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The Transition to Personal Accounts and Increasing Retirement Wealth: Macro and Micro Evidence

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ABSTRACT

Retirement saving has changed dramatically over the last two decades, with a shift from employer-managed defined benefit (DB) pensions to retirement saving plans that are largely managed and controlled by employees. In 1980, 92 percent of private retirement saving contributions were to employer-based plans and 64 percent of these contributions were to DB plans. Today, about 85 percent of private contributions are to plans in which individuals are largely responsible for deciding how much to contribute to the plan, how to invest plan assets, and how and when to withdraw money from the plan. In this paper we use both macro and micro data to describe the corresponding change in retirement assets and in retirement saving. We give particular attention to the possible substitution of pension assets in one plan for assets in another plan, in particular the substitution of 401(k) assets for DB assets.

The macro data show that between 1975 and 1999 assets to support retirement increased about five-fold relative to wage and salary income, suggesting large increases in the wealth of future retirees. The enormous increase in DC assets dwarfed any potential displacement of DB plan assets. In addition, in recent years the annual "retirement saving rate"–calculated as retirement plan contributions over NIPA personal income–has been over 5 percent, much higher than the NIPA total personal saving rate, which has been close to zero. The difference between the NIPA personal saving rate and the "gross retirement saving rate" is explained by the way NIPA measures personal saving.

Retirement saving today would likely be at least one percentage point greater had it not been for two circumstances: congressional legislation in the 1980s that limited employer contributions to DB pension plans, and the reduction in DB contributions as market returns increased. It is also likely that the "gross retirement saving rate" would be much higher today if it were not for the 1986 retrenchment of the IRA program.

Retirement plan contributions, as well as favorable rates of return in the 1990s, explain the large increase in retirement plan assets. Employee retirement saving under a DC plan is easily measured and quite transparent to the employee. On the other hand, annual employee "saving" under a DB plan is more difficult to measure and unlikely to be clearly understood by employees. The average annual saving rate under a 401(k) plan is perhaps twice as high as average saving under a DB plan, when properly measured.

The micro data show no evidence that the accumulation of 401(k) assets has been offset by a reduction in DB assets. Because annual saving is much greater under 401(k) than under DB plans, and because of the market return advantage of 401(k) plans, assets at retirement under a 401(k) plan would typically be much higher than under a DB plan. In addition, a large fraction of 401(k) enrollees retained DB coverage further increasing their the retirement saving.

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--401(k) plans in particular, but also 403(b) plans for non-profit 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, while 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 and 64 percent of these contributions were to DB plans. In 1999, about 85 percent of private contributions were to accounts in which individuals 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 that occurred over the last two decades. We begin with an analysis of macro data on saving for retirement. We then turn to micro data, aiming to explain, and in some cases reconcile, the relationship between the macro and the micro data.

There are at least two motivations for our analysis. The first is simply to document the changes in aggregate retirement saving over the past 25 years and to describe how these changes are related to the shift from employer-sponsored defined benefit plans to individual-controlled retirement saving. The second is to determine whether the shift toward individual retirement saving, and the corresponding

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 [1996a], we found large net saving effects of personal retirement plans--IRAs and 401(k)s. We have emphasized the potential offset between individual retirement account saving and other forms of financial asset saving, as well as the accumulation of home equity. On balance we find very little, if any, offset in either case. Other analysts have come to different conclusions, although the most recent studies, such as Poterba, Venti, and Wise [1998a] and Engen and Gale [2000] seem to reach conclusions that are more similar than the findings in earlier work.

Much less attention has been directed to the possible offset of personal retirement assets by a reduction in the assets in defined benefit pension plans. 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 DC or a 401k plan. It is not clear from her analysis, however, whether the growth in 401(k) plans displaced an appreciable portion of DB plans. Papke, Petersen, and Poterba [1996] conducted a survey of firms with 401(k)s, and found that very few had terminated a pre-existing defined benefit plan when they instituted their 401(k) plan. Their sample may not have been representative of the broader population of firms, however.

More recently, Ippolito and Thompson [2000] combined Form 5500 data with information from the Pension Benefit Guarantee Corporation (PBGC), which allowed them to determine within-firm changes in plans over time. They find little firm-level displacement of DB plans by 401(k) plans. They conclude that the replacement of a DB

by a 401(k) is a "rare event." Engelhardt [2000], based 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 discuss below, the HRS data allow neither accurate determination of whether a person is covered by a 401(k) plan, nor accurate categorization into 401(k) eligible and non-eligible 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. The first considers aggregate data on the total stock of retirement wealth. Aggregate data show very large increases in total retirement assets, relative to income, over the past 25 years. They strongly suggest that the enormous growth in individual retirement assets has more than offset any displacement of asset growth in traditional DB pension plans.

In section two, we consider contributions to all retirement plans, and show that the "retirement saving rate" alone is much greater than the personal saving rate reported in the National Income and Product Accounts (NIPA) in recent years. Our "retirement saving rate" is determined by the retirement saving of current employees. (The NIPA saving rarte can be strongly affected by the consumption by retirees of distributions from retirement accounts. The relationship between our retirement saving

rate and the NIPA personal saving rate is discussed below.) We document the substantial growth over time in contributions to self-directed retirement saving programs, such as 401(k) plans. We suggest that legislation restricting contributions to DB pension plans, as well as the reduction in DB pension saving associated with strong financial market returns, may have substantially reduced the "retirement saving rate."

In section three, 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 DB plan liability accrual data from Form 5500 filings to compare 401(k) and DB plan saving rates. This comparison and other related information suggests that the saving rate under a typical 401(k) plans is at least twice as high as that under a typical DB plan.

In section four, 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 Survey of Income and Program Participation, to investigate the possible substitution of 401(k) assets for DB assets. We document patterns of participation in 401(k) and other retirement plans, and we find no evidence of strong substitution patterns. Section five presents further analysis of this issue, using data on the set of workers who are included in the Health and Retirement Survey. The HRS results support those in section four.

A brief conclusion summarizes our findings with respect to both aggregate and household-level data on changing patterns of retirement saving.

1. AGGREGATE DATA ON ASSETS IN RETIREMENT SAVING PLANS

1.1 Retirement Account Assets

While it is not possible to precisely link particular assets with particular motives for saving, perhaps the best single indicator of the amount that households have saved for retirement is the stock of assets in retirement saving accounts. A number of factors could contribute to variation in the stock of retirement account assets. If the flow of earnings increases, one would expect that to result in a greater stock of retirement account 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 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. (Appendix 1 describes all of our data sources). This ratio increased over five-fold between 1975 and 1998, from 0.39 to 2.02. There are three distinct segments of the plot: modest growth through 1981; accelerated growth beginning in 1982--after the introduction of IRA and 401(k) plans (as well as increases in stock market returns)--and continuing through 1994; and rapidly accelerated growth beginning in 1995, corresponding to large increases in equity

market returns. Figure 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 2 dis-aggregates private retirement assets into several components. It shows that assets in DB plans continued to grow after the introduction of 401(k) and IRA plans, but 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. These data alone, however, cannot rule out the possibility of substitution, since we do not have information on the time path that other retirement plan assets would have followed in the absence of the growth in defined contribution assets.

To help evaluate the likelihood of substitution between personal retirement assets and DB assets, we consider how much the assets in defined benefit plans would have increased in the absence of personal retirement account assets if all contributions to these accounts had come at the expense of DB contributions. This counterfactual scenario would imply that between 1985 and 1998, DB assets would have grown by a factor of 8.4 instead of 2.7.

The focus on private retirement assets in Figure 2 excludes assets in federal, state, and local retirement plans, and assets held by life insurance companies in retirement plans, that are also part of the retirement asset pool.[1] Figure 3 shows the

[1]The Flow of Funds accounts defines the latter series as including "assets of private pension plans held at life insurance companies, such as guaranteed investment

assets in private plans, from Figure 2, 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.

The assets in retirement accounts include assets that 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.

1.2 Housing and Other Non-Retirement Assets

Aside from promised Social Security benefits, the most important asset of a large fraction of Americans is housing equity. 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 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 other assets, non-retirement-non-home-equity net worth, as a share of disposable income. This ratio decreased a bit and then increased between 1985 and 1999. But the increase between 1975 and 1999, 27 percent, was not nearly as great as the increase in retirement account assets over this period.

1.3 Retirement Assets and Demographic Trends

The growth of retirement assets relative to income may be "explained" by a number of changes. The advent of new retirement saving vehicles is likely to be one.

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contracts and variable annuity plans, that are managed for the benefit of individuals who are not separately identified to the insurance companies."

But other forces, such as demographic changes, may also have contributed to this development. 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. Information provided by the Social Security Administration Office of the Actuary provides insight on this issue. In 1975, life expectancy for a U.S. man at age 62 was 15.5 years, while that for a woman was 20.3 years. By 1997, male life expectancy at age 62 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 62. 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 suggest an increase in resources of roughly ten percent, much less than the actual growth of retirement assets relative to income.

The second important change was the aging of the labor force. Translating information on the age structure of the population into predictions about the wealth to income ratio requires a detailed documentation of saving by age, yet there is no agreement on the relative importance of lifecycle, precautionary, and other factors in saving decisions. In 1975, the average age of those over the age of 20 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 20 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. Similar statistics apply if we focus on the labor force, rather than the population at large. The average age of those in the labor force in 1985 was 38.5 years, while 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 a bit older and had fewer remaining years of work to accumulate assets for retirement. This may also have induced a larger stock of retirement assets.

The final change that may have affected retirement saving relative to income 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, 1984-5, and 1998-9. Their data show a sharp decline in labor force participation rates between 1970 and 1984-5, but relatively little decline subsequently. The participation rates for 1998-99 were virtually identical to those in 1984-85. At ages above 65, 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 60s 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.

These statistics suggest that changes in retirement ages are not likely to account for substantial changes in retirement wealth relative to income during the last two decades. This is particularly true for the period since the mid-1980s. Demographic factors–shifting age structure and lengthening life expectancy--seem likely to account for modest increases in total wealth for retirement, but are unlikely to account for more than a small fraction of the large changes we observe.

2. RETIREMENT PLAN CONTRIBUTIONS & THE "RETIREMENT SAVING RATE"

The accumulation of retirement assets depends on the inflow of contributions, the payout of benefits, and the return on invested assets. Figure 5a shows contributions to private pension plans, which increased almost six fold between 1975 and 1999, while Figure 5b shows contributions to all retirement plans. The set of private plans includes self-directed plans such as 401(k) plans and IRAs. 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.

Figure 6 shows both private and total retirement plan contributions scaled by disposable income. We define these ratios as "retirement saving rates." They reflect only one part of the retirement asset accumulation picture–contributions to retirement plans. They do not capture the outflow of benefits from various pension plans, or the

return to the assets in these plans. The "retirement saving rates" measure the proportion of current earnings that are saved in retirement accounts by current employees. They do not withdrawal of assets by retirees.

Figure 6 shows two trends. First, the "private retirement saving rate" is remarkably stable. It was about 3.5 percent in 1975 and in 1999. During this same period, the NIPA personal saving rate declined from 10.6 percent to 2.2 percent. We will return to discussion of this difference below. Second, there is one exception to this stability: a large increase in the retirement saving rate when the IRA program was initiated, and a decrease when the program was curtailed in 1986. This pattern suggests that the total pool of assets in retirement plans would likely be much greater today if the IRA program had not been limited in 1986.

2.1 Time Series Changes in the "Retirement Saving Rate"

The relative stability of the retirement saving rate conceals fluctuations in some of the factors that affect this rate. Contributions to private defined-contribution type plans increased sharply over the 1975-1999 period, while DB contributions varied widely, and at the end of the period 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 7 shows the sum of the number of active participants in all of the different types of defined benefit and defined contribution plans.[2]

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[2]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 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.

Figure 7 shows rapid growth of 401(k) plans. These plans, which first became available in 1982, grew to almost 38 million participants by 1997. Participation in DB plans rose in the years prior to 1984, when it reached about 30 million, and then declined 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. In total, the number of plan participants increased from about 39 million in 1975 to over 80 million in 1997. Like IRA contributions, the sharp increase and subsequent sharp drop in IRA participants suggests that the number of retirement plan participants could well have been much higher had the IRA program not been curtailed in 1987.

Contributions per participant in DB, DC, and 401(k) plans are shown in Figure 8a. Figures 8b and 8c show IRA and 401(k) contributions, and contributions to Keogh plans. DB contributions per participant fluctuated substantially, and were about 40 percent higher at the end than at the beginning of the period. Non-401(k) DC contributions per participant increased about two-fold over the period, and on average were higher than DB contributions. Contributions to 401(k) plans were much greater than contributions to either DB or non-401(k) DC plans, and increased almost 50% between 1982 and 1996 alone.[3] Figure 8b shows that during the "unrestricted" IRA period between 1982 and 1996, IRA contributions on average were greater than 401(k) contributions.

Figure 8c shows that Keogh contributions, although a small proportion of total

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[3]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.

retirement saving, increased enormously over this period. Between 1981 and 1986 alone, contributions per participant increased over 200 percent. This increase coincides with Economic Recovery Tax Act of 1981's increase in Keogh contribution limits from $7500 to $15000.

Figure 9 shows the trend in the number of participants in all plans combined and the trend in the average contribution given participation. These two trends together yield the increase in total contributions shown above. The participation numbers reflect substantial double counting, since many individuals participate in more than one plan. For example, a large fraction of 401(k) participants also participate in a DB plan. Thus the increase in the contribution per unique covered employee would be substantially higher than the increase shown in Figure 9.

2.2 DB Contributions and the "Retirement Saving Rate"

Figure 10 shows an index of defined benefit plan contributions per participant, which vary a great deal from year to year. 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 effect of returns on DB plan assets on current funding decisions. Unlike other pension arrangements, 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 to 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. Berheim and Shoven [1988] present an early discussion of 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 under DB plans and discouraged firms from over-funding their pension plans. Prior to 1986 firms could fund their DB plans in excess of the 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 had funding restrictions not been imposed, DB pension assets in 1995 would have been 28 percent higher than they were in that year. Schieber and Shoven [1997] report that when the Omnibus Budget Reconciliation Act of 1987 limits on contributions to over-funded plans 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 "gross retirement saving rate." This should provide insight on how the legislative and financial market determinants of DB contributions affect this saving rate. While 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 saving rate.

Total DB contributions are the product of the number of DB plan participants and the contribution per participant. Fluctuations are due largely to fluctuation in the contribution per participant. Figure 11 shows indices for total wages and salaries, and

for DB, DC, and Keogh contributions per participant. The wages of wage and salary workers increased 150 percent between 1975 and 1997. DC contributions per participant increased about 150 percent as well, which is consistent with contributions specified as a proportion of wage earnings. On the other hand, DB contributions per participant fluctuated substantially, and on average fell relative to wages.

Suppose that there had been no legislation limiting contributions to DB plans, that market returns had not affected DB contributions, and that there were no changes in the demographic structure of the workforce covered by DB plans or in life expectancy after retirement. 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 increasing life expectancy and an aging workforce, one might have expected contributions per employee to increase faster than wages.

To explore how legislative and return-induced downward pressures on defined benefit plan contributions may have affected gross retirement saving, we construct a "what if" scenario. Figure 12a displays the ratio of total pension contributions to wage and salary earnings, for both the private sector and for all pensions. This retirement saving rate including the federal and state and local sector is about two percentage points higher than that for the private sector alone.[4] Now, 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 12b shows the private retirement saving rate

[4]Neither of the series include contributions to privately held pensions plans administered by insurance companies, which hold about 9 percent of the assets in all pension plans.

under this counterfactual, together with the actual rate. The saving rate under the counterfactual assumption was one percentage point higher than the actual rate at the end of the period. In 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 gross private retirement saving rate by a substantial amount.

The aggregate data also suggest that the gross retirement saving rate would have been substantially higher were it not for the curtailment of the IRA program. Between 1982 and 1985, IRA saving added approximately 2.3 percentage points to the "gross retirement saving rate." Now it accounts for only 0.3 percentage points.

To summarize, our analysis of the aggregate data on retirement assets increased very dramatically over the past two decades. It seems unlikely, in this light, that the rise of assets in DC retirement plans was offset by a reduction of assets in DB plans. This conclusion is consistent with micro analysis showing increases in individual financial assets with the advent of 401(k) and IRA plans, and with the evidence that we present below. The trend in DB plan activity is probably affected by many forces other than the growth of DC plan contributions. 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."

2.3 Contrasting NIPA Saving and the "Retirement Saving Rate"

The retirement saving as a proportion of wages and salaries, or personal disposable income, has been much higher than the NIPA personal saving rate, which has been close to zero in recent years. In the NIPA:

Saving = Disposable Income - 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 the plans, are counted as income.[5] However, to the extent that distributions from pension plans are consume--so that NIPA measured consumption increases--they 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. The contribution was made from income earned in that year, and since the contribution was not consumed, it added to personal saving in 1982. If the 401(k) was invested in non-dividend paying stocks, the internal build-up in the pension plan contributed nothing to NIPA income in any year after

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[5]However, taxes on realized capital gains reduce measured income and thus lower NIPA saving. This effect can be substantial. Reinsdorf and Perozek [2000] estimate that capital gains taxes were 0.9 percent of disposable income in 1988, but had risen to 1.9 percent by 1999.

1982.[6] In 2001, when assets were distributed from the 401(k) plan, there was no change in reported income, but if these distributions financed higher consumption, the distribution would reduce personal 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 13 and 14 show that in recent years, distributions from DB plans and IRAs have far exceeded contributions to these plans.[7]

The growth in retirement plan assets during the last decade highlights the limitations of the current NIPA treatment of pension saving. The problem will only become worse in the future. Poterba, Venti, and Wise [2001] project that average 401(k) balances for the cohort retiring in 2025 will be roughly ten times greater than the balances for those who retired in the mid-1990s. This implies that the component of spendable income accounted for by retirement plan withdrawals, and never captured in the NIPA income measure will increase over time. This will work to further reduce the NIPA measure of personal saving.

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[6]The amount of interest and dividends on assets in 401(k) funds is modest. In 1996 interest and dividends earned by 401(k) assets were $20.7 billion. In contrast, contributions were $104 billion and capital gains were $129.3 billion. See U.S. DOL [1999].

[7]Until 2000 the treatment of public pensions in NIPA was almost the reverse of the treatment of private pensions. Benefits from the federal civilian retirement plan, state and local pension plans, and Social Security were counted as income. Employee contributions were not counted as income. Thus employee contributions reduced saving. Benefits, to the extent they were spent, entered the NIPA saving calculation both as income and as consumption and in this case left saving unchanged. Now public and private pensions are treated the same in the NIPA.

3. RETIREMENT PLAN CONTRIBUTIONS VERSUS EMPLOYEE SAVING

In this section we compare the lifetime saving under a DB plan to saving under a DC plan. We begin with a conceptual framework. We emphasize that the employee's perception of retirement saving is likely to be very different under the two plans. We show that the pattern of retirement asset accumulation under the two plans is likely to be very different. In addition, the early retirement incentives inherent in DB plan provisions suggest that DB plan participants will retire earlier than DC participants, and thus for this reason will accumulate less in retirement assets. We then discuss the implications of these conclusions for the comparison of individual assets in DB and DC plans, which is taken up in subsequent sections. And we show that the conceptual analysis helps to understand how the number of DB and DC plans in the economy can affect aggregate contributions to pension plans and the aggregate accumulation of pension plan assets. Finally, we consider empirical evidence on asset accrual in DB plans.

3.1 Contributions vs. 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 types of DC plans, contributions by employers and employees are easily

observed by participants. Thus there is no difference 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 individual covered by the plan may be very different from the employer contribution per participant. And, the annual amount an individual perceives to be saved on his or her behalf in a DB plan is likely to be different from the actual saving, as well as from the employer contribution rate. Similarly, the individual's DB pension wealth is not easily observed and is difficult to determine. The participant's DB pension wealth is the discounted value of promised future benefits , that is, 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. Because most DB plans are "back-loaded," this annual benefit accrual is typically very small for young workers and is typically 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 a precise personal saving rate at a given age under the plan. This makes it difficult to compare personal saving--from the perspective of the participant--under DB and DC plans. Some simple algebra helps to fix these ideas and to understand how DC and DB saving rates can be compared.

For a person covered by a DB plan, saving is defined in terms of promised future retirement benefits. In particular, the increment to future retirement wealth is the change in promised future benefits associated with working another year at the firm–the accrual in future pension benefits. Current saving is the present value of the change in promised future benefits. Notice that DB saving is defined by a formula that determines benefits in

the future. In contrast, DC saving is defined by the current contribution and the increment to future retirement wealth is determined by the future value of the contribution, determined by the market rate of return.

In a simplified case, DB benefits are given by $B_t = \lambda W_t s$, where λ is is a parameter of the plan and typically is between 0.01 and 0.02, and W_t is earnings after s years of service. After s years of employment, this is the accrued benefit promised at the normal retirement age, say 65. 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

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

where w is the annual rate of increase in earnings. The change in future pension wealth is given by this change in benefits, times the annuity value of a dollar at the retirement age, given by A(65). Thus in the DB case, the increase in future retirement wealth associated with working another year under the DB plan is given by $\Delta DBPW=(ws+1)W_t \lambda.A(65)$. Saving at age t under the DB plan, comparable to the 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

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

Note that ΔDCPW depends on the market rate of return but that ΔDBPW depends on the rate of increase in the wage rate. Suppose that λ = .015, that k = .10, and that A(65) = 8. Suppose also that people work from age 25 to age 65. Then this ratio is $[(1+r)^{65-t}/(1 + ws)] * [.10 / .12]$. Suppose further that r=0.09 and w=0.05. At one year of employment the ratio is 20.04, at 20 years it is 2.05, and at 40 years 0.24. DC wealth accrues early in the working life and DB wealth accrues late--it is "back-loaded". (The ratio of the DC contribution at age t to DB saving at age t is k, over the DB increment at retirement discounted back to age t.)

In reality, however, the DB plan is not nearly so simple. Actual accrual depends 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] DB saving is zero prior to vesting. In addition, most DB plans have an early retirement age (often 55), which is an important determinant of the accrual pattern. After the early retirement age, benefit accrual typically declines, and often becomes negative. The more complicated accrual patterns under these circumstance are described in detail in Kotlikoff and Wise [1989]. We draw on their work to illustrate typical saving patterns under DC and DB plans.

Suppose the DB plan has vesting after 10 years of service, early retirement at 55, normal retirement at 65, and an early retirement discount factor of 3 percent per year. The factor λ is set at 0.015. This is a typical plan, except that now vesting would usually be after five years of service, rather than ten. Suppose the 401(k) contribution rate is 10 percent.

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[8]This is partly true for some 401(k) plans as well. In some cases the employer matching contribution is subject to a short vesting requirement.

Table 1 shows saving at selected ages under this DB plan, compared to saving under a DC plan with a ten percent contribution rate. In this example, earnings increase at a nominal rate of about 8 percent per year at age 25 and declines to about 3 percent by 65. (These earnings should be thought of as the historical earnings of persons now approaching retirement.) The table shows three measures of saving: (1) saving as a proportion of earnings at age t, (2) saving in dollars at age t, and (3) the associated increment to wealth at age 65. The figures in Appendix 2 show the first and third measures of saving for each age from 25 through 65.

The DC plan saving is shown in columns (4), (6), and (8). At age 25 for example, one percent of earnings is contributed to a DC account–shown in column (4). The dollar amount, $923, is shown in column (6). At a 9 percent market rate of return, the $923 would grow to $28,988 by age 65. At age 45, one percent of earnings is $3,129, and this amount grows to $17,535 by age 65,assuming a 9 percent rate of return. The total accumulation of assets under the DC plan will be $726,171, by age 65.

The calculation of accumulation under the DB plan is more complicated. There is no saving in the DB plan until the employee is vested, so saving is zero at ages 25 and 30. Saving begins at age 34. 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 55. The provisions provide a strong incentive to stay at the firm until the early retirement age. After age 55, however, there is an incentive to leave the firm. Indeed the accrual of pension benefits is negative after age 55. The accrual pattern and the incentive effects can be seen clearly in Appendix Figure 1.

In this plan, the value of future DB pension benefits is maximized if receipt of benefits begins at age 55. Consider, for example, saving at age 45. The increment to promised future pension wealth shown in column (7) is $6,757, if receipt of benefits begins at age 55. After age 55, the three percent increment in benefits for each year that benefit receipt is delayed is not enough to offset the receipt of benefits for one fewer years. Thus benefit accrual is negative after age 55. For each year benefit receipt is delayed after 55, 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 45 is $3,111. This is the increment to assets at age 55, discounted back to age 45 at 9 percent.[9] As a proportion of the wage, DB saving is 9.9 percent at age 45, shown in column (3). If the DB employee remained in the firm until age 55 and then started to receive benefits, the value of lifetime benefits (the annuity) would be $154,939. But if the employee delayed receipt of benefits until age 65, the value of benefits would decline to $137,539.

Notice that at age 45, DB and DC saving are essentially the same, $3,111 and $3,129 respectively. Yet the increment to total wealth is only $6,757 under the DB plan,

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[9]We realize that in principal 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 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 Pension Benefit Guarantee Corporation guarantees accrues DB benefits only in a given plan. The average rate used by DB plans in Form 5500 reports was 7.77 percent in 1977. For simplicity in this illustration we let the discount rate equal the assumed rate of return.

compared to $17,535 under the DC plan. The difference in the increment to wealth at retirement is simply due to the assumed age of receipt (taken to be the age that maximizes benefits under the DB plan). The increment to DC wealth at age 55 (from saving at 45) is $7,407 (close to the DB increment of $5,757), as compared to $17,535 at age 65. The increment to DB wealth at age 55 is show in column (9). Over a working life, the maximum accumulation of DB pension wealth occurs at age 55. At that age, the present value of future benefits is $154,931. Total accumulation in the DC plan at that age is $263,358. But if the DC employee continues to work until 65 the accumulation in the DC plan increases to $726,171. The DB employee, however, would lose pension wealth if receipt of benefits was delayed until age 65–pension wealth would decline from $154,931 to $137,549. Thus very few employees covered by DB plans work until age 65.

Finally, many employees would not remain under the same DB plan over a working life, however, even to the early retirement age, and thus would not accumulate the working life assets shown in the illustration above. The DB wealth at retirement would be much less if a person were to change jobs several times, but still retain a DB plan with the same provisions. In addition, many DB plan provisions include Social Security offsets, which would reduce the saving implied by the above illustration.

3.2. Implications for the Micro Comparison of Pension Assets and for Aggregate Retirement Saving

The illustration highlights two features of saving in DB and DC plans: (1) The age profile of asset accrual is very different under the two plans. (2) To the extent that DC

participants work longer than DB participants, the pension assets that accumulate in the individual DC account are likely to be greater than the assets that accumulate in the individual DB "account." These features add to the higher level of asset accumulation due to the higher annual plan contribution per active participant in the DC plan.

A component of the discussion below is the comparison of the accumulated pension assets of persons with DB plans to the accumulation of those with 401(k) plans. At age 63, 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 a survey respondent's reported annuity from a DB plan. Consider, for example, the pension assets of two persons age 65, 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 55. Working longer will increase the assets of the DC participant. Although we do not have a quantitative estimate of the magnitude of this effect, the direction seems clear.

The discussion in section 1 above focuses on the aggregate accumulation of pension assets over time. The illustration here also helps to understand how--in addition to the difference in annual plan contributions per active participant in the two plans--the economy-wide accumulation can be affected by the mix of DB and DC plan participants. Consider this example: suppose that the "working age " is 40 years, from 25 to 65. Assume also that DC participants work the entire 40 years. But DB employees work only 30 years, until age 55. They are retired for 10 of the 40 "working" age years. Suppose that the annual DC contribution per participant is C. And suppose that the contribution

per participant (employee) to the DB plan is C/2. Then over the working age 25 to 65, contributions to the DC account will be C*40. But contributions per participant to the DB plan will be only (C/2)*30 over the working age. Thus over the working age, DB contributions will not be one-half of DC contributions, but only 3/8 of DC contributions. Thus for any given cohort of workers, the accumulation of assets will depend on not only on the contribution per active (working) participant to DC and to DB plans, but also on the number of years over which participants work.[10]

3.3 Empirical Evidence on Contribution Patterns

To determine whether on average, over all ages, the gain in retirement support from DC saving is greater than from DB saving, we can consider external data. Kotlikoff and Wise [1989], estimate that on average DB contributions to DB pension funds are equal to perhaps 4 to 6 percent of the wage earnings of DB enrollees. The average 401(k) contribution is about 9 percent of earnings. The data on contributions per active (working) participant above show 401(k) contributions per participant about twice as large as DB contributions per participant. The prior discussion in this section also shows that contributions to DC plans are likely to continue over more years than contributions to DB plans. Ultimately, benefits from DB plans must come from DB contributions, and benefits from DC plans from DC contributions. Assuming that investment returns in the two plans are similar, the 401(k) plan will provide much greater benefits at age 65 say, for persons with similar earnings by age while working. As emphasized above, however,

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[10]Of course workers who retire earlier get more leisure. The focus here, however, is on the accumulation of retirement assets, not on the comparison of utility of persons covered by DB and DC plans.

DB plan contributions go disproportionately to persons who covered by the same plan over an entire working life. Employees who change jobs often will accumulate much less in pension assets, as documented by Kotlikoff and Wise [1989].

This conclusion is consistent with the findings of Samwick and Skinner [1998]. They compare the "saving" effects of 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 that DB plans.

Form 5500 filings provide data that matches closely the DC and DB annual saving rates, as described algebraically above. For an individual DB participant, the annual pension saving is the increase in promised future benefits due to working an additional year under the plan–the annual accrual, rather than the contribution (per participant) that the firm makes to the DB plan. The annual accrual of promised DB benefits is reported in Form 5500 data for all plan employees combined.[11] This is of course an average over 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 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

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[11]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 following tabulations reported here are based on completed responses.

more than twice the annual DB saving rate, on average. 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 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 (discussed above), all seem quite consistent. They suggest 401(k) annual saving rates at least twice as large as DB saving rates.

This annual accrual is the increase in promissed future benefits that the plan must fund. Suppose that there is no change in the plan obligations to retirees. And suppose that the plan cannot be underfunded or overfunded. This accrual puts a limit on the increase in plan assets. In this simplified example, plan contributions per would fluctuate depending on the accrual and on the market return on assets, as discussed above. Legislative changes in funding limits would also affect contributions, as discussed above as well. There is of course no such limit–to the up side or to the down side–on the accumulation of assets in DC plans.

Detailed projections of 401(k) retirement assets, like those in Poterba, Venti, and Wise [1998b, 2001], are also consistent with implications of the foregoing analysis and are discussed below.

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 much of the current discussion of 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, and implications that can be drawn form these data alone, we consider several ways to evaluate the possible displacement of DB plan assets by DC assets, 401(k) assets in particular. We begin with an illustrative comparison that suggests the order of magnitude that should be expected in comparing the potential displacement of DB assets by 401(k) assets. We then turn to a series of approaches to the evaluation of substitution.

In considering possible displacement of plan assets, it is useful to note the trend in the number of plan participants. The number of participants, including persons counted in more than one plan, is shown in Figure 15, as a proportion of wage and salary employees. The total increased from 64 to 81 percent between 1975 to 1997. Notice again 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.

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 3 shows the fraction of 401(k) participants that

also has 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 pre-existing 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 3 shows the 401(k) participation rate, given eligibility for the years 1990 to 1997.[12] These rates are in excess of 75 percent in all years. For pre-existing 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 noticeable trend over time. Over the period, the proportion of participants accounted for by persons in new 401(k) plans declined from about 7 percent to between 3 and 4 percent as is shown in the last panel of Table 3. The percent of plans accounted for by new 401(k) plans declined from about 14 percent to about 4 percent. Very little of the decline in DB dual coverage is accounted for by 401(k) participants with dual coverage who subsequently lose their DB plan.

