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Measuring Pension Wealth

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Abstract

Pension wealth plays a critical role in older individuals' retirement behavior and financial security. Accordingly, the magnitude and distribution of pension wealth is important in the ongoing debate about whether households, especially Baby Boomers, have saved adequately for retirement. This chapter summarizes the results of a long-term effort to develop an improved calculator to measure defined contribution pension wealth of older Americans. We implement the approach to construct alternative estimates of DC plan balances for Health and Retirement Study (HRS) participants. We find that pension wealth resulting from voluntary saving (and accrued earnings thereon) comprises half of DC pension wealth calculated for HRS respondents with matched summary plan descriptions. We also find lower mean estimates of DC pension wealth than prior estimates. Much of this reduction in estimated DC wealth occurs for the wealthiest tail of the pension-wealth distribution. Our findings imply that researchers must think more carefully about the economic assumptions underlying pension measures.

Disciplines

Economics

Comments

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Chapter 10

Measuring Pension Wealth

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Pension wealth plays a critical role in older individuals' retirement behavior and financial security. Accordingly, the magnitude and distribution of pension wealth is important in the ongoing debate about whether households, especially Baby Boomers, have saved adequately for retirement.[1] For this reason, researchers and policymakers need accurate measures of pension wealth if they are to assess the impact of pensions, prompting substantial effort devoted to gathering information on pension characteristics and wealth from households nearing retirement.[2] Unfortunately, there is growing awareness of the fact that many respondents are unaware of and unable to articulate many key attributes of their pension plans.[3] This has led to concern that respondent-reported pension information may give an inaccurate picture of older persons' financial security, and it may also impart bias to empirical studies of the role of pensions on retirement.[4] For this reason, researchers and policymakers need accurate measures of pension wealth if they are to assess the impact of pensions, prompting substantial effort devoted to gathering information on pension characteristics and wealth from households nearing retirement.[5]

To supplement respondent-reported pension information, some analysts have turned to pension plan reports and administrative data, seeking to generate more accurate measures of pension wealth. For example, the Health and Retirement Study (HRS) linked lifetime earnings records from the Social Security Administration (SSA) and pension plan rules collected from employer-provided pension Summary Plan Descriptions (SPDs) for many respondents. These can then be used in concert with the Pension Estimation Program (PEP), a computer software program which calculates pension entitlements at alternative retirement dates. This approach is gaining favor for measuring retirement wealth for policy analysis.

Our research, summarized in this chapter, describes a long-term effort to develop an improved methodology for measuring defined contribution (DC) pension wealth of older Americans. Specifically, we have devised a new pension benefit calculator that can be used with the HRS, which we call the HRS DC/401(k) Calculator. This new software extends researchers' ability to model DC plans, building in detailed plan characteristics and

time-varying rates of return, annual earnings, and pre-tax deferrals. We are able to show that prior estimates of pension wealth have probably overstated DC plan wealth by as much as 20 percent, and 401(k) plan balances by as much as 40 percent. The findings imply that accurate measurement of pension wealth hinges on a set of complex assumptions, and even small changes in assumptions can generate large differences in pension wealth and substantively change policy prescriptions. We also believe that administrative pension data is invaluable in supplementing respondent-reported information from household surveys. Accordingly, those engaged in or starting surveys of older households should devote substantial effort to incorporate such data into their research designs.

In what follows, we begin with a brief description of pension information found in the Health and Retirement Study, which is the basis for most research on Baby Boomers and their retirement preparedness. Next, we present new estimates of DC pension wealth for the first 'original' HRS cohort interviewed in 1992, based on the employer-provided plan descriptions and administrative data, and we compare our results with those generated from previous methodology. Then we extend the analysis for the cohort of so-called War Babies (WBs), first interviewed by the HRS in 1998. Finally, we offer a summary and implications for research.

Methodology for Generating Pension Wealth for DC Pension Participants

Several sources of data have been gathered that are useful in producing estimates of pension wealth for DC plan participants. Here we discuss various approaches to combining these.

Respondent Reports

In surveys designed to elicit retirement wealth including the HRS, respondents and spouses are routinely asked to describe their pensions on their current and past jobs. Specifically, in the HRS, respondents are asked first if they are included in a pension, retirement, or tax-deferred savings plan. If the individual answers 'yes', then he is asked additional detailed questions about as many as three plans on that job. This respondent-reported information includes the type of plan (e.g. formula-based (DB), account-based (DC), or combination). In addition, questions are asked about the number of years the worker has been included in the plan, the amount of the employer contribution, the amount of the employee contribution, and the plan balance. If the individual has more than three plans on the current job, then the sum of the balances on the fourth and higher plans

is requested. Those with a DC plan are asked to identify the type: thrift or savings, 401(k)/403(b)/SRA, profit-sharing, stock purchase/employee stock ownership (ESOP), and other. Answers to these pension questions have been used to calculate respondent-reported pension assets including 401(k) assets.

