

Preliminary

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**Pensions and Wealth:
New Evidence from the Health and Retirement Study***

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* Contact author: jkscholz@facstaff.wisc.edu, (608)262-5380. Portions of this analysis use HRS Preliminary Release data. The preliminary data from wave 4 has not been cleaned and may contain errors that will be corrected in the final Public Release version of the dataset. We are grateful to the Center on the Demography of Aging at the University of Wisconsin – Madison for financial support; to Bob Hauser for his encouragement; Bill Gale and seminar participants at Stanford and UCLA for comments; and to the professionals who developed the Health and Retirement Study.

American households' pension arrangements have changed sharply over the past 25 years. In 1975, 70.8 percent of the 38.4 million active participants in pensions were in defined benefit (DB) plans, where pension benefits typically depend on length of service and compensation patterns, but have little to do with the investment returns of pension assets. By 1995 only 35.5 percent of the 66.2 million active participants were in DB plans.¹ The rest were in defined contribution (DC) plans, where the size of the pension benefit depends directly on the investment performance of the assets held in the pension. In roughly 85 percent of these DC plans, workers control investment choices, given a specific set of employer-designated options (Mitchell, 2000).

At least since Cagen (1965) and Katona (1965), economists have been interested in the effects of pensions on household saving and consumption.² Four high-quality empirical studies in the mid 1980s (King and Dicks-Mireaux, 1982; Diamond and Hausman, 1984; Dicks-Mireaux and King, 1984; and Hubbard, 1986) examined the relationship between pension and non-pension wealth and each found similar results. Pension wealth was found to “offset” non-pension wealth by anywhere from 10 to 50 cents per dollar of pension wealth, with most estimates in the lower part of this range. Social security wealth was found to offset non-pension wealth by 17 to 40 cents per dollar.³ The studies typically regress non-pension wealth on some empirical measure of lifetime or permanent income, other demographic

¹From “Private Pension Plan Bulletin,” Abstract of 1995, Form 5500, Annual Reports, Spring 1999, Pension and Welfare Benefits Administration, Office of Policy and Research, Department of Labor, http://www.dol.gov/dol/pwba/public/programs/opr/bullet1995/e_8.htm.

²Appendix 1 provides a brief survey of selected early papers on this topic.

³Bernheim (1987) estimated large social security offsets, implying a reduction of \$0.77 in non-pension wealth for every dollar of social security wealth.

characteristics and pension wealth.

At least two concerns arise with the earlier pensions literature. First, the data used for the studies are at least 20 years old and with the pronounced shift to defined contribution pensions, the pension landscape has changed strikingly.

Second, the earlier papers take as their starting point that the life-cycle hypothesis implies that pensions should offset non-pension wealth dollar-for-dollar. The underlying thought experiment is to fix lifetime resources, and then imagine reallocating one dollar of earnings (in present value) from a young age to an old age via a pension. Since lifetime resources are unaffected, consumption is unaffected. But with one less dollar of income when young and unchanged consumption, net worth will be one dollar lower. It is an interesting empirical question whether we observe dollar-for-dollar offsets. Families may be credit constrained, which could prevent them from borrowing against pension wealth. Pensions may hasten retirement decisions, causing people save more than they otherwise would during their (shorter) working life. Pensions may insure against uncertain lifespans, leading people to save less than they otherwise would. Or people may deviate from life-cycle behavior in other ways.

Gale (1998) emphasizes the fact (it was also mentioned by Bernheim, 1987) that by fixing lifetime earnings (or permanent income), the thought experiment underlying earlier work is not the one that, under the life-cycle model with no uncertainty and perfect credit markets, would lead to dollar-for-dollar offsets. Since those with larger pensions, holding lifetime earnings constant, have greater lifetime resources, they will both consume and save more than those with smaller pensions. Hence, one should expect to see pension offsets, but they will be

less than dollar-for-dollar even if the simple life-cycle model holds perfectly.

Recent work if anything broadens the range of pension offset estimates in the literature. Gale finds, using the 1983 Survey of Consumer Finances, larger offsets than what is common in the literature, sometimes equaling negative one depending on the sample specification and the estimation procedures. In contrast, Gustman and Steinmeier (1999a) use the 1992 cross-section of the Health and Retirement Study (HRS) and conclude “We find that pensions displace only a fraction of other savings, or that there is no displacement at all” (p. 275). Reconciling past work on pensions and wealth accumulation is a goal of this paper.

Enhancing understanding of the effects of pensions on household saving would help resolve several central policy issues. First, the budgetary cost of the net exclusion of pension contributions and earnings from employer plans is estimated to be \$88.8 billion in 2000 (FY2001 Budget). This tax expenditure is designed to increase private and national saving and enhance retirement income security. If people fully substitute pension and financial wealth, however, the pension tax expenditure will not increase private saving. The revenue loss from the tax expenditure could *lower* national (the sum of public and private) saving, and do nothing more than provide a large incentive for employers to offer compensation in the form of pensions, which in turn disproportionately benefits high-wage workers and their employers (since the probability of pension coverage increases with earnings). Alternatively, if there is little offset, pension subsidies may be a cost-effective way to increase private and national saving.

Second, there is considerable concern in the popular press about the retirement income

preparation of the baby boomers.⁴ Engen, Gale and Uccello (1999) and Gustman and Steinmeier (1999a) find that most Americans appear to be saving adequately for retirement, while Moore and Mitchell (1998) and Bernheim (1997) suggest they are not. Regardless of how one interprets the existing evidence, if current trends in 401(k) contributions are projected forward, baby boomers will have a considerable amount of DC pension wealth (Poterba, Venti and Wise, 1998). Of course, if families offset increases in DC pension wealth with reductions in non-pension net worth, the sharp upward trend in 401(k) wealth tells us little about the adequacy of retirement saving. Alternatively, if there is little offset, the explosion in DC pension wealth may ensure adequate retirement resources for most families.⁵

Third, the relationship between pensions and saving provides a good test of the lifecycle model. Pension wealth is substantial and retirement is a major life event. Moreover, pensions bear directly on the fundamental premise of the life-cycle model, that families equate the

⁴See for example, “Binge Buyers: Many Baby Boomer Save Little, May Run Into Trouble Later On: They Don’t Build Nest Eggs Nearly Rapidly Enough for an Easy Retirement,” Bernard Wysocki Jr., 6/5/95, A1, Wall Street Journal. The story reads, “A long time ago, New England was known for its thrifty Yankees. But that was before the baby boomers came along. These days, many New Englanders in their 30s and 40s, and indeed their counterparts all over America, have a different style: they are spending heavily and have sunk knee-deep in debt. ... A recent study sponsored by Merrill Lynch & Co. showed that the average middle-aged American had about \$2,600 in net financial assets. Another survey by the financial-services giant showed that boomers earning \$100,000 will need \$653,000 in today’s dollars by age 65 to retire in comfort – but were saving only 31 percent of the amount needed. In other words, saving rate will have to triple. Experts say the failure to build a nest egg will come to haunt the baby boomers, forcing them to drastically lower standards of living in their later years or to work for longer, perhaps into their ‘70s. ‘I guess I believe the dire predictions,’ says Alan Auerbach, an economist and retirement-savings expert at the University of California at Berkeley. The future may be even worse than generally predicted, he adds, if Social Security benefits are cut or taxes are raised to fund the huge army of retirees in early 21st century.”

⁵The absence of offset might be worrisome in a bear market. The shift from DB to DC pensions has led to workers bearing greater investment risk, both through market fluctuations and by directing investment allocations, than was previously the case. The same retirement wealth “bonus” that workers with DC pensions might receive in rising markets with passive behavior could become a retirement wealth deficit in flat or declining markets.

marginal utility of consumption across periods. The degree to which the life-cycle model adequately represents behavior, in turn, has major implications for the efficacy of policy initiatives like IRAs, 401(k)s and social security reform that are intended to enhance the well-being of families.

In this paper we take a new look at the relationship between pensions and household wealth accumulation. To anchor intuition about the effects that pensions have on non-pension net worth, we work with a simple three-period life-cycle model. The framework highlights some of the concerns we have with existing cross-sectional studies, and guides our subsequent empirical work. We then describe our sample from the Health and Retirement Study (HRS) and briefly compare our sample to other HRS-based work. Our empirical work focuses on the relationship between the non-pension net worth of families in 1992 and DC, DB and social security wealth.

We are the first study to estimate the relationship between pension and non-pension wealth accounting fully for lifetime (past and future) resources. Like Gustman and Steinmeier (1999a) and others, we find no evidence of significant pension offsets at the median of the net worth distribution. As we describe in the analytic framework section, however, estimates are difficult to interpret when there is a mixture of credit constrained and unconstrained households in the sample. When we estimate quantile regressions with a sample of college graduates, we find large offsets for DB pension and social security wealth in the higher quantiles of the wealth distribution.

I. Analytic Framework

We motivate our empirical approach with a very simple life-cycle consumption framework. Assume consumers live three periods, face no uncertainty and receive exogenous labor and pension income. Households wish to

$$\max_{C_0, C_1, C_2} V_j(W_j) = U(C_j) + \mathbf{b} \{V_{j+1}(W_{j+1})\}, \quad st.$$

$$(1) \quad Y_j = C_j + S_j$$

$$(2a) \quad W_0 = Y_0$$

$$(2b) \quad W_1 = Y_1 + RS_0$$

$$(2c) \quad W_2 = P + R^2S_0 + RS_1$$

$$(2d) \quad W_3 = 0$$

$$(3) \quad RS_0 + S_1 \geq 0$$

where C is consumption, S is saving, \mathbf{b} is the rate of time preference, R is the gross rate of return, Y is income, P is pension wealth, equations (1) are the per period budget constraints, and equations (2a) to (2d) describe the evolution of available resources for consumption. Equation (3) is a borrowing constraint that, when operative, prevents households from borrowing against pension wealth. With concave, well-behaved preferences and interior solutions (where $C_i > 0$) and no credit constraints, optimal consumption choices satisfy

$$u'(C_0) = \mathbf{b} R u'(C_1) = (\mathbf{b} R)^2 u'(C_2).$$

To make the following discussion transparent, assume $\mathbf{b} = R = 1$. Then,

$$C_0 = C_1 = C_2 = \frac{Y_0 + Y_1 + P}{3} \quad .^6 \text{ Non-pension wealth at the end of period 0, (which equals}$$

S_0), is

$$(4) \quad S_0 = Y_0 - C_0 = \frac{2}{3}(Y_0 + Y_1 + P) - Y_1 - P, \text{ or}$$

$$(5) \quad S_0 = Y_0 - C_0 = \frac{2}{3}Y_0 - \frac{1}{3}Y_1 - \frac{1}{3}P.$$

Equations (4) and (5) represent alternative functional forms that can be used to estimate the relationship between non-pension and pension wealth. They highlight in a simple way several issues that arise in cross-sectional work on pensions and wealth. First, most pensions and saving papers “test” the null hypothesis that pension wealth displaces non-pension wealth dollar-for-dollar. The underlying rationale for this test is clear in equation (4). Consider two identical households that differ only in the timing of their income. One has \$1 less Y_0 and \$1 more P than the other. With identical lifetime resources, consumption is equal for the two people in every period, so the person with \$1 larger P will have \$1 smaller S_0 . So it will appear that pensions offset nonpension wealth dollar-for-dollar. But this result requires

⁶With constant relative risk aversion preferences, $C_0 = \frac{\left(Y_0 + \frac{Y_1}{R} + \frac{P}{R^2}\right) R^2}{R^2 + R(Rb)^{\frac{1}{g}} + (Rb)^{\frac{2}{g}}}$, where g is

the coefficient of relative risk aversion (the reciprocal of the intertemporal substitution elasticity).

analysts to control for lifetime resources (the *sum* of lifetime earnings, pension and social security wealth) *and* separate terms for all future income (including pensions, social security and human capital), since the conceptual experiment that is considered in these tests is *reallocating* lifetime resources between current (or past) earnings and future pensions.⁷ No previous studies have estimates this specification.

Second, Gale (1998) emphasizes the fact that previous cross-sectional work does not typically condition on lifetime (past and future) resources, but rather conditions on some measure of total earnings to date or an empirical measure of “permanent” income. Equation (5), where Y_0 reflects resources earned to date, reflects the most common earlier approach.

In equation (5), $\frac{\partial S_0}{\partial P} = -\frac{1}{3}$ rather than -1, so pensions do not offset non-pension wealth

dollar-for-dollar despite the fact that the estimating equation comes from the life-cycle model that is thought to imply dollar-for-dollar pension offsets.

Gale (1998) proposes (and implements) a way to make results of empirical models like equation (5) interpretable. He suggests that if studies of pension and non-pension wealth only condition on lifetime earnings to date (Y_0), analysts should adjust future pension and human capital wealth by a factor, Q , that reflects the incremental present discounted value of

⁷Pensions can still positively affect wealth in richer models where credit constraints prevent households from borrowing against future wealth (Hubbard, 1986), and where pensions induce earlier retirement (Feldstein, 1974; Samwick, 1998). Pensions may reduce wealth by providing annuities that insure against uncertain life spans (Hubbard, 1987). The thought experiment also requires households to have identical rates of time preference, risk aversion and interest rates.

consumption that the pension would have induced at the time a person is observed in the data. In this simple case, pension wealth would be divided by 3 (meaning that under the given assumptions, households should increase period 0 consumption by one-third the value of the period 2 pension).⁸ After adjusting pension wealth in equation (5) by the appropriate scaling factor, the offset coefficient will again equal -1.0 in the life-cycle model.

To summarize, there are two approaches adopted in sensible cross-sectional empirical models that examine the effects of pensions on saving. The first, following the empirical approach described in equation (4), is to condition on lifetime wealth (earnings as well as social security and pension wealth), future human capital, and pension wealth in regressions seeking to explain non-pension wealth. The pension and future human capital variables then proxy for the timing of lifetime resource receipt, so, all else being equal, a family with greater pension resources will have back-loaded lifetime resources and thus should have fewer nonpension resources. Alternatively, Gale (1998) suggests conditioning on earnings to date and then adjusting pension wealth and future human capital by a factor proportional to the present discounted value of induced consumption at the observed age.

Gale implements the equation (5) approach using data from the 1983 Survey of Consumer Finances. Nobody has estimated the specific specification suggested by equation (4). Both approaches are very demanding on the data – the second particularly so since it depends on knowledge of interest rates, time preference and risk aversion and many families are covered

⁸Gale (1998) derives a general expression for Q in a continuous time model with no uncertainty and constant relative risk aversion preferences. We derive similar expressions in our discrete time framework in Appendix 2. We use this expression from Appendix 2 in our empirical work.

by several pensions over their lifetimes.⁹

Neither approach yields interpretable estimates when there is a mixture of credit constrained and unconstrained households in the population. When the credit constraint binds,

$C_0 = C_1 = \frac{Y_0 + Y_1}{2} \leq C_2 = P$. Then period 0 wealth is

$$(6) \quad S_0 = Y_0 - C_0 = \frac{1}{2}(Y_0 + Y_1 + P) - Y_1 - \frac{1}{2}P, \text{ or}$$

$$(7) \quad S_0 = Y_0 - C_0 = \frac{1}{2}Y_0 - \frac{1}{2}Y_1.$$

In this case, changes in pension wealth do not affect consumption in periods 0 and 1, so the true offset under these assumptions is zero. Hence, the approach embodied in (7) appears more appealing (Gale characterizes it as being more robust in cases where the offset is not dollar-for-dollar). Of course, equation (6) is also true (it is derived directly from the model),

so the effect of pensions on wealth under this approach, $\frac{dS_0}{dP}$, is equal to the *sum* of the

coefficients on lifetime resources and pensions.

⁹Heterogeneity is also clearly important. If workers with low discount rates are attracted to jobs offering pensions, inferences about the effects of pensions on non-pension wealth using comparisons of workers with and without pensions could understate the effect of pensions on non-pension wealth.

Surprisingly, if there is a *mixture* of credit constrained and unconstrained households in the population, \mathbf{g} in the alternative models $S_0 = \mathbf{a}(Y_0 + Y_1 + P) + \mathbf{b}Y_1 + \mathbf{g}P$ and $S_0 = \mathbf{a}Y_0 + \mathbf{b}QY_1 + \mathbf{g}QP$ is *not* bounded by 0 and -1.¹⁰ Consequently, our empirical approach (and the empirical approach in all previous work) will only yield unbiased estimates for populations that are homogeneous (after conditioning on observable characteristics) with respect to their pension offset.

II. Data and Descriptive Evidence

We primarily use data from the first wave of the HRS, collected in 1992. Income questions elicit information from calendar year 1991, while asset and liability questions refer to the time of the survey, in 1992. There has been a considerable amount of data description and discussion of the HRS in other sources, so our description will be fairly brief.¹¹

The HRS is a national panel study with an initial sample (in 1992) of 12,652 persons and 7,607 households. It oversamples blacks, Hispanics and residents of Florida. The baseline 1992 study consisted of in-home, face-to-face interviews of the 1931-1941 birth cohort, and their spouses, if married. Follow-up interviews were given by telephone in 1994, 1996 and

¹⁰ For example, the first regression specification in this paragraph yields a \mathbf{g} coefficient of -2.6 if there are three people in the population, where the first is unconstrained with (Y_1, Y_2, P) of (100,80,120) and the other two are constrained with (100,90,110) and (100,80,110). The second regression yields a \mathbf{g} coefficient of -2.0 if there are three people in the population, where the first two are unconstrained with (120,90,120) and (120,60,150) and the third is constrained with (120,60,120). It is easy to construct much more extreme examples.

¹¹ An overview of the HRS is given in a Supplementary issue of the *Journal of Human Resources*, 1995 (volume 30). There, 22 authors discuss and assess the data quality of many dimensions of the initial wave of the HRS. Subsequently careful work with the HRS related to this paper includes Gustman, Mitchell, Samwick and Steinmeier (1998), Moore and Mitchell (1998), Gustman and Steinmeier (1999a) and Gustman and Steinmeier (1999b).

1998. Wave 4 of the HRS (from 1998) is preliminary.

The survey covers a wide range of topics, including batteries of questions on health and cognitive conditions and status; retirement plans and perspectives; attitudes, preferences, expectations and subjective probabilities; family structure and transfers; employment status and job history; job demands and requirements; disability; demographic background; housing; income and net worth; and health insurance and pension plans. Selected specific details of our data construction work are given in Appendix 3.

For the purpose of this study, pension and wealth data are particularly important. We indirectly have access to specific details of the pension plans covering selected HRS respondents through the “Pension Present Value Database” that Bob Peticolis and Tom Steinmeier have kindly made available on the HRS Web Site.¹² The program makes present value calculations of HRS pensions for wave 1 respondents for nine different scenarios, corresponding to the Social Security Administration’s low, intermediate and high long-term projections for interest rates, wage growth rates and inflation rates. For our study, we use the intermediate values for underlying assumptions with the Peticolis-Steinmeier DB pension wealth calculations.¹³

Following others in the literature (for example, Engen, Gale and Uccello, 1999, page 159), we do not use the Peticolis-Steinmeier calculations for valuing DC pensions. Gustman and Steinmeier (1999b) document discrepancies between reported and calculated pension

¹²See <http://www.umich.edu/~hrswww/center/rescont2.html>.

¹³The intermediate Social Security Administration assumptions are 6.3 percent for interest rates, 5 percent for wage growth, and 4 percent for inflation.

values, showing the mean accumulations reported by respondents are only 69 percent of the amounts calculated by using pension documents. It might seem that there is no *a priori* reason to choose between self-reports of DC pension wealth or calculations made on the basis of detailed plan documents. In this case, however, we view the self-reports to be more useful than the calculated values for two reasons. First, one could argue that it is people's perception of their DC wealth that will influence life-cycle consumption behavior. Second and more importantly, the pension calculation program assumes a constant contribution rate over time for participants of plans with voluntary contributions. If workers alter their contribution patterns (in particular, begin to increase contributions as they approach retirement and/or have children that leave the household), the calculated amounts will be overstated. Indeed, Gustman and Steinmeier (1999b) present evidence consistent with DC pension contributions increasing with age. Because of this, we use self-reported information to calculate DC pension wealth.¹⁴

To construct lifetime human capital, we use self-reported data on current and retrospective earnings to estimate separate fixed-effects log earnings regressions for men and women by two education groups (less than college graduate, and more than college graduate).¹⁵

We developed a simple social security simulation to calculate social security benefits for the respondent and spouse or, if higher, the couple, based on the imputed earnings histories.

¹⁴After documenting the problem, Gustman and Steinmeier (1999b) raise concerns about respondent misreporting, so they use the plan documents for DC wealth, adjusted downwards based on a regression analysis of self-reported and calculated pension wealth. This leads them to reduce the calculated DC pension amounts by roughly half for a calculated pension of \$25,000 and almost two-thirds for a calculated pension of \$100,000.

¹⁵Details of the calculation are in Appendix 3. We plan to eventually use the restricted Social Security earnings records. Gustman and Steinmeier (1999b) show, however, that one can generate reasonably accurate estimates of earnings and social security benefits using core data from the HRS.

When doing a similar exercise, Gustman and Steinmeier (1999b) found they overestimated average indexed yearly earnings by about 6.6 percent when comparing them to the actual Social Security data, overestimating male earnings by about 3.5 percent and female earnings by about 23 percent. The larger discrepancy for women presumably reflects the fact that women are more likely than men to move in and out of the labor market. The correlation between earnings and the true social security reports was 0.82. Gustman and Steinmeier found they overstated social security *benefits* by 0.8 percent for men and 13.6 percent for women when they used imputed earnings histories based on the retrospective earnings information that we use. The correlation of computed and actual benefits was 0.81.

Table 1 reports means, medians, and standard deviations for selected variables in the 1992 cross-section making use of the HRS household weights.¹⁶ The income numbers are similar to the values presented in Table 1 of Gustman, Mitchell, Samwick and Steinmeier (1998). Our labor income measure is larger than the Gustman *et al.* earnings category, because we include pension and social security benefits if they are being received. Our mean capital measure is \$1,800 smaller than the Gustman *et al.* “asset income” measure. Overall, our weighted mean total income figure of \$44,845 is somewhat smaller than the Gustman *et al.* figure of \$48,203, but their figures include imputations for health insurance, pension and social security accruals (rather than actual receipts, which we include), so the aggregate figures are close. The asset values in Table 1 also are very similar to Gustman, Mitchell, Samwick and Steinmeier (1998, Table 3). Mean pension wealth of \$140,653 exceeds the \$116,012 figure

¹⁶Weights do not make a large difference in the sample statistics, though the unweighted totals are slightly lower due to the over-sampling of blacks and Hispanics.

of Gustman, Mitchell, Samwick and Steinmeier (1998) and the \$124,991 figure in Gustman and Steinmeier (1999a).

There are large differences between our estimates of lifetime earnings and social security wealth and estimates reported in Gustman and Steinmeier (1999a). We have not yet been able to explain these differences. Our estimate of household lifetime earnings (a mean of \$1,931,183 and median of \$1,636,528) is much higher than the mean estimate of \$1,273,960 in Gustman and Steinmeier (Table 6). Our number is not obviously implausible, as median family income in 1998 was \$46,737 and families will typically have 40 or more years of earnings.¹⁷ Rust (1999) in a comment to Gustman and Steinmeier (1999a) also notes that the expected discounted stream of future wage earnings is excluded from their analysis, while we assume people continue working to their expected retirement age in a manner consistent with the assumptions of the Peticolis-Steinmeier pension calculator. Not surprisingly, with significantly higher lifetime earnings, we also have significantly larger household social security wealth than what is reported by Gustman and Steinmeier (\$187,258 relative to \$141,675).

Table 2 shows the fraction of the population covered by a DC pension (only), a DB pension (only), and both types of pensions, and conditional on pension coverage, the mean and median pension values. Figures are given for the full population and by percentiles of lifetime earnings. Four features stand out. First, pension coverage is widespread (except in the lowest lifetime income quantile) and conditional on having a pension, the dollar amounts are large.

¹⁷Median family income comes from the 2000 Economic Report of the President, table B-31.

Second, conditioning on lifetime income (recall that the sample is relatively homogeneous in age), the value of pensions for those who have both types is roughly twice that of the value of pensions for those who hold only DB pensions, while the value of pensions for those with only DB pensions is, in turn, generally significantly larger than the value of pensions with those who hold only DC pensions. Third, with a few exceptions, conditional pension wealth increases monotonically with income. Fourth, medians are always smaller than means, reflecting the well-known skewness of wealth data.

Table 3 shows mean and median non-pension net worth for those without pensions, for those with DC pensions (only), for those with DB pensions (only), and for those with both pension types. The table provides mixed evidence on the potential degree to which pensions offset net worth. Those without pensions (outside the bottom quintile of the lifetime earnings distribution) generally have larger non-pension net worth than families with DB pensions and both types of pensions. This result is consistent with the possibility that pension wealth causes families to accumulate less non-pension net worth. At the same time, the net worth of families with only DB pensions and both types of pensions are broadly similar. Because the value of pensions for families with both types is significantly larger than the value of pensions for those with only DBs, the similarity of non-pension net worth between the two groups is consistent with pensions having little effect on non-pension wealth accumulation.

III. Regression Analysis

The previous analysis is suggestive, but more structured empirical work is needed to make even tentative conclusions about the relationship between pensions and household wealth.

Recent Work on Pensions and Wealth

Gale (1998) provides a thorough discussion of pensions and saving. His empirical work is based on the 1983 Survey of Consumer Finances (SCF) and consists of median and “robust” regressions of non-pension financial assets and non-pension net worth on a variety of household characteristics including age, education, current income and adjusted pension and social security wealth.¹⁸ His results show two features of the data that are consistent across many specifications and the two estimation approaches. First, measures of offset are larger when net worth (excluding pensions) is the dependent variable than when financial assets is the dependent variable. Second, adjusting pension wealth to equal the expected present discounted value of induced consumption increases the size of the estimated offset.

Gale is explicit about the potential empirical shortcomings of his paper. The SCF sample is fairly small, totaling 638 of the original 4,262 SCF observations after restricting it to households with a full-time worker between the ages 40 and 64 and dropping those who are self-employed or farmers, those who did not answer a question about their expected retirement date, and those whose pension and social security data were missing. The 1983 SCF also has only a single observation on income, so lifetime cash earnings must be accounted for by proxy variables like age, education, current income and the interaction of age and education. To the extent these variables fail to adequately account for lifetime cash earnings, estimates may be biased. The imputations of pension and social security wealth in the SCF also incorporate a good deal of uncertainty. The social security calculations, in

¹⁸See StataCorp (1999) for a description of the Stata robust regression procedure.

particular, rely on CPS-based cross-sectional wage regressions to construct imputed earnings histories. Uncertainty associated with the imputations may account for the fact that the apparent offset of social security wealth in Gale (1998) is considerably smaller than pension wealth.

Gustman and Steinmeier (1999a) use the first wave of the HRS to examine the relationship between pensions and wealth.¹⁹ They examine a broad range of specifications, examining net worth, net worth in logs, and the ratio of net worth to lifetime earnings. They present coefficients reflecting the effects of pension wealth using mean, median and robust regression, split between the full sample and households in the bottom and top half of the earnings distribution. They condition on a lengthy set of covariates.²⁰ Across specifications there is little evidence of pension wealth offsets, which leads the authors to conclude “that pensions cause very limited displacement of other wealth, if any.”

We have three specific concerns with Gustman and Steinmeier (1999a) that make the pension offset portion of their study somewhat difficult to compare to Gale’s work. First, they exclusively use pension data drawn from the employer-provided pension formulas (they use a hot deck imputation procedure to fill in missing values). As noted above and in Gustman and Steinmeier (1999b), this is likely to result in accurate pension estimates for DB plans but will overstate DC pension wealth (also see footnote 14). Spuriously overstating DC pension

¹⁹Their paper also includes a thorough discussion of wealth holdings in the HRS and presents useful calculations of saving adequacy.

²⁰Their specifications include measures of lifetime earnings, male’s share of earnings, age, retirement horizon, veteran’s status, health, single male, single female, manufacturing, public employment, management, professional, white collar, self-employment, unionization status and firm size, race, children present, child in college, and educational attainment.

wealth will tend to bias pension offset coefficients toward zero. Second, as mentioned by Rust (1999), the human capital wealth measure included in the Gustman and Steinmeier analysis excludes the expected discounted stream of future earnings. If those with large amounts of future human capital have little pension wealth and little non-pension net worth, the analysis may spuriously find little wealth offset of pensions. Third, while the study conditions on the present discounted value of cash-wage receipts, the analysis is still subject to the concerns raised by Gale (1998). To uncover the offset between pension and non-pension wealth when conditioning only on cash earnings, pension and social security wealth should be adjusted to equal the expected present discounted value of induced consumption. We address this concern by adopting the alternative approach, of conditioning on the *sum* of lifetime human capital, pension and social security wealth, as well as including future earnings and pension and social security wealth as separate covariates.

In addition to addressing the concerns mentioned above, ours is the first study (we believe) that examines the potential differences that may arise in the effects of DB and DC pensions.

Empirical Results

Tables 4, 5 and 6 summarize our empirical specification and sensitivity analysis. Table 4 presents quantile (50th, 70th and 90th) regression estimates for our baseline specification.²¹ For the baseline specification, we select a sample of households with at least a college education. We do this for two reasons. First, as shown in footnote 10, the pension parameter

²¹All quantile regression standard errors reported in the paper are bootstrapped.

estimates are uninterpretable when there is a mixture of credit constrained and unconstrained households. Selecting a sample of college graduates should minimize the number of credit constrained households in the sample. Second, Bernheim and Scholz (1993a) show that the wealth accumulation of college graduates comes much closer to matching the predictions of the life-cycle model than does the wealth accumulation of households with less education.

Quantile regression is particularly useful in this application.²² Sixty percent of the total sample has some pension benefits, but the total lifetime value of benefits for the median person in the pension distribution (including zeros) is roughly \$32,000. This is a small fraction of lifetime resources. Given the strong assumptions needed to calculate components of lifetime resources, it is asking a lot of the data to detect the effect of shifting a small fraction of lifetime resources from early to late in life. In addition, the distribution of net worth is skewed. The 90-10 ratio of lifetime earnings is 8.2. The 90-10 ratio of net worth is 1,358. If we are interested in the effectiveness of the pension tax expenditure in promoting national saving, we need to understand behavior toward the top of the wealth distribution (assuming the benefits of the tax expenditure are positively related to the size of the pension). Moreover, high net worth households presumably have the financial sophistication and wherewithal to equate intertemporally the marginal utility of consumption. Hence, it makes sense to examine the implications of the life-cycle model by focusing on high net worth households.

All regressions focus on the variation in net worth across households. A focus on narrow

²²See Buchinsky (1998) for more discussion of quantile regression.

asset measures (such as financial assets), could miss, for example, families with large pensions maintaining consumption standards by holding greater property-backed debt than families with equivalent lifetime resources but smaller pensions. Gale (1998) shows that it is important to focus on broader wealth measures in an empirical study of pensions and wealth.

We use a standard set of covariates common to empirical studies of household saving. It is clear that net worth should increase with age for households in our sample (most respondents are 51 to 61 years old in 1992). Preferences may vary by education level, so we include dummy variables reflecting the educational attainment of respondents. Several studies have documented differences in wealth accumulation across different ethnic groups, so we include indicator variables for black and Hispanic families. Finally, we include indicator variables for couples, for at least one family member being in “fair or poor” health, and for families where at least one person is currently in the labor market.

The covariates of primary interest for the empirical model are defined contribution pension wealth; defined benefit pension wealth; social security wealth; future human capital wealth; and total lifetime wealth, which is defined as the discounted sum of real lifetime earnings, defined benefit pension wealth, defined contribution pension wealth and social security wealth. Conditioning on total lifetime wealth, the pension, social security and future human capital variables capture differences across households in the timing of the receipt of lifetime wealth.

As expected in Table 4, net worth increases with age (except at the median), education (the omitted category is post-graduate education), and for being married. Net worth is smaller

for black and Hispanic families and families where at least one member is in poor or fair health. Only the race and ethnicity indicator variables are consistently significant at usual levels across quantiles. Moving up quantiles, net worth is 11.7 percent of lifetime resources at the median, 20.4 percent at the 70th percentile, and 42.6 percent at the 90th percentile.

All four of the terms reflecting future wealth – human capital, DB, DC and social security – are negative in each specification. The future human capital and DC terms are imprecisely estimated, but with one exception (human capital in the median regression), we cannot rule out the possibility that there is *no* offset. At the 50th and 70th quantiles, we can, with a high degree of confidence, rule out the possibility there is complete offset (a coefficient of -1) of future human wealth and DC wealth.

Focusing on DB pensions and social security wealth, it is clear in the median regression that there is not *complete* offset, though we can rule out no offset at a better than 1 percent level of confidence for DB wealth and at 9 percent level of confidence for social security wealth. At the 70th and 90th quantiles we find large offsets of \$0.44 to \$2.64. Three of the four estimates equal or exceed -1 in the usual confidence interval.

Table 5 summarizes the OLS estimates from a set of specifications with identical covariates to Table 4. Analysts rarely use OLS regression in studies of wealth accumulation because of the skewness of the wealth distribution and concerns that data outliers will inappropriately influence the analysis. We share these concerns, but to a surprising (at least to us) degree, the same qualitative conclusions appear in both the mean and quantile regressions.

OLS estimates for college graduates in the baseline model show modest offsets for DC

wealth and large (by the standards of the literature) offsets for DB and SS wealth. The SS wealth coefficient includes -1 in the normal confidence interval. Estimates are consistently positive for social security wealth for the lower education group. We again emphasize that if there is a mixture of credit constrained and unconstrained households in the population, the resulting parameter estimates do not equal a weighted average of the two effects.

Consequently, we think the estimates for the low education groups are difficult, if not impossible, to interpret.

The alternative specifications focus on several aspects of model specification. In the first, we estimate models similar to the most common model in the existing literature. We condition on lifetime earnings (to date), other covariates common to empirical models of wealth and an aggregate pension variable (that combines DC, DB and social security wealth). The estimates show no pension offset. Adding industry and occupation dummies to the baseline model or a self employment dummy to the baseline model moves estimates around somewhat, but the same qualitative patterns result. There appear to be large offsets for DB and social security wealth for college graduates.

The final set of estimates implement a simple version of the pension adjustment suggested by Gale (1998). The adjustment drives the DC pension coefficient to zero. For college graduates, the DB and social security coefficients increase slightly. There appear to be large offsets for DB and social security wealth for college graduates.

Table 6 presents the analogous sensitivity results for the quantile specifications. Similar patterns emerge. The college sample shows consistent, economically large offsets in the

upper quantiles of the wealth distribution, particularly for DB and social security wealth. The “conventional” specification shows no offset, demonstrating the importance of specifying the empirical model appropriately. The results differ from those reported by Gale (1998), who finds consistently negative pension offsets, and differ from Gustman and Steinmeier (1999a), who find no evidence of pension offsets.

Why Are DC Offsets Smaller Than DB and Social Security Offsets?

Our results consistently show a smaller offset for DC wealth than for DB and social security wealth. There are three potentially non-exclusive factors that may account for this result. First, and most directly, non-pension offsets to DC wealth may be smaller than for other types of pension wealth. Weisbenner (1999) hypothesizes that the process of making investment decisions in a DC pension helps inform families about investment options, and possibly the usefulness of saving. Either by sensitizing people to the need for saving or educating them about the mechanics of saving, DC pensions may result in less non-pension wealth offset.

Second, the DC pension effect may be influenced by selection. Workers with a strong taste for saving may be drawn to jobs with DC pension coverage, where the worker controls investment choices and in many situation, controls contribution amounts that are matched by employers. Ippolito (1993) emphasizes this type of selection and Ippolito (1999) presents suggestive empirical evidence consistent with this phenomenon. Those with a high taste for saving may contribute aggressively to their DC plan and also save more in other forms. Gustman and Steinmeier (1999a) raise this as a possibility, and then subtract the employee’s

contribution from the DC pension balance. Unfortunately, the balance is also the result of many past contribution decisions, and our view is that given the HRS survey questions, it is impossible to construct an “exogenous” measure of DC pension balances.

Third, we might expect to see different DC and DB pension coefficients in a cross-section, because of the rate-of-return uncertainty of DC pension. For a pension of a given expected value, DC pensioners might have larger non-pension net worth from precautionary saving (and smaller expected pension offsets) than DB pensioners.

What Is the Source of the “Substitution” for DB Pensions and Social Security Wealth?

Without a model we can not determine the source of the DB pension and social security offset to net worth.²³ We can, however, provide suggestive evidence. Doing so is easy for the OLS regressions, since estimates on the components of net worth add to the overall coefficient on net worth. Doing this exercise for the sample of college graduates, we find that offsets are largest for “other” assets (businesses and vehicles) and net financial assets. We see only modest offsets on housing and retirement assets.

Unlike the OLS estimates, the coefficients on the quantile regressions of components of net worth on pension and social security wealth do not aggregate to the coefficient on net worth. Nevertheless, the median regression results show large offsets for housing, financial assets and other assets in the upper net worth quantiles.

IV. Conclusions

The Health and Retirement Study provides by far the best U.S. data to examine the

²³Gale and Scholz (1994), for example, model IRAs and household saving and make precise conclusions about the source of new IRA contributions in their data.

empirical relationship between pension and non-pension wealth. It is recent, has detailed information from plan providers on pension values and has extensive additional questions that allow analysts to calculate net worth and lifetime human capital.

With these data, we find a consistently negative relationship between DB and social security wealth and non-pension net worth for college graduates, particularly in higher net worth percentiles. These correlations are consistent with households accumulating less non-pension net worth in response to future promised social security or pension benefits. Estimates at the upper income quantiles often include -1 (complete offset) in the usual confidence interval. Ours is one of the few papers to show a negative correlation between social security and non-pension net worth and to show a negative correlation between defined benefit pension wealth and non-pension net worth.

We find smaller pension offsets than Gale (1998). His data are from 1983, when DB pension plan assets were much more than twice the size of DC pension plan assets, and fewer DC plans allowed employees to make discretionary contributions. Given we find larger defined benefit offsets than defined contribution offsets, the greater importance of defined benefit pensions in Gale's data may account for some of the differences. His sample selection criteria may also have resulted in a sample closer in characteristics to our college graduate than to the population at large (Gale used 15 percent of the sample in his study).

Our work is more comparable to Gustman and Steinmeier (1999a), since both papers use the same data, though the papers report different results. There are important differences between the two studies: we condition on total lifetime resources, for example, while they

condition on human capital wealth and do not include future earnings. These differences will push their estimated pension coefficients toward zero relative to ours. More importantly, they aggregate DC and DB pension wealth and focus exclusively on the median in their quantile regression specifications (they also report robust regression results, and find no apparent pension offset). The focus on the median misses evidence of significant, negative correlations at higher quantiles of the net worth distribution for those with college degrees. Given the skewed distribution of net worth, it is useful to examine the relationship of pensions and net worth at higher net worth percentiles than the median to better understand the aggregate effects of pensions on wealth. Our quantile regression evidence is consistent with the OLS results, which suggest there is a significant, large, negative correlation between DB and social security wealth and non-pension net worth for college graduates, particularly in the higher net worth quantiles.

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Appendix 1

Early work on pensions and saving found that pensions appear to *increase* saving in other forms. Cagen (1965) suggested that pension coverage calls attention to retirement needs and prospects and thereby fosters a "recognition effect" that stimulates saving. Katona (1965) discussed an additional effect where pensions help make retirement goals feasible, so individuals intensify their rate of saving as they get closer to their retirement goals. Schoeplein (1970) uses data from Canadian tax returns and, in a simple regression framework, finds that saving divided by income appears to be positively correlated with pensions contributions divided by income for high income households. Green (1981) also finds a positive relationship between pension contributions and other saving when estimating a life-cycle saving model using data from the 1953 Oxford Saving Survey supplemented with the 1969 U.K. Family Expenditure Survey.

Wolff (1988) discusses various pitfalls in estimating life-cycle patterns of wealth in cross-sectional data. He estimates the relationship of "liquid net worth" as a flexible function of age and permanent income, pension wealth, and social security wealth and finds no relationship between pension wealth and liquid net worth and marginally significant positive effects for social security wealth. He also emphasizes that the appropriate model of wealth accumulation for households in the top 5 percentiles of the wealth distribution appears to differ from the appropriate model for the rest of the population. More recently, Venti and Wise (1993) find a positive correlation between pensions and "personal financial assets" using an analysis of variance framework with data from the Survey of Income and Program

Participation.

Other work finds that both pensions and social security displace other forms of wealth. Munnell (1976) was one of the first to estimate a life-cycle saving model incorporating the effects of pensions. She used data on saving from a Department of Labor sample of households from 1966-1971, but she did not have data on social security and pension income or wealth. Using dummy variables for social security and pension coverage, she found that social security and pension coverage is negatively correlated with private saving, and that social security coverage has the stronger effect. Because of data limitations she could not estimate the magnitude of the displacement effect.

King and Dicks-Mireaux (1982) use high quality data on wealth, income, and demographic characteristics from a 1977 cross-section of Canadian households. The empirical model regresses the log of the wealth (excluding pensions) to income ratio against a flexible age spline, the log of the pension wealth to income ratio, the log of the social-security-wealth-to-income ratio, and a set of demographic characteristics. The authors present a detailed method for calculating permanent income in cross-sectional data. Their point estimates (evaluated at the means of the data) imply that social security wealth offsets other forms of wealth by roughly 25 cents, while private pension wealth offsets other forms of wealth by 10 to 18 cents. For the top net worth decile the offset is dollar for dollar with social security wealth and 40 cents for private pension wealth.

Diamond and Hausman (1984) examine the effects of pensions and social security on the timing of retirement and on saving. They estimate a model similar to King and Dicks-Mireaux,

though their measure of permanent income is average income over the years they observe households in the 1966-1976 National Longitudinal Survey of Mature Men. They report that an increase in the expected ratio of pension to permanent income decreases the ratio of saving to permanent income by 14 cents to the dollar. The offset of social security is 24 to 40 cents. Hubbard (1986) uses methodology similar to King and Dicks-Mireaux with data from the 1979 President's Commission on Pension Policy and estimates offsets of 33 cents for social security and 16 cents for private pensions. Dicks-Mireaux and King (1984) discuss a Bayesian framework for examining the sensitivity of their earlier pension results and find consistent evidence of offsets to pensions and social security that are in the 17 to 50 cent range, though this study is unusual in that it finds larger effects for pensions than for social security.²⁴

²⁴Related papers include Bernheim and Shoven (1988), who show that pensions are a significant component of national saving. Gale (1993) discusses a number of pension legislative changes. Hubbard (1987) discusses analytic issues that arise when estimating life-cycle models to examine the effects of pensions and saving. McDermed, Clark, and Allen (1989) discuss different methods for calculating pension wealth and use the 1983 Survey of Consumer Finances and Pension Provider Survey to present tabulations of pensions and other forms of wealth by age. Feldstein (1978) discusses conceptual issues that arise when thinking about the relationship between pensions and saving and presents time series evidence on the size of the displacement effect. Feldstein and Pellechio (1979) and particularly Kotlikoff (1979) provide a thorough discussion of the issues that arise when measuring the effects of social security on saving in a life-cycle model. Shefrin and Thaler (1988) present an alternative to the life-cycle model, where assets are not fungible across different "mental accounts." Hubbard, Skinner, and Zeldes (1995) emphasize the importance of incorporating precautionary motives in studying household saving behavior. Blinder (1981) and Avery, Elliehausen and Gustafson (1987) also discuss issues related to pensions, social security and wealth.

Appendix 2: Derivation of the “Q factor”

The spirit of the life-cycle model with perfect certainty is that households maximize utility with complete information over earnings and pensions during their lifetimes. We first derive the pension and future human capital adjustment factors for this admittedly extreme assumption. The model matches the highly stylized three-period model in the body of the paper, but uses a discrete, finite horizon framework with constant relative risk aversion preferences. The derived adjustment factors for the perfect information cases are discrete time analogs to the factors presented in Gale (1998). The second part of the appendix derives adjustment factors assuming households are “surprised” by pension wealth at the time of vesting. We do not model the source of the surprise, but show the adjustment factors differ from those presented by Gale. The “Q” factors derived below are used in our empirical models when we use adopt the Gale approach.

Perfectly informed households

Households maximize utility subject to a budget constraint,

$$\begin{aligned} \max_{C_t} \quad & \sum_{t=0}^T \mathbf{b}^t u(C_t) \\ \text{s.t.} \quad & \sum_{t=0}^T C_t d^t = \sum_{t=0}^T Y_t d^t \end{aligned} \tag{P}$$

where C_t and Y_t is consumption and income at time t , \mathbf{b} is the rate of time preference, and d is the “market” real discount rate, i.e. $d = (1 + r)^{-1}$, where r is the real interest rate. Note that initial assets are, without loss of generality (since one can incorporate any initial asset, into Y_0) are assumed to be zero.

With a well-behaved utility function $u(\cdot)$,

$$u'(C_t) = u'(C_0) \left(\frac{d}{\mathbf{b}} \right)^t$$

With a constant relative risk aversion (CRRA), i.e. $u(C) = \frac{C^{1-r}}{1-r}$, the above expression can be simplified to

$$C_t = C_0 \left(\frac{d}{\mathbf{b}} \right)^{\left(\frac{t}{r} \right)} = C_0 \mathbf{g}^t \quad (1),$$

where $\mathbf{g} \equiv \left(\frac{d}{\mathbf{b}} \right)^{\left(\frac{1}{r} \right)}$. To solve for the initial consumption C_0 , we substitute (1) into the budget

constraint of (P), and get

$$C_0 \sum_{t=0}^T (\mathbf{g}d)^t = \sum_{t=0}^T Y_t d^t \Rightarrow C_0 = \mathbf{a} \sum_{t=0}^T Y_t d^t; \quad \mathbf{a} \equiv \left(\sum_{t=0}^T (\mathbf{g}d)^t \right)^{-1} = \frac{1-\mathbf{g}d}{1-(\mathbf{g}d)^{T+1}} \quad (2).$$

Thus, for any period of time A , the non-pension wealth (at the end of period) is

$$W_A = d^{-A} \left(\sum_{t=0}^A Y_t d^t - \sum_{t=0}^A C_t d^t \right) \Rightarrow d^A W_A = \sum_{t=0}^A Y_t d^t - C_0 \sum_{t=0}^A (\mathbf{g}d)^t = \sum_{t=0}^A Y_t d^t - C_0 \left(\frac{1-(\mathbf{g}d)^{A+1}}{1-\mathbf{g}d} \right).$$

where $d^A W_A$ is the value of period A wealth from the perspective of time 0. Substitute (2) into the above expression, we have

$$d^A W_A = \sum_{t=0}^A Y_t d^t - Q(A) \sum_{t=0}^T Y_t d^t; \quad Q(A) \equiv \left(\frac{1 - (gd)^{A+1}}{1 - (gd)^{T+1}} \right) \quad (3)$$

Now, let us separate the life time “human capital wealth”, $\sum_{t=0}^T Y_t d^t$, into 2 parts: the

“cash earnings stream”, $\sum_{t=0}^T E_t d^t$ and “pension wealth,” $\sum_{t=0}^T B_t d^t$. As a practical matter, one can include social security benefits in either cash earnings stream or pension wealth. Note that the household can work while receiving pension benefits, i.e. E_t and B_t are both positive for some period t . Thus, (3) can be written as

$$d^A W_A = \sum_{t=0}^A Y_t d^t - Q(A) \sum_{t=0}^T E_t d^t - Q(A) \sum_{t=0}^T B_t d^t \quad (4),$$

where, again,

$$Q(A) \equiv \left(\frac{1 - (gd)^{A+1}}{1 - (gd)^{T+1}} \right) \quad (5).$$

Equation (4) and (5) are comparable to equation (6) and (7) of Gale (1998), respectively.

Appendix 3: Data Construction

Individual Characteristics

Source: Wave I-IV Section CS (Cover Sheet) and Section A (Demographic Background)

Procedure: No special procedure required

Missing Handle: Information available in the subsequent waves is used in case that the relevant information is missing in Wave I.

Assets

Source: Wave I Section D (Housing) and Section M (Net Worth Other than Housing)

Procedure: No special procedure required

Missing Handle: Incomplete answers (Other, Don't Know, Refused) are left missing.

Lifetime Human Capital Wealth

Source: Wave I-IV employment sections (Wave I Section F, G and H, Wave II Section FA, FB and FC, Wave III Section G and Wave IV Section G) and Wave I Section K (Retirement Plans)

Procedure:

- (i) *Income Observations.*

Wave I:

For each respondent, Wave I employment sections provide up to eight different earnings observations. Five are actual values – the latest and the beginning earnings at the most recent job, and the earnings at the end of the three other jobs (job history) that are not the latest jobs. Up to three extra observations can be found in the pension part of the current job employment section (Section F). In this section, respondents who were included in a defined benefit or combination plan were asked expected pay at the earliest time they would be eligible for full pension benefits. However, most cases have only one extra observation here.

Wave II-IV:

For the purpose of constructing an earnings profile, earnings observations from Wave II-IV are used only when the jobs in the respective waves are the respondents' Wave I jobs. Earnings observations from a new job are not included because the probability that it will be a part-time job is relatively high. The usable observations are either contained in the current job section, if respondents were still working for pay in their Wave I jobs at that wave, and the last job section, if respondents had quit their Wave I job some time before being interviewed in a specific wave. Similar to Wave I, extra expected earnings observations can be obtained from the pension parts of the employment sections.

- (ii) *Working Period.*

Date of earliest work, date of the first full-time work, expected/actual

date of last full-time work and expected/actual date to exit the job market are used to determine the respondent's lifetime working period. To construct the earliest year of work, the beginning year of each job reported in Wave I and the year that respondents reported in Wave III that they worked more than six months are used to determine the respondents' earliest years of work. However, a lower limit (respondent's school years + 6) is imposed to rule out unreasonably low values. The first year of full-time work is the higher value of the earliest year of work excluding the Wave III year of full-time work and the Wave III year of full-time work, meaning that some Wave I jobs might be part-time.

The respondents' years of last full-time work are the retirement years from Section K for respondents who were working for pay in Wave I if they reported that they had been retired. If respondents did not report that they retired, the expected dates of last full-time work (question F91 of Section F) are used when available, and the age of 65 is assumed for respondents who did not report that they would never stop working and who were not 65 at Wave I. For respondents who either were not younger than 65 but not older than 72 or reported they would never stop working, the age of 72 is used. For people who were older than 72, they are assumed to stop working in the Wave I year. The year of last full-time work is the last working years for respondents who were not working for pay in Wave I and did not reported any intention to reenter the job market, or the year of partial retirement if they reported that they had been partially retired. If respondents reported that they would reenter the job market and were not partially retired, the Section K expected retirement year is used as the year of last full-time work. In case that information is not available, the age step-65, 72, and current age if current age is greater than 72-applies.

The difference between the years of last full-time work and the years to exit the job market occurs when respondents reported that they were partially retired in Section K but still working for pay, or when they reported that they would work fewer hours or changed jobs at the question F91. For the latter cases, the expected years to exit the job market will be the expected retirement dates reported in Section K if available. The age step-65, 72, and current age if current age is greater than 72-are used for the remaining cases. For respondents who were partially retired, not working for pay in Wave I and reported the intention to reenter the job market, the expected year to exit the job market is the expected retirement date reported in Section K if available and the age step-65, 72, and current age if current age is greater than 72-are used for the remaining cases.

(iii) *Lifetime Income Profiles.*

(A) Observation Selection:

The respondents are classified into 4 mutually exclusive groups: non-college female, non-college male, college graduate female and college graduate

male. For each group, a procedure to exclude “inaccurate” earnings observations is performed. First, earnings observations are converted to a real 1991 dollars. Observations with annual positive earnings less than the first percentile of the positive earnings of the respective gender-education group (range from \$1,383 for non-college female to \$2,500 for college graduate male) are excluded. For the second step, “peak” and “trough” ages—ages with highest and lowest earnings, respectively—are determined. Because unreasonably low peak ages are more likely to be a result of inaccurate information, observations with peak ages below the fifth percentile are excluded. Observations with trough ages greater than the 90th percentile with earnings less than one-third of the respondents’ median earnings are excluded to rule out cases that changed working statuses from full-time to part-time. This step is performed three times in sequence. The resulting highest cutoff peak-age thresholds of the four groups are 35, 36, 35 and 39, respectively. The third step excludes observations with relatively extreme values. Practically, an average growth rate between two chronologically adjacent observations is determined. Then, conditional on the length of time interval of the two observations, observations with average growth rates less than the 10th percentile and greater than the 90th percentile are excluded. Finally, respondents who never worked for pay for a few months and respondents who were self-employed in the most recent jobs with maximum annual earnings greater than \$15,000 are excluded. High earning self-employed respondents are not included because they may have different pattern of earnings.

(B) Earning Regression and Income Profile Construction:

The valid observations obtain from the observation selection step are used to perform four fixed effect regressions, one for each gender-education group. The specification is $\ln(E_{it}) = c + b_1 * Age_i + b_2 * Age_i^2 + f_i + e$, where E_{it} is earnings of individual i at age Age_i ; c , b_1 , and b_2 are common coefficients for each group, f_i is an individual fixed effect and e is an error term. For every respondent whose observations were included in the regression, a fixed effect is calculated directly from the regression and is thus unique. For cases that are excluded, a fixed effect is calculated for every earning observation. With the gender-education group coefficients and individual fixed effects, income profiles from age 22-80 are calculated. For respondents with more than one income profiles because their observations were not included in the earning regressions, each profile is used to calculate the lifetime human capital wealth, explained in detail below, and the profiles with the median lifetime human capital wealth are used. For some cases, this implies that the average between 2 median-human-capital-wealth earning profiles are used.

(iv) *Lifetime Human Capital Wealth.*

Define a real gross rate of interest as the year-to-year gross nominal interest rate divided by the respective year gross inflation rate. The income

profiles are discounted to the value of year 1991 perspective by using the real gross rate of interest. From 1920 to 1999, the actual figures are used because step (i) observations contains actual value at 1999, i.e. from Wave IV. From 2000 and beyond, the real interest rate of 2.21% implied by the standard Social Security Administration (SSA) assumptions about interest and inflation rates (6.3% and 4%, respectively) is used.

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Social Security Wealth

Source:

- (a) Lifetime Income Profiles from Lifetime Human Capital Calculation
- (b) Wave I Section H (Job History) and Wave III Section G (Employment)
- (c) Life-Tables; Vital Statistics of the United States, 1992, Volume II, Section 6; U.S. Department of Health and Human Services, Public Health Service, Centers for Disease Control and Prevention, National Center for Human Statistics.

Procedure:

- (i) *Select Years for Average Indexed Monthly Earnings Calculation.*

Question G164-G165 at Section G of Wave III provide information of a period when respondents did not pay social security taxes. In addition, Wave I Section H provides information of periods when respondents worked with federal or local governments. If respondents provided the length of time rather than the beginning and end years without paying social security taxes, the length is matched with the Section H information. (See Myers (1993) for the discussion about government workers and social security taxes.)

- (ii) *Calculate Average Indexed Monthly Earnings Calculation (AIME).*

First, the upper limit of contribution (the “annual maximum taxable earnings”) in real 1991 dollars for each year is determined. The upper limits for year 2000 and beyond are assumed to be constant in real terms and equal to the year 1999 limit. Then, the social-security-relevant earnings profiles are constructed by truncating the human-capital-wealth earnings profiles according to the upper limit. In addition, the part of the earnings profiles that respondents did not pay social security taxes are replaced with zero.

To calculate the average indexed monthly earnings (AIME), the “computation period”—which is, in general, five less than the number of years that have elapsed after 1950 (or, if later, the year that respondents attained age 21) and before the year in which the worker attains 62—is first determined. Then, select from the social-security-relevant earnings profiles a set of the highest earnings observations, where the number of observations in this set is equal to the computation period plus the length without social security taxes if the beginning and end years without social security taxes are not identified. The latter part is added because the total earnings used to calculate AIME will be the

total earnings of the observations in this set less the product of the mean of positive earnings observations of the period with positive earnings in this set and the number of years without social security taxes. This “net” earnings is then divided by the number of months in the computation period to get AIME. Finally, respondents with the numbers of positive earning years minus the number of years without social security taxes less than 10 are assumed to have AIME equal to zero since they do not have enough quarters of coverage to qualify for social security benefits.

(iii) *Calculate Primary Insurance Amount.*

The 1991 bend-point formula is then applied to AIME to calculate the corresponding primary insurance amounts (PIA). The formula is 90% of the first \$370, 32% of the next \$1,860 and 15% for any dollar over \$2,230. PIA is also calculated based on the special-minimum benefit formula. The higher values of these two primary insurance amounts is used as the respondents’ PIA. For details of the social security calculation, see Social Security Administration (1993) and Myers (1993).

(iv) *Calculate Social Security Wealth.*

It is assumed that every respondent starts receiving social security benefits at age of 65. Thus, the “expected social security benefits” are equal to their PIA’s for single respondents. For married respondents, the expected social security benefits are the maximum between their PIA and 50% of their spouses’ PIA at the time their spouses are alive, and the maximum between their PIA and 100% of their spouses’ PIA after their spouses passed away.

The social security wealth of each individual is a discounted sum of his/her expected social security benefits from age 65 until the respondent dies, where the expected date of death is derived from the Life Table. Again, the real discount rate is 2.21% implied by the standard Social Security Administration (SSA) assumptions about interest and inflation rates.

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Pension Wealth

Source:

- (i) Wave I-IV employment sections (Wave I Section F, G and H, Wave II Section FA, FB and FC, Wave III Section G and Wave IV Section G)
- (ii) Health and Retirement Study Pension Present Value Database (Level 1), Version 1.0 by Bob Peticolas and Tom Steinmeier (P&S)
- (iii) Life-Tables; Vital Statistics of the United States, 1992, Volume II, Section 6; U.S. Department of Health and Human Services, Public Health Service, Centers for Disease Control and Prevention, National Center for Human Statistics.

Procedure:

- (i) *Current Job Pensions.*

From the language of the questionnaire, pension wealth is classified into 3 groups: defined benefit, defined contribution and combination plan pension wealth. The latter are pension plans that have both defined-benefit and defined-contribution components but do not have specific information about each part of the plan.

Defined Benefit and Combination Plan Pension Wealth:

The main source of information for the values of defined benefit and contribution pension is P&S “Scenario 1”, which uses the standard SSA assumptions about interest and inflation rates. However, given that P&S calculate the figures under the survival-probability discount framework, i.e. that a respondent’s date of death is a stochastic process whose distribution is given by the SSA life table, the figures are converted into a deterministic-like date of death framework used in this study. Since the discounted lifetime benefits with a constant benefit amount is a concave function, the pension wealth in this study will not be less and in general will be greater than the values calculated under the stochastic framework.

For samples that are not included in P&S, the self-reported information of expected pension benefits in the employment sections is used to calculate pension wealth. If expected benefits are reported in a percentage of incomes at some date, the expected pay at that date associated with the question is used. If the expected pay information is missing or unreasonable, the information from the earning profiles in the human capital wealth calculation step is used. Pension benefits are assumed to continue until respondents pass away, where the expected dates of death are derived from the Life Table, and assumed to be constant in a nominal term if there is no information about cost-of-living-adjustment for the benefits. The pension wealth is thus calculated as a real discounted sum of the pension benefits streams under the standard SSA assumption real interest rates (2.21%). The figures derived from later waves will be used in case that Wave I figures cannot be calculated due to missing information.

Defined Contribution Pension Wealth:

The main source of information for defined contribution pension wealth calculation is the self-reported information from the employment sections. First, respondents and their employers are assumed to contribute the same amount, if the reported is in amount per time period, or the same percentage of earnings, if the reported is in percentage of earnings, from the time of interview to the expected date of receiving pension benefits (see, for example, question F63 at Wave I Section F). The discounted sum of the contributions profiles is then added to the Wave I defined contribution account balance. For respondents who did not provide account values in Wave I and who reported to have only one defined contribution plan in that wave, the account balances at a subsequent wave are used and the same calculation for the contribution profiles applies,

except that now the starting point of the contribution profile is the time of the respective wave interview.

(ii) *Previous Job Pensions.*

The main source of information for previous job pension wealth is P&S. For samples not included by P&S, the self-reported information about the expected and actual pension benefits in Section G and H of Wave I is used to calculate pension wealth. Pension benefits are assumed to continue until respondents pass away and assumed to be constant in a nominal term if there is no information about cost-of-living-adjustment for the benefits. The pension wealth is thus calculated as a real discounted sum of the pension benefits streams using the standard SSA assumption real interest rates of 2.21%.

Missing Handle: Leave incomplete information as missing

References

1. Social Security Administration, “Annual Statistical Supplement, 1993”, U.S. Department of Health and Human Services.
2. Department of Health and Human Services, Public Health Service, “Life-Tables; Vital Statistics of the United States, 1992, Volume II, Section 6”, U.S. Centers for Disease Control and Prevention, National Center for Human Statistics.
3. Myers Robert J., “Social Security, 4th Edition”, Pension Research Council, Wharton School of the University of Pennsylvania, University of Pennsylvania Press, 1993.

Table 1 Means, Medians, and Standard Deviations from the 1992 Cross-Section of the HRS			
Variable	Mean	Median	Standard Deviation
Labor Income	39,917	30,672	43,210
Capital Income	3,525	0	13,896
Transfer Income	764	0	2,432
Other Income	493	0	7,412
Total Income	44,845	34,500	48,045
PDV Lifetime Earnings	1,931,183	1,636,528	1,774,811
DC Pension Wealth	42,784	0	496,950
DB Pension Wealth	96,192	15,375	166,686
Pension Wealth	140,653	34,057	543,073
Social Security Wealth	187,258	183,835	102,105
Housing Wealth	75,615	50,000	124,157
Business Wealth	75,947	0	357,579
Net Financial Assets	50,167	7,000	170,758
Retirement Accounts	19,554	0	61,598
Vehicles	12,916	7,500	50,395
Non-Pension Net Worth	234,235	100,000	508,925
Mean Age	56		4.9
Mean Ed (years)	12.5		3.1
Fraction Female	.47		.50
Fraction Black	.11		.31
Fraction Hispanic	.07		.26
Fraction Couple	.67		.47
Fraction Working	.70		.46

Source: Authors' calculations from the 1992 HRS. Sample sizes in each cell range from 7,323 to 6,041 depending on missing values and the table is weighted using the HRS household weights. Labor income includes wages and salaries, business and farm income, income from a professional practice, bonuses and tips, other employment income, pension income, veterans benefits and social security benefits. Capital income includes rents, royalties, dividends, interest, trust fund receipts, and annuities. Transfer income includes unemployment insurance, workers' compensation, alimony, child support, food stamps, welfare and SSI. Other income includes financial support from friends and any other sources of income. Net financial assets include checking accounts, saving accounts, money market funds, equity, mutual funds, bonds, certificated of deposit, and other saving or assets (such as collectibles), less debt on credit cards, life insurance products or other financial liabilities.

Table 2 Percentage of Population with DC and DB Pensions and Conditional Means and Medians, by Lifetime Income Percentile, 1992 Wave						
Lifetime Income Percentile	Percentage with only DC Pension	Conditional Mean (Median)	Percentage with only DB Pension	Conditional Mean (Median)	Percentage with both DC & DB	Conditional Mean (Median)
0-20	4.7	23,989 (10,625)	12.5	74,496 (43,132)	8.1	188,590 (75,737)
20-40	8.4	43,132 (23,048)	32.8	102,274 (68,952)	24.5	203,518 (88,507)
40-60	9.6	59,981 (32,394)	35.0	156,657 (105,851)	34.3	256,136 (150,402)
60-80	8.9	319,610 (44,142)	32.3	193,692 (144,751)	44.3	310,539 (252,108)
80-90	6.0	91,621 (41,842)	27.1	262,818 (232,002)	51.5	408,305 (333,688)
90-95	10.1	101,760 (70,458)	23.1	299,214 (220,956)	47.4	634,858 (392,819)
95-100	14.6	496,989 (334,538)	18.4	282,262 (209,164)	39.4	744,546 (571,869)
Total	8.2	148,858 (35,359)	27.3	166,003 (105,381)	31.6	337,899 (205,860)

Source: Data are from the 1992 HRS and authors' calculations. Conditional medians are in parentheses.

Table 3: Mean and Median Non-Pension Net Worth by Pension Coverage and Lifetime Income Percentile, 1992								
	Owners of No Pension		Owners of DC Pension Only		Owners of DB Pension Only		Owners of DB & DC Pension	
Lifetime Income Percentile	Mean NW	Median NW	Mean NW	Median NW	Mean NW	Median NW	Mean NW	Median NW
0-20	59,893	6,000	70,535	32,250	81,083	37,650	112,426	65,500
20-40	166,304	46,312	93,369	57,000	113,677	60,500	131,134	64,380
40-60	263,116	98,000	167,949	89,500	157,422	90,900	170,541	103,000
60-80	403,388	171,800	350,439	152,600	208,104	136,000	225,772	148,050
80-90	551,732	272,000	485,849	217,800	312,169	204,300	273,303	204,000
90-95	725,538	472,000	805,037	367,000	502,665	224,500	389,306	289,500
95-100	1,135,413	724,000	1,609,351	882,000	638,358	303,000	608,349	355,000
Total	227,792	44,100	370,430	118,500	198,028	101,700	236,967	141,500

Source: Data are from the 1992 HRS and authors' calculations. Figures use the HRS household weights.

Table 4: Quantile Regression of DC, DB and Social Security Wealth on Non-Pension Net Worth College Graduates or More, 1992 HRS

	Coefficient	Standard error	T-statistic
50th Quantile			
Age	-782.54	2,176.86	-0.36
College Graduate Only	-19,783.71	9,727.94	-2.03
Black	-62,216.94	11,693.38	-5.32
Hispanic	-74,261.96	19,565.02	-3.80
Bad Health	-39,912.76	12,477.36	-3.20
Couple	10,887.85	17,121.59	0.64
Working	943.59	21,119.97	0.05
Total Lifetime Wealth	0.12	0.02	5.25
Future Human Capital Wealth	-0.19	0.07	-2.72
DC Pension Wealth	-0.12	0.14	-0.89
DB Pension Wealth	-0.19	0.06	-3.30
SS Wealth	-0.23	0.13	-1.73
Constant	106,809.50	117,652.30	0.91
70th Quantile			
Age	2,407.82	4,255.20	0.57
College Graduate Only	-15,364.22	23,297.97	-0.66
Black	-128,562.80	19,923.53	-6.45
Hispanic	-168,945.90	29,994.03	-5.63
Bad Health	-50,591.79	31,110.63	-1.63
Couple	56,427.31	32,270.73	1.75
Working	-39,359.16	32,695.67	-1.20
Total Lifetime Wealth	0.20	0.04	5.75
Future Human Capital Wealth	-0.22	0.11	-2.02
DC Pension Wealth	-0.20	0.23	-0.85
DB Pension Wealth	-0.44	0.07	-6.23
SS Wealth	-0.87	0.23	-3.84
Constant	54,794.64	248,895.20	0.22
90th Quantile			
Age	3,721.04	9,584.69	0.39
College Graduate Only	22,993.03	76,702.19	0.30
Black	-203,802.00	68,394.46	-2.98
Hispanic	-307,113.30	59,256.55	-5.18
Bad Health	-87,633.10	100,449.50	-0.87
Couple	212,932.90	66,489.69	3.20
Working	-24,548.12	90,219.12	-0.27
Total Lifetime Wealth	0.43	0.08	5.63
Future Human Capital Wealth	-0.39	0.25	-1.58
DC Pension Wealth	-0.44	0.62	-0.71
DB Pension Wealth	-0.98	0.14	-6.99
SS Wealth	-2.64	0.60	-4.39
Constant	179,579.00	570,930.50	0.32

Table 5: OLS Pension Estimates for Alternative Specifications			
Specification	DC Estimate	DB Estimate	SS Estimate
	Baseline Model		
Full Sample	-.053 (.012)	-.175 (.028)	-.068 (.102)
College Graduates	-.158 (.024)	-.540 (.085)	-.684 (.290)
Some College or Less	-.039 (.022)	-.089 (.027)	.178 (.103)
	“Conventional” Model (control for earnings, aggregate pension wealth and covariates)		
Full Sample	Pension coefficient = -.005 (.010)		
College Graduates	Pension coefficient = -.001 (.016)		
Some College or Less	Pension coefficient = -.013 (.016)		
	Industry and Occupation Dummies		
Full Sample	-.051 (.012)	-.162 (.028)	.039 (.105)
College Graduates	-.159 (.024)	-.484 (.088)	-.493 (.294)
Some College or Less	-.036 (.022)	-.081 (.028)	.273 (.106)
	Add Self Employment Dummy to Baseline		
Full Sample	-.048 (.012)	-.108 (.027)	-.073 (.100)
College Graduates	-.148 (.023)	-.359 (.086)	-.540 (.284)
Some College or Less	-.027 (.021)	-.046 (.027)	.158 (.101)
	Gale-Style “Q Adjustment” for Pensions		
Full Sample	.009 (.014)	-.142 (.036)	-.031 (.122)
College Graduates	.016 (.022)	-.502 (.112)	-.799 (.369)
Some College or Less	-.009 (.028)	-.069 (.035)	.229 (.121)

Notes: Authors' calculations using OLS regressions with specifications similar to the one shown in Table 4. Data are from the HRS. Standard errors are in parentheses.

Table 6: Quantile Regression Sensitivity Across Specifications for Pension Offset Regressions									
	Median Regression			70 th Quantile Regression			90 th Quantile Regression		
Specification	DC Est	DB Est	SS Est	DC Est	DB Est	SS Est	DC Est	DB Est	SS Est
	Baseline Model								
Full Sample	-.049 (.015)	-.027 (.026)	-.075 (.103)	-.096 (.016)	-.113 (.040)	-.339 (.138)	-.262 (.229)	-.497 (.271)	-1.363 (1.546)
College	-.120 (.135)	-.192 (.058)	-.230 (.133)	-.199 (.235)	-.444 (.071)	-.873 (.227)	-.436 (.617)	-.985 (.141)	-2.639 (.601)
High School	-.026 (.060)	.038 (.027)	.073 (.056)	-.075 (.027)	-.086 (.020)	-.150 (.092)	-.249 (.058)	-.264 (.133)	.466 (.361)
	“Conventional” Model (control for earnings, aggregate pension wealth and covariates)								
Full Sample	Pension = .004 (.017)			Pension = -.009 (.015)			Pension = -.019 (.007)		
College	Pension = -.003 (.251)			Pension = -.004 (.187)			Pension = -.012 (.573)		
High School	Pension = .057 (.040)			Pension = .002 (.015)			Pension = -.020 (.059)		
	Industry and Occupation Dummies								
Full Sample	-.050 (.043)	-.030 (.034)	-.026 (.099)	-.095 (.023)	-.113 (.037)	-.259 (.134)	-.258 (.156)	-.391 (.120)	-1.198 (.404)
College	-.112 (.076)	-.181 (.062)	-.123 (.089)	-.200 (.200)	-.400 (.115)	-.840 (.282)	-.419 (.638)	-.763 (.161)	-2.481 (.673)
High School	-.026 (.077)	.039 (.042)	.100 (.074)	-.072 (.047)	-.082 (.026)	-.051 (.112)	-.173 (.058)	-.185 (.113)	-.535 (.346)
	Add Self-Employment Dummy to Baseline								
Full Sample	-.047 (.067)	-.000 (.029)	-.062 (.082)	-.095 (.081)	-.112 (.020)	-.356 (.115)	-.224 (.488)	-.240 (.071)	-1.166 (.268)
College	-.102 (.022)	-.132 (.049)	-.101 (.132)	-.180 (.040)	-.315 (.072)	-.815 (.300)	-.222 (.564)	-.642 (.182)	-2.218 (.931)
High School	-.026 (.127)	.054 (.035)	.054 (.071)	-.002 (.107)	-.025 (.044)	-.103 (.134)	-.181 (.204)	-.196 (.066)	-.797 (.270)
	Gale-Style “Q Adjustment” for Pensions								
Full Sample	.005 (.080)	.037 (.024)	-.040 (.074)	.010 (.082)	-.021 (.042)	-.321 (.236)	-.005 (.563)	-.274 (.189)	-1.529 (.409)
College	-.004 (.046)	-.133 (.044)	-.271 (.213)	-.005 (.090)	-.339 (.091)	-1.020 (.416)	-.013 (.945)	-.834 (.245)	-3.255 (.945)
High School	.005 (.068)	.088 (.026)	.107 (.066)	.003 (.019)	-.011 (.023)	-.091 (.121)	-.004 (.017)	-.026 (.143)	-.541 (.362)

Notes: Authors’ calculations with quantile regressions with specifications similar to the one shown in Table 4. Data are from the HRS. Standard errors (in parentheses) are based on only 20 bootstrap replications.