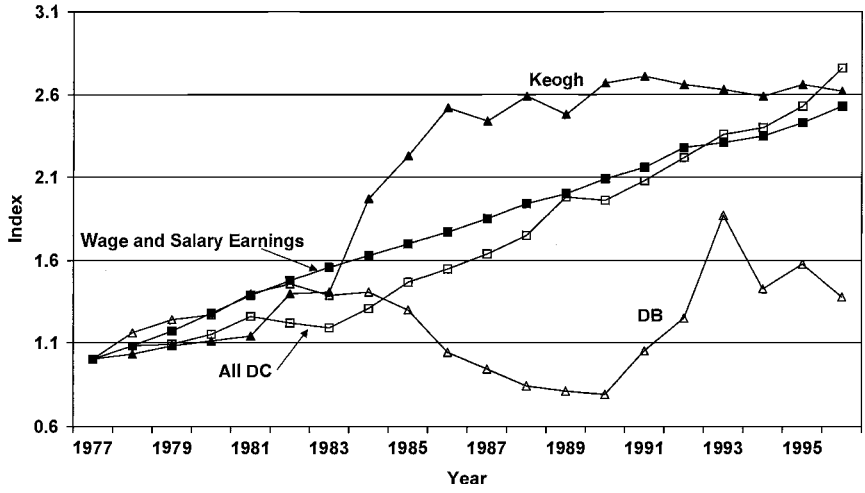

Fig. 1.11 Contributions per participant (index: 1977 = 1)

Suppose that there had been no legislation limiting contributions to DB plans, that market returns had not affected DB contributions, that life expectancy at retirement had been constant, and that there were no changes in the demographic structure of the workforce covered by DB plans. If the returns on DB plan assets were in line with expectations, one might have expected DB contributions per participant, relative to wages, to remain roughly constant. Given rising life expectancy and an aging workforce, one might have expected contributions per employee to increase relative to wages.

To explore the effects of legislative and return-induced downward pressures on DB plan contributions, we construct a "what if" scenario. Considering the *private sector only,* suppose that DB contributions per employee had increased at the same rate as wages in every year after 1977. Figure 1.12 shows the private retirement plan contribution rate under this counterfactual, together with the actual rate. The saving rate under this counterfactual assumption was 1 percentage point higher than the actual rate at the end of the period. In the years when the DB contribution rate was at its lowest, the counterfactual saving rate was close to 2 percentage points higher than the actual rate. This counterfactual suggests that legislative changes like those in 1986, and unexpectedly favorable returns on DB plan assets, probably reduced the private retirement plan contribution rate by a substantial amount.

The aggregate data also suggest that the retirement plan contribution rate would have been substantially higher were it not for the curtailment of the IRA program. Between 1982 and 1985, IRA saving added approxi-

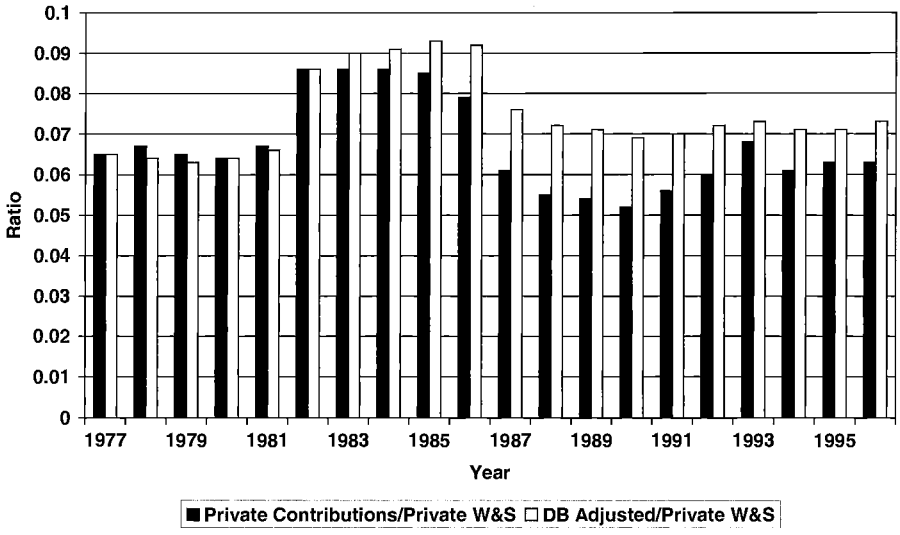

Fig. 1.12 Ratio of private and DB adjusted pension contributions to wage and salary earnings

mately 2.3 percentage points to the retirement plan contribution rate. Now it accounts for only 0.3 percentage points.

In summary, aggregate retirement assets increased dramatically over the past two decades. All else being equal, this reduces the likelihood that the rise of assets in DC retirement plans was offset by a reduction of assets in DB plans. This conclusion is consistent with the findings in previous studies using household data, which show increases in individual financial assets with the advent of 401(k) and IRA plans, and with the evidence that we present later. The decline in DB plans was probably due to many factors other than the growth of DC plans. Gustman and Steinmeier (1992), for example, find that at least half of the trend in DB plans from 1977 to 1985 "is due to a shift in employment mix towards firms with industry, size, and union status that have historically been associated with lower defined benefit rates." Ippolito (1995) concludes that "about half of the shift is attributable to a loss of employment in large unionized firms where DB plans are used intensively."

1.2.3 NIPA Saving and the Retirement Plan Contribution Rate

Contributions to retirement plans as a proportion of either wages and salaries or personal disposable income have substantially exceeded the NIPA personal saving rate in recent years. In the NIPA, saving equals disposable income, less consumption. This definition implies that increases in *measured income* increase saving, and increases in *measured consumption* decrease saving. Contributions to pension plans are treated as income in the NIPAs, so these contributions increase saving. Interest and dividends received by pension plans are also imputed as a component of income, and pension plan management fees are charged as a consumption outlay.

Neither capital gains on pension assets, nor distributions from pension plans, are included in NIPA income. If distributions from pension plans are partly consumed, however, the net effect of pension distributions will be to raise consumption and therefore, without any corresponding increase in income, to reduce NIPA saving.

The NIPA treatment of pensions can be illustrated with an example. Consider an employee who contributed to a 401(k) plan in 1982. Assuming that the contribution was made from income earned in that year, and reduced the contributor's consumption in 1982, the act of contributing would have raised personal saving in 1982. If the 401(k) assets were invested in non-dividend paying stocks, the internal buildup in their value would not have contributed anything to NIPA income in any year after 1982, until the date of distribution.[5] Assume that the assets were distrib-

5. The U.S. Department of Labor (1999) reports that in 1996, interest and dividends on 401(k) assets totaled $20.7 billion, while contributions were $104 billion and capital gains were $129.3 billion.

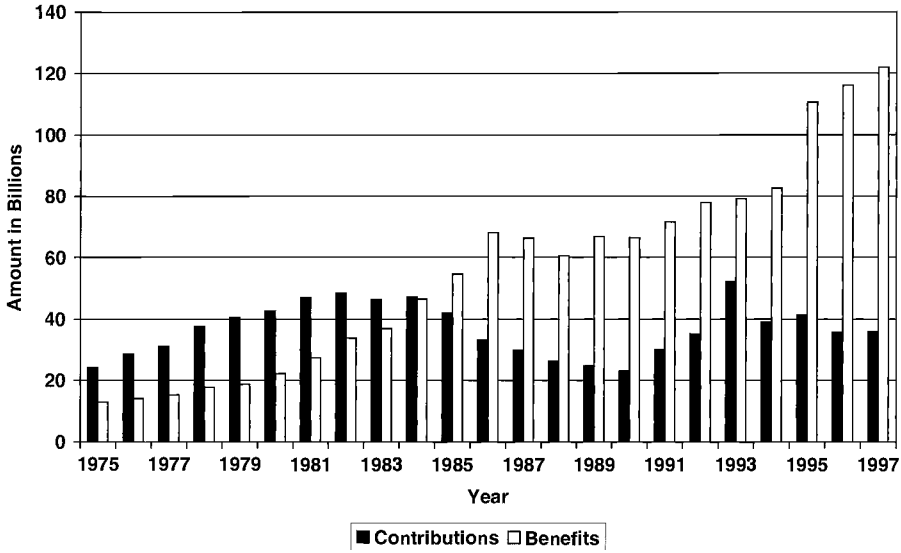

Fig. 1.13 DB contributions and benefits

uted from the 401(k) plan in 2001. At that point, there would be no increase in NIPA income. If the beneficiary of the distributions raised consumption as a result of these distributions, the net effect would be higher consumer spending and, therefore, lower saving. With large capital gains between 1982 and 2001, the distribution is likely to be very large relative to the initial contribution in 1982. Lusardi, Skinner, and Venti (2001) estimate that in 1999, the NIPA accounting of DB pension transactions alone *reduced* NIPA personal saving by almost $55 billion. Figures 1.13 and 1.14 show that in recent years, distributions from DB plans and IRAs have far exceeded contributions to these plans.[6]

The growth in retirement plan assets during the last decade highlights the limitations of the current NIPA treatment of pension saving. Gale and Sabelhaus (1999) and Reinsdorf and Perozek (2002) discuss limitations of the current definition of personal saving other than those associated with pensions. The distortions in the NIPA personal saving rate that result from the treatment of pension income will only become worse in the future. PVW (2001), for example, project that average 401(k) balances for the co-

6. Until 2000, the treatment of public pensions in NIPA was almost the reverse of the treatment of private pensions. Employee contributions to the federal civilian retirement plan, state and local pension plans, and Social Security were not included in income, while benefits from these plans were counted as income. Employee contributions thus reduced saving. If benefits were fully spent, the resulting increase in consumption would precisely offset the increase in income associated with the benefits and saving would not be affected. Since 2000, public and private pensions are treated the same in the NIPA.

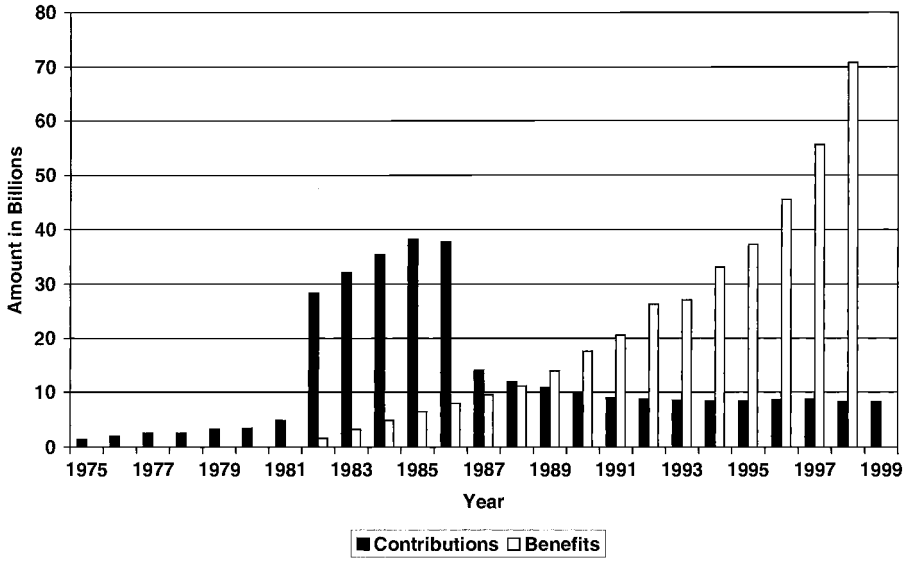

Fig. 1.14 IRA contributions and benefits

hort retiring in 2025 will be roughly ten times greater than the balances for those who retired in the mid-1990s.

1.3 Retirement Plan Contributions versus Employee Saving

In this section we compare lifetime saving under an illustrative DB plan to that under a DC plan. We show that the pattern of retirement asset accumulation under the two plans is very different, and we note that an employee's perception of retirement saving under the two plans is likely to be very different as well. In addition, the early retirement incentives inherent in many DB plans suggest that DB plan participants will retire earlier than DC participants, and thereby will accumulate less in retirement assets. We then discuss implications of these findings for the comparison of individual assets in DB and DC plans, as well as the aggregate accumulation of pension assets, and consider empirical evidence on asset accrual in DB plans.

1.3.1 Contributions versus Saving: A Conceptual Framework

Contributions to traditional non-401(k) DC plans are typically a constant percentage of employee earnings and are primarily funded by employer contributions. Contributions to 401(k) programs are also proportional to earnings, but the precise relationship between earnings and contributions depends on each firm's match rate and contribution limit, as

well as on the saving choices of participants. About one-third of all 401(k) contributions are made by employers and two-thirds by participants.

In both 401(k) plans and other types of DC plans, contributions by employers and employees are easily observed by participants, making it unlikely that there are any differences between contributions to these plans and the amounts individuals perceive as "saved." This is not true for saving through DB plans. The annual DB saving that can be ascribed to a given plan participant may be very different from the employer contribution per participant. The amount a DB plan participant *perceives* to be saved on his or her behalf may be very different from the actual saving, as well as from the employer contribution to the plan.

Similarly, a participant's DB pension wealth is not easily observed and is difficult to determine. It is the discounted value of promised future benefits accrued to date. The annual *personal* DB saving rate is the change in promised benefits associated with working another year under the DB plan.[7] Because most DB plans are "backloaded," this annual benefit accrual is typically very small for young workers and much larger for older workers, particularly as they approach the plan's early retirement age.

Unless the specific features of a DB plan are known, it is not possible to calculate saving rates at different ages under the plan. This makes it difficult to compare personal saving—from the perspective of the participant—under DB and DC plans. We present a simple framework to fix these ideas and to compare DC and DB saving rates.

For a person covered by a DB plan, saving is defined in terms of promised future retirement benefits. The increment to future retirement wealth is the change in accrued future benefits associated with working another year at the firm. Current saving is the present value of this accrual. Defined benefit saving is defined by a formula that determines benefits in the future, whereas DC saving is defined by the current contribution. In a DC plan, the increment to future retirement wealth is determined by the future value of the current contribution, which depends on the intervening rate of return on the plan assets.

In a simplified case, DB benefits are given by $B_t = \lambda W_t s$, where λ is a parameter of the plan, typically between 0.01 and 0.02, and W_t denotes earnings at age t, and s is the number of years of service that the employee has at age t. After s years of employment, this is the accrued benefit promised at the normal retirement age, say sixty-five. If the employee leaves the firm after s years, future benefits at retirement are given by this formula. The change in B with another year of employment is given by

7. The measure of accrued DB pension wealth that we use corresponds to the firm's current, or terminal, liability. Firms also compute projected liabilities, which use a forecast of future wage growth to value the future cost of years of service accrued to date.

$$\Delta B_t = \lambda\left[W_t + s\left(\frac{dW}{dt}\right)\right] = (ws + 1)W_t \cdot \lambda,$$

where w is the annual rate of increase in earnings. The change in future pension wealth is given by this change in benefits, multiplied by the annuity value of a dollar at the retirement age of sixty-five, $A(65)$. Thus in the DB case, the increase in future retirement wealth associated with working another year is $\Delta\text{DBPW} = (ws + 1) \cdot W_t \cdot \lambda \cdot A(65)$. Saving at age t under the DB plan, which can be compared to DC saving at age t, is this amount discounted back to age t. This accrual is an increase in the DB plan obligation that must be funded by the employer.

The ratio of the change in future retirement wealth associated with working another year under the DC plan to the change in wealth from working another year under the DB plan is given by

$$\frac{\Delta\text{DCPW}(t)}{\Delta\text{DBPW}(t)} = \frac{kW_t(1 + r)^{65-t}}{(ws + 1)W_t\lambda \cdot A(65)} = \frac{(1 + r)^{65-t}}{(1 + ws)} \cdot \frac{k}{\lambda \cdot A(65)}.$$

Note that ΔDCPW depends on the market rate of return but not on the rate of increase in the wage rate, which affects ΔDBPW. The market rate of return may affect ΔDBPW through the $A(65)$ term. Suppose that $\lambda = .015$, that $k = .10$, and that $A(65) = 8$. Suppose also that people work from age twenty-five to age sixty-five. Then the ratio ΔDCPW/ΔDBPW is $[(1 + r)^{65-t}/(1 + ws)] \cdot [.10/.12]$. Suppose further that $r = 0.09$ and $w = 0.05$. At one year of employment the ratio is 20.04, at twenty years it is 2.05, and at forty years it is 0.24. Defined contribution wealth accrues early in the working life and DB wealth accrues late—it is backloaded.

Most actual DB plans are not as simple as the one previously considered. Actual accruals depend on the specific provisions of the DB plan. An employee is usually not vested in the plan before working some minimum number of years.[8] Defined benefit saving is zero prior to vesting. In addition, most DB plans have an early retirement age (often fifty-five), which is an important determinant of the accrual pattern. After the early retirement age, benefit accrual typically declines (often becoming negative), creating an incentive to retire early. The more complicated accrual patterns under these circumstances, and the associated incentives to retire, are described in detail in Kotlikoff and Wise (1987, 1988, 1989a, 1989b). Lazear (1985) proposed that firms use these incentives to induce older workers—paid more than their marginal product—to retire. In the following illustration we use a typical plan, similar to a plan described in Kotlikoff and Wise (1989b), that incorporates a substantial incentive to retire after the early retirement age.

8. This is also true for some 401(k) plans in which the employer matching contribution is subject to a short vesting requirement.

Table 1.1 Illustration of Saving under DB and 401(k) Plans

		Saving/Wage		Saving in Dollars		Saving as Increment to Wealth at Retirement			
Age	Wage	DB	401(k)	DB	401(k)	DB	401(k) to 65	401(k) to 55	401(k) to 60
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
25	9,229	0	0.09	0	831	0	26,089	11,020	16,956
29	11,991	0.053	0.09	636	1,079	5,973	24,012	10,143	15,606
30	12,754	0.016	0.09	207	1,148	1,640	23,433	9,898	15,230
35	16,983	0.029	0.09	494	1,528	2,539	20,279	8,566	13,180
40	21,784	0.049	0.09	1,063	1,961	3,552	16,906	7,141	10,988
45	26,908	0.078	0.09	2,097	2,422	4,554	13,572	5,733	8,821
50	31,998	0.119	0.09	3,809	2,880	5,376	10,490	4,431	6,818
54	35,757	0.162	0.09	5,782	3,218	5,782	8,304	3,508	5,397
55	36,623	–0.046	0.09	–1,672	3,296	–1,672	7,803	3,296	5,071
60	40,330	–0.118	0.09	–4,765	3,630	–4,765	5,585	—	3,630
64	42,363	–0.189	0.09	–8,016	3,813	–8,016	4,156	—	—
Average									
25–64		0.017	0.09	111	2,425	—	14,768	—	—
25–54		0.062	0.09	1,730	2,025	3,549	—	7,535	—
Total pension wealth if retire at age:									
55						102,911	—	221,182	
60						142,139	—	—	362,205
65						181,458	575,970	—	—

Source: Authors' calculations.

Suppose the DB plan has vesting after five years of service, early retirement at age fifty-five, normal retirement at age sixty-five, and an early retirement discount factor of 3 percent per year. The factor λ is set at 0.013. Table 1.1 shows saving at selected ages under this DB plan and under a 401(k) plan with a 9 percent contribution rate. In this example, the nominal rate of growth of earnings declines from 7 percent per year at age twenty-five to 1 percent at age sixty-five. These earnings should be thought of as the historical earnings of persons now approaching retirement. The associated saving should be thought of as the saving of workers covered under the DB or the 401(k) plan over a working lifetime.[9] The table shows three measures of saving: saving as a proportion of earnings at age *t* (columns 3 and 4), saving in dollars at age *t* (columns 5 and 6), and the associated increment to wealth at age sixty-five (columns 7 through 10).

Table 1.1, column (4) shows 401(k) plan saving as a percent of earnings. At age twenty-five, for example, 9 percent of earnings is contributed to a

9. Workers now approaching retirement could only have been covered by a 401(k) plan for about two decades.

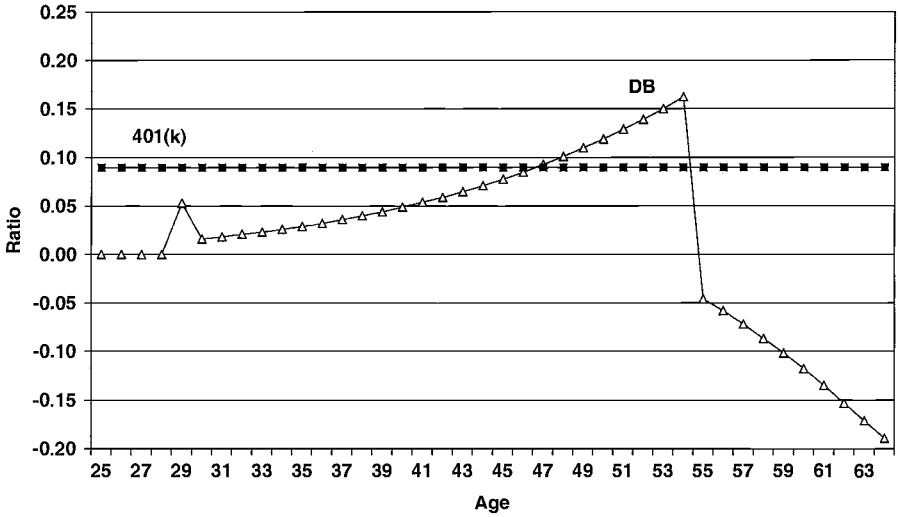

Fig. 1.15 Ratio of DB and 401(k) saving to earnings

DC account. The dollar amount, $831, is shown in column (6). At a 9 percent market rate of return, the $831 would grow to $26,089 by age sixty-five, as shown in column (8). At age forty-five, 9 percent of earnings is $2,422, and this amount grows to $13,572 by age sixty-five. The total accumulation of assets under the DC plan will be $575,970 by age sixty-five, if the employee continues to work and to make contributions until that age. This value is shown in the last row of column (8). Columns (9) and (10) show the increment to assets at retirement if the employee works until ages fifty-five and sixty, respectively. The total accumulation of assets at these ages is $221,182 and $362,205, respectively.

The calculation of saving under the DB plan is more complicated. There is no saving in the DB plan until the employee is vested, which occurs at age thirty. Much more important are the provisions that determine pension accrual at later ages. Like the typical DB plan, the provisions of the DB plan used in this illustration discourage work past the early retirement age of fifty-five,[10] while providing a strong incentive to stay at the firm until the early retirement age. Indeed, the accrual of pension benefits is negative after age fifty-five. Figure 1.15 shows this accrual pattern (saving) and the related incentive effects.

In this plan, the value of future DB pension benefits is maximized if receipt of benefits begins at age fifty-five. Consider, for example, saving at age

10. The HRS data show that 29.8 percent of all workers qualify for early retirement before age fifty-five, another 44.7 percent are eligible at exactly age fifty-five, and only 14.8 percent qualify for early retirement after age sixty. The average early retirement age is 54.2 and the average age of normal retirement is 61.3. See Gustman and Steinmeier (2000a).

forty-five. The increment to promised future pension wealth, shown in column (7), is $4,554, *if receipt of benefits begins at age fifty-five.* After age fifty-five, the 3 percent increment in benefits for each year that benefit receipt is delayed is not enough to offset the receipt of benefits for one fewer year. For each year benefit receipt is delayed after age fifty-five, the present value of retirement benefits declines. This is the common feature of DB plans that encourages retirement after the early retirement age.

The dollar saving shown in column (5) at age forty-five is $2,097. This is the increment to assets at age fifty-five, discounted back to age forty-five at 9 percent.[11] As a proportion of the wage, DB saving, shown in column (3), is 7.8 percent at age forty-five. If the DB employee remained in the firm until age fifty-five and then started to receive benefits, the value of lifetime benefits would be $102,911.

Notice that at age forty-five, for example, DB saving is only moderately less than DC saving—$2,097 versus $2,422. Yet the increment to total wealth at retirement is $4,554 under the DB plan, while it is $13,572 under the 401(k) plan, assuming that the employee works until age sixty-five. The difference in the increment to wealth at retirement is simply due to the difference in the assumed age of receipt of benefits. This is taken to be age fifty-five under the DB plan, because that is the age that maximizes benefits under the DB plan. The increment to DC wealth at age fifty-five (from saving at forty-five) is $5,733, as shown in column (9).

Over a working life, the maximum present discounted value of future DB benefits is achieved if the receipt of benefits begins at age fifty-five. At that age, the present value of future benefits is $102,911. Total accumulation in the 401(k) plan at that age is $221,182. Accumulation of assets in DB and DC plans, assuming retirement at age fifty-five under both plans, is shown in figure 1.16. But if the DC employee continues to work until age sixty-five, the accumulation in the DC plan increases to $575,970. The DC employee continues to make contributions at 9 percent of earnings, and assets accumulated at age fifty-five continue to grow at 9 percent.

For the DB employee, however, benefits grow much more slowly after the early retirement age. In our example, the nominal annual DB benefit continues to increase because of earnings growth and additional years of service. In addition, benefits are higher because they will be received for fewer

11. We realize that in principle the discount rate applied to future DB benefits need not be the same as the market return earned on DC contributions. However, there is no clear way to measure the risk under each type of plan, and thus no obvious way to make a risk adjustment to the discount rates. Employees covered by DC plans face investment risk, but in DB plans most of this investment risk is borne by employers. Conversely, as a consequence of job change or job loss, employees covered by DB plans face the risk of losing a large fraction of the benefits they would accrue without job change. The erosion of benefits that results from job change is much less severe under DC plans. The average discount rate used by DB plans in Form 5500 reports was 7.77 percent in 1997. For simplicity in this illustration we let the discount rate equal the assumed rate of return.

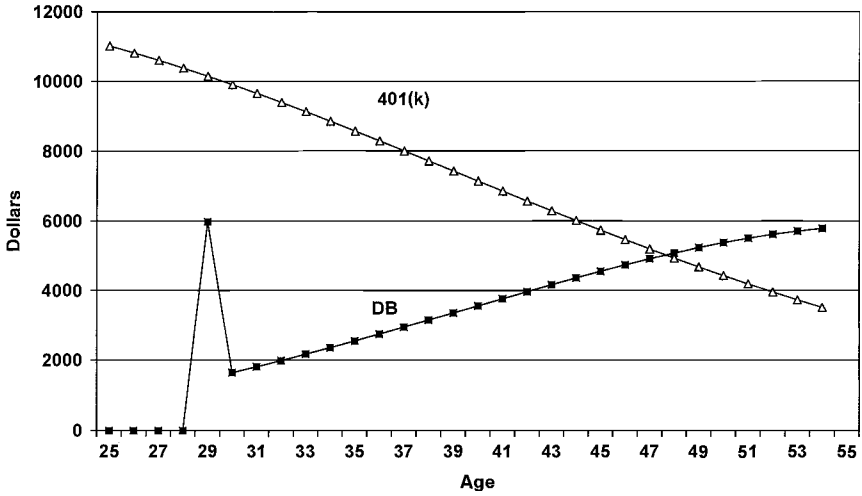

Fig. 1.16 DB and 401(k) saving increment to wealth (retirement at age 55)

years, but the increase is not enough to offset the fewer years of benefit receipt. This is reflected in the reduction in DB saving beginning at age fifty-five, shown in columns (3), (5), and (7) of table 1.1. The benefit at age fifty-five is determined by the promised benefit at age sixty-five discounted at 3 percent. That is, the adjustment for taking benefits before age sixty-five—and thus receiving benefits for more years—is only 3 percent per year. Thus when the receipt of benefits is delayed, say until age sixty-five, the benefit is increased by only 3 percent for each one-year reduction in the number of years benefits will be received. By age sixty-five, pension wealth in age sixty-five dollars is $181,458. The increase between ages fifty-five and sixty-five is not enough to offset the reduction in the number of years benefits will be received.

Figure 1.17 shows the accumulations of assets under DB and DC plans, assuming retirement at age sixty-five. In current dollars, DB pension wealth grows by a factor of 1.76 between ages fifty-five and sixty-five, while DC wealth grows by a factor of 2.64. At age fifty-five, DC assets are 2.12 times as much as DB assets. If employees work to age sixty-five, DC assets are 3.17 times as much as DB assets.

The assumption underlying figure 1.17, that DB plan participants work until age sixty-five, will tend to understate the difference between DB and 401(k) accumulation profiles. Given DB incentives to retire early, few employees covered by DB plans work until age sixty-five. Stock and Wise (1990a, 1990b), Lumsdaine, Stock, and Wise (1990, 1992, 1994), Gustman and Steinmeier (1989, 2000a), and Samwick (1998) present estimates of the effect of such incentives. Evidence on the early retirement effect of such in-

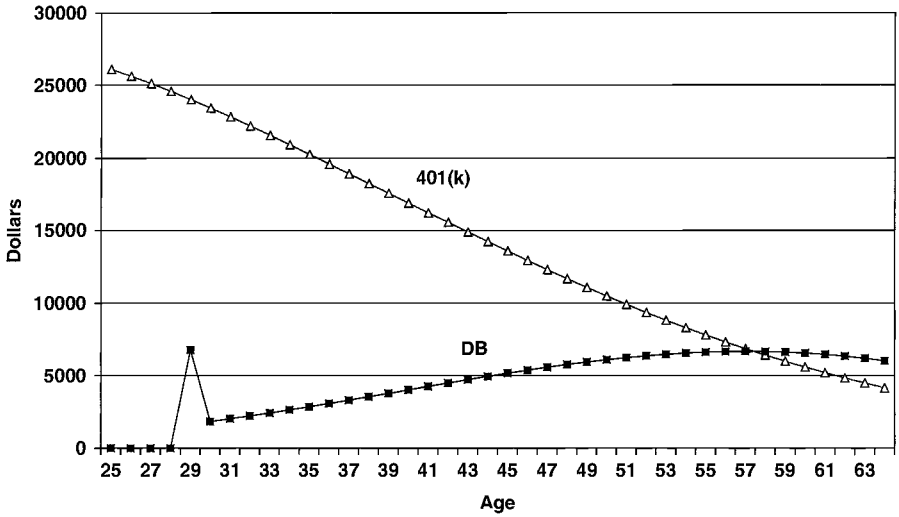

Fig. 1.17 DB and 401(k) saving increment to wealth (retirement at age 65)

centives in public social security programs around the world is presented in Gruber and Wise (1998, 1999), Coile and Gruber (2000) present recent estimates of such incentives in the U.S. Social Security program. Friedberg and Webb (2000) suggest that compared to a DB plan, a DC plan would increase the retirement age by two years. Samwick and Wise (2003) find that the average annual labor force departure rate for HRS respondents between ages fifty-five and sixty is 1.8 percent for persons without a pension plan, 3 percent for those with a DC plan only, 11.5 percent for persons with a DB plan only, and 12.1 percent for those with both a DB and a DC plan.

One other factor may lead our calculations to overstate the actual pension wealth of DB participants. Many employees do not remain under the same DB plan until the early retirement age, and thus do not accumulate the working life assets shown in the preceding illustration. The DB wealth at retirement would be much less if a person were to change jobs several times.

1.3.2 Implications for Analyzing Pension Assets and Retirement Saving

The previous illustration highlights the difference in the age profile of asset accrual under DB and 401(k) plans, and the fact that 401(k) participants are likely to work longer than DB participants, thereby accumulating more pension assets. Thus as larger and larger numbers of employees accumulate more years of employment under DC plans, retirement plan assets relative to current earnings are likely to rise.

To link our hypothetical DB-401(k) comparison with the earlier discussion of aggregate pension assets in DB and DC plans, consider a setting in

which the potential "working life" is forty years, from ages twenty-five to sixty-five. Assume also that DC participants work the entire forty years, but DB employees work only thirty years, until age fifty-five. They are retired for ten of the forty working years. Suppose that the annual DC contribution per participant is C, and that the contribution per participant (employee) to the DB plan is $C/2$. Then over the working ages twenty-five to sixty-five, contributions to the DC account will be $C \cdot 40$. But contributions per participant to the DB plan will be only $(C/2) \cdot 30$, or only 3/8 of DC contributions. If the DB employees work thirty-five years, until age sixty, DB contributions will be 43.75 percent of DC contributions. Thus, for any given cohort of workers, the accumulation of assets will depend on not only the contribution per active (working) participant to DC and to DB plans, but also the number of years over which participants work.[12]

The DB-401(k) illustration can also help to inform the micro comparison of the accumulation of individual pension assets under DB and 401(k) plans, as discussed later. At age sixty-three, for example, individual (annuity) assets of DB participants are likely to be decreasing, while the assets of individual DC participants are likely still rising, as long as they are still in the labor force. Indeed, survey-based estimates of DB pension wealth are often calculated by capitalizing the survey respondent's reported annuity from a DB plan. Consider, for example, the pension assets of two persons at age sixty-five, one covered by a DB plan the other by a DC plan. Suppose the DC person just retired, while the DB person retired at age fifty-five. Working longer will increase the assets of the DC participant. Because relatively few employees now near retirement have worked for a long period of time under a DC plan, this effect may have only a modest influence on current comparisons, like those discussed later. The effect will become quantitatively more important with the spread of 401(k) plans. Although we do not have a quantitative estimate of the magnitude of this effect, the direction seems clear.

1.3.3 Empirical Evidence on Defined Benefit Accruals versus Contributions

To determine whether averaged over all ages the increase in retirement support from DC plan saving is greater than that from DB plan saving, we can consider external data. Kotlikoff and Wise (1989) estimate that contributions to DB plans average 4 to 6 percent of the wage earnings of DB enrollees. The average 401(k) contribution is about 9 percent of earnings. The Form 5500 data on contributions per active (working) participant discussed previously show 401(k) contributions per participant about twice as

12. Workers who retire earlier also get more leisure. Our focus, however, is on the accumulation of retirement assets, not on the comparison of utility of persons covered by DB and DC plans.

large as DB contributions per participant, and we noted previously that contributions to DC plans are likely to continue over more years than contributions to DB plans. Assuming that investment returns in the two plans are similar, the 401(k) plan should provide much greater benefits at ages such as sixty-five for persons with similar earnings histories.

We noted previously that DB plan contributions disproportionately benefit persons who are covered by the same plan over an entire working life. Employees who change jobs often will accumulate much less in DB pension assets, as documented by Kotlikoff and Wise (1989). This conclusion is consistent with the findings of Samwick and Skinner (1998). They compare DB and DC plans by running a broad range of earnings histories through plan provisions from the Pension Provider Supplements to the 1983 and 1995 Survey of Consumer Finances. They find that DC plans provide substantially higher retirement benefits than DB plans.

Form 5500 filings also provide data that matches closely the DC and DB annual saving rates (or accruals), as described algebraically above. For an individual DB plan participant, annual pension saving is the increase in promised future benefits due to working an additional year under the plan, not the contribution per participant that the firm makes to the plan. The annual accrual of promised DB benefits is reported in Form 5500 data for all plan employees combined.[13] This summary statistic combines employees of all ages, and thus may be very different from the accrual for any individual employee. Averaged over all DB plans, this accrual can be compared to the average contribution per participant in 401(k) plans.

Table 1.2 shows the DB change in accrued liability per active employee for 1990 through 1997, together with 401(k) contributions per participant. These data suggest that over these years the annual 401(k) saving rate per active (working) participant was more than twice the annual average DB saving rate. While the values reported in the Form 5500 data are imperfect—they depend on interest rate and mortality assumptions, and the response rate is low—the accrual values per employee correspond rather closely to contributions per employee in all years but 1993, when the DB contribution per employee was unusually large ($2,074). Thus contributions per employee, average accrued liability per employee, and the estimates of total DB versus 401(k) contributions as a percent of wages all seem quite consistent.

The annual accrual under DB plans is the increase in promised future benefits that the plan sponsor must fund. If the plan cannot be over- or underfunded, and there are no changes in the plan that might affect obligations to retirees, then the annual accrual puts a limit on the potential in-

13. These data are from Schedule B of the Form 5500. Each DB plan is asked for the "expected increase in current liability due to benefits accruing in the plan year." About 25 percent of all DB plans did not file or have missing data for Schedule B. The tabulations reported here are based on completed responses.

Table 1.2 **Change in DB Plan Annual Accrued Liability per Active Employee, and 401(k) Plan Contribution per Participant**

Year	DB Change in Accrued Liability per Active Employee	401(k) Contribution per Participant	Ratio 401(k) to DB Saving
1990	961	2,507	2.61
1991	976	2,694	2.76
1992	1,110	2,872	2.59
1993	1,252	2,996	2.39
1994	1,315	3,010	2.29
1995	1,359	3,115	2.29
1996	—	3,371	—
1997	1,784	3,065	1.72

Source: DB data are authors' calculations from Form 5500 data.

Note: To eliminate apparent data entry errors, plans with change in accrued liability greater than $10,000 per employee have been deleted. Essentially the same results are obtained if plans with a change greater than $20,000 per employee are eliminated.

crease in plan assets. Plan contributions would fluctuate depending on the accrual and on the market return on assets held in DB plans. In contrast, there are no limits on the accumulation of assets in DC plans, although there are limits on contributions. During periods of favorable asset returns, such as the 1990s, assets of DC plans are likely to rise much more rapidly than assets in DB plans.

1.4 Household-Level Data on Retirement Plan Asset Substitution

We now turn to direct analysis of substitution between defined contribution pension assets and DB pension assets, using household data. One of the implicit assumptions in many discussions of potential substitution between DB and DC plan assets is that workers have one pension arrangement or the other. Yet in many cases, workers have *both* plans; we call this *dual coverage.* Understanding dual coverage is essential for analyzing the potential for displacement of DB assets by 401(k) assets. We therefore begin our analysis of substitution by analyzing dual coverage, as well as other aspects of pension coverage, using the U.S. Department of Labor's Form 5500 filings.

After discussion of new findings based on the Form 5500 data, we consider the potential substitution between 401(k) assets and DB plan assets. There are several ways substitution may occur, including direct replacement of existing DB plans by 401(k) plans, shrinking or capping DB plans when 401(k) plans are introduced to firms with existing DB plans, and perhaps decisions not to introduce DB plans at firms that choose to introduce 401(k) plans instead. Engen, Gale, and Scholz (1994), Papke (1999), Engelhardt (2000), and Pence (2001) discuss the different channels of substitution. We consider several ways to evaluate the possible displacement of DB plan assets by DC assets, and 401(k) assets in particular.

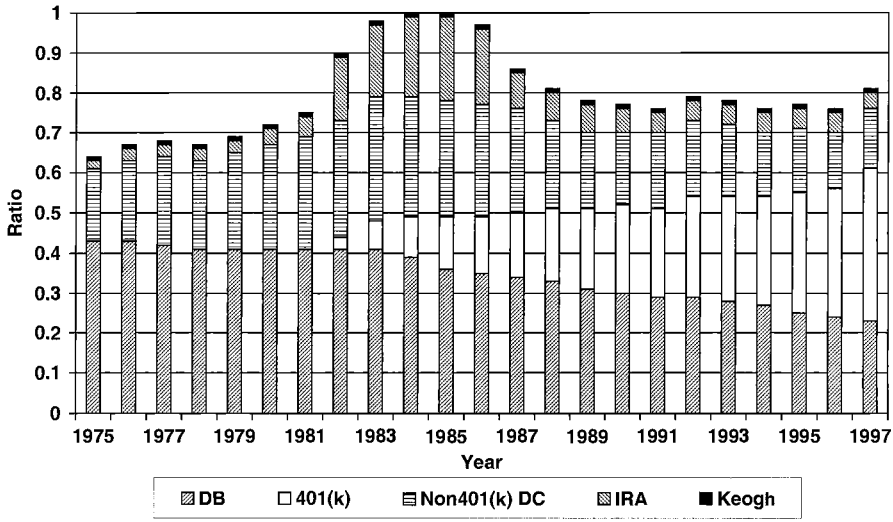

Fig. 1.18 Ratio of plan participants to private wage and salary employment, with double counting

In considering possible displacement of plan assets, it is useful to note the trend in the number of plan participants. Figure 1.18 shows the proportion of wage and salary workers who are pension plan participants, *including persons counted in more than one plan.* The total increased from 64 to 81 percent between 1975 and 1997. Note that in 1985 and 1986, about 20 percent of the labor force participated in the IRA program. This proportion fell to about 4 percent by the mid-1990s.

1.4.1 Dual Coverage and 401(k) Plans

Information on employer-provided pension plans, including 401(k) plans, is reported each year in firm Form 5500 filings, which provide data on funding and other financial features of pension plans. We have used these data as the basis for a number of calculations. The top panel of table 1.3 shows the fraction of 401(k) participants that also have a DB plan for the years 1984 to 1997. Three columns of data are presented. The first column pertains to all 401(k) plans. For the years 1988 to 1997, the second and third columns present results for preexisting 401(k) plans and new 401(k) plans in each year. The proportion of 401(k) participants with a DB plan declined substantially over the period—from 82.4 percent to 42.4 percent. The proportion of DB participants in new 401(k) plans was substantially smaller than the proportion in existing plans in all years. On average, the proportion in new plans was about 26 percent. There is notable year-to-year fluctuation, which we suspect is due to small sample sizes.

The second panel of table 1.3 shows the 401(k) participation rate, given

Table 1.3 **401(k) Plans: Percentage with DB Plan and Participation Rate**

Year	All 401(k) Plans	Pre-existing Plans	Plans in First Year of Coverage
	Percent of 401(k) Participants with a DB Plan		
1984	82.4		
1985	78.0		
1986	75.3		
1987	69.7		
1988	67.8	69.3	47.5
1989	65.3	66.8	46.0
1990	61.8	63.5	32.8
1991	58.2	60.2	26.1
1992	55.7	58.3	19.0
1993	52.9	54.4	22.9
1994	51.0	51.6	32.9
1995	46.9	47.6	28.0
1996	45.8	46.0	39.4
1997	42.4	43.2	22.5
	401(k) Participation Rate Given Eligibility (Percent)		
1990	83.4	83.7	77.3
1991	81.5	82.2	70.4
1992	81.4	82.0	72.8
1993	80.0	80.6	68.7
1994	79.9	80.4	63.0
1995	77.5	78.3	54.4
1996	77.0	77.1	63.6
1997	75.8	76.0	71.4
	Percent of All Plans (Participants)		
1988	100.0	86.3 (93.0)	13.7 (7.0)
1989	100.0	85.9 (92.7)	14.1 (7.3)
1990	100.0	87.7 (94.5)	12.3 (5.5)
1991	100.0	89.8 (94.1)	10.2 (5.9)
1992	100.0	89.6 (93.4)	10.4 (6.6)
1993	100.0	89.3 (95.2)	10.7 (4.8)
1994	100.0	94.6 (97.0)	5.4 (3.0)
1995	100.0	95.2 (96.7)	4.8 (3.3)
1996	100.0	95.9 (97.4)	4.1 (2.6)
1997	100.0	95.7 (96.4)	4.3 (3.7)

Source: Authors' calculations from Form 5500 filings.

eligibility, for the years 1990 to 1997.[14] These rates are in excess of 75 percent in all years. For preexisting plans, the rate is around 80 percent, declining from about 83 to 76 percent between 1990 and 1997. The participation rate for new plans is about 65 percent on average, with no clear

14. These data are not available prior to 1990. The participation rate is the ratio of participants with positive account balances to total participants. All other panels in this table are based on data for active (nonretired) participants.

Table 1.4 **401(k) Contribution and Participation Rate, by DB Coverage**

Year	All 401(k) Plans	With a DB Plan	Without a DB Plan
	Contributions per Active Participant		
1990	2,394	2,586	2,082
1991	2,433	2,700	2,061
1992	2,594	2,916	2,188
1993	2,718	3,075	2,310
1994	2,744	3,154	2,315
1995	2,896	3,417	2,435
1996	3,001	3,429	2,638
1997	3,056	3,615	2,645
	Participation Rate Given Eligible		
1990	83.4	83.4	83.3
1991	81.5	83.3	79.0
1992	81.4	83.9	78.2
1993	80.0	82.4	77.3
1994	79.9	82.3	77.3
1995	77.5	80.4	74.9
1996	77.0	80.5	74.1
1997	75.8	78.4	74.0

Source: Authors' calculations from Form 5500 filings.

trend over time. Although not shown in the table, in 1988, 86.3 percent of all plans were preexisting, and 93 percent of all participants were in preexisting plans. These proportions changed over time so that by 1997, 95.7 percent of all plans were preexisting and 96.4 percent of participants were in these plans. Very little of the decline in DB dual coverage is accounted for by 401(k) participants with dual coverage who subsequently lost their DB plan.

Table 1.4 shows 401(k) contribution and participation rates by dual DB coverage status. The average contribution per participant increased substantially over time, as shown previously. The information in table 1.4 shows that the average contribution is 25 to 40 percent higher for those with than for those without a DB plan. Perhaps firms with DB plans pay higher salaries than firms without DB plans. This may make both employer and employee 401(k) contributions higher in firms offering DB plans. It is also possible, as Katona (1965) suggested, that participation in one pension plan increases workers' awareness of saving-related issues and thereby encourages other saving. Participation rates in 401(k) plans are somewhat higher for persons who have a DB plan than for those who do not. Persons with a DB plan may also be older, and PVW (1998a) show that 401(k) participation rates tend to increase with age.

1.4.2 Loss of Dual Coverage

The data underlying table 1.3, in particular the proportion of new- and continuing-plan 401(k) participants with a DB plan, are shown in the first

panel of table 1B.1. From these data, it is possible to determine the rate at which 401(k) participants with dual coverage lose DB coverage. We find that the loss rate is 1.0 percent for 1996–97, 4.6 percent (1995–96), 1.7 percent (1994–95), 0.7 percent (1993–94), –1.1 percent (1992–93), 6.1 percent (1991–92), and –5.1 percent (1990–91). A negative sign indicates that the number of 401(k) participants with DB plans *increased* from one year to the next. On average the year to year loss rate was 1.1 percent.

These data show that very few persons with dual coverage lost their DB coverage over this time period. The data also show that the decline in the number of persons covered by DB plans over this period cannot be accounted for by the loss of the DB plans of 401(k) participants; we have no reason to believe that the experience in earlier years was any different. These data suggest that the decline in the proportion of 401(k) participants with DB plans is largely accounted for by the entry of new 401(k) participants with low dual coverage rates. This is consistent with diffusion of 401(k) plans to smaller firms without prior DB plans.

1.4.3 Hypothetical Growth of Defined Benefit Assets Without 401(k) Plans

We now consider two simple scenarios of how DB assets might have evolved in the absence of 401(k) plans. The scenarios make extreme assumptions concerning the replacement of DB plans by 401(k) plans. The results can be interpreted as providing bounds on the extent of substitution between 401(k) plans and DB plans. The simulations are based on three data series for the period 1984 to 1997: (1) the number of participants in 401(k) plans and DB plans, (2) contributions per participant to 401(k) plans and to DB plans, and (3) the percent of 401(k) plan participants that also have a DB plan. We obtain the sum of plan contributions—both to 401(k) plans and to DB plans—by persons with a 401(k) plan. We then compare this sum to contributions that would have been made to DB plans in the absence of the 401(k) program. Table 1.5 shows the data and calculated values.

The number of DB and 401(k) plan participants is shown in columns (2) and (3) of table 1.5. The percent of 401(k) enrollees also enrolled in a DB plan is shown in column (4). The average contribution per participant in these plans is shown in columns (5) to (8). For persons with both a DB and a 401(k), total pension saving is necessarily greater than saving under a stand-alone DB plan.[15] In 1984, about 82 percent of 401(k) participants also had a DB plan. The percent of workers with dual enrollment declined rather consistently to about 42 percent in 1997. In the first years after they

15. DB plans generally preceded supplemental 401(k) plans. Because DB plans are formula based, it is difficult to scale back DB benefits when 401(k)s are introduced. Indeed, the data in table 1.5 show that DB contributions are higher in firms where DB plans are supplemented by a 401(k) plan.

Table 1.5 **Contributions of Current 401(k) Participants With and Without a 401(k) Program**

	DB	401(k)		DB Contribution		401(k) Contribution	
Year (1)	Participants (2)	Participants (3)	% with DB Plan (4)	Without 401(k) (5)	With 401(k) (6)	Without DB (7)	With DB (8)
1984	30,172	7,579	0.824	1,332	1,640	2,202	2,411
1985	29,024	10,352	0.78	1,350	1,350	1,866	2,605
1986	28,670	11,573	0.753	1,516	1,382	2,194	2,841
1987	28,432	13,163	0.697	1,287	1,250	2,312	2,796
1988	28,081	15,424	0.678	1,481	1,279	2,148	2,775
1989	27,304	18,449	0.653	1,385	1,067	2,176	2,728
1990	26,344	20,366	0.618	1,143	695	2,082	2,586
1991	25,747	21,130	0.582	1,270	1,018	2,061	2,700
1992	25,362	24,064	0.557	1,355	1,338	2,188	2,916
1993	25,127	25,576	0.529	1,538	2,333	2,310	3,075
1994	24,615	27,242	0.51	1,576	1,540	2,315	3,154
1995	23,531	30,803	0.469	1,809	2,094	2,435	3,417
1996	23,262	33,854	0.458	1,886	1,484	2,638	3,429
1997	22,866	37,716	0.424	1,979	2,247	2,645	3,615

(*continued*)

Table 1.5 (continued)

	Persons with a 401(k)				If all 401(k) Participants Had a DB Plan Instead	DB Displacement = Decline in DB Plans	
	With a DB Plan		Without a DB Plan	Total		DB Participants Displaced	Lost DB Contributions
	DB (9)	401(k) (10)	(11)	(12)	(13)	(14)	(15)
1984	10,242	15,057	2,937	28,236	10,095	0	0
1985	10,901	21,034	4,250	36,185	13,975	1,148	1,550
1986	12,043	24,758	6,272	43,073	17,545	1,502	2,277
1987	11,468	25,652	9,221	46,341	16,941	1,740	2,239
1988	13,375	29,019	10,668	53,062	22,843	2,091	3,097
1989	12,854	32,865	13,930	59,649	25,552	2,868	3,972
1990	8,747	32,548	16,198	57,493	23,278	3,828	4,375
1991	12,519	33,204	18,203	63,926	26,835	4,425	5,620
1992	17,934	39,085	23,325	80,344	32,607	4,810	6,518
1993	31,565	41,604	27,827	100,996	39,336	5,045	7,759
1994	21,396	43,820	30,902	96,118	42,933	5,557	8,758
1995	30,251	49,364	39,828	119,443	55,723	6,641	12,014
1996	23,010	53,167	48,404	124,581	63,849	6,910	13,032
1997	35,933	57,810	57,461	151,204	74,640	7,306	14,459
Total	252,238	498,987	309,426	1,060,651	466,152	53,871	85,669

Source: Authors' calculations from Form 5500 filings.

became available, most 401(k) plans were initiated in large firms with an already existing DB plan. Subsequently, the diffusion of 401(k) plans included larger numbers of smaller firms that were less likely to have preexisting DB plans. To the extent that the expansion in 401(k) plans has been increasing through plans in smaller firms without prior DB plans, 401(k) contributions are not substituting for contributions to preexisting DB plans. Whether such firms would have adopted another plan if it were not for the 401(k) option is an open question; we address this in the following alternative scenarios.

On average, per enrollee contributions to 401(k) plans are greater than per participant contributions to DB plans. In addition, the average DB contribution is greater for those who also have a 401(k) plan, and the 401(k) contribution is greater for those who also have a DB plan.

Contributions to the plans of employees with a 401(k) are shown in columns (9) to (12). We separately report DB contributions in firms with and without 401(k) plans, as well as contributions to 401(k) plans in firms with and without DB plans. The nominal sum of pension contributions on behalf of employees covered by a 401(k) plan over the years 1984–97 is $1,061 billion. About $252 billion was contributed to the DB plans of 401(k) enrollees with dual coverage, about $499 billion to the plans of those with dual coverage, and about $309 billion to the plans of those enrolled only in a 401(k) plan.

How much higher might DB plan contributions have been in the absence of 401(k) plans? We consider two alternative scenarios that put an upper bound on the displacement of DB contributions by 401(k) contributions. First, we assume that all persons who have stand-alone 401(k) plans would otherwise have had stand-alone DB plans in the absence of the 401(k) program. (We also assume that DB contributions for persons with both 401(k) plans and DB plans are unchanged.) As a practical matter it is unlikely that most firms that now offer only 401(k)s—especially small firms—would ever offer DB plans in the absence of 401(k) plans, so this assumption should produce an upper bound on the amount of substitution.

Under this scenario, contributions to all DB plans would have totaled about $466 billion from 1984 to 1997. This is shown in column (13), which is the product of columns (3) and (7). This $466 billion is composed of $252 billion of actual contributions to DB plans by persons with dual coverage and $214 billion in additional DB contributions that would result if all stand-alone 401(k) plans were converted to DB plans, and if these converted plans then exhibited the average contribution rate for stand-alone DB plans. This additional $214 billion of DB contributions represents only 26 percent of the $1,061 billion of the total contributions to the plans of 401(k) participants.

The low estimate is the consequence of two factors. First, stand-alone 401(k) plans are a relatively recent phenomenon. Much of the growth of

401(k) participation, particularly in the early years, is among persons who retained DB coverage. For these persons there is little or no displacement. Second, average contribution rates to DB plans are substantially lower than contribution rates to 401(k) plans. Replacing a stand-alone DB plan by a stand-alone 401(k) plan will, on average, increase contributions per participant.

A less extreme scenario, but one that is still likely to overstate substitution, is that the entire reduction in DB plan participation between 1984 and 1997 can be attributed to displacement caused by the introduction of the 401(k) program. The number of DB participants displaced in each year under this scenario is shown in column (14). "Lost" contributions to DB plans under this scenario are shown in column (15), and they total about $86 billion. This is only 11 percent of all 401(k) contributions.

The absence of large-scale displacement is the consequence of several factors. First, much of the growth of 401(k) plans, particularly in the early years, is among persons who retain their DB coverage. Second, 401(k) contributions as a share of salary are about twice as great as DB plan contributions as a share of salary, so even in the most extreme case, 401(k) assets could not have been fully offset by a reduction in what otherwise would have been the DB assets of the 401(k) enrollees. Indeed, the earlier discussion suggests that accumulation of retirement assets resulting from 401(k) contributions is likely to be substantially greater than the accumulation from contributions to DB plans. Finally, the decline in the number of persons covered by DB plans but not by 401(k) plans is too small to account for much of the 401(k) growth.

1.4.4 Projections of 401(k) Assets

The foregoing calculations compare aggregate 401(k) plan assets with aggregate DB plan assets in two hypothetical scenarios. We can also make comparisons between 401(k) plan assets and DB plan assets using household-level data. Data from the HRS suggest that in 1992, the mean value of assets in DB plans was $54,800 for persons aged 51 to 61. The average for employees of all ages would be much less. In PVW (1998a), we estimated how much the 1992 HRS respondents would have accumulated in their 401(k) accounts if they had been eligible for 401(k) plans over their entire working lives. Based on our projections of the participation rates of future cohorts, we made forward-looking projections, one for the cohort reaching age sixty-five in 2025, and the other for those reaching age sixty-five in 2035. We compared our projected 401(k) assets to Social Security assets, assuming that the Social Security program remained unchanged.

We can also compare projected 401(k) assets to DB pension assets. While Social Security assets of HRS respondents averaged $103,392, DB pension assets average only $54,500. PVW (2001) suggest that projected 401(k) assets would be 136 to 451 percent of DB pension plan assets (de-

pending on how contributions are invested), assuming no reduction in DB assets. Even if DB pension assets were set to zero for this cohort, which is tantamount to assuming that 401(k) plans crowded out all DB plans, there would still be substantial incremental 401(k) wealth. Data on 401(k) participation rates and contributions that have become available since we made our projections lead us to believe that, if anything, these 401(k) asset projections may underestimate future 401(k) assets.

The "cohort approach" used to obtain the projections described above has the advantage of combining all survey respondents. It is therefore not contaminated by saver heterogeneity. It is also unaffected by differences in the lifetime accumulation profiles of DB and DC assets, because the comparison is between the realized assets of persons at, or approaching, retirement. These comparisons reflect the realized assets, after a lifetime of pension saving, that are available to support retirement consumption.

1.4.5 The "Eligibility Experiment" Applied to Defined Benefit Plan Assets

In PVW (1998a), we used data from the SIPP to compare the financial assets and home equity of families eligible for a 401(k) plan with the assets of families who were not eligible. We found little difference in the assets of eligible and noneligible families in 1984—near the introduction of the 401(k) program. By 1991, however, the assets of the eligible group were substantially greater than those of the ineligible group. We concluded that there was essentially no substitution of 401(k) assets for other financial assets or for home equity. This comparison is the basis for our comparison of the pension assets of HRS respondents.

Following the same idea, we considered whether the apparent increase in the financial assets of the 401(k) eligible groups could have been offset by a reduction in their DB assets. For this to have happened, the DB coverage of persons who became eligible for a 401(k) plan would have had to decline. The results, however, are difficult to interpret. We now explain why and offer our interpretation of the data patterns.

In 1984, there was little difference in the non-IRA-401(k) financial assets or the home equity assets of the eligible and ineligible groups. But, the eligible group was much more likely to have a DB plan, especially at the lower income levels, than it was in later years. By 1991, there was still little difference in the non-IRA-401(k) financial assets or the home equity assets of the two groups. But the net total financial assets of the eligible group were much greater than the financial assets of the ineligible group. There is no measure of DB plan assets for either year in the SIPP. Could the DB plan assets of the eligible group, relative to those of the ineligible group, have fallen enough to offset the increase in financial assets of the eligibles? To judge the likelihood of this, we considered the change in the DB coverage of the two groups.

The key DB numbers are the percent change between 1984 and 1991 in DB coverage of eligible and ineligible families. The percent decline in DB coverage was much greater for the ineligible group than for the eligible group. One might judge from this fact that there was not a disproportionate fall in the DB assets of the eligible group. But interpretation of the data is confounded by two trends. One is the general decline over time in the proportion of employees covered by a DB plan, which would affect both the eligible and the ineligible groups. The other trend is the increase in 401(k) eligibility. As 401(k) eligibility increases, families who were ineligible become eligible. The effect of this movement from ineligible to eligible status on the percent of eligibles covered by a DB plan depends on the premove DB coverage of the new 401(k) eligibles.

Suppose we rely on Ippolito and Thompson's (2000) result that existing DB plans are very rarely terminated when 401(k) plans are started, and we accept our previous result that once dual DB-401(k) coverage is established, subsequent loss in DB coverage is very unlikely. The HRS data alone do not enable us to disentangle the various determinants of DB coverage. But our attempts to match the shift in the DB coverage of the 401(k) eligible and ineligible groups suggest that during this period, most of those who moved from ineligible to eligible status had a DB plan before becoming eligible—reducing the proportion of the ineligible group with a DB plan and increasing the proportion of the eligible group with a DB plan.

1.4.6 Cohort Analysis of Defined Benefit versus 401(k) Substitution

We emphasized before that if the increase in 401(k) assets is to be offset by a reduction in DB assets, the reductions must come for the most part through a reduction in DB participation. We showed that the reduction over time in the DB coverage of 401(k) participants with dual 401(k) and DB coverage was very small, and concluded that shifting composition of the 401(k) eligible pool was the most likely explanation for changing DB participation rates of eligibles and ineligibles. Another way to evaluate the extent of the reduction in DB participation with the increase in 401(k) plans is to consider cohort data. Figure 1.19 shows the relationship between 401(k) eligibility and participation in DB plans for three cohorts, using data from the SIPP for 1984, 1987, 1991, 1993, and 1995. These data span the first thirteen years of the 401(k) program. Each cohort is identified by its age in 1984. For example, the C(44) cohort is followed from ages forty-four to fifty-five.

Within each cohort, there were enormous increases in 401(k) eligibility. But the within-cohort increases in 401(k) eligibility are not nearly offset by corresponding within-cohort reductions in DB participation. Indeed, for the two younger cohorts, both DB participation and 401(k) eligibility increase with age. There is no evidence of DB-for-401(k) offset, with rising 401(k) participation associated with declining DB plan coverage. These data pertain to all employed persons, and are not confounded by the "mix-

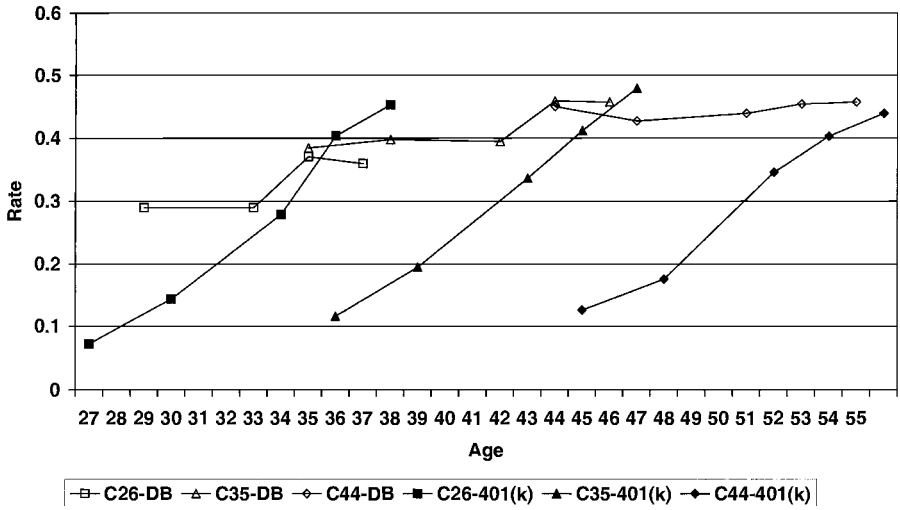

Fig. 1.19 DB participation and 401(k) eligibility: Data for three cohorts

ture" problem that makes the results of the eligibility experiment difficult to evaluate.

The evidence in figure 1.19 does not necessarily imply that 401(k) plans did not displace any DB plans. Perhaps DB participation would have risen more rapidly were it not for the spread of 401(k) plans, or firms would have offered more generous defined benefit plans if 401(k) plans had not expanded. But it seems to us extremely unlikely that DB plan participation would have increased, other things being equal, as quickly as 401(k) plans spread. For example, for a cohort like the C(44) group, it is likely that DB participation would have changed little with age, as figure 1.19 shows, even if 401(k) participation had not increased.

In addition, the 401(k) data show very large cohort effects. At any age, successively younger cohorts are much more likely to be eligible for a 401(k) plan. There are also DB cohort effects, with successively younger cohorts less likely, on average, to be covered by a DB plan. The data for the few cohorts shown in figure 1.19, however, do not reveal this trend. (The cohort data are only shown through age fifty-five. The SIPP data do not allow correction for the more rapid retirement of persons covered by DB plans after the plan early retirement age, which is often at age fifty-five. Thus at older ages it is not possible to use these data to make accurate comparisons of 401(k) and DB plan participation rates.)

1.5 Retirement Plan Substitution among Older Workers: HRS Evidence

The HRS provides the most comprehensive information available on persons approaching retirement. The heads of households for HRS fami-

lies were ages fifty-one to sixty-one in 1992. Some of these persons could have participated in a 401(k) plan for up to ten years by 1992. In principle the HRS data should allow estimation of the contribution of the 401(k) program to the saving of persons in this age group during the early years of the program. Such estimates might be obtained through a comparison of 401(k) eligibles and ineligibles, as described in the previous section and in PVW (1995). Unfortunately, because the HRS asks respondents whether they *contribute* to a 401(k) plan, not whether they are *eligible* to contribute, it is not possible to directly estimate the 401(k) eligibility effect.

In this section, we explain the problems of inferring 401(k) eligibility status in the HRS. We then discuss estimates of 401(k) eligibility based on adjustments that at least partially address these problems. Finally, we use these estimates to analyze the relationship between 401(k) eligibility and pension plan assets. Consistent with the results reported previously, we find no evidence that the increase in 401(k) assets was offset by a reduction in DB assets. We believe, however, that comprehensive determination of 401(k) eligibility status in the HRS is not possible and that our HRS results are likely to underestimate the net gain in pension retirement assets from the 401(k) program.

The relationship between 401(k) plans and DB retirement assets in the 1992 HRS is also the focus of a recent study by Engelhardt (2000). He concludes that DB assets are higher among households ineligible for a 401(k) than among those eligible for a 401(k), suggesting substitution of 401(k) for DB pension assets. The findings presented previously suggest that employees covered by 401(k) programs should have more retirement assets than employees not covered by a 401(k) plan. We find that a key reason for the difference between Engelhardt's conclusions and ours is the assignment of eligibility status, which is critical to determining pension wealth.

1.5.1 Data Limitations in the HRS

Our aim is to provide estimates of the pension and other assets of HRS respondents who were and were not eligible for a 401(k) plan. To begin, we compare DB coverage rates, for persons eligible and ineligible for a 401(k) plan, in the HRS and in other surveys. The other surveys explicitly inquire about 401(k) eligibility, whereas the HRS does not. This comparison is presented in table 1.6 and pertains to pension status on the employees' current job.[16] The HRS rates are based on the assignment of eligibility used by En-

16. The HRS provides some information on pension status on prior jobs as well. We restrict attention to the current job since it is difficult to determine 401(k) eligibility on prior jobs. Many employees have rolled prior 401(k) balances into IRAs, and thus we are likely to underestimate 401(k) eligibility on prior jobs. The HRS percentages in the table pertain to respondents who indicated that they had a DB or 401(k) plan. We have made no attempt here to allocate other responses such as "both," "don't know," and "DC-type unknown." We have also dropped self-employed persons.

Table 1.6 **Percent of 401(k) Eligibles and Ineligibles with a DB Pension, by Survey**

Survey and Year	Eligibles	Ineligibles	Ratio
1992 HRS	40.8	43.6	0.94
Form 5500	55.7	—	
1993 CPS	53.9	25.4	2.12
1991 SIPP	69.5	28.4	2.45
1995 SCF	38.3	17.2	2.23

Source: Authors' calculations from the surveys listed in the first column of the table.

gelhardt (2000). All entries in the table are weighted and all entries except those derived from the Form 5500 data pertain to persons in the age range covered by the HRS.

The 1992 HRS stands out as the only survey in which DB coverage is higher among 401(k) ineligibles than among eligibles.[17] In the other surveys, the DB coverage rate for eligibles is more than *twice* as great as the DB coverage rate for ineligibles. The particular method used to assign eligibility is one reason for the large disparity between the HRS and other surveys. We also show later that even under alternative, and we believe more reasonable, conventions for assigning eligibility, there remains a wide gap between DB coverage rates reported in the HRS and the rates reported in other surveys.

The HRS does not inquire about eligibility for a 401(k) plan, although it asks about 401(k) contributions.[18] Consider the 1992 HRS data on 401(k) contributor status and DB coverage, shown in table 1.7. The HRS respondents report whether they contribute to a 401(k) plan and whether they are covered by a DB plan. These data are shown in the left panel of table 1.8. They pertain only to persons who indicate they are included in their employer's plan. (They differ from the HRS data in table 1.6, which were weighted and also include additional persons assumed to be eligible for a 401(k).) The unweighted percent of 401(k) contributors with a DB plan is somewhat greater than the percent of noncontributors with a DB plan—46 versus 41.7 percent. But compared to the DB coverage of 401(k) eligibles versus noneligibles reported in other surveys (table 1.6), these data for

17. Using households rather than persons, Engelhardt (2000) finds that 51 percent of the eligibles and 48 percent of the ineligibles have a DB plan. A household is classified as eligible if either member is eligible for a 401(k) plan. The data in table 1.6 are also consistent with the results of Engen, Gale, and Scholz (1994) who find the ratio of eligibles with DB coverage to ineligibles with DB coverage in the SIPP to be 1.65 in 1984, 1.77 in 1987, and 2.27 in 1991.

18. These are self-reported pension data. For persons who self-report having a pension, the HRS collected pension data from the employer. Thus persons who incorrectly self-report no pension coverage will be missing employer-reported data as well. In addition, the need to match every respondent to a pension combined with an employer response rate of only 65 percent means that fewer than half of the households have complete employer-reported pensions. Both Engelhardt (2000) and Gustman and Steinmeier (2000b) show an enormous degree of conflict between self-reported and firm-reported pension status.

Table 1.7 **HRS 1992 Reported 401(k) Contributor Data and Illustrative Inferred 401(k) Eligibility**

	Reported in the HRS 401(k) Contributor			Inferred from External Sources 401(k) Eligible		
DB Coverage	Yes	No	All	Yes	No	All
Number						
DB	622	1,699	2,321	919	1,402	2,321
No DB	729	2,376	3,105	729	2,376	3,105
All	1,351	4,075	5,426	1,648	3,778	5,426
Percent						
DB	46.0	41.7	42.8	55.8	37.1	42.8
No DB	54.0	58.3	57.2	44.2	62.9	57.2
All	100.0	100.0	100.0	100.0	100.0	100.0

Source: Authors' calculations from the HRS.

Table 1.8 **HRS Conditional Median Assets by 401(k) Eligibility Status (with eligibility determined by our random assignment method)**

	Income Interval ($)					
Asset Category and Eligibility Status	<20,000	20,000–30,000	30,000–40,000	40,000–50,000	50,000–75,000	>75,000
			Net Non-Retirement Financial Assets			
Eligible	3,069	3,862	5,614	8,983	14,672	33,155
Ineligible	2,897	3,069	6,310	6,250	13,966	23,690
Difference	172	793	–697	2,733	707	9,466**
			Retirement Assets Other Than 401(k)			
Eligible	*18,634*	*24,539*	*40,746*	*46,996*	*83,533*	*180,000*
Ineligible	*15,326*	*22,738*	*37,827*	*50,338*	*73,270*	*146,859*
Difference	*3,308*	*1,801*	*2,919*	*–3,342*	*10,263***	*33,141***
			Total Retirement Assets			
Eligible	*20,701*	*34,170*	*50,492*	*60,263*	*101,524*	*240,902*
Ineligible	*14,580*	*22,909*	*37,862*	*50,748*	*73,814*	*145,626*
Difference	*6,120*	*11,261***	*12,631***	*9,515*	*27,709***	*95,276***
			Net Housing Equity			
Eligible	35,135	37,248	45,641	42,496	59,043	83,409
Ineligible	21,596	32,854	45,233	48,861	55,350	79,517
Difference	13,539**	4,393	409	–6,365	3,693	3,891
			DB Coverage			
Eligible	0.29	0.42	0.5	0.53	0.66	0.74
Ineligible	0.2	0.35	0.53	0.54	0.63	0.61

Source: Authors' calculations from the HRS.
**Statistically significant at the 5 percent level.

contributors versus noncontributors show a very low rate of DB coverage. Given that the HRS does not provide eligibility, we want to convert 401(k) contributor status data to 401(k) eligibility status data. In particular, to make the conversion we must identify persons among the 401(k) noncontributors who are eligible to contribute to a 401(k) plan.

There are two separate determinations to be made. The empirically more important case involves noncontributing 401(k) eligibles who are covered by another pension. These persons would be among the 1,699 persons in table 1.7 who do not contribute to a 401(k) plan, but have a DB plan. The sequence of questions in the first three waves of the HRS provides no way for a noncontributing 401(k) eligible, also covered by a DB plan, to self-identify as eligible for a 401(k) plan; such information will be available in the 2000 wave of the HRS. Since a large portion of 401(k) eligibles are covered by a DB plan, it is likely that a large fraction of the noncontributors with a DB plan are in fact eligible for a 401(k) plan. Engelhardt (2000) assumes that all of these are ineligibles without a DB plan, thus likely misclassifying a large fraction of persons with a DB plan.

Here, we simply want to illustrate what the unknown eligibility numbers could be. Suppose we convert the contributor data to eligibility data as follows. We know from the Form 5500 data that about 82 percent of eligibles contributed to their 401(k) plan in 1992. Thus there would be 1,351/.82 = 1,648 persons eligible for a 401(k) – 297 more than contributed to a 401(k). Using an extreme example, suppose that all of the 297 had a DB plan but did not contribute. Then there would be 919 = 622 + 297 eligibles with a DB plan, and 1,402 ineligibles with a DB plan. This estimate is shown in the right panel of table 1.7. The key point is that even with this assumption, only 55.8 percent of the eligible group would have a DB plan compared to 37.1 percent for the ineligible group, a ratio of 1.5. This ratio is still much lower than the ratios from any of the other surveys. Thus it would appear that if the data reported in the HRS are used to determine eligibility, the implied proportions of 401(k) eligibles and ineligibles with a DB plan are far from the values in other surveys that explicitly inquire about eligibility.

There is in fact an additional problem in the HRS data, and a second determination to be made, which is not addressed in the table 1.7 illustration. Respondents are asked whether they are "included" in a pension plan. Respondents who say no (and presumably do not have a DB plan), are asked whether they are eligible for a pension plan offered by their employer. About 175 respondents say yes. But we don't know what kind of pension is offered. In particular, is it a DB, 401(k), or a non-401(k) DC, or some other plan? Engelhardt (2000) assumes that all of these persons are 401(k) eligibles without a DB plan.[19] Thus this assumption adds respondents with no

19. Evidence from other surveys suggests that not all of these persons are eligible for a 401(k) plan. The 1995 Survey of Consumer Finances (SCF) asked a similar question but fol-

DB coverage to the pool of 401(k) eligibles. Recall that the first—and more serious—misclassification adds eligibles with DB coverage to the pool of 401(k) ineligibles. These two misclassifications bias upward the DB assets of 401(k) ineligibles, and bias downward the DB assets of 401(k) eligibles. The combined effect of these two forms of misclassification may be substantial.

1.5.2 HRS Results Based on Eligibility

There is no easy way to determine with certainty the 401(k) eligibility status of HRS respondents. The convention used by Engelhardt (2000), as explained previously, biases downward the proportion of 401(k) eligibles with a DB plan and biases upward the proportion of 401(k) ineligibles with a DB plan. We adopt assumptions that we believe are more neutral with respect to DB coverage by 401(k) eligibility status.

We need to determine the eligibility of each 401(k) respondent. All 401(k) contributors are clearly eligible. Among 401(k) noncontributors, some are eligible and some are not. Our approach is to determine the proportion of 401(k) noncontributors that is actually eligible to contribute to a 401(k) plan. We do this based on proportions of noncontributing eligibles that have a DB, as is evident in the Form 5500 data. In 1992, 82 percent of 401(k) eligibles in the Form 5500 data were 401(k) contributors. Let E_E be the total number of eligibles, E_C be the number of observed contributors (all eligible), and E_N be the number of noncontributors that should be eligible. Then the number of eligibles is $E_E = E_C + E_N$. From the Form 5500 data, the ratio of contributors to eligibles is $E_C/E_E = 0.82$. The number of additional eligibles among the HRS noncontributors is then $E_N = E_C(1/.82 - 1)$. Thus, the proportion of noncontributors that should be eligible is $P = (1/0.82 - 1)(E_C/N_N)$, where N_N is the total number of noncontributors.

These calculations suggest that the percentage of noncontributors predicted to be eligible to contribute to a 401(k) plan in the HRS is equal to P percent of all observed noncontributors. Of this P percent, the Form 5500 data indicate that 55.7 percent have a DB plan on their current job, and 44.3 percent do not. Thus we randomly reassign $.557 \times P$ percent of 401(k) noncontributors with a DB plan in the HRS to be noncontributing eligibles. We also randomly reassign $.443 \times P$ percent of 401(k) noncontributors without a DB plan to be noncontributing eligibles. This approach as-

lowed it up by asking what type of plan the respondent was eligible to be included in. Eighty percent of the weighted responses from persons aged fifty-one to sixty-one indicated a 401(k) plan for their first job, and 36 percent for their second job (62.2 percent overall). The 1993 Current Population Survey (CPS) asks for the reason why a respondent is eligible, but not included. Only one-quarter of the respondents indicated that they chose not to contribute, which would suggest nonparticipation in a 401(k) plan. Instead, part-time status and lack of tenure with the employer were the most frequently cited reasons for exclusion from an employer's pension plan. These other surveys suggest that some of cases assumed to be 401(k) eligibles in the HRS are instead persons not covered by their employer's DB plan.

sures that the DB coverage rate of the respondents added to the eligibility pool is the same as the DB coverage rate of the respondents already in the pool.

Unfortunately, the Form 5500 benchmark data is not available by age or by income. The 55.7 percent dual coverage rate that we use is undoubtedly a low estimate for the HRS respondents (aged fifty-one to sixty-one in 1992) because it applies to all ages, and we know from the previous cohort data that older persons are more likely to have a DB plan. The other surveys also show that the percent with a DB plan increases with age.

We have adopted a similar assignment convention for missing and ambiguous responses to pension questions in the HRS. If a respondent is "included" in a pension, then the respondent is asked for the plan type—DB or DC. The respondent is asked to indicate the type of pension for up to three pensions. The available choices include: "DB," "DC," or "both." A significant number of respondents did not provide a response. We use the following conventions. First, respondents answering "DB" were coded as having a DB plan. Second, respondents answering "DC" were then asked about the type of DC plan. The choices "thrift or saving" or "401K/403B/SRA" or any combination involving these two choices were coded as 401(k) plans. The other choices offered pertain to non-401(k)-DC plans. For respondents indicating that they have a DC plan, but not providing the type of DC plan, we randomly assign the plan as 401(k) or not 401(k) in proportion to the number of valid responses indicating that they had 401(k) and non-401(k)-DC plans. Third, persons indicating "both" as the type of pension were coded as having a DB plan *and* a DC plan. For these respondents the DC plan is randomly assigned to be a 401(k) plan based on the ratio of 401(k) plans to all DC plans among completed responses. Fourth, a significant number of respondents who indicated they were included in a pension plan did not provide the type. These persons were randomly assigned as having a DB plan or a 401(k) plan in the same proportions as completed responses.

All of the previous calculations are done at the level of the respondent. After these assignments are made, we combine the individual data to obtain assignments on a family basis. The asset data is reported on a family basis. A family is a 401(k) contributor, or 401(k) eligible, if either partner is a contributor or is eligible.

Table 1.8 presents results comparing the assets of persons eligible and ineligible for a 401(k) plan.[20] The key results are in the panel labeled "total retirement assets." Total retirement assets are substantially higher (and the difference is statistically significant for all but the lowest income interval)

20. These are the results of weighted median regressions for 4,895 households. Each household had to have at least one member working and not self-employed. Covariates include marital status and the age and education of the head of household. Conditional median asset balances are evaluated at the sample means of the covariates.

for the 401(k) eligible group. The panel just above shows that retirement assets other than 401(k) assets do not differ much by eligibility status, except for the two highest income intervals. In these top intervals, the assets of eligibles are higher than the assets of ineligibles. Thus these estimates suggest that the accumulation of 401(k) assets was not offset by a reduction in the DB assets of the HRS respondents. Nonretirement financial assets do not differ much by eligibility status. Some of the cells show zeros because fewer than half of the observations have nonzero values, and thus the median is zero.

As previously explained, the HRS data—even after our assignment assumptions—are likely to exaggerate the proportion of 401(k) ineligibles with a DB plan, relative to the proportion of eligibles with a DB plan. After assignment of eligibility, the proportion of 401(k)-eligible households with DB plans is 59.3 percent and the proportion of ineligibles is 47 percent. The ratio is 1.26, which is still much lower than the ratio reported in other surveys. The coverage percent by income interval is reported in the bottom panel of table 1.8. The SIPP-based ratios reported in table 1.6 exceed 2, when averaged over all income groups. Thus we believe that the calculations in table 1.8 underestimate the addition to pension wealth of families eligible for a 401(k) plan.

1.6 Conclusions

The way Americans save for retirement has changed dramatically in the last two decades. In 1980, 92 percent of private retirement saving contributions were to employer-based plans and 64 percent of these contributions, or 59 percent of all contributions, were to DB plans. In 1999, about 85 percent of private contributions went to accounts directed largely by individuals. In this paper we have analyzed a broad range of aggregate and household data to understand the implications of this change.

The aggregate data show that assets in retirement plans have increased fivefold, relative to wage and salary earnings, over the past two decades. The increase in these assets to support retirement will likely mean very large increases in the assets of future retirees. The increase in DC assets has been so large that it is unlikely that a significant fraction of the growth in DC assets occurred at the expense of reduced DB assets.

In addition, over the past two decades, the annual retirement plan contribution rate has been over 5 percent, as a proportion of NIPA personal income, and over 8 percent relative to NIPA wage and salary earnings. Both are much higher than the NIPA personal saving rate, which is now close to zero. The treatment of retirement plan contributions and payouts in the NIPAs contributes to the very low measured personal saving rate.

Retirement saving today would likely be substantially greater if Congress had not enacted legislation in the late 1980s to limit firm contribu-

tions to DB pension plans. In the absence of this legislation, and the favorable asset market returns during the 1990s that reduced the need for employers to contribute to their DB plans, the retirement plan contribution rate would have been at least 1 percentage point higher in the late 1990s than it actually was. It is also likely that the retirement plan contribution rate would be much higher today if it were not for the retrenchment of the IRA program after 1986.

On average, the contribution per active participant to 401(k) plans has been about twice as large as contributions to DB plans, suggesting much higher wealth accumulation under 401(k) than under DB plans. In addition, differences in the pattern of saving by age can have an important effect on retirement asset accumulation under the two plans. From the employee perspective, retirement saving through a DB or DC plan each year can be thought of as the increase in the financial support that each plan will provide in retirement. Employee retirement saving under a DC plan is quite transparent to the employee, while annual employee saving under a DB plan is quite opaque and unlikely to be clearly understood. The pattern of saving by age is much different under DB and 401(k) plans, as we show using a hypothetical DB plan. The pattern of pension wealth accrual in the DB plan typically provides a large incentive to retire early. As a consequence, DB employees will typically accumulate assets over fewer years than DC employees. Taken together, the higher contribution rate under DC plans and the greater number of years over which assets accumulate are likely to increase very substantially the asset accumulation in DC plans relative to DB plans.

Our analysis of household-level data on retirement saving yields a number of findings that complement the conclusions from the aggregate analysis. Dual coverage under both 401(k) and DB plans is common, but it has declined over time as more employees without a prior DB plan have been offered 401(k)s. Over 80 percent of 401(k) eligibles had a DB plan in 1984, and about 43 percent had one in 1997. Few 401(k) participants covered by a DB plan—only about 1 percent each year—subsequently lose DB coverage. Our estimates suggest that between 1984 and 1997, total contributions to all pension plans of persons with a 401(k) plan were three times as great as what contributions to DB plans would have been in the absence of the 401(k) program. The displacement of DB plan contributions was probably less than 11 percent of the total plan contributions of 401(k) participants.

Based on our prior independent projections, the mean 401(k) balances of persons who will reach retirement age in 2035 will be 1.4 to 4.5 times as great, depending on asset market returns, as mean DB balances, assuming no decline in DB coverage. Cohort analysis shows a decline in DB coverage for successively younger cohorts, but no within-cohort reduction in DB coverage as 401(k) coverage increased.

The HRS data suggest that accumulation of 401(k) assets substantially increased the total retirement assets of persons approaching retirement in 1992. We find no evidence of substitution of 401(k) assets for DB assets for persons in the HRS age group.

Appendix A

Data Sources

Figure 1.1: Private retirement assets are the sum of DB, DC pension reserves from the Flow of Funds Accounts (FFA), and IRA assets from Sabelhaus (2000). Total retirement assets also include state, local, and federal pension reserves from the FFA. Wage and salary disbursements are from table 2.1 of the NIPA. Pension assets held by life insurance companies are excluded.

Figure 1.2: The DB and DC assets for 1985–99 are from the FFA. For the years 1975–84, estimates are obtained by applying the ratio of DB to DC assets from Form 5500 filings to total assets from the FFA. The IRA assets are from Sabelhaus (2000). The figure excludes private pension assets held by life insurance companies.

Figure 1.3: All series are from the FFA.

Figure 1.4: Housing equity is from the FFA. Other assets are total net worth (from the FFA), less housing equity, less private retirement assets as defined in note to figure 1.1. Personal disposable income is from table 2.1 of the NIPA.

Figure 1.5, panel A: The DB and DC contributions are from Form 5500 reports. The data for 1998 and 1999 are authors' estimates. The IRA and Keogh contributions are from the Internal Revenue Service (IRS) Statistics of Income. The IRA contributions pertain to tax-deductible contributions only.

Figure 1.5, panel B: Private pension contributions are the sum of the components described in panel A. State and local and federal contributions are from the NIPA.

Figure 1.6, panel A: Private pension contributions are the sum of the components described in figure 1.5, panel A. Total pension contributions are the sum of the components described in figure 1.5, panel B. Personal disposable income is from the NIPA.

Figure 1.6, panel B: Private pension contributions are the sum of the components described in figure 1.5, panel A. Total pension contributions are the sum of the components described in figure 1.5, panel B. Wage and salary earnings (disbursements) are from the NIPA.

Figure 1.7 and figure 1.8, panel A: All series except IRA and Keogh participants are from the Form 5500. The IRA and Keogh participants are from (SOI). 401(k) data for 1982 and 1983 are authors' estimates.

Figure 1.8, panel B: The 401(k) series is from the Form 5500. 401(k) data for 1982 and 1983 are authors' estimates. The IRA data are from the IRS Statistics of Income.
Figure 1.8, panel C: The Keogh data are from the IRS Statistics of Income.
Figures 1.9, 1.10, and 1.11: All DB and DC plan data are from the Form 5500, whereas Keogh data are from the IRS Statistics of Income.
Figure 1.12: Actual pension contributions are the same as in Figure 1.6, panel b. The DB adjusted series is as described in the text. Data to calculate this series are not available after 1996. Wage and salary earnings (disbursements) are from the NIPA.
Figure 1.13: All data are from the Form 5500.
Figure 1.14: IRA contributions are from the IRS Statistics of Income. The IRA contributions pertain to tax-deductible contributions only. IRA benefits are from Sabelhaus (2000).
Figures 1.15, 1.16, and 1.17: Authors' calculations as described in the text.
Figure 1.18: DB, DC, and 401(k) participants are from the Form 5500. IRA and Keogh participants are from the IRS Statistics of Income. Wage and Salary employment from the DOL web page.
Figure 1.19: Authors' calculations from the SIPP.

Appendix B

The DB Loss Ratio from Dual Coverage Participants

The top panel of table 1B.1 shows the raw data, calculated from Form 5500 filings, that we use to estimate the DB loss ratio. The lower panel (third column) determines the additions to existing plans. The number of additional participants to existing plans from years t to $t + 1$ is simply the increase in total participants, less the participants in plans just started that year. The identity governing its evolution is:

number in 401(k) with a DB in year $t + 1$
= number in 401(k) with a DB in year t
+ number in *new* 401(k) with a DB in year $t + 1$
− [(number in 401(k) with DB in t)
+ (DB coverage additions to existing 401(k)s)] · (DB loss rate)

The DB loss rate is the proportion of persons with a DB who drop (or lose) the DB plan. Positive values of the loss rate indicate that some 401(k) participants with DB coverage are moving to situations without such coverage. We assume that among the additional participants in existing 401(k) plans, the percent with a DB plan is the same as the percent with a DB in existing plans in the prior year. The components of the loss ratio calculations are shown in the last section of the table. DB denotes the number of workers

Table 1B.1 Calculation DB Plan Loss Ratio

Year	From Form 5500 Filings: All Plans Active Participants (T)	All Plans % with DB Plan (t)	Plans in 1st Year Active Participants (n)	Plans in 1st Year % with DB Plan (p)	Pre-existing Plans Active Participants (N)	Pre-existing Plans % with DB Plan (P)	Additions to Existing Plans: Participant Increase in All Plans $[T(t+1) - T(t)]$	Participants from New Plans	Additions to Existing Plans $[T(t) - n(t+1) - T(t+1)]$
1990	20,365,592	61.8	1,113,387	32.8	19,252,205	63.5			
1991	21,129,557	58.2	1,237,212	26.1	19,892,345	60.2	763,965	1,237,212	–473,247
1992	24,064,248	55.7	1,587,113	19.0	22,477,135	58.3	2,934,691	1,587,113	1,347,578
1993	25,576,318	52.9	1,232,422	22.9	24,343,896	54.4	1,512,070	1,232,422	279,648
1994	27,241,793	51.0	817,009	32.9	26,424,784	51.6	1,665,475	817,009	848,466
1995	30,803,020	46.9	1,028,994	28.0	29,774,026	47.6	3,561,227	1,028,994	2,532,233
1996	33,854,427	45.8	873,167	39.4	32,981,260	46.0	3,051,407	873,167	2,178,240
1997	37,716,368	42.4	1,377,491	22.5	36,338,877	43.2	3,861,941	1,377,491	2,484,450
Total							17,350,776	8,153,408	9,197,368

Year	Existing Plans with DB (NP)	New Plans with DB (np)	($NP + np$)	Additions $[A(t+1)]$	[DB($t+1$)]	Additions with DB $[A(t+1)P(t)]$	Loss Ratio (l)	Participants Losing DB Plans
				Determination of Loss Ratio				
1990	12,229,001	365,080	12,594,080					
1991	11,973,202	322,912	12,296,115	–473,247	12,295,289	–300,606	0.051	612,973
1992	13,099,674	301,075	13,400,750	1,347,578	13,401,380	811,107	–0.061	–837,105
1993	13,245,514	282,225	13,527,738	279,648	13,527,315	162,979	0.011	156,999
1994	13,629,904	268,551	13,898,454	848,466	13,898,763	461,650	–0.007	–105,307
1995	14,160,527	287,604	14,448,131	2,532,233	14,446,616	1,306,126	–0.017	–281,570
1996	15,164,783	344,202	15,508,986	2,178,240	15,508,713	1,035,971	–0.046	–769,228
1997	15,680,225	309,935	15,990,161	2,484,450	15,987,968	1,142,350	–0.010	–182,672
Total						4,619,577		–1,405,910

Source: Authors' calculations from Form 5500 filings.

with DB plans, N denotes the number in existing plans, P the proportion in existing 401(k) plans with a DB plan (which equals the proportion of workers added to existing 401(k) plans who have a DB plan), n the number of workers in new plans, p the proportion in new plans with a DB plan, A the number of additions to participants in existing plans, l the proportion of those with a DB who drop the plan, and t the year. The formula for the loss ratio is then:

$$\mathrm{DB}_{t+1} = (N_t P_t + n_t p_t + n_{t+1} p_{t+1}) - (N_t P_t + n_t p_t + A_{t+1} P_t) l$$

$$l = \frac{(N_t P_t + n_t p_t + n_{t+1} p_{t+1}) - DB_{t+1}}{(N_t P_t + n_t p_t + A_{t+1} P_t)}$$

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Comment

Sylvester J. Schieber

This paper by Poterba, Venti, and Wise (hereafter PVW) documents the substantial shift toward defined contribution plans in the employer-based segment of the U.S. retirement system in recent years. It suggests that saving through this element of the retirement system has increased as a result of the shift toward defined contribution pensions. It helps to explain what has been a puzzle to many people regarding the decline in personal saving rates recorded in recent years during a time that more and more people have been saving through their defined contribution plans.

This is an important paper because of the deliberations that are now underway regarding potential changes in the structure of the U.S. Social Security program. It is important because it indicates the direction the market-based segment of our retirement system has taken over the past twenty years or so and gives us some clues as to how people might react un-

Sylvester J. Schieber is vice president of Watson Wyatt Worldwide.

der some Social Security reform options now being discussed. It may also show the way to reform Social Security so that workers will voluntarily put more money into retirement savings, a potentially positive outcome given underfunding of retirement programs today and the demographic demands that they face.

My comments on this paper are limited to three points. First, I agree with the authors' general conclusion that the transition to personal accounts has broadened the retirement security of many American workers; however, I will argue the effect has been skewed toward the more highly paid. The evidence presented here and elsewhere suggests that this has occurred more because of restrictions in plan coverage than because of workers', even those at lower wages, unwillingness to participate in contemporary defined contribution plans when offered the opportunity. Second, I will challenge the conclusion in the paper that the growth in reliance on defined contribution plans does not appear to have shrunk the level of defined benefit provision in absolute terms. Finally, I will attempt to apply the very positive results documented in this analysis to the contemporary debate about how to reform Social Security.

The spectacular shift in the employer-sponsored retirement system since the passage of the Employee Retirement Income Security Act (ERISA) in 1975 is probably as succinctly summarized by the relative shift in contributions to plans as in any other way. Poterba, Venti, and Wise note that contributions to private defined benefit plans varied widely between 1975 and 1999 but were essentially equivalent at the beginning and end of the period. During this same time period, contributions to private defined contribution plans increased fourteenfold. At the end of the period, average contributions per worker eligible to participate in 401(k) plans were much greater than those being made to either defined benefit or defined contribution plans solely dependent on employer contributions.

Despite all of the good news in this paper, there is reason to be cautious about the results presented in it. The major problem with our employer-based segment of the retirement system is the relatively limited coverage that it provides to certain segments of the workforce. For example, it is frequently observed that only about half the U.S. workforce at any point in time is participating in an employer-sponsored retirement plan. Figure 1C.1 shows that workers at lower earnings levels have been much less likely to participate in a plan than workers at higher earnings levels. The implications of the skewed participation in employer-sponsored plans are reflected in table 6 of the PVW paper, where they show the results of simulations of the potential retirement benefits that will be available to people retiring in 2035 by lifetime earnings.

I believe that PVW's conclusion that the private defined benefit system is "on its own track," largely unaffected by the shift toward defined contribution plans, deserves further scrutiny. The reason I believe this is that I am

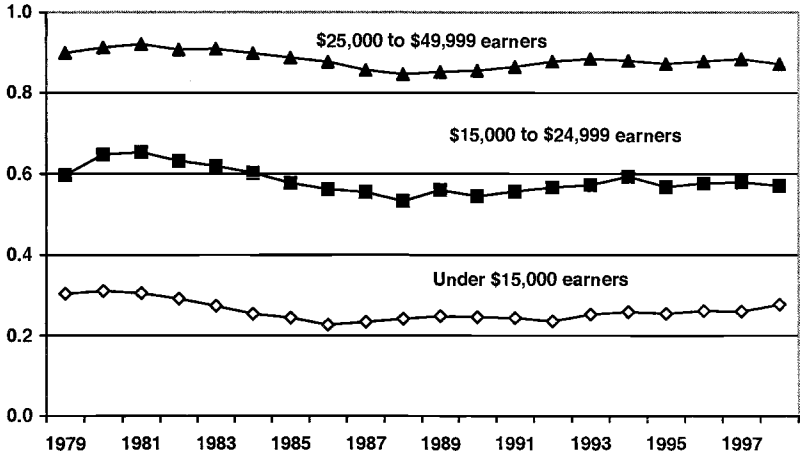

Fig. 1C.1 Pension participation rates for workers with earnings under $50,000 per year relative to those earning over $50,000 per year for selected years (amounts are in 1998 dollars): Ratio of pension coverage rate to coverage rate of those earning $50,000 or more

Source: Author's calculations from supplement of the March *Current Population Survey,* various years.

convinced the modification of existing defined benefit plans in response to the growth in supplementary defined contribution plans has been greatly delayed but is now underway. The 401(k) plans that most larger employers sponsor today evolved from thrift-saving plans that they sponsored as supplements to their defined benefit plans prior to the adoption of section 401(k) of the tax code. Employee contributions to these plans included no tax incentives and participation in them was relatively low. In addition, most of the plans had highly restricted investment options, often limiting the investment of assets to money market or Guaranteed Investment Contract (GIC) vehicles. The large employers that sponsored these plans had traditionally structured their defined benefit plans around Social Security and workers' saving behavior with specific retirement income targets in mind. The retirement income targets were set so workers could roughly maintain their preretirement standards of living after they quit working. Given the benefits provided by Social Security and the employer's defined benefit plan, the estimated saving rates required on the part of various sorts of workers could be determined. For example, one such set of estimated saving rate requirements is shown in table 1C.1.

The estimated savings rates in this case were developed for workers covered by four different defined benefit plans. These plans were selected from a sample of some 560 plans on which Watson Wyatt had benefit formulas that allowed estimation of pension benefits. From the whole set of plans,

Table 1C.1 **Alternative Levels of DB Plan Generosity and the Estimated Savings Rates Required to Maintain Preretirement Standards of Living from All Retirement Income Sources for Workers Retiring at Age Sixty-five with Thirty Years of Service**

	Required Personal Savings Rate Associated with the Pension Plan at the:			
Salary when Pension Coverage and Saving Begins	15th Percentile	40th Percentile	65th Percentile	90th Percentile
12,500	0.0	0.0	0.0	0.0
15,000	2.1	0.9	0.0	0.0
20,000	4.8	3.5	2.3	0.0
25,000	6.1	4.8	3.6	1.3
30,000	6.9	5.6	4.5	2.2
40,000	8.2	6.8	5.8	3.6
50,000	9.5	8.1	7.1	4.9
60,000	10.4	8.9	7.8	5.7
70,000	11.5	9.8	8.8	6.7
80,000	12.6	10.9	9.8	7.8

Source: McGill et al. (1996, 417).

Note: Sources of retirement income include Social Security, the employer defined benefit pension, and income financed through personal saving.

the four pension plans in the table were chosen from various points in the array of generosity of benefits provided. Someone covered by a very generous pension will not have to save as much in order to maintain preretirement living standards after retirement as a worker in a more limited plan. In the full analysis presented in McGill et al. (1996, chapters 18 and 19), target saving rates were developed for workers starting at various ages under their pension plans, retiring at various ages, and under a range of wage growth and interest rate assumptions. The set of projections shown in table 1C.1 was developed under the assumption that workers would receive a real return on their savings of 2 percent per year. The projections suggest that workers at low wage levels under most pension plans sponsored by large employers have faced relatively moderate saving requirements if they worked until normal retirement age and received even a relatively conservative return on their savings. Higher-wage workers would have to save more, primarily because of the redistributive nature of Social Security. Workers who wished to retire earlier would need to save at higher rates as well. But the rates of saving that would be required outside of Social Security and many of the pension plans that larger employers in the United States have sponsored in the past are well within the range of saving that goes on in most defined contribution plans today.

Poterba, Venti, and Wise document that workers' participation and contribution rates in 401(k) plans are relatively high where plans are offered. In addition, in virtually all plans that exist today, workers get to choose

where to invest their money from a broad range of investment options. Much of the money in these plans is invested in financial assets that have paid much higher rates of return over time than was anticipated when 401(k) plans were first established (see Clark et al. 2000; Clark and Schieber 1998). The net result has been that the retirement portfolios offered by many employers have proven to be more generous than anticipated by both workers and their retirement plans sponsors. Until recently this was a fortuitous outcome to which plan sponsors paid little attention, but now there are a combination of forces that I believe are motivating employers to reconsider their retirement plan offerings. I believe the outcome of this process is that the defined benefit side of the retirement portfolio will shrink relative to the defined contribution plans that are so widely prevalent.

Poterba, Venti, and Wise have documented the slowdown in funding of defined benefit plans that arose because of various legislative actions taken after the beginning of the 1980s. Schieber and Shoven (1997) have argued that the aging of the workforce driven by the demographic composition of the U.S. population will lead to increased funding requirements for defined benefit plans as baby boom era workers approach retirement age. The front edge of the baby boom generation is now turning fifty-five, the age of early retirement eligibility in many large defined benefit plans. Throughout the latter part of the 1990s, the rapid escalation in pension asset values hid the implications of the baby boomers' aging, but recent financial markets performance is going to expose the resulting obligations that pension plan sponsors face because of the funding slowdown that PVW identify. If employers do not curtail accruals in their defined benefit plans, many of them are going to face much higher pension costs and funding requirements than they are accustomed to.

Compounding the effects of population aging on defined benefit pensions are the same demographics implications for retiree health benefits. In addition, where employers can fund at least some of their pension obligations as they accrue, they have been much more limited by the law in their ability to fund retiree health obligations. Retiree health benefit costs and obligations are expected to rise even more rapidly than those for defined benefit pensions. As a result, many employers have begun to significantly curtail or completely eliminate their retiree health benefit plans. As part of that process, many are reassessing the complete portfolio of retirement benefits that they provide. In an era where management has become very concerned about economic performance and limiting unexpected obligations, there is a natural tendency to shift away from the risks associated with promises of future benefits that cannot be fully funded as accrued.

The other major factor that has come into play in recent years is a very tight labor market compared to what managers have traditionally faced. Many employers that introduced early-retirement incentives into their defined benefit plans did so in the 1970s or 1980s when the baby boomers

were rapidly expanding the available labor supply. The U.S. labor force growth rate in the 1990s was the lowest it had been since the 1950s (Lofgren, Nyce, and Schieber 2001). Indeed, very few managers still at work in the latter half of the 1990s would have remembered such a tight labor market in their working lives. By the end of the 1990s, the surplus labor phenomenon that had led to the creation of early retirement incentives had disappeared, and employers were beginning to consider ways to encourage workers to extend their working lives. At least in part, this change in attitude about keeping workers in the workforce until later in life helps to explain the shift to cash balance pensions or other types of hybrid pension plans (see Brown et al. 1999; Clark and Schieber 2004). Virtually every defined benefit plan that has been shifted to a new hybrid structure thus far has included the elimination of the early retirement incentives that were in the prior plan.

Although there have been several motivations for changing the structure of defined benefit plans, the thing that has facilitated most employers doing it has been the unexpectedly strong performance of their defined contribution plans. In that regard, the reaction of the defined benefit system to the growing dependence on individual account plans has been greatly delayed. There was a slowdown in the conversion of traditional defined benefit plans during 2000, but that was due largely to the strong negative reactions to earlier plan conversions that garnered both press and political attention. The underlying motivations for changing plans, however, have not gone away. The size of the defined contribution system today and the robust participation in it by workers will continue to give employers an opportunity to adjust their defined benefit plans to accommodate their needs to attract workers and control costs.

The final element of my comment on the PVW paper pertains to what we might learn from our 401(k) experience that would enlighten the discussion about Social Security reform. Ideally, our experience with individual account plans might help us to devise a way of reforming the system that would at once resolve the Social Security funding shortfalls and enhance retirement security for today's workers. President George W. Bush has suggested that we should reform Social Security by diverting a portion of the current payroll taxes into individual accounts. He has set down as principles that the new program not reduce benefits for people currently retired or close to retirement and that the existing commitment to disability insurance be maintained. He has said that participation in the revised plan will be voluntary and that it is not to be financed by new taxes.

The reason that Social Security is underfunded in the future is that current tax rates supporting the system cannot sustain the program if current retirement patterns persist into the future. Although virtually no one who has studied the program quibbles with this conclusion, there seems to be a tremendous reluctance on the part of policymakers to raise payroll tax

rates to resolve the financing shortfall, and there is little support for raising retirement ages or implementing other universal benefit cuts. Despite the popular belief in some circles that setting up and funding individual accounts will solve the problem without having to invoke other tax increases or benefit reductions, the effects of funding will not occur rapidly enough or be sufficient to offset the projected underfunding in the system. Unless we are willing to cut benefits or raise taxes, it would seem that the laws of arithmetic dictate that we will have to put more money into the system from some other sources. That is where the 401(k) experience documented by PVW is instructive.

Consider for the sake of discussion a modified version of the plan that was put forward by Schieber and Shoven (1999) that they labeled *PSA2000*. Their original plan called for the creation of mandatory Personal Security Accounts (PSAs) as part of Social Security reform. This modified version of the PSA2000 proposal would allow workers to make a voluntary contribution of up to 2.5 percent of their pay to their PSA. For each dollar that the worker contributed to the account, Social Security would match it dollar for dollar. This would essentially replicate the way many employers sponsor and structure their 401(k) plans.

We know how people behave under 401(k) plans and might expect that they would behave somewhat similarly under this version of a PSA plan. In a prior paper to the one under review here, PVW (1998, 181) used *Current Population Survey* data to estimate that 71 percent of eligible workers during 1993 participated in a 401(k) or similar plan. Clark et al. (2000, 100) used administrative data on a sample of eighty-seven 401(k) plans to show that 79 percent of workers eligible to participate in them did so during 1995. Where the participation rates fall off in a way that would be of concern in considering a voluntary PSA proposal is at lower earnings levels, especially among younger workers. Getting workers with relatively low earnings to participate at nearly universal levels in voluntary retirement savings plans, especially very young ones, would likely take more than just a direct match of their contributions.

Once workers are motivated to participate in 401(k) plans, their contribution rates are significant as shown in table 1.2. Poterba, Venti, and Wise (1998, 181) found that in 1993, contributions by families participating in 401(k) plans averaged 8.7 percent of salary, with employee contributions accounting for roughly two-thirds of the total, and employer matching making up the rest. They also found little variation in contribution rates across the earnings spectrum. Clark et al. (2000, 104), using plan administration data, found that the average employee contribution in the eighty-seven plans they studied was 6.9 percent of the worker's wages. The lowest contribution rates reported in this latter study were 4.4 percent of pay for workers in their twenties earning under $25,000 in 1995. Even workers at the lowest earnings levels and at the youngest ages tend to contribute at

rates significantly above the 2.5 percent level that would be allowed in the national voluntary PSA plan posited here for discussion purposes.

Poterba, Venti, and Wise's work and other independent research leads to the conclusion that a voluntary saving program that allowed workers to contribute up to 2.5 percent of pay to an individual account where Social Security matched it on a dollar-for-dollar basis would entice a large majority of workers to participate in the plan. These studies also suggest that if a 100 percent match on contributions was proffered, those who entered on their own would likely take advantage of the whole match offered to them. One way to address the natural tendency of workers at low earnings levels to forego participation in voluntary retirement saving plans is to provide them with a tax credit to help them participate in a national voluntary PSA plan of the type outlined here. For example, it might be desirable to give a full credit for any worker whose annual covered earnings were less than or equal to full-time employment at the national minimum wage. To limit its costs, the tax credit could be phased out on a sliding scale up to an annual earnings level at twice that amount. Such a tax credit clearly would make the plan redistributional toward lower-wage workers consistent with the current structure of Social Security. This should result in virtually universal participation by workers with earnings up to $20,000 per year. If we estimate that 90 percent of the workers above that would buy in on their own, which is consistent with Clark et al. (2000), a plan of this sort could end up with 95 percent or more of all workers participating on a voluntary basis. It would all be voluntary but would potentially be bringing a great deal of new savings into the system. Creation of a program of this sort on a national basis would not only offer the potential of bringing additional resources to bear on solving the Social Security financing problem, it would also greatly expand the availability of a 401(k) type vehicle to workers who have traditionally been left out of this powerful retirement saving opportunity.

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