Table 4 shows 401(k) contribution and participation rates by dual DB coverage status. The average contribution per participant increased substantially over time, as

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[12] 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 (non-retired) participants.

shown above. The information in Table 4 shows that the average contribution is much higher for those with than for those without a DB plan–25 to 40 percent higher in these years. Perhaps those with DB plans also have higher earnings; this would make 401(k) contributions higher. It is also possible that participation in one pension plan increases workers' awareness of saving-related issues and thereby encourages other saving. (Katona [1965])advanced this hypothesis for the greater other saving observed among pension participants.) Participation rates in 401(k) plans are somewhat higher for persons who have a DB plan than for those who don't have a DB plan. Persons with a DB plan may also be older and 401(k) participation rates tend to increase with age, as shown in Poterba, Venti, and Wise [1998b].

4.2 Loss of Dual Coverage

The data underlying Table 3, in particular the proportion of 401(k) participants with a DB plan, by whether the 401(k) is a new or a continuing plan, are shown in the first panel of Appendix Table 2 in Appendix 3. From these data, using a procedure described in the appendix, it is possible to determine the rate at which 401(k) participants with dual coverage lose DB coverage. We find that the loss rate for the year 1996-97 is 1.0 percent. For earlier years, this rate is 4.6 percent (95-96), 1.7 percent (94-95), 0.7 percent (93-94), -1.1 percent (92-93), 6.1 percent (91-92), and -5.1 percent (90-91). 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 0.011.

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. Finally, these results show 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.

4.3 Hypothetical Growth of DB Assets Without 401(k) Plans

We now consider two simple simulations of how DB assets might have evolved in the absence of 401(k) plans. This exercise is based on extreme assumptions concerning th replacement of DB plans by 401(k) plans. The results can thus be interpreted as providing upper bounds on the extent of substitution between 401(k) 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) and in DB plans, (2) the contribution per participant to 401(k) and to DB plans, and (3) the percent of 401(k) participants that also has 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, based on two scenarios. The calculations are explained in detail in Appendix 4. Here we point to the critical features of the data and show the final results.

In 1984, about 82 percent of 401(k) participants also had a DB plan. For persons with both a DB and a 401(k), total pension saving is necessarily greater than saving under a stand-alone DB plan.[13] The percent of workers with dual enrollment declined

[13]In general, the DB plans preceded the supplemental 401(k) plans. Because DB plans are formula based, it is difficult to "scale back" DB benefits when 401(k)s are

rather consistently to about 42 percent in 1997. In the first years after they 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 pre-existing DB plans. To the extent that the expansion in 401(k) plans has been increasingly through plans in smaller firms, without a prior DB plan, the 401(k) contributions are not substituting for contributions to pre-existing DB plans. Whether such firms would have adopted another plan if it were not for the 401(k) option is an open question and we address this issue in the alternative scenarios discussed below.

On average, per enrollee contributions to 401(k) plans are greater than 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. Total pension contributions to employees covered by a 401(k) plan over the years 1984 to 1997 are $1061 billion.[14] About $252 billion was contributed to the DB plans of 401(k) enrollees with dual coverage, about $499 billion to the 401(k) plans of those with dual coverage, and about $309 billion to the 401(k) 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

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introduced. Indeed, the data in columns 7 and 8 of Appendix Table 2 show that DB contributions are higher in firms where DB plans are supplemented by a 401(k) plan.

[14]For convenience, the sums reported in this section are in nominal dollars. The same patterns emerge if we use real dollars.

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).[15] 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)s, so this assumption will surely produce an upper bound on the amount of substitution. The calculations for this scenario in Appendix Table 2 show that contributions to all DB plans would have totaled about $466 billion from 1984 to 1997. This $466 billion is composed of $252 of actual contributions to DB plans by persons with dual coverage and $214 in additional DB contributions that would result if all stand-alone 401(k)s were instead DB plans (with the firm contribution rate for stand-alone DB plans). This additional $214 billion of DB contributions represents only 26 percent of all plan contributions by 401(k) participants ($1061 billion).. 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 retain their DB coverage. For these persons there is little or no displacement effect. Second, average contribution rates to DB plans are substantially lower than contribution rates to 401(k) plans. Replacement of a stand-alone DB by a stand-alone 401(k) 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. "Lost" contributions to

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[15]We assume that the DB contributions for persons with both DB and 401(k) plans are unchanged.

DB plans under this scenario are calculated to be $85.7 billion, which is only 11 percent of all 401(k) contributions

Both of the above scenarios are based on rather strong assumptions about the replacement of DB plans by 401(k)s. The former estimate assumed that all stand-alone 401(k) plans displaced DB plans; the latter assumed that all of the reduction in DB participation since 1984 is the result of displacement by 401(k)s. These are separate estimates of the upper bound to displacement and the actual amount of substitution will likely be much less. Nonetheless, these scenarios show that foregone contributions to DB plans could only account for a small share--at most 26 percent and probably less than 11 percent--of the enormous growth of pension contributions for persons with 401(k)s. The absence of large-scale displacement is the consequence of several factors. First, much of the growth of 401(k)s, 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 discussion in section 3 above implies that growth of retirement assets resulting from 401(k) contributions is likely to be much greater than that from contributions to DB plans. Finally, the decline in the number of persons covered by DB plans that is not also covered by a 401(k) plan is too small to account for much of the 401(k) growth.

4.4 Projections of 401(k) Assets

Data from the Health and Retirement Survey 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 [1998b], 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. We assumed that our estimated earnings profiles represented the past earnings of the HRS families, and we estimated what they would have accumulated in 401(k) assets had they had the participation rates that we project for two cohorts: one reaching age 65 in 2025 and the other reaching age 65 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. Projections like those in Poterba, Venti, and Wise (2001, Table 10 suggest that projected 401(k) assets would be 136 to 451 percent of DB pension plan assets, 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 these 401(k) asset projections are likely to 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, since 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.

4.5 The "Eligibility Experiment" Applied to DB Plan Assets

In PVW [1998b], we used data from the Survey of Income and Program Participation (SIPP) to compare the financial assets and home equity of families eligible for a 401(k) with the assets of families who were not eligible. We found little difference in the assets of eligible and non-eligible families in 1984–near the introduction of the 401(k) program. By 1991, however, the assets of the eligible group were substantially greater. 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 the comparison of the pension assets of HRS respondents discussed in section 4.5 below.

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 the DB assets of the eligible groups. For this to have happened, the DB coverage of persons who became eligible for a 401(k) plan would have to have declined. The results, however, are difficult to interpret. Thus here we explain why and give our best judgement about the implications of the data. (The details are available from the authors upon request.)

In 1984, there was little difference in the 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. 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 not eligible families. The percent decline in DB coverage was much greater for the ineligible group than for the eligible group. One might judge from these data that there was not a disproportionate fall in the DB assets of the eligible group. But the interpretation of the data is confounded by two trends. One trend 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 pre-move DB coverage of the new 401(k) eligibles. Suppose we rely on Ippolito's [2000] result that existing DB plans are very rarely terminated when 401(k) plans are started, and we accept our result above that once dual DB-401(k) coverage is established, the subsequent loss is DB coverage is very slow. The data alone do not allow the possible determinants of eligibility to be cleanly disentangled. But our attempts to match the shift in the DB coverage of the 401(k) eligible and ineligible groups suggests that during this period, most of those who moved from the ineligible to eligible status had a DB before becoming eligible--reducing the proportion of the ineligible group with a DB and increasing the proportion of the eligible group with a DB.

4.6 Cohort Analysis of DB vs. 401(k) Substitution

We emphasized above that if the increase in DC 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. We also considered the change in DB participation among persons eligible and not eligible for a 401(k) plan, 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 reduction in DB participation with the increase in 401(k) plans is to consider cohort data. Figure 16 shows the relationship between 401(k) eligibility and participation in DB plans for three cohorts, using data from the Survey of Income and Program Participation (SIPP) for 1984, 1987, 1991, 1993, and 1995. These data span the first 13 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 44 to 55.

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 "mixture" problem that makes the eligibility "natural experiment" data more difficult to evaluate.

The evidence in Figure 16 does not necessarily imply that there was no displacement of DB plans as 401(k) plans expanded. Perhaps DB participation would have risen more rapidly were it not for the spread of 401(k) plans. But it seems to us extremely unlikely that DB plan participation would have increased, other things equal, as quickly as 401(k) plans spread. For example, the "C44" cohort is followed from age 44 to

age 55. For this cohort it is likely that DB participation would have changed little with age, which is what the realized data shown in the presence of the 401(k) expansion.

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 16, however, does not reveal this trend. (The cohort data are only shown through age 55. 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 55. Thus at older ages it is not possible using these data to accurately compare the 401(k) and DB rates.)

5. RETIREMENT PLAN SUBSTITUTION AMONG OLDER WORKERS: EVIDENCE FROM THE HEALTH AND RETIREMENT SURVEY

The Health and Retirement Study (HRS) provides data that are in many ways the most comprehensive information available on persons approaching retirement. We would like to consider the assets of HRS families, whose heads were 51 to 61 in 1992. Some of these persons could have participated in a 401(k) plan for up to 10 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 an eligible versus ineligible "natural experiment" as described in Poterba, Venti, and Wise [1995], and considered also in section 4.3 above. Unfortunately, because the HRS asks respondents whether they contribute to 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 first 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 above, 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 results–based on HRS data–likely 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 for households eligible for a 401(k), suggesting substitution of 401(k) for DB pension assets. The findings presented above in this paper show quite strongly that employees covered by 401(k) programs should have more retirement assets than employees not covered by a 401(k). 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.

5.1 Data Limitations

Our aim is to provide estimates of the pension and other assets of persons who were and were not eligible for a 401(k) plan. To begin, we compare DB coverage rates, for persons eligible and not eligible for a 401(k), reported in the HRS with rates reported in other surveys. The other surveys explicitly inquire about 401(k) eligibility, while the HRS does not. This comparison is presented in Table 5 and pertains to pension status on the

employees current job.[16] The HRS rates are based on the assignment of eligibility used by Engelhardt [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 survey.

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

We emphasized that the HRS does not inquire about eligibility for a 401(k), although it asks about 401(k) contributions.[18] Consider the 1992 HRS data on 401(k)

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[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.

[17]Using households rather than persons, Engelhardt finds 51 percent of the eligibles have a DB and 47.7 percent of the ineligibles have a DB. A household is classified as eligible if either member is eligible for a 401(k).

[18] These are self-reported pension data. For persons who self-report having a pension the HRS collected pension data from the employer. Unfortunately, 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-

contributor status and DB coverage, shown in Table 6. The HRS respondents report whether they contribute to a 401(k) and whether they are covered by a DB plan. These data are shown in the left panel of Table 7. They pertain only to persons who indicate they are included in their employer's plan. (They differ from the HRS data in Table 5, 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 non-contributors with a DB plan--46 versus 41.7 percent. But compared to the DB coverage of 401(k) eligibles versus non-eligibles reported in other surveys (Table 5), these data for contributors versus non-contributors 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 consider which persons among the 401(k) non-contributors are actually eligible to contribute to a 401(k).

There are two separate determinations to be made. The empirically more important case involves non-contributing 401(k) eligibles who are covered by another pension. These persons would be among the 1699 persons in Table 6 who do not contribute to a 401(k), but have a DB plan. The sequence of questions in the first three waves of the HRS provides no way for a non-contributing 401(k) eligible, also covered by a DB plan, to self-identify as eligible for a 401(k); 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 non-contributors with a DB are in fact eligible for a 401(k).

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reported pensions. Both Engelhardt [2000] and Gustman and Steinmeier [2000] show an enormous degree of conflict between self-reported and firm-reported pension status.

Engelhardt [2000] assumes that all of these are non-eligibles without a DB plan, thus likely mis-classifying 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 this way: We know from the Form 5500 data that about 82 percent of eligibles contributed to their 401(k) in 1992. Thus there would be 1351/.82 = 1648 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 1402 non-eligibles with a DB plan. This estimate is shown in the right panel of table 6. 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 non-eligible 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 non-eligibles 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 6 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 DB coverage to the pool of 401(k) eligibles. Recall that the first--and more serious--mis-classification adds eligibles with DB coverage to the pool of 401(k) ineligibles. Taken together, these two mis-classifications 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 mis-classification may be substantial.

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 above, 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) non-contributors, some are eligible and some are not. Our approach is to determine the proportion of 401(k) non-contributors that is actually eligible to contribute to a 401(k). We do this based on proportions of non-

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[19]Evidence from other surveys suggests that not all of these persons are eligible for a 401(k). The 1995 SCF asked a similar question but followed it up by asking what type of plan the respondent was "eligible to be included in." Eighty percent of the weighted responses age 51-61 indicated 401(k) for their first job and 36 percent for their second job (62.2 percent overall). The 1993 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). 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.

contributing eligibles that have a DB, 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 non-contributors 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 non-contributors is then

$$E_N = E_C(1/.82 - 1) .$$

Thus the proportion of non-contributors that should be eligible is

$$P = (1/0.82 - 1)(E_C/N_N) .$$

where N_N is the total number of non-contributors.

That is, the percentage of non-contributors predicted to be eligible to contribute to a 401(k) in the HRS is equal to P percent of all observed non-contributors. 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 x P percent of 401(k) non-contributors with a DB plan in the HRS to be non-contributing eligibles. We also randomly reassign .443 x P percent of 401(k) non-contributors without a DB plan in the HRS to be non-contributing eligibles. This approach assures 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 (age 51 to 61 in 1992) because it applies to all ages, and we know from

the cohort data above 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 these conventions: (1) Respondents answering "DB" were coded as having a DB plan. (2) 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 did not provide 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. (3) 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. (4) Finally, a significant number of respondents who indicated they were included in a pension did not provide the type of pension. 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 calculations above 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.

Results comparing the assets of persons eligible and not eligible for a 401(k) plan are shown in Table 7.[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) 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 non-eligibles. 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. Non-retirement financial assets do not differ much by eligibility status. Some of the cells show zeros because fewer than half of the observations have non-zero values and thus the median is zero.

As explained above, the HRS data–even after our assignment assumptions–are likely to exaggerate the proportion of 401(k) non-eligibles with a DB plan (relative to the proportion of eligibles with a DB plan). After assignment of eligibility, the proportion of 401(k) eligibles households with DB plans is 59.3 percent and the proportion for 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 in reported in the bottom panel of Table 8 and these implied ratios are much lower than the ratios reported in Table 5, which is based on SIPP data. The ratio of the coverage rates reported in Table 5 is over 2,

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[20]These are the results of weighted median regressions for 4895 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. Conditional median asset balances are evaluated at the sample means of the covariates.

averaged over all income groups. Thus we believe that the calculations in Table 8 underestimate the addition to pension wealth of families eligible for a 401(k) plan.

6. CONCLUSIONS

Retirement saving has changed dramatically in the last two decades, with a shift from employer managed defined benefit pensions to retirement saving plans that are largely managed and controlled by employees. In 1980, 92 percent of private retirement saving contributions were to employer-based plans and 64 percent of these contributions were to DB plans. In 1999, about 85 percent of private contributions went to accounts in which individuals are largely responsible for deciding how much to contribute to the plan, how to invest plan assets, and how and when to withdraw money from the plans. We have considered in this paper the changes in the magnitude and the composition of saving for retirement that occurred over the period of this rapid change in the mode of retirement saving. We considered both macro data on the economy-wide saving for retirement and accumulated assets for retirement. We then considered micro data. Throughout the paper we have emphasized the possible substitution of pension assets in one plan for assets in another plan, in particular the substitution of 401(k) assets for DB assets.

The macro data show that assets in retirement plans have increased very dramatically over the past two decades–by about five-fold relative to wage and salary income. The increase in these assets to support retirement will likely mean very large increases in the assets of future retirees. It also seems evident that the large majority of the increase in DC retirement assets did not occur at the expense of a reduction in DB plan assets.

In addition, in recent years the annual "retirement saving rate"–calculated as retirement plan contributions as a proportion of NIPA personal income–has been over 5 percent, or 8 percent relative to earnings. Both are much higher than the NIPA personal saving rate, which is now close to zero. We discuss the main reasons why the NIPA measure does not capture the recent growth in the retirement saving sector.

Retirement saving today would likely be substantially greater, if it were not for congressional legislation in the latter 1980s that limited firm contributions to DB pension plans. In the absence of the circumstances that limited DB plan contributions per participant–due to both legislation as well as favorable capital market returns on DB plan assets--the realized retirement saving rate would have been substantially higher than it is now, perhaps at least 1 percentage point higher in 1999. It is also likely that the "retirement saving rate" would be much higher today if it were not for the retrenchment of the IRA program after 1986.

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 by employees. On average we find that the annual saving rate per active participant under a 401(k) plan is perhaps twice as high as average saving under a DB plan. But the pattern of saving by age is much different under the two plans. The pattern of pension wealth accrual in the DB plan typically provides large incentive to retire early, as explained in detail in Kotlikoff and Wise [1989}. In this paper we explain that these incentive mean that DB employees accumulate assets of many fewer years that DC

employees. Thus in addition to the difference in the annual saving rate under the two plans, the difference in the number of years over which assets accumulate is likely to increase very substantially the asset accumulation in DC over DB plans. This affects the micro comparison of the DB and DC assets of individuals, as well as the economy wide contributions to retirement plans and the economy-wide accumulation retirement plan assets.

Our analysis of household-level data on retirement saving yields a number of findings that reinforce the conclusions from the aggregate analysis. Dual coverage by 401(k) plans as well as 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 in 1997. Few 401(k) participants covered by a DB plan lose the DB coverage–they have roughly a one percent per year chance of losing DB coverage. Our estimates suggest that between 1984 and 1997, contributions to 401(k) plans were between two and three times what contributions to defined benefit plans would have been in the absence of the 401(k) program. This translates into much greater projected 401(k) balances, than projected DB plan assets under the "no 401(k) scenario," for those who will reach retirement age between 2025 and 2035.

Comparison of DB plan coverage in 1984 and 1991 does not suggest that 401(k)s displaced DB plans, although the data do not support very precise conclusions. 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

those in the HRS age group.

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Appendix 1: Data Sources

Figure 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 2. DB and DC assets for 1985-99 are from the FFA. For the years 1975-1984 estimates are obtained by applying the ratio of DB to DC assets from Form 5500 filings to total assets from the FFA. IRA assets are from Sabelhaus (2000). The figure excludes private pension assets held by life insurance companies.

Figure 3. All series from the FFA.

Figure 4. Housing equity if rom the FFA. Other assets are total net worth (from the FFA) less housing equity less private retirement assets as defined in note to figure 1a. Personal disposable income from Table 2.1 of the NIPA.

Figure 5a. DB and DC contributions are from Form 5500 reports. The data for 1998 and 1999 are authors estimates. IRA and Keogh contributions are from the IRS Statistics of Income. The IRA contributions pertain to tax-deductible contributions only.

Figure 5b. Private pension contributions are the sum of the components described in figure 5a. State and local and federal contributions are from the NIPA.

Figure 6. Private pension contributions are the sum of the components described in figure 5a. Total pension contributions are the sum of the components described in Figure 5b. Personal disposable income is from NIPA.

Figure 7. DB, DC and 401(k) participants from the Form 5500. IRA and Keogh participants from the SOI. 401(k) data for 1982 and 1983 are authors' estimates.

Figure 8a. All series are from the Form 5500. 401(k) data for 1982 and 1983 are authors' estimates.

Figure 8b. 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 8c. The Keogh data are from the IRS Statistics of Income.

Figures 9, 10. All data are from the Form 5500.

Figure 11. Data for DB and DC plans are from the Form 5500. Keogh data are from the IRS Statistics of Income.

Figure 12a. Sources for pension contributions are the same as Figures 5a and 5b. Wage and salary earnings (disbursements) are from the NIPA.

Figure 12b. Actual pension contributions are the same as in Figure 12a. 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 13. All data are from the form 5500.

Figure 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).

Figure 15. 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 16. Authors' calculations from the SIPP.

App. Figure 1-3. Authors' calculations as described in the text.

Appendix 2. Illustration of DB Versus 401(k) Saving

Table 1 in the text shows selected data on saving through an illustrative DB plan, compared to a 401(k) plan. More detail is shown here for all ages. Appendix Figure 1, which reproduces approximately a profile used in Kotlikoff and Wise (1989), shows the ratio of DB and 401(k) saving to a lifetime wage profile. The DB saving rate increases exponentially as the employee approaches the early retirement age. After the early retirement age, the rate drops precipitously and becomes negative before age 65. In contrast, the 401(k) rate is constant over the working like, assuming that the average contribution rate applies at all ages. In dollar terms, 401(k) saving increases--with the wage--throughout the working life, as shown in Appendix Figure 2.

The DB saving follows a pattern similar to the saving rate in Appendix Figure 1. The affect of the market return on the 401(k) saving is shown if Appendix Figure 3. The 401(k) saving in this figure is the increment to wealth at retirement, attributable to saving at each age, assuming a 9 percent rate of return. The DB increment is the increment to promised benefits, due to working under the DB plan for one more year. For almost all ages, the 401(k) increment is substantially greater than the DB increment. Recall that the DB saving rate in Appendix Figure 1 is derived from this same increment: in Appendix Figure 1 the increment shown if Appendix Figure 3 is discounted to a given age, and shown as a percent of the wage at that age.

Appendix 3: The DB Loss Ratio from Dual Coverage Participants

The first panel of Appendix Table A-1 shows the raw data, calculated from Form 5500 filings, used to estimate the DB loss ratio. The second panel determines the additions to existing plans, shown in the third column. The number of additional participants to new plans from year t to year t+1 is simply the increase in total participants, minus 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)plans)]*(DB loss rate)

The DB loss rate is the proportion of persons with a DB who drop (or lose) the DB plan. 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 with DB plans, N denotes the number in existing plans, P the proportion in existing 401(k) plans with 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, P the proportion of additions with a DB, l the proportion of those with a DB who drop the plan, and t the year. The formula for the loss ratio is then:

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

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

Appendix Table 1. Calculation DB Plan Loss Ratio

From Form 5500 Filings

Year	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
1990	20365592	61.84	1113387	32.79	19252205	63.52
1991	21129557	58.19	1237212	26.1	19892345	60.19
1992	24064248	55.69	1587113	18.97	22477135	58.28
1993	25576318	52.89	1232422	22.9	24343896	54.41
1994	27241793	51.02	817009	32.87	26424784	51.58
1995	30803020	46.9	1028994	27.95	29774026	47.56
1996	33854427	45.81	873167	39.42	32981260	45.98
1997	37716368	42.39	1377491	22.5	36338877	43.15

Additions to Existing Plans

	Participant Increase All Plans T(t+1)-T(t)	Participants From New Plans	Additions to Existing Plans T(t)+n(t+1)-T(t+1)
1990			
1991	763965	1237212	-473247
1992	2934691	1587113	1347578
1993	1512070	1232422	279648
1994	1665475	817009	848466
1995	3561227	1028994	2532233
1996	3051407	873167	2178240
1997	3861941	1377491	2484450
	17,350,776	**8,153,408**	**9,197,368**

Determination of Loss Ratio

	Exist Plans with DB NP	New Plans with DB np	Additions NP + np	Additions A(t+1)	Additions DB(t+1)	Additions with DB A(t+1)P(t)	Loss Ratio I	Participants losing DB plans
1990	12229001	365080	12594080					
1991	11973202	322912	12296115	-473247	12295289	-300606	-0.051	-612973
1992	13099674	301075	13400750	1347578	13401380	811107	0.061	837105
1993	13245514	282225	13527738	279648	13527315	162979	-0.011	-156999
1994	13629904	268551	13898454	848466	13898763	461650	0.007	105307
1995	14160527	287604	14448131	2532233	14446616	1306126	0.017	281570
1996	15164783	344202	15508986	2178240	15508713	1035971	0.046	769228
1997	15680225	309935	15990161	2484450	15987968	1142350	0.010	182672
						4,619,577		**1,405,910**

Appendix 4: The Growth of Pension Assets With and Without 401(k)s

The illustration of the growth of DB assets with and without a 401(k) plan is based on three data series for the period 1984 to 1997: (1) the number of participants in 401(k) and in DB plans, (2) the contribution per participant to these plans, and (3) the percent of 401(k) participants that also has a DB plan. The data are shown in Appendix Table 2. The number of DB and 401(k) plan participants is shown in columns (2) and (3). The percent of 401(k) enrollees that is also enrolled in a DB plan is shown in column (4). Based on the percent of 401(k) enrollees with dual coverage in column (4), the number 401(k) enrollees with and without DB plans is shown in columns (5) and (6) respectively. The average contribution per participant in these plans is shown in columns (7) - (10). Total DB and 401(k) pension plan contributions by 401(k) enrollees are shown in columns (11) through (14). The totals over all years are shown in the last row of the table.

The first scenario assumes that all persons who have stand-alone 401(k) plans would otherwise have stand-alone DB plans in the absence of 401(k)s. Total DB contributions under this scenario are shown in column (15) which is the product of columns (3) and (7). For the period 1984 to 1997 the total is $466 billion. This $466 billion is composed of $252 of actual contributions to DB plans by persons with dual coverage (column 11) and $214 in additional DB contributions that would result if all stand-alone 401(k)s were converted to DBs. Effectively, $214 of DBs would displace $309 of stand-alone 401(k)s. Another $499 billion of 401(k) contributions among persons with DB plans (column 12) did not displace DB contributions. Thus of the total of $808 billion contributed to 401(k)s over this period (sum of columns 11 and 12), at most $214 billion, or 26

percent, could have replaced DB contributions.

The second scenario assumes that the entire reduction in DB participation between 1984 and 1997 can be attributed to displacement caused by the introduction of the 401(k) plan. The assumed number of DB participants displaced in each year is presented in column 16. "Lost" contributions to DB plans are calculated as (16) x (7) or $85.7 billion, which is only 11 percent of all 401(k) contributions.

Appendix Table 2. Contributions of Current 401(k) Participants With & Without the 401(k) Program

Year	DB Plan Partici-pants	Partici-pants	% with DB Plan	401(k) Plans Number with DB	401(k) Plans Number Without DB	DB Contribution Without 401(k)	DB Contribution With 401(k)	401(k) Contribution Without DB	401(k) Contribution With DB
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
1984	30172	7579	0.824	6245	1334	1332	1640	2202	2411
1985	29024	10352	0.78	8075	2277	1350	1350	1866	2605
1986	28670	11573	0.753	8714	2859	1516	1382	2194	2841
1987	28432	13163	0.697	9175	3988	1287	1250	2312	2796
1988	28081	15424	0.678	10457	4967	1481	1279	2148	2775
1989	27304	18449	0.653	12047	6402	1385	1067	2176	2728
1990	26344	20366	0.618	12586	7780	1143	695	2082	2586
1991	25747	21130	0.582	12298	8832	1270	1018	2061	2700
1992	25362	24064	0.557	13404	10660	1355	1338	2188	2916
1993	25127	25576	0.529	13530	12046	1538	2333	2310	3075
1994	24615	27242	0.51	13893	13349	1576	1540	2315	3154
1995	23531	30803	0.469	14447	16356	1809	2094	2435	3417
1996	23262	33854	0.458	15505	18349	1886	1484	2638	3429
1997	22866	37716	0.424	15992	21724	1979	2247	2645	3615

	Total Pension Plan Contributions for Persons with a 401(k) Plan				Total Contributions if all 401(k) participants had a DB Plan Instead	Total Contributions w/o the 401(k) Plan, Assuming DB Displacement Equal to the Decline in DB Plans		
	Those with a DB Plan		Those Without a DB Plan (401k Con) tributions)	Tot Con-tributions for Persons With a 401(k)		DB Par-ticipants Displaced	Total DB Partici-pants Would Have Had	Total Contribu-tions to DB Plans
	DB Plan Contribu-tions	401(k) Contribu-tions						
	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)
1984	10242	15057	2937	28236	10095	0	6245	8318
1985	10901	21034	4250	36185	13975	1148	9223	12450
1986	12043	24758	6272	43073	17545	1502	10216	15488
1987	11468	25652	9221	46341	16941	1740	10915	14047
1988	13375	29019	10668	53062	22843	2091	12548	18584
1989	12854	32865	13930	59649	25552	2868	14915	20658
1990	8747	32548	16198	57493	23278	3828	16414	18761
1991	12519	33204	18203	63926	26835	4425	16723	21238
1992	17934	39085	23325	80344	32607	4810	18214	24679
1993	31565	41604	27827	100996	39336	5045	18575	28568
1994	21396	43820	30902	96118	42933	5557	19450	30654
1995	30251	49364	39828	119443	55723	6641	21088	38147
1996	23010	53167	48404	124581	63849	6910	22415	42275
1997	35933	57810	57461	151204	74640	7306	23298	46106
Total	252238	498987	309426	**1060651**	**466152**	**53871**	220239	**339973**

Table 1. Illustration of saving under DB and 401(k) plans.

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Age	Earnings	Saving / Earnings		Saving in Dollars		Saving as Increment to Wealth at Retirement		
		DB	401(k)	DB	401(k)	DB	401(k) To 65	401(k) T0 55
25	9229	0	0.1	0	923	0	28988	12245
30	13487	0	0.1	0	1349	0	27533	11630
34	17445	0.188	0.1	3276	1745	20015	25229	10657
35	18519	0.035	0.1	646	1852	3320	24571	10379
40	24430	0.060	0.1	1460	2443	4879	21066	8596
45	31288	0.099	0.1	3111	3129	6757	17535	7118
50	39102	0.162	0.1	6322	3910	8924	14243	5756
54	45987	0.235	0.1	10797	4778	3	11312	5013
55	47784	0.000	0.1	3	4961	-236	10774	4778
60	57091	-0.030	0.1	-1704	5709	-1704	8784	
64	64662	-0.066	0.1	-4256	6466	-4256	7048	
Average, ages 25-64		0.052	0.1	1599	3292	3439	18154	
Average, ages 25-54		0.077		2624		4998		
Total pension wealth:								
sum ages 25 to 64						137549	726171	
sum ages 25 to 54						154931		263356

Table 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	2507	2.61
1991	976	2694	2.76
1992	1110	2872	2.59
1993	1252	2996	2.39
1994	1315	3010	2.29
1995	1359	3115	2.29
1996	--	3371	1.69
1997	1784	3065	1.72

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

Table 3. 401(k) Plans: Percent with DB 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		
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.

Table 4. 401(k) Contribution and Participation Rate, by DB Coverage

	All 401k plans	With a DB plan	Without a DB Plan
		Contributions per Active Participant	
1990	2394	2586	2082
1991	2433	2700	2061
1992	2594	2916	2188
1993	2718	3075	2310
1994	2744	3154	2315
1995	2896	3417	2435
1996	3001	3429	2638
1997	3056	3615	2645
		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.

Table 5. 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

Table 6. HRS 1992 Reported 401(k) Contributor Data and Illustrative Inferred 401(k) Eligibility

DB Coverage	Reported in the HRS 401(k) Contributor			Inferred from External Sources 401(k) Eligible		
	Yes	No	All	Yes	No	
Number:						
DB	622	1699	2321	919	**1402**	2321
No DB	729	2376	3105	729	2376	3105
All	**1351**	4075	5426	1648	3778	5426
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%

Table 7. HRS Conditional Median Assets by 401(k) Eligibility Status (With Eligibility Determined by Our Random Assignment Method)

Asset Category and Eligibility Status	Income Interval					
	< $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	3069	3862	5614	8983	14672	33155
Ineligible	2897	3069	6310	6250	13966	23690
Difference	172	793	-697	2733	707	9466*
Retirement assets other than 401(k)						
Eligible	**18634**	**24539**	**40746**	**46996**	**83533**	**180000**
Ineligible	**15326**	**22738**	**37827**	**50338**	**73270**	**146859**
Difference	**3308**	**1801**	**2919**	**-3342**	**10263***	**33141***
Total retirement assets						
Eligible	**20701**	**34170**	**50492**	**60263**	**101524**	**240902**
Ineligible	**14580**	**22909**	**37862**	**50748**	**73814**	**145626**
Difference	**6120**	**11261***	**12631***	**9515**	**27709***	**95276***
Net housing equity						
Eligible	35135	37248	45641	42496	59043	83409
Ineligible	21596	32854	45233	48861	55350	79517
Difference	13539*	4393	409	-6365	3693	3891
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

Figure 1. Ratio of Private and Total Retirement Assets to Wage and Salary Earnings

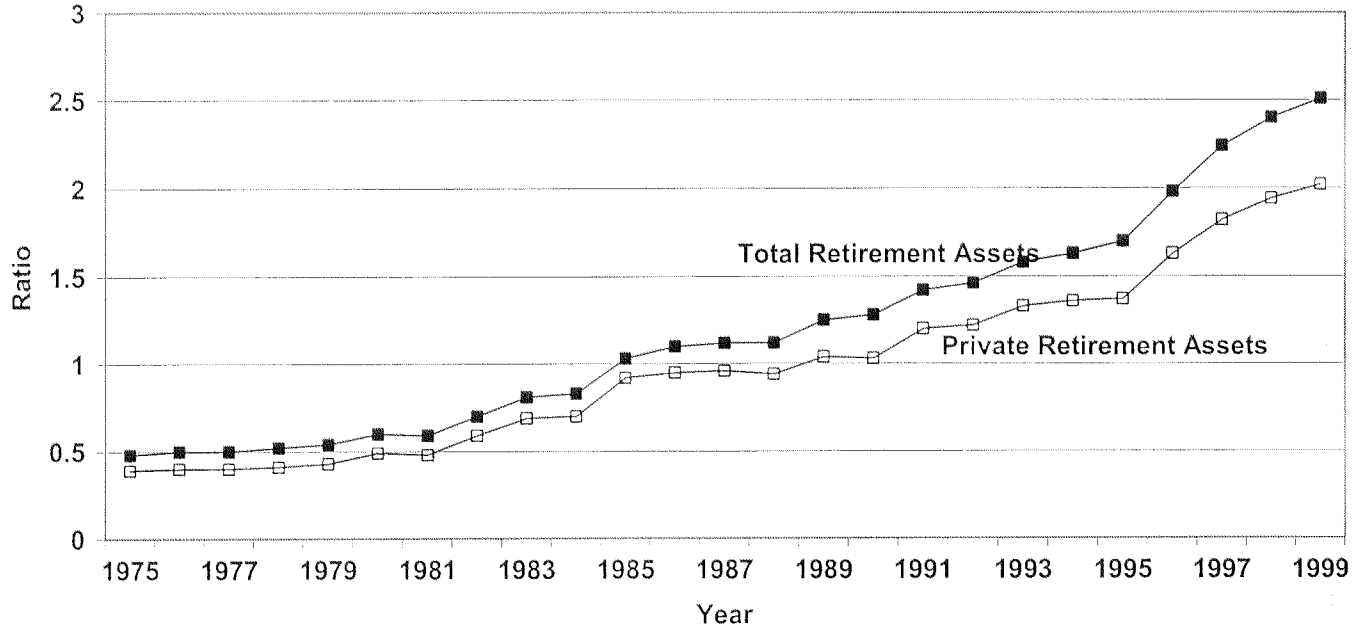


Figure 2. Private Retirement Assets

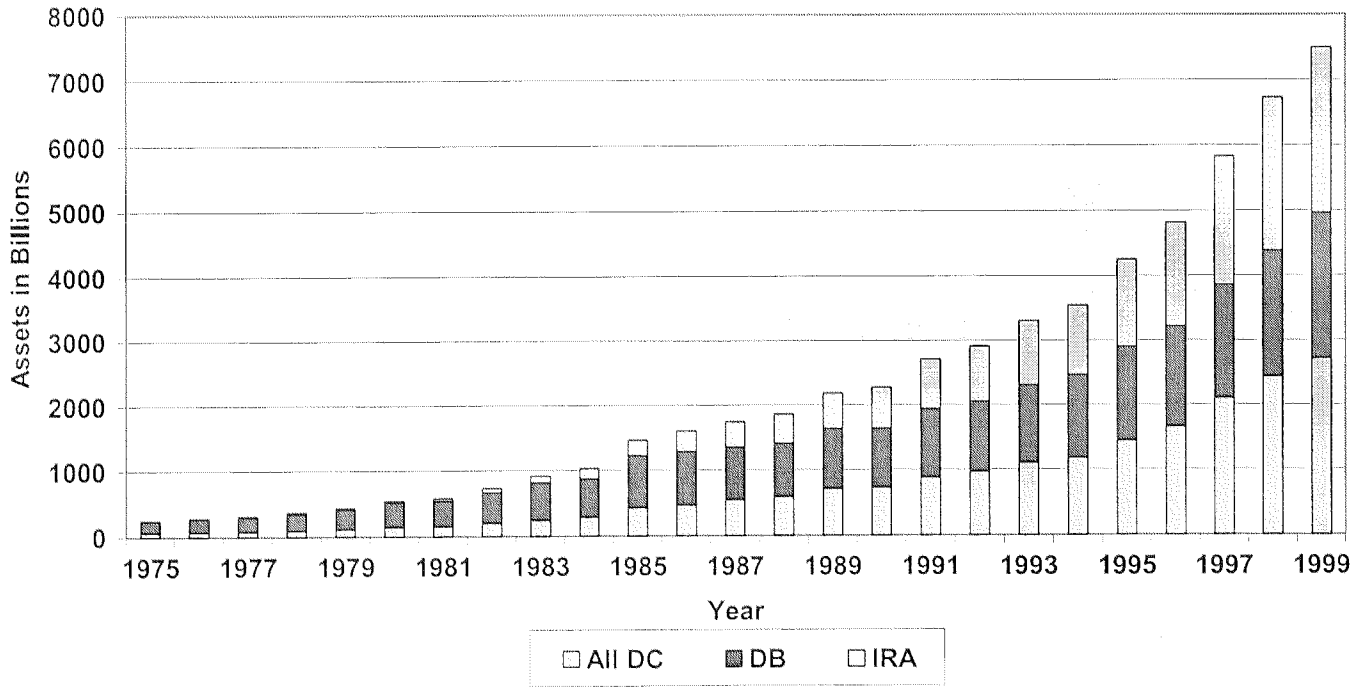


Figure 3. Public and Private Retirement Assets

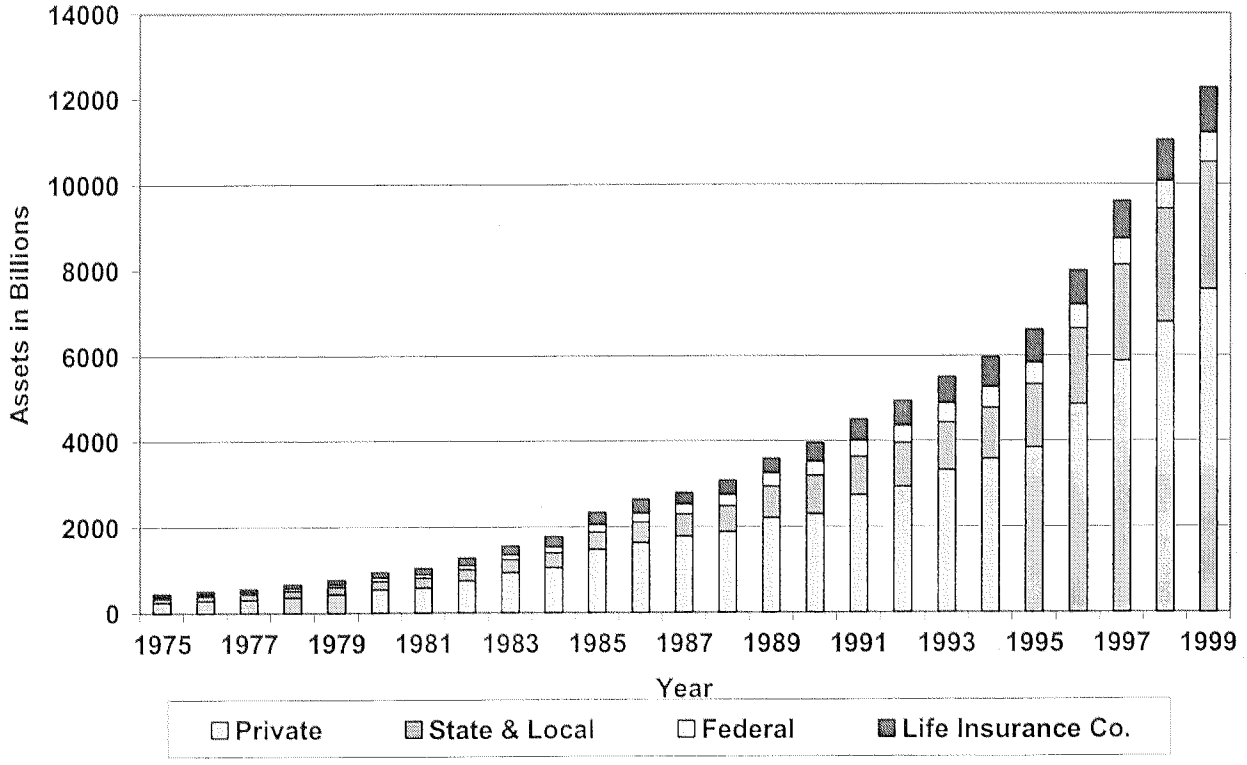


Figure 4. Ratio of Home Equity and Other Assets to Disposable Income

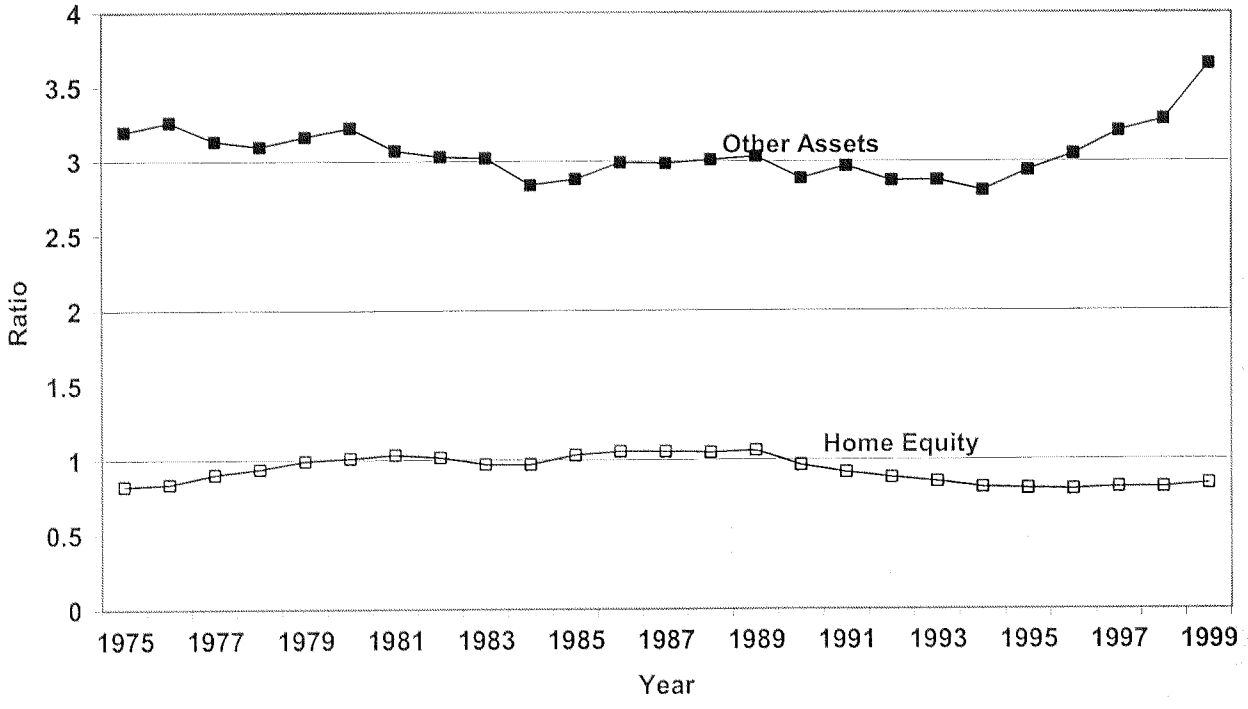


Figure 5a. Private Pension Contributions

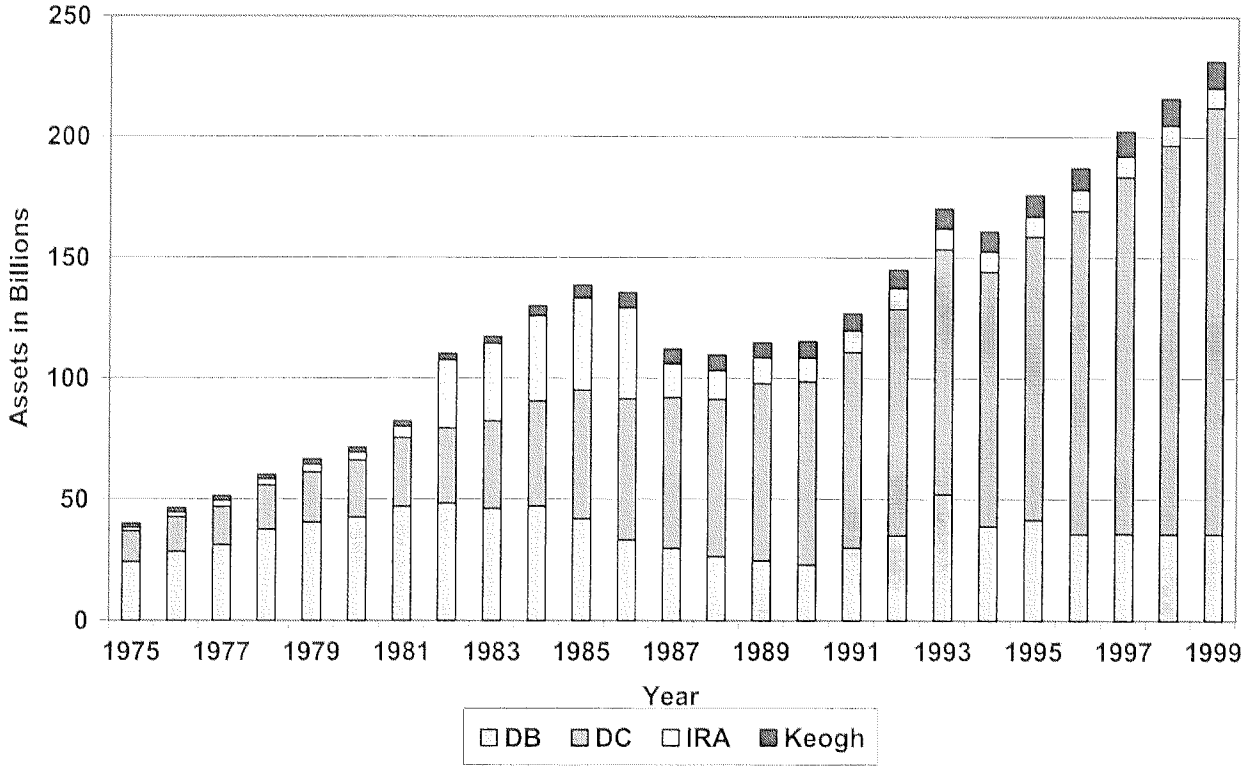


Figure 5b. All Pension Contributions

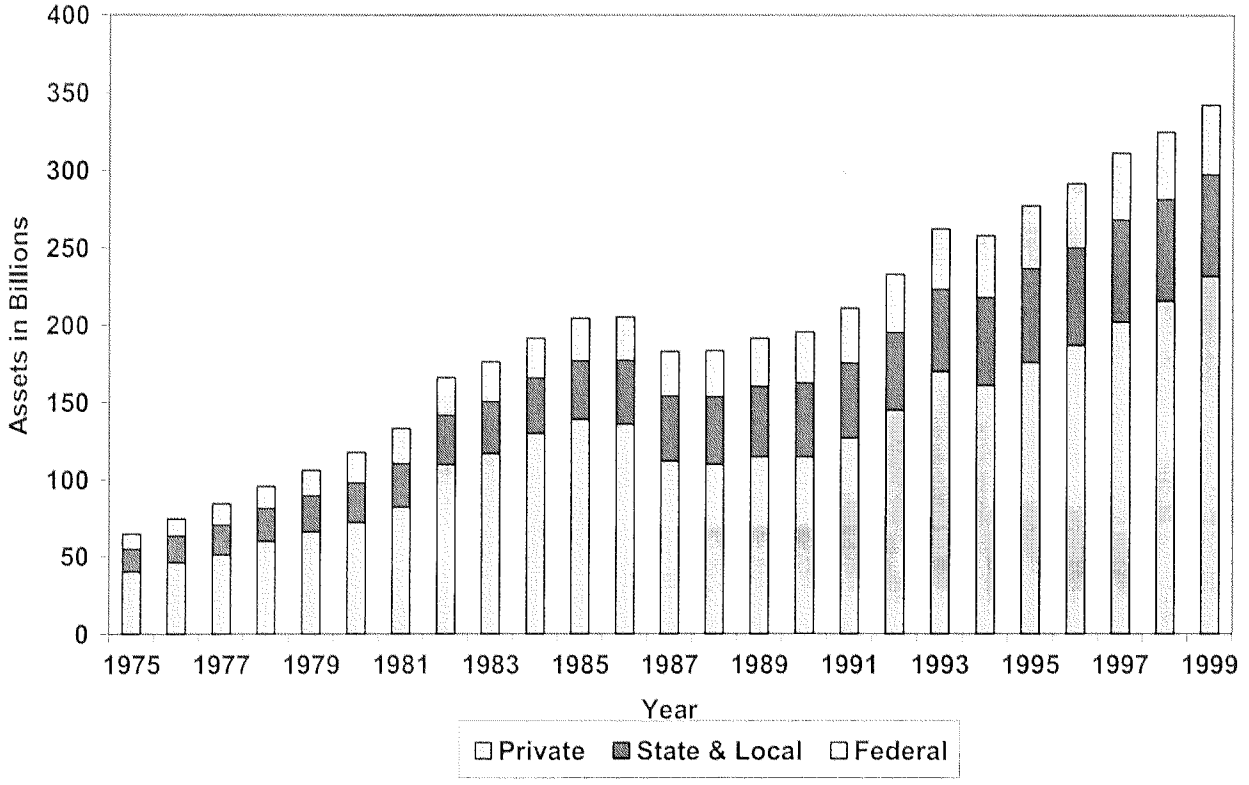


Figure 6. Ratio of Private and Total Pension Contributions to Disposable Income

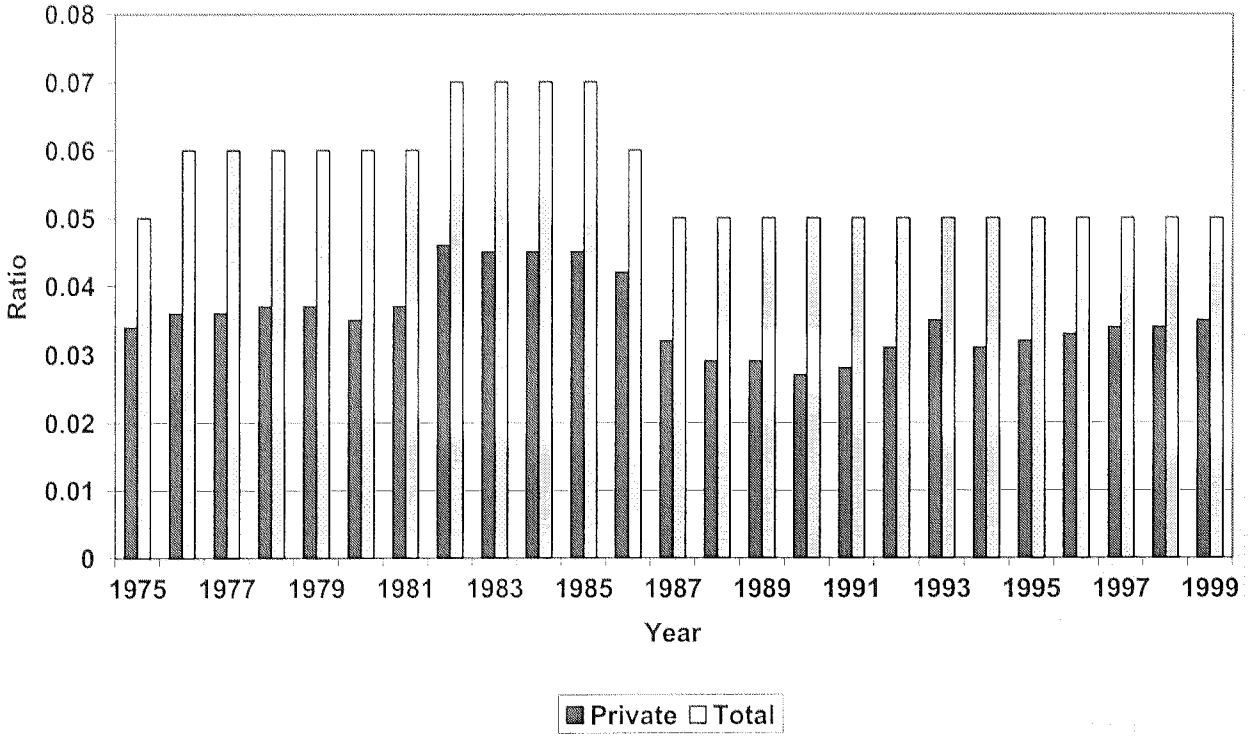


Figure 7. Active Participants in Private Pension Plans (with double counting)

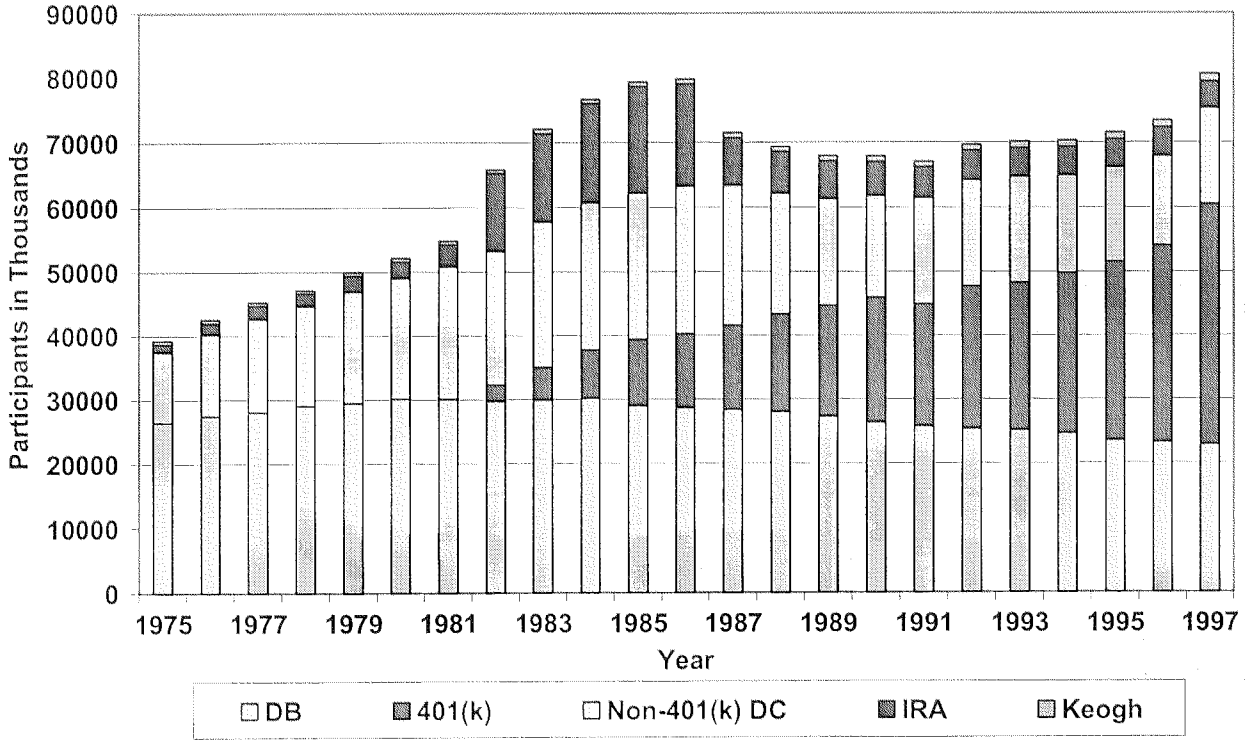


Figure 8a. Contributions per Active Participant DB, DC, and 401(k)

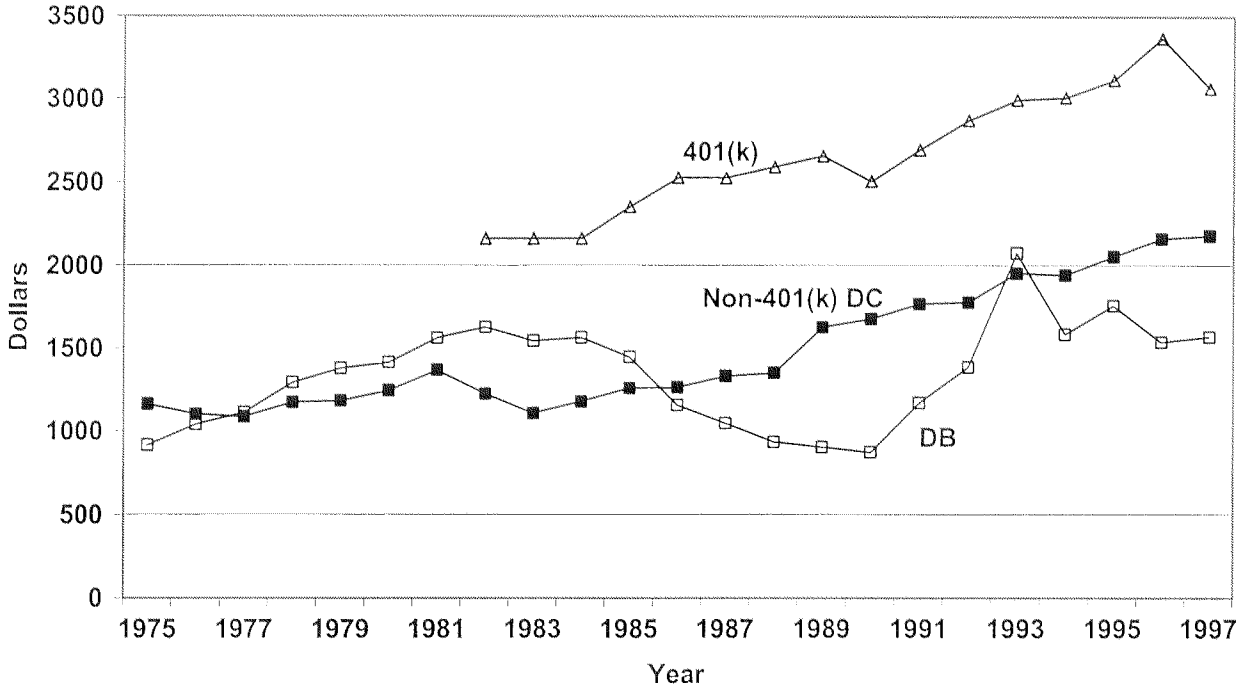


Figure 8b. Contributions per Active Participant IRA and 401(k)

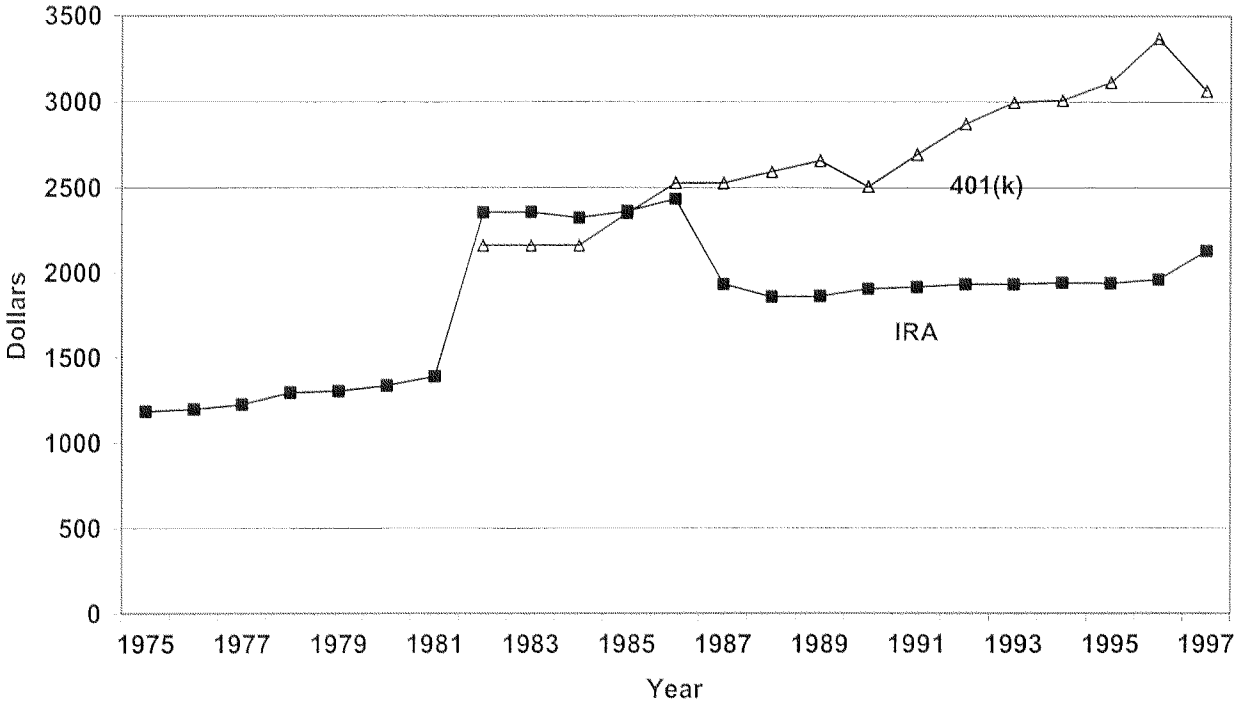


Figure 8c. Contributions per Active Participant
Keogh

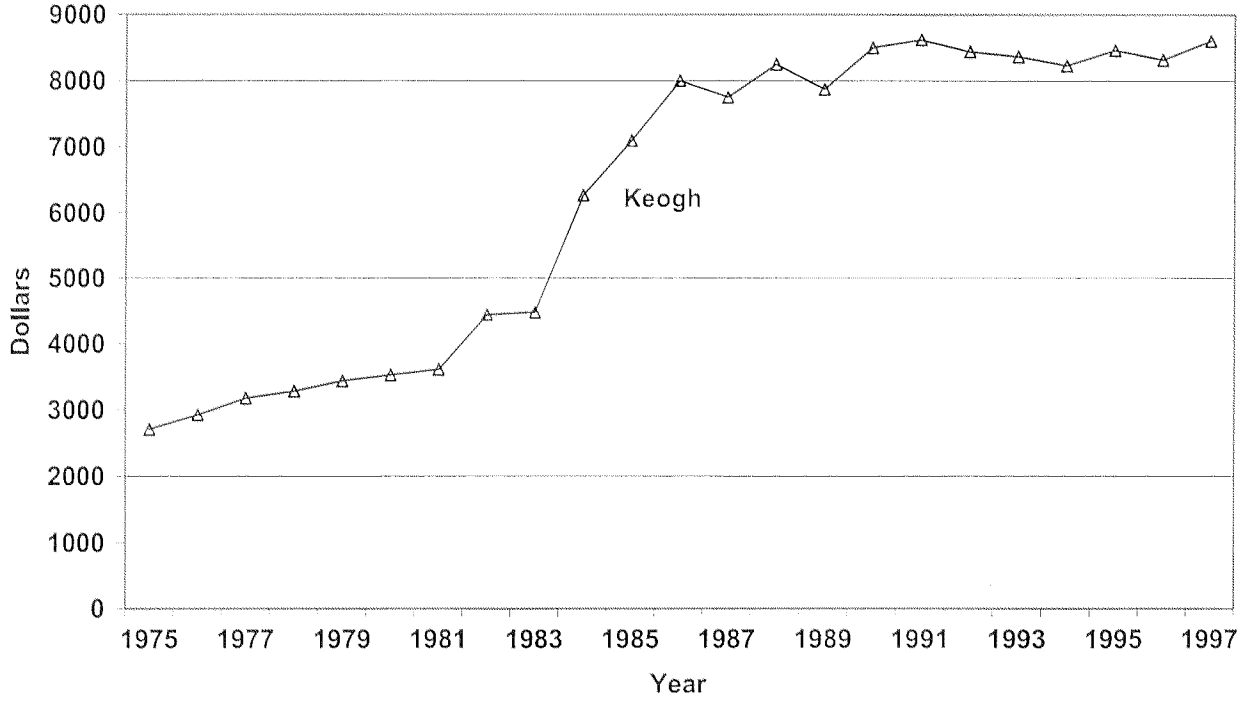


Figure 9. Participants and Contributions per Participant for All Plans

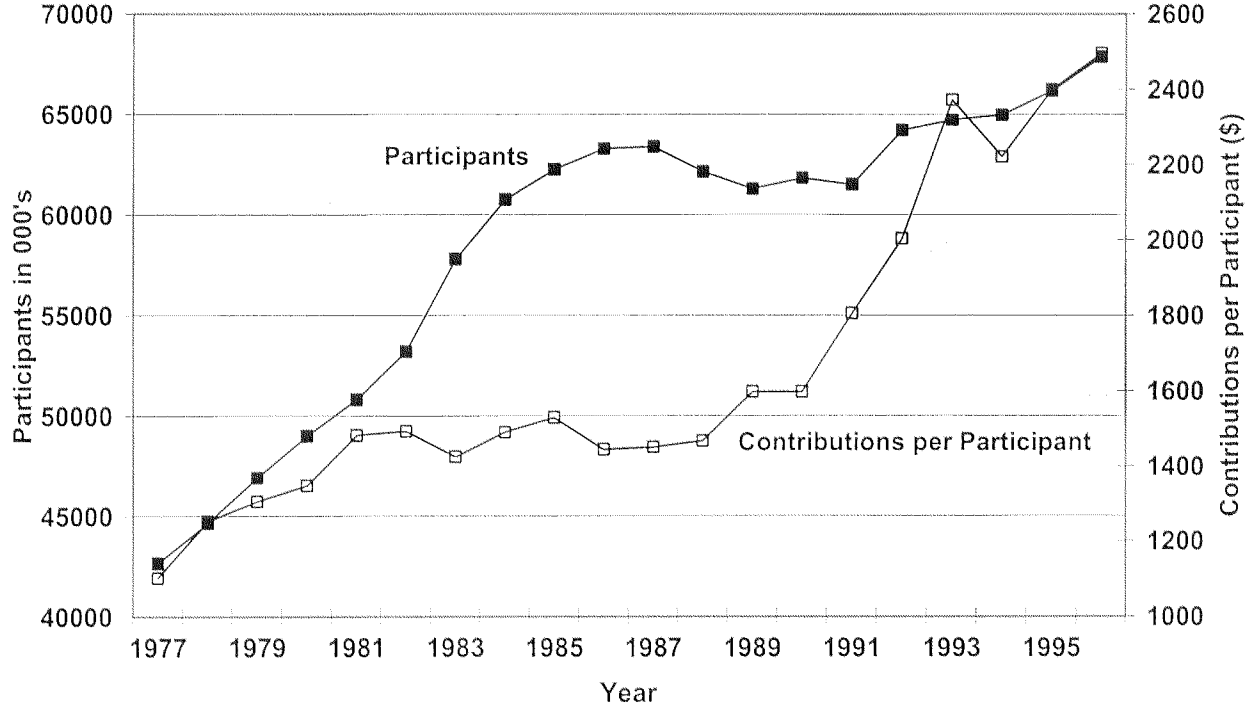


Figure 10. DB Contributions, Participants, and Contributions per Participant (Index: 1977=1)

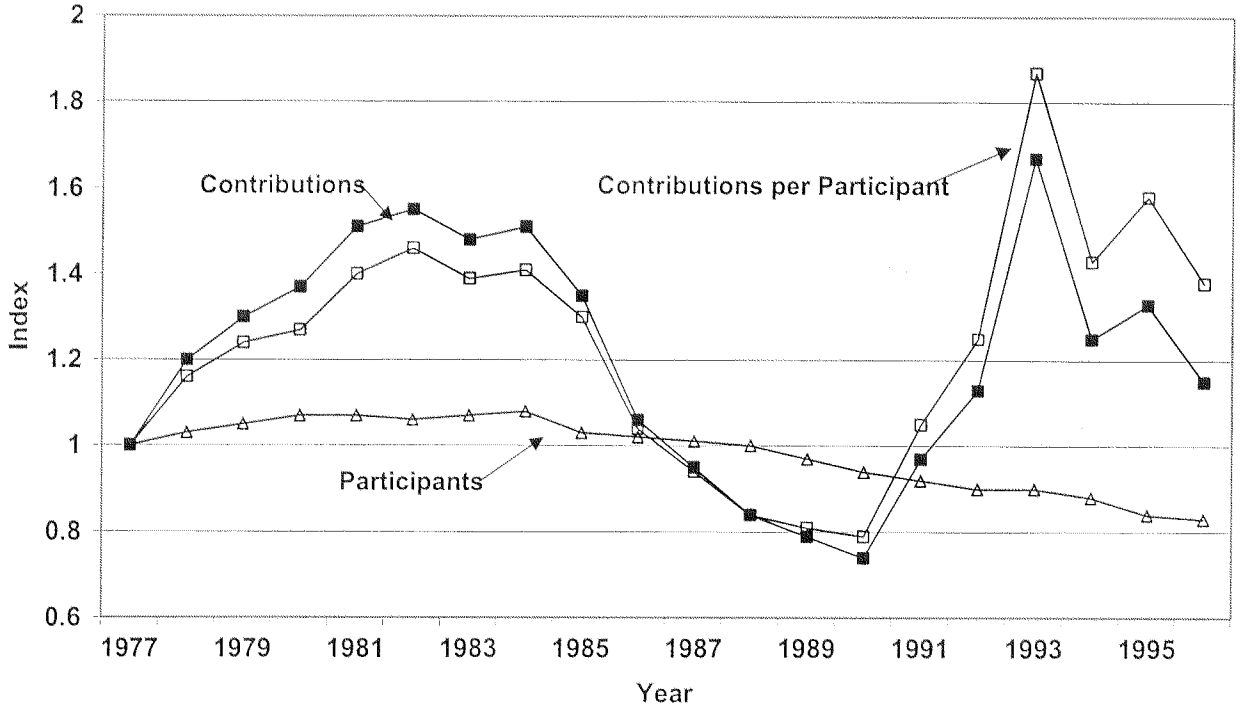


Figure 11. Contributions per Participant (Index: 1977=1)

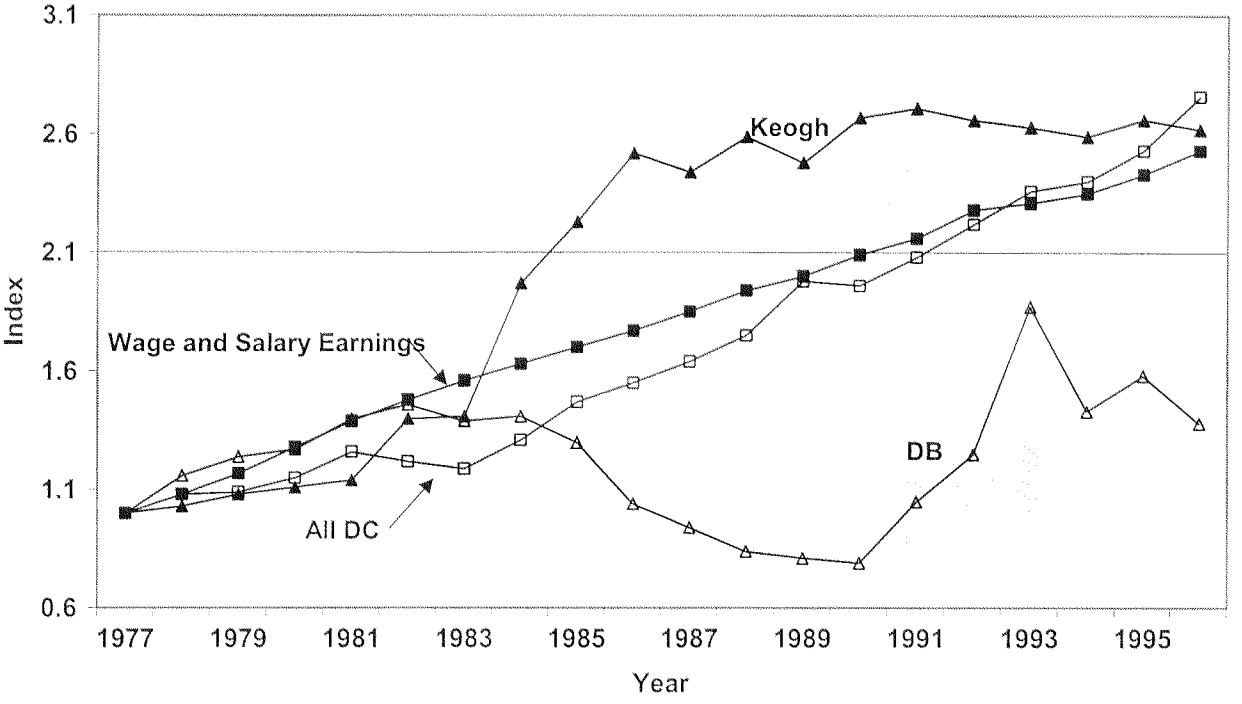


Figure 12a. Ratio of Private and Total Pension Contributions to Wage and Salary Earnings

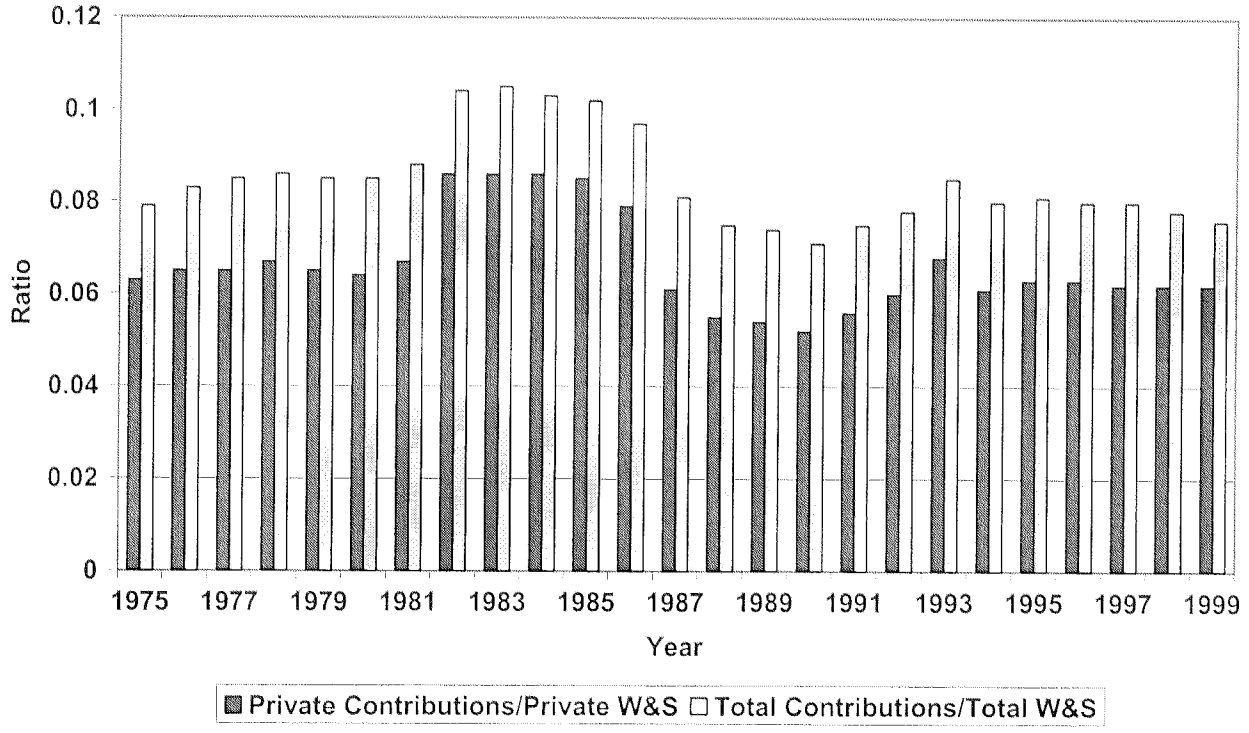


Figure 12b. Ratio of Private and DB Adjusted Pension Contributions to Wage and Salary Earnings

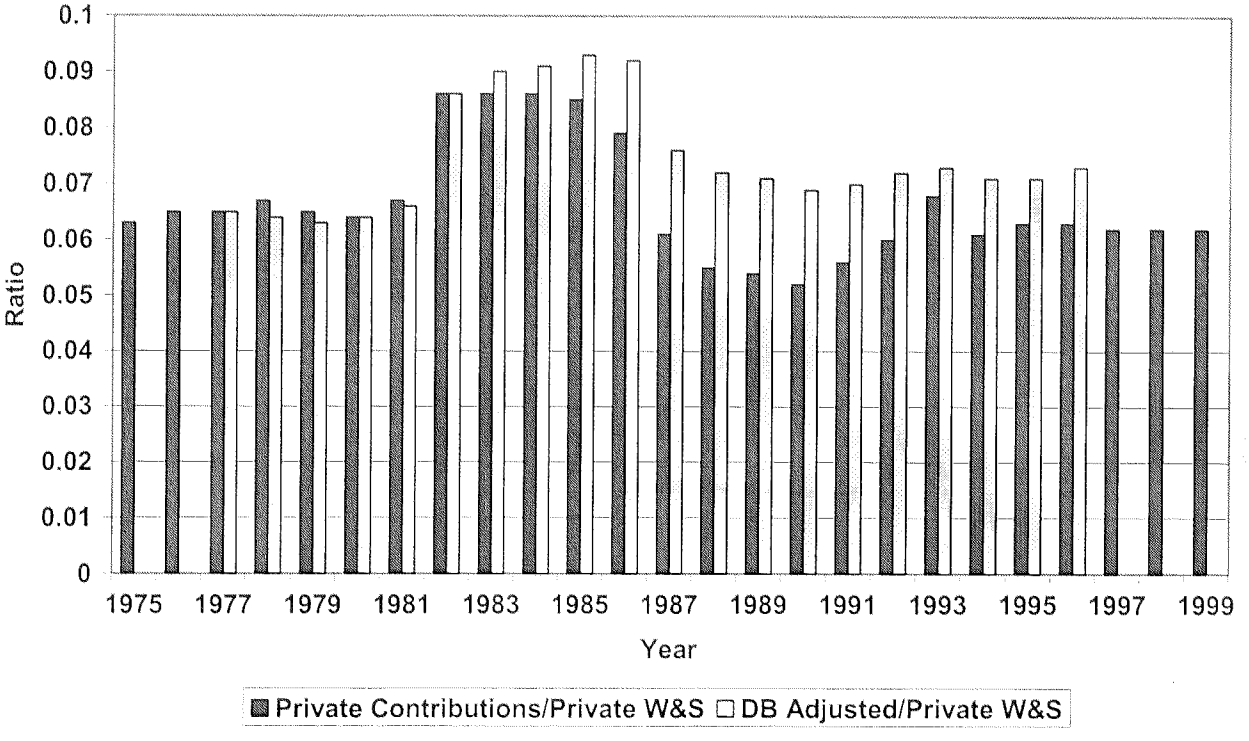


Figure 13. DB Contributions and Benefits

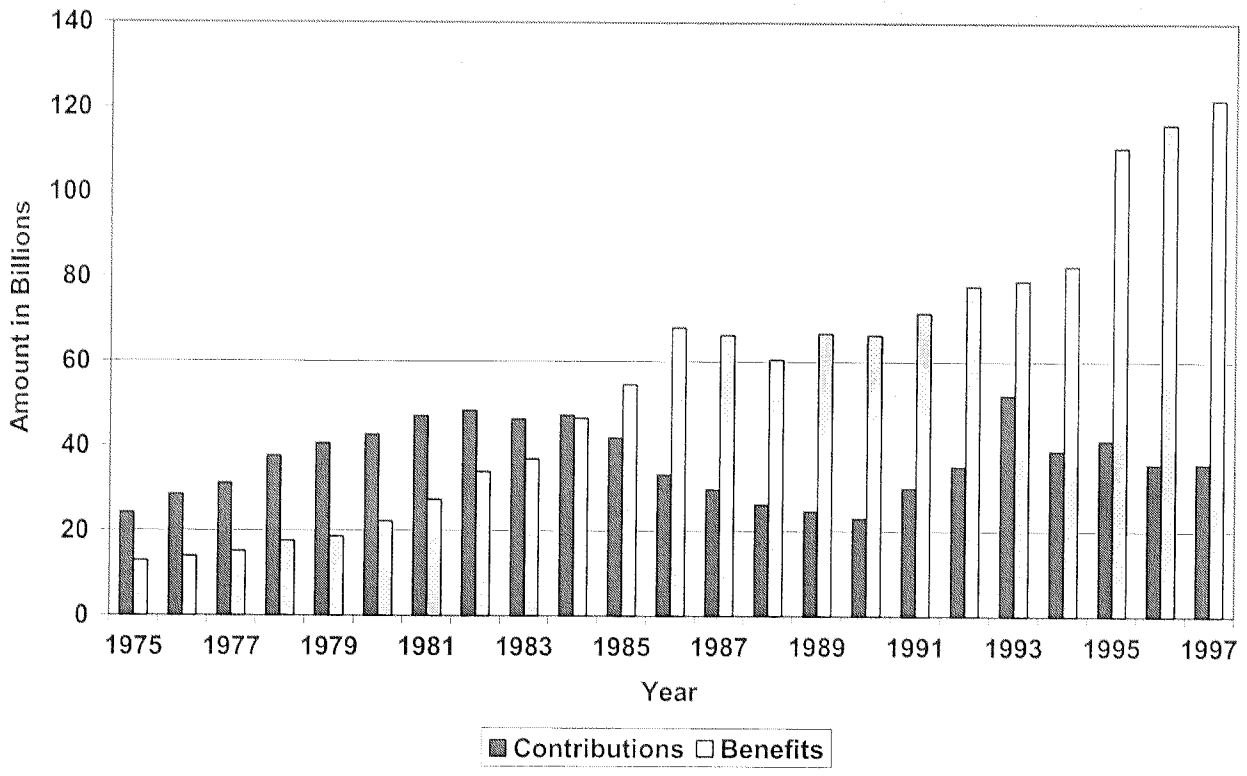


Figure 14. IRA Contributions and Benefits

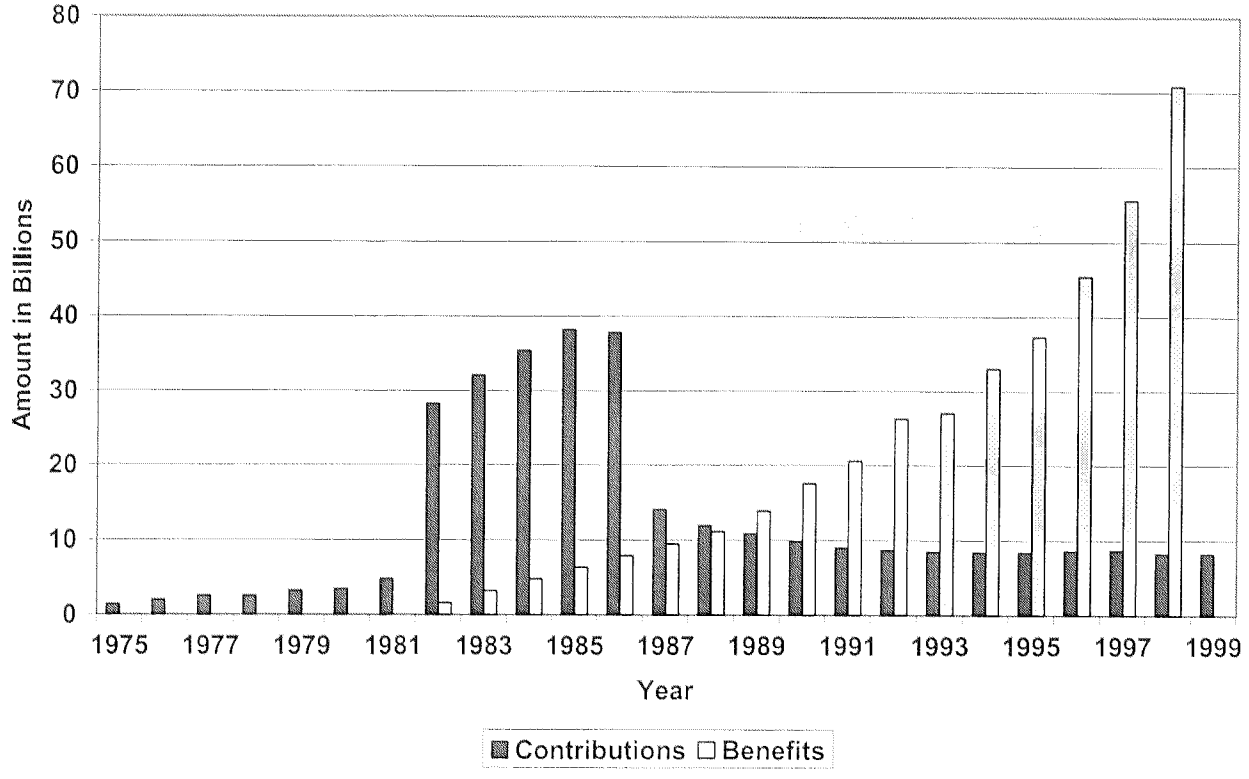


Figure 15. Ratio of Plan Participants to Private Wage and Salary Employment, with Double Counting

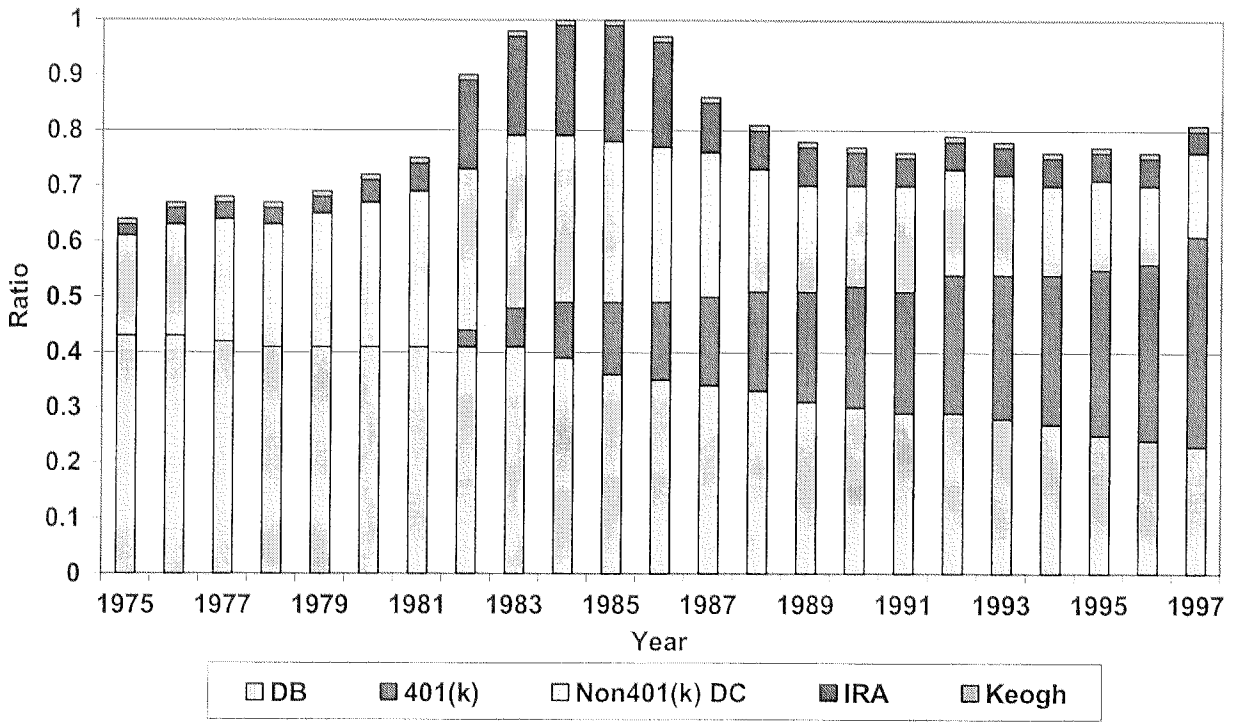
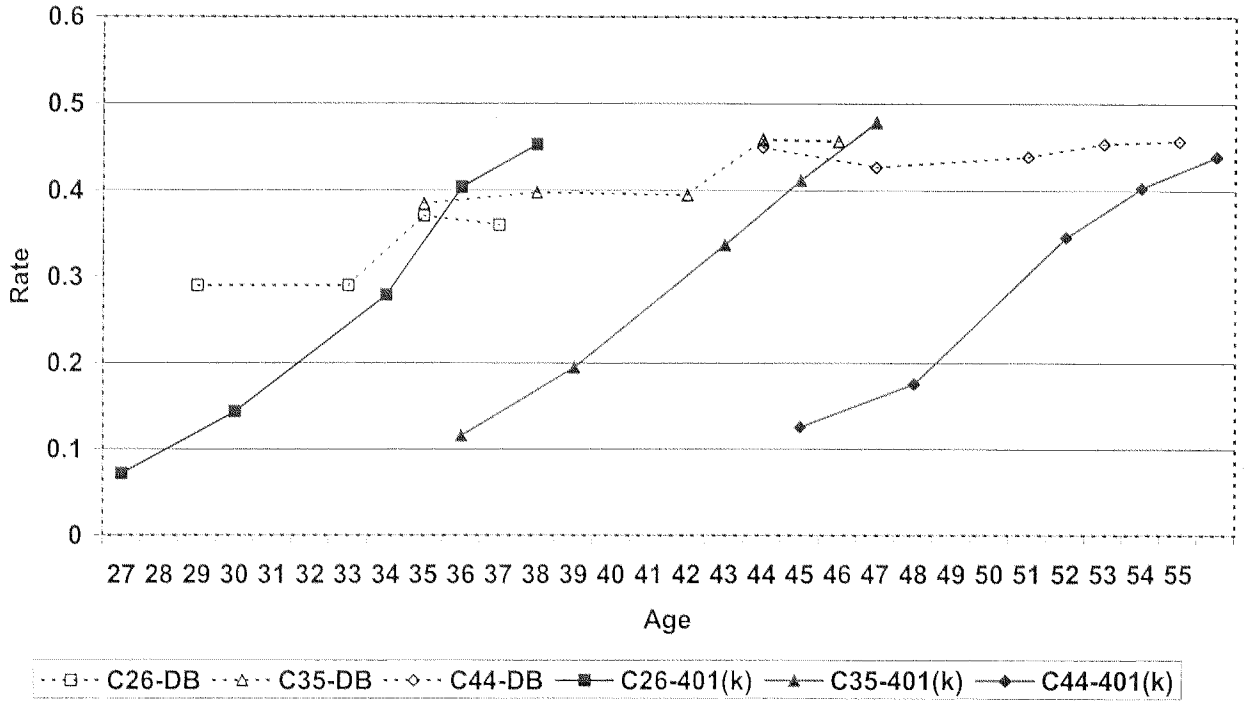
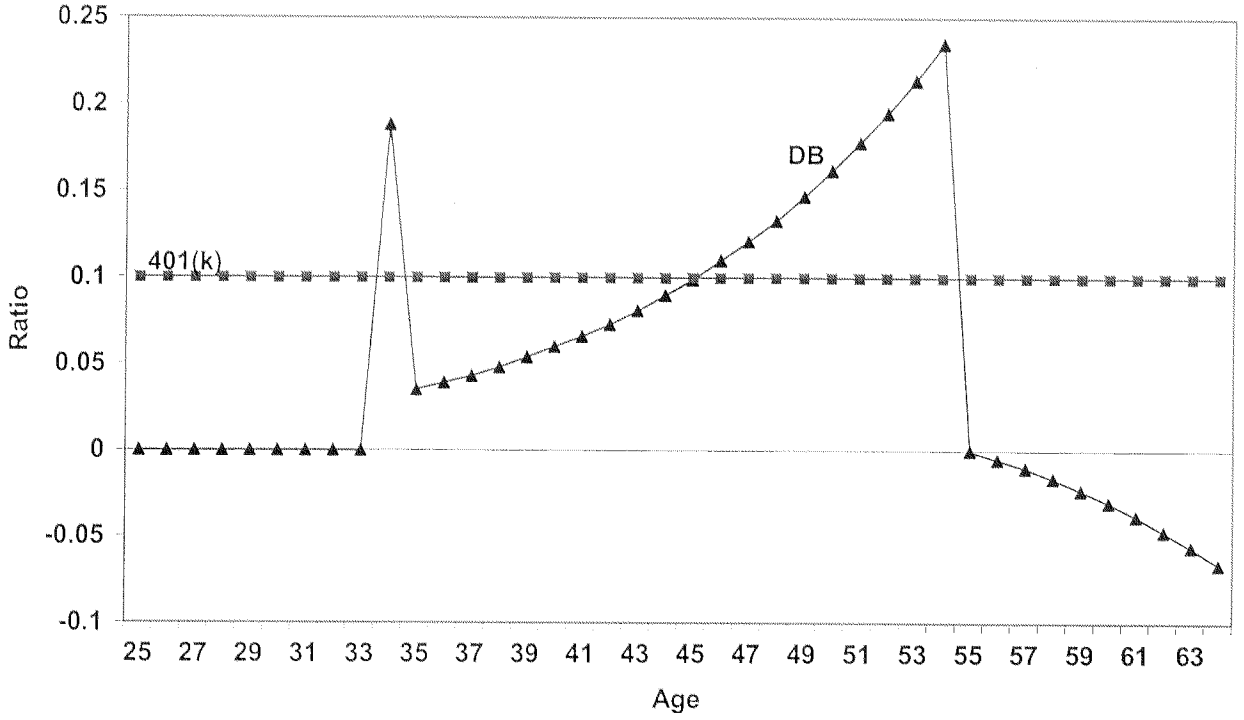


Figure 16. DB Participation and 401(k) Eligibility: Data for Three Cohorts



Appendix Figure 1. Ratio of DB and 401(k) Saving to Earnings



Appendix Figure 2. DB and 401(k) Saving Increment to Wealth at Retirement