The primary advantage of respondent-reported DC wealth is that it can be thought of as reflecting what a household believes its pension plan balance to be at the time of the survey. Yet substantial measurement error can plague these data. One reason is that respondents may report their pension plan type incorrectly; for instance, a worker who really has a DB may report having a DC plan (or vice versa); a respondent with a non-401(k) DC plan could report having a 401(k); someone with a DB and a 401(k) plan could report just one plan, and so on. Another problem is that even if individuals correctly identify their plan type, they may report plan values inaccurately. This may be particularly true for DB participants, as these plans embody complicated formulas based on salary, age, years of service, early and normal retirement dates, about which the respondent may not be aware; even small errors in reporting early and normal retirement ages for such plans can dramatically alter the implied accrual profiles and present value calculations. In addition, measurement error in reported plan type is almost surely correlated with error in reported plan value. Finally, research on HRS respondents' plan reports indicates that there are many missing values which must be imputed by the researcher in order to arrive at pension wealth numbers. Thus Venti and Wise (2000) report that records for almost 40 percent of HRS households require that at least one piece of pension information be imputed to construct measures of self-reported pension wealth. Such imputations can result in additional measurement error.[6]

Employer-Based Plan Information

To complement this respondent-reported pension information, the HRS also attempted to collect pension SPDs from employers of HRS respondents for all current and previous jobs in which the respondent reported being covered by a pension. Researchers at the University of Michigan then coded these SPDs and linked them to a software program called the PEP. Taking this as inputs, estimates of DC pension wealth can be generated along with assumptions about earnings and saving trajectories, rates of return and inflation. Nevertheless, the PEP makes some simplifying assumptions in its modeling strategy for calculating DC wealth, including the assumption of a single time-invariant rate of return common to all participants, a time-invariant inflation rate, a time-invariant voluntary contribution rate

to 401(k)-type plans, a simple earnings forecasting equation for career earnings, and the presumption of plan eligibility since the date of hire (cf. Rohwedder 2003; Engelhardt et al. 2005).

By contrast, our pension Calculator software includes a more flexible set of economic assumptions for estimating DC wealth. We also include an additional source of data, namely lifetime earnings histories provided under restricted data conditions by the SSA.[7] The great advantage of these records is that they provide an accurate source of earnings from 1980 and also reports of pre-tax employee contributions to pension plans since 1984. Unlike respondent-reported information, these reports are not subjected to measurement error as they represent employer official reports on earnings and deferrals (Cunningham and Engelhardt 2002). This information, combined with respondent-reported earnings, permits us to construct a complete earnings history from 1951 to the survey entry year, for those who entered the HRS in 1992 and 1998. We believe that the improved earnings data, combined with the enhanced pension wealth Calculator, generate substantially better calculations of DC pension wealth.

The Calculator is designed so that it can replicate the PEP, but it also incorporates several important innovations not found in the earlier program. Specifically, it (*a*) invokes plan adoption and amendment dates indicated in the SPD to determine eligibility for plan features, (*b*) allows time-varying, individual-specific rates of return, (*c*) allows time-varying inflation rates, (*d*) allows time-varying, individual-specific voluntary contribution rates, and (*e*) allows easier, more direct use of administrative earnings data. It does not attempt to estimate DB wealth, which is handled quite well by the PEP.[8]

Pension Wealth Computations: Replicating the Baseline

To show how the Calculator works, we first seek to replicate the results generated by the PEP; subsequently, we will demonstrate how changing assumptions and data alter results. Accordingly, we first compare the total DC plan balances evaluated at the time of job severance, known as the quit date, generated by both approaches.[9]

For replication purposes, each plan can be characterized as belonging to one of three types. First, for the majority of plans, the Calculator and PEP produce identical output. Second, there is a small group of plans for which the Calculator and Program fail to produce the same output, because of identifiable programming anomalies in the PEP.[10] The Calculator contains two sets of code for these plans: the first is the correct code and the second

overrides the correct code and hard-codes the plans to match the Program's coding.[11] Finally, there is a very small set of plans, covering around 5 percent of the DC plan participants in 1992, for which the Calculator and Program fail to produce the same output because of unidentifiable programming anomalies.[12] As a result, when comparing output from the Calculator and the PEP, there may be a small number of participants and plans for which there is potentially large disagreement.

Table 10-1 summarizes some key outcomes across the two programs. Here, we report the DC plan balance at the quit date for some 2,352 respondents in the HRS Participant Data.[13] The Calculator is parameterized to replicate the PEP, and we assume a time-invariant real rate of return of 2.3 percent, inflation of 4 percent, self-reported earnings from the HRS interview and wage equation parameters from the default Participant file, and time-invariant voluntary contributions equal to what respondents self-report in the initial interview (the default in the Participant file). We also assume that participants were eligible for both employer and employee contributions to the plan since their hire date.[14]

The first row of the table reflects the absolute value of the percentage difference between the plan balances computed under the Calculator and the PEP; the mean difference is 5.7 percent. Of course, the mean includes outliers, as is evident from the 75th percentile of the distribution; the fact that this is 0 indicates that at least 75 percent of the participants have exact matches. At the 90th percentile, the percentage difference between the two programs is just under 4 percent. Therefore, the disagreement between the two programs is less than 4 percent for 90 percent of the participants. What drives the mean difference of 5.7 percent is a relatively small number of plans and participants for which the programs do not agree which show up in the 95th and higher percentiles (these are the programming anomalies mentioned above). We note that differences of around 15 percent, as seen for the 95th percentile, are not that surprising given that even tiny differences are compounded over time in DC plans. In contrast, the observed difference of 116 percent at the 99th percentile is almost surely more systemic in nature.

Table 10-2 shows the Calculator's results for separate runs that illustrate the impact of the hard-coding of plans to match the PEP. Specifically, the first row in panel A shows selected statistics on plan balances at quit date, when the Calculator invokes hard-coding to match the Program. In the second row, we show the same statistics when plans are coded in a manner more consistent with others. In general, hard-coding results in lower plan balances as of the quit date: the mean difference of 6.6 percent (or $14,392) and the median is 5.4 percent (or $1,648). In other words, the differences are larger at higher percentiles in the distribution, so that at the 95th percentile, the balances differ by 9.5 percent.

TABLE 10-1 Comparing DC Plan Balances at Quit Date for HRS Participants: Results for the Calculator and the Program ($2004; N = 2,352)

Measure	*Mean*	*Standard Deviation*	*10th Percentile*	*25th Percentile*	*Median*	*75th Percentile*	*90th Percentile*	*95th Percentile*	*99th Percentile*
Percentage difference between *Calculator*'s and *Program*'s plan balance	5.70	59.81	0	0	0	0	3.96	15.80	116.90
Calculator's plan balance ($)	206,978	450,608	0	0	30,413	218,626	598,620	967,365	2,006,049
Program's plan balance ($)	215,023	506,684	0	0	29,237	220,310	607,167	990,897	2,228,760

Source: Authors' calculations.

Notes: N refers to sample size. Here the Calculator is parameterized to replicate PEP outcomes; see text.

TABLE 10-2 Comparing DC Plan Balances for HRS Participants at Quit Date and the Expected Present Value of DC Wealth in 1992: Plans 'Hard-Coded' to Replicate the Pension Estimation Program ($2004; N = 2,383)

Parameterization	*Mean*	*Standard Deviation*	*10th Percentile*	*25th Percentile*	*Median*	*75th Percentile*	*90th Percentile*	*95th Percentile*	*99th Percentile*
A. DC plan balance at quit date									
Invoke hard-coding to replicate the *Program*	204,579	448,198	0	0	29,152	214,647	593,923	947,834	2,006,049
Do not invoke hard-coding	218,971	514,750	0	0	30,800	224,901	629,199	997,485	2,112,629
B. Expected PV of DC wealth in 1992									
Invoke hard-coding to replicate the *Program*	64,178	131,978	0	0	15,927	75,416	182,693	270,578	575,831
Do not invoke hard-coding	69,562	155,670	0	0	16,883	80,154	190,700	286,630	673,056

Source: Authors' calculations.

Notes: For this comparison, the Calculator was parameterized as follows: the default participant file was used; years of pension eligibility for both voluntary and employer contributions were measured since the date of hire; the voluntary contribution rate was taken from the default participant file; the real rate of return was set equal to 2.3%; the inflation rate was set to 4%; and annual earnings were calculated using the self-reported earnings in the participant file and the earnings equation from the PEP.

One difficulty with the analysis of plan balances at the retirement date is that individuals in the analysis sample are of different ages and have different retirement dates. This means that the balances in Panel A are not measured in the same calendar year's dollars. Panel B of the table addresses this and shows the same statistics, but for the expected present value of DC wealth in 1992, which takes into account the probability of survival to the retirement date. At the mean, DC pension wealth is 8.4 percent higher when hard-coding is not invoked. At the median, this difference is 6 percent, and it remains at this level even up to the 95th percentile.

Sensitivity of Pension Wealth Computations to Economic Assumptions

The Calculator is designed to allow the researcher to explore the impact of moving away from default economic and plan assumptions, should the researcher seek this flexibility. In what follows, we briefly outline how varying these influences estimates of DC wealth (see also Rohwedder 2003; Engelhardt et al. 2005).

Time-Varying Rates of Return

When calculating DC wealth with the PEP, the researcher chooses the rate of return to use, but the Program assumes for the pension calculations that the real rate of return is common across individuals and time-invariant. For example, in a commonly used parameterization for 1992, the real rate of return is assumed to be 2.3 percent, which was the SSA's intermediate forecast in that year. This means that the PEP assumes that real returns are always 2.3 percent, commonly experienced by all participants. The potential impact of this assumption depends on the application.

In fact, of course, real rates of return have varied substantially over time (see Appendix, Table 10A-1). For the 20 years prior to the 1992 HRS, the mean 1972–91 real return for the portfolio of bonds was 2.6 percent with substantial variation ranging from −16.8 percent in 1979 to 31.6 percent in 1982. In principle, for any given across-period mean return, the DC balance at the end of that period will be path-dependent; that is, the temporal pattern of deviations from that mean return matters for DC balances because of the role of compounding. In addition, because contributions to DC plans are defined frequently as a percentage of pay, the temporal pattern of real returns will interact with the shape of the age-earnings profile to generate differences in plan balances that would not be captured under the assumption of a time-invariant mean rate of return.

It is also worth noting that DC plans differ, in terms of the financial instruments in which participants can invest their contributions, and of course, they will experience different patterns of returns over time.[15] Accordingly, in our approach, the Calculator permits both future and past time-varying rates of return to be used in the calculations. Table 10-3 compares selected statistics on the distribution of plan balances in 1991 using the historical returns on a portfolio of 100 percent long-term bonds from Ibbotson (2003), extended back to the earliest start year in the sample; the mean real return for this period was 1.8 percent.[16] Table 10-3 indicates little difference in plan balances using time-invariant or time-varying returns. Yet there is an important caveat, in that for any given mean return, the timing of the annual returns matters. In this particular application, there is little difference in balances but if the order of the returns were reversed (e.g. assuming the 1991 return occurred in 1952 etc.), then balances would be lower with time-varying returns than with time-invariant returns.

Altering Assumptions about Pre-Tax Voluntary Contributions and Eligibility

Also of interest is how sensitive results are to the PEP assumptions that (*a*) pre-tax voluntary contributions to DC plans vary across individuals, but are time-invariant, and (*b*) that eligibility for such contributions begins at the date of hire. While the source of the SPD, the effective date of the plan, and the effective date of the last amendment of the plan were collected, the PEP does not incorporate those dates when calculating DC pension wealth; rather, the software assumes that respondents were eligible for their plans since they were hired. The potential impact of changing this assumption depends on the application, but for many research questions involving DC plans, the timing of when the plan was first available to the participant is likely to be of great importance for calculating pension measures. For example, 401(k) plans were not permitted until 1978 and few were adopted until after 1981 when the IRS issued clarifying regulations for these plans; for this reason, 1982 can be taken as the de facto earliest year of 401(k) introduction after which plan adoption rates increased rapidly (see Figure 10-1). We seek to assess what difference it makes to incorporate the plan's inception date, as well as assuming that participants were likely ineligible for 401(k) saving before 1982.[17] Furthermore, some of the voluntary pre-tax saving options in the SPDs matched to HRS respondents were also adopted in the mid- to late-1980s.

Table 10-4 illustrates the impact of these assumptions for DC quit-date balances and expected present values for a variety of Calculator parameterizations. Panel A shows the quit-date balance, and the first row replicates

TABLE 10-3 DC Plan Balances for HRS Participants in 1991, Computed Using Calculator and Time-Varying Rates of Return ($2004; N = 2,306)

Parameterization	*Mean*	*Standard Deviation*	*10th Percentile*	*25th Percentile*	*Median*	*75th Percentile*	*90th Percentile*	*95th Percentile*	*99th Percentile*
Time-invariant rate of return	46,075	123,632	0	0	5,197	44,490	128,880	219,319	495,001
Time-varying rate of return	49,148	134,072	0	0	5,283	47,401	137,629	236,187	520,199

Source: Authors' calculations.

Notes: The Calculator was parameterized as follows: the default participant file was used; years of pension eligibility for both voluntary and employer contributions were measured since the date of hire; the voluntary contribution rate was taken from the default participant file; in the first row, the real rate of return was set equal to 1.8%; the inflation rate was set to 4%; and annual earnings were calculated using the self-reported earnings in the participant file and the earnings equation from the PEP.

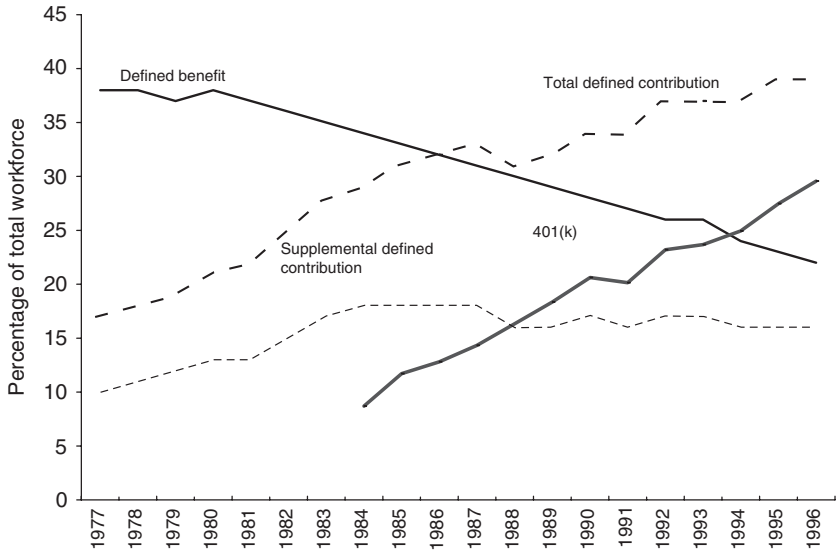

Figure 10-1. Private sector pension plan participation by plan type: 1977–96. (*Source*: US Department of Labor (2001).)

the baseline results from Table 10-2. The mean and median plan balances at the quit date are $218,971 and $30,802, respectively. The second row provides lower results for both figures of $105,297 and 0, respectively, assuming that participants did not contribute voluntarily in any of the years since hire. In other words, these statistics indicate balances associated only with employer and mandatory employee contributions over the course of employment. This highlights the important role that voluntary saving plays in DC plan balances, even for HRS workers not exposed to 401(k)-type pension arrangements for much of their careers. In particular, the mean amounts to only 48 percent of the baseline computation, which indicates that voluntary saving (and accrued earnings thereon) comprise about half of DC balances at retirement; further the typical HRS individual had only a voluntary-saving provision.[18]

The third row in Panel A indicates the quit-date balance had all participants voluntarily contributed 5 percent of pay each year of employment. At every percentile, participants now would be predicted to have positive balances at the quit date: mean and median balances would be $254,778 and $130,356, respectively. The fourth row of Panel A illustrates the impact of limiting the number of years of eligibility for pre-tax voluntary contributions. This limit is derived from three pieces of information, namely the plan adoption date, the date of last amendment in the SPD, and the first

TABLE 10-4 DC Plan Balances for HRS Participants at the Quit Date and the Expected Present Value of DC Wealth in 1992, Computed Using Calculator and Taking into Account Voluntary Contributions ($2004)

Parameterization	*N*	*Mean*	*Standard Deviation*	*10th Percentile*	*25th Percentile*	*Median*	*75th Percentile*	*90th Percentile*	*95th Percentile*	*99th Percentile*
A. DC plan balance at quit date										
Contribution rate from participant file	2,383	218,971	514,750	0	0	30,802	224,901	629,199	997,486	2,112,629
Zero contribution rate	2,383	105,297	333,753	0	0	0	95,129	308,518	512,165	1,110,494
Five-percent contribution rate	2,383	254,778	451,853	9,922	43,381	130,356	315,015	612,495	875,112	1,715,939
Contribution rate from participant file; restricted eligibility	2,383	184,736	449,148	0	0	30,023	196,331	527,525	809,779	1,741,739
W-2 contribution rate; eligibility since the date of hire	2,383	179,992	416,388	0	0	38,662	197,850	495,454	780,603	1,741,373
W-2 contribution rate; restricted eligibility	2,383	163,339	386,793	0	0	34,545	186,476	456,638	705,285	1,603,888
B. Expected present value of DC wealth in 1992										
Contribution rate from participant file	2,383	69,562	155,669	0	0	16,884	80,155	190,700	286,603	673,056
Zero contribution rate	2,383	37,869	115,268	0	0	0	38,937	105,153	160,285	346,014
Five-percent contribution rate	2,383	94,008	152,007	11,673	25,133	59,068	114,238	202,278	278,671	536,131
Contribution rate from participant file; restricted eligibility	2,383	59,203	139,254	0	0	16,159	69,981	153,743	233,794	503,408

W-2 contribution rate; eligibility since the date of hire	2,383	64,343	155,906	0	0	20,483	74,686	159,411	268,066	556,579
W-2 contribution rate; restricted eligibility	2,383	55,822	127,295	0	0	19,083	69,046	141,189	204,987	481,944
C. DC plan balance in 1991										
Contribution rate from participant file	2,306	49,148	134,072	0	0	5,283	47,401	137,629	236,188	520,199
Zero contribution rate	2,306	27,798	97,831	0	0	0	20,900	79,238	126,672	286,890
Five-percent contribution rate	2,306	70,767	136,265	2,651	10,950	34,174	87,927	171,379	231,966	476,262
Contribution rate from participant file; restricted eligibility	2,306	59,203	139,254	0	0	16,159	69,981	153,743	233,794	503,408
W-2 contribution rate; eligibility since the date of hire	2,306	44,931	136,551	0	0	7,526	40,824	116,352	217,056	479,863
W-2 contribution rate; restricted eligibility	2,306	35,638	104,711	0	0	13,277	35,121	91,013	148,210	324,942

Source: Authors' calculations.

Note: The Calculator was parameterized as follows: the default participant file was used; years of pension eligibility for both voluntary and employer contributions were measured since the date of hire in the first, second, third, and fifth rows, and as described in the text in the fourth and last rows; the voluntary contribution rate was taken from the default participant file for the first and fourth rows, and as described in the text for the second, third, fifth, and last rows; the real rate of return was set equal to 2.3%; the inflation rate was set to 4%; and annual earnings were calculated using the self-reported earnings in the participant file and the earnings equation from the PEP.

date in which a pre-tax deferral was made from the W-2 data.[19] The fourth row indicates that restricting the years of eligibility has an important impact on mean quit date DC plan balances; in particular, the mean based on restricted eligibility for voluntary contributions is $184,736, or 15.6 percent lower than the first row. Not surprisingly, the impact is largest in the upper portion of the distribution.

The Impact of Voluntary Contribution Rates from W-2 Data

The final two rows of Panel A in Table 10-4 illuminate how using administrative records (W-2 data) on pre-tax deferrals changes outcomes, by integrating actual workers' time-varying, individual-specific voluntary contributions to their DC plans over time. As Cunningham and Engelhardt (2002) have previously found, this has the effect of reducing plan balances at the mean by 17.8 percent compared to the baseline. It is interesting that the median balance rises by 25 percent, because some participants made actual contributions in 1984–91 at rates that exceeded what they indicated in their initial 1992 interviews. In other words, capturing actual contribution rates in the W-2 data does a much better job of capturing voluntary contribution patterns.

The final row in Panel A shows the combined impact of using both the W-2 contribution rates and the restrictions on years of eligibility for voluntary contributions. The results for quit date balances are striking: means plan balances are 25.4 percent lower under this parameterization than under the baseline assumptions, and median plan balances are 12 percent higher. In other words, the differences compared to the PEP assumptions are not linear, as the PEP attributes less to the middle group and more to the top end of the distribution.

Panels B and C of Table 10-4 show similar statistics for expected present values of DC wealth (in 1992) and plan balances (in 1991), respectively. Our message is the same: the mean present value of DC wealth is lower by about 20 percent and means plan balances are about 28 percent lower when we use the W-2 contribution rates and tighter eligibility restrictions.[20] It would appear that the baseline assumptions understate DC wealth in the middle of the distribution but overstate it at the upper end of the distribution. And clearly the bottom line is that DC wealth estimates are sensitive to modeling assumptions.

DC Pension Wealth Estimates Based on Administrative Earnings Data

Thus far, the analysis has examined the sensitivity of DC wealth estimates assuming respondent-reported pay at the time of the survey and a very

simple earnings projection equation built into the PEP. Next, we turn to examine how pension wealth numbers differ if we estimate an earnings model using as input the administrative SSA covered-earnings data from 1951 to 1979 and W-2 data from 1980 to the year prior to the survey year (1991 for the Original HRS cohort and 1997 for the WBs).[21] For those respondents who gave consent to match administrative earnings data, parameter estimates from this model and administrative data were used to construct complete earnings histories for each HRS respondent who entered in 1992 or 1998.[22]

The first row of Panel A in Table 10-5 estimates quit-date DC plan balances for members of the original HRS cohort using these new earnings trajectories and imposing the eligibility restrictions discussed above.[23] The mean and median DC balances are $321,846 and $68,089, respectively, substantially higher than the first row of Table 10-4. The second row provides the plan balances for just the subset of 1,857 individuals who had their Social Security earnings histories and W-2s linked to the surveys; the results show that removing individuals for whom earnings had to be imputed raises the mean to almost $363,528 and is monotonic across the pension-value distribution.

In the third row of Panel A, we repeat the analysis but instead use the WBs cohort; the sample is smaller so there are only 551 observations (the match rate for employer SPDs was also lower and the consent rate for matched administrative earnings was lower as well). The mean and median DC plan balances at the quit date were $399,363 and $27,875, respectively. But these balance figures obscure what appears to be a dramatic increase in pension wealth inequality. For the original HRS cohort in 1992, the pension balance at the 75th percentile was about four times larger than the median pension value. In 1998, for the WBs, the 75th percentile was more than 16 times the median. Whether this reflects the longer exposure to DC plans by the WBs or is simply due to differences in those for whom the administrative data could be obtained is unclear. The fourth row of Panel A shows the balances at the quit date for the subsample of 311 individuals from the War Baby cohort who gave permission to link their Social Security earnings; Panels B and C show the present value of DC wealth and the plan balance in the survey entry year, respectively.

Some final results appear in Table 10-6, which shows the DC plan balances due to employee pretax voluntary contributions and associated employer matching contributions, for the subset of participants from Table 10-6 who had a pretax saving option. Panel A shows that for participants with matched W-2s, the mean balance from pretax saving excluding the employer match was $16,850, but the median came to 0; this indicates that most of the original HRS respondents who were eligible for pretax saving did not participate in their plans. Indeed, even at the 75th percentile,

TABLE 10-5 DC Plan Balances for HRS Original Cohort and War Babies Cohort: Using Administrative Earnings Records to Measure Earnings, Voluntary Contributions, and Eligibility ($2004)

Cohort and Sample	*N*	*Mean*	*Standard Deviation*	*10th Percentile*	*25th Percentile*	*Median*	*75th Percentile*	*90th Percentile*	*95th Percentile*	*99th Percentile*
A. DC plan balance at quit date										
Original cohort full sample	2,383	321,846	750,202	0	0	68,089	324,116	874,137	1,422,381	3,483,233
Original cohort Subsample with matched earnings	1,857	363,527	820,932	0	0	78,883	353,360	1,002,432	1,659,664	3,613,718
War Babies cohort full sample	551	399,363	1,030,290	0	0	27,911	437,485	1,169,626	1,825,488	4,137,835
War Babies cohort subsample with matched earnings	311	674,051	1,298,836	0	44,457	259,609	814,325	1,743,379	2,404,895	4,607,698
B. Expected present value of DC wealth in entry year										
Original cohort full sample	2,383	133,112	301,055	0	0	34,737	129,819	335,621	597,988	1,485,251
Original cohort subsample with matched earnings	1,857	152,123	331,163	0	0	40,490	151,245	391,372	705,339	1,559,285
War Babies cohort full sample	551	120,278	239,276	0	0	23,606	157,546	321,382	533,764	940,049
War Babies cohort subsample with matched earnings	311	200,028	289,615	0	36,714	126,154	263,355	484,804	651,546	1,089,068
C. Plan balance in year prior to entry into the survey										
Original cohort full sample	2,306	119,630	307,226	0	0	13,057	95,553	328,235	610,695	1,475,872
Original cohort subsample with matched earnings	1,793	138,835	338,476	0	0	18,067	116,670	380,545	735,481	1,538,111
War Babies cohort full sample	544	83,749	175,157	0	0	2,520	100,709	269,727	397,432	799,645
War Babies cohort subsample with matched earnings	305	134,802	212,758	0	6,428	57,145	175,563	336,049	529,928	898,201

Source: Authors' calculations.

Notes: The Calculator was parameterized as follows: the default participant file was used; years of pension eligibility for both voluntary and employer contributions were measured using a combination of the plan adoption date, date of last amendment, and year of first pre-tax deferral from the W-2s; voluntary contribution rates from the W-2s for those who gave consent and self-reported from the participant file for those who did not give consent; earnings from covered-earnings and W-2 data for those who gave consent and imputed based on the earnings regression described in the text for those who did not give consent; and the real rate of return and inflation rate were time-varying and taken from Ibbotson (2003), where the return data were based on a portfolio of 100% corporate bonds.

TABLE 10-6 DC Plan Balances Due to Employee Pre-Tax Voluntary and Employer Matching Contributions: HRS Original Cohort and War Babies Cohort, for Year Prior to Survey Entry ($2004)

Cohort and Sample	*N*	*Mean*	*Standard Deviation*	*10th Percentile*	*25th Percentile*	*Median*	*75th Percentile*	*90th Percentile*	*95th Percentile*	*99th Percentile*
A. Voluntary contribution balances for eligible participants										
Original cohort full sample	1,840	14,073	32,925	0	0	0	12,956	42,650	79,805	163,637
Original cohort subsample with matched earnings	1,437	16,850	36,019	0	0	0	16,839	52,963	93,893	170,030
War Babies cohort full sample	524	53,113	133,193	0	0	0	51,256	182,733	256,641	529,928
War Babies cohort subsample with matched earnings	294	94,183	166,559	0	2,038	33,944	144,804	239,989	329,979	679,709
B. Employer matching contribution balances for the subsample offered matching										
Original cohort full sample	903	5,974	13,417	0	0	0	5,549	19,317	34,468	62,042
Original cohort subsample with matched earnings	711	7,320	14,781	0	0	347	7,718	23,453	39,732	66,788
War Babies cohort full sample	263	12,325	25,863	0	0	0	13,426	40,340	66,741	109,119
War Babies cohort subsample with matched earnings	145	22,356	31,483	0	534	10,709	29,619	64,921	79,885	148,997
C. Sum of voluntary and matching contribution balances for eligible participants										
Original cohort full sample	2,477	17,004	38,903	0	0	0	15,298	51,787	99,413	190,098
Original cohort subsample with matched earnings	1,934	20,472	42,680	0	0	0	20,049	64,192	115,982	205,648
War Babies cohort full sample	706	59,300	144,096	0	0	0	65,431	198,085	284,433	529,928
War Babies cohort subsample with matched earnings	396	105,209	179,377	0	2,506	41,798	157,435	280,808	376,378	679,709

Source: Authors' calculations.

balances are quite modest ($16,839), in sharp contrast with the fourth row WBs who had longer exposure to 401(k)-type plans; mean and median balances for them were $94,183 and $33,944, respectively. Panel B shows the distribution of balances due to employer matching contributions for the subset of plans that offered matching (about half the plans). Median balances due to matching are $347 and $10,709 for the original HRS and WBs cohorts, respectively. Panel C shows balances for the sum of the employee voluntary and employer matching contributions. Even with matching, the average balance for the original HRS cohort was only $20,472, substantially less than the WBs, again reflecting their longer exposure to these DC plans.

Conclusions and Discussion

Inasmuch as pensions represent a substantial component of older households' retirement saving, it is critical to measure the level and distribution of pension wealth properly. Yet asking respondents about their pension wealth may run the risk of measurement error. In this chapter, we show how our newly developed Calculator software can be used to construct alternative estimates of DC plan balances for HRS participants. We have emphasized the crucial role of economic assumptions, and we demonstrate several conclusions. First, pension wealth resulting from voluntary saving (and accrued earnings thereon) comprises half of DC pension wealth calculated for HRS respondents with matched SPDs. Second, our Calculator yields substantially lower mean estimates of DC pension wealth for HRS participants than the PEP that has been used to date. In particular, we calculate DC pension wealth to be 20 percent lower when we use reasonable modeling assumptions and arguably better input data; wealth in 401(k)-type pension plans alone is estimated at 40 percent less. Third, most of the reduction in estimated DC wealth occurs for the right tail of the pension–wealth distribution. Fourth, the PEP understates DC wealth in the middle of the pension–wealth distribution. Overall, we find that the mean 401(k) balance, including employer matching contributions, was about $20,472 for the original HRS cohort in 1992, but the median was 0; this suggests that the majority of those eligible did not participate in such plans back then. By contrast, the later generation known as the WBs had greater and earlier exposure to such plans; their mean and median balances were $105,209 and $41,798, respectively, indicating the growing importance of 401(k)s in retirement saving for younger cohorts.

These results suggest that research which has used pension wealth figures created from HRS sources to date may have mismeasured DC pension and retirement wealth adequacy for a sizable fraction of HRS participants. Accordingly, this analysis implies that researchers must think more carefully about the economic assumptions underlying pension measures. We

have shown that the default assumptions in the PEP overstates DC pension wealth, with the extent of mismeasurement dependent on what the researcher assumes about eligibility and employer (nonmatching) contributions. In other words, the SPDs alone offer an incomplete picture of employer pension provisions, which are needed to accurately estimate pension entitlements to DC plans. Future work will need to recognize that pension plans are dynamic as well so that SPDs must be collected repeatedly for covered workers. In addition, it is important to frequently update administrative records on earnings; fortunately, the HRS has received respondent consent to update administrative earnings files through 2003. This will permit substantially more accurate modeling of the dynamics of retirement and saving behavior of older Americans and cohort trends in retirement wealth.

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Notes

[1] See, e.g. Mitchell and Moore (1998, 2000) and Mitchell et al. (2000).

[2] See, for instance, the US Health and Retirement Study (HRS); the English Longitudinal Survey of Ageing (ELSA); the Survey of Health, Ageing and Retirement in Europe (SHARE), which covers Denmark, Sweden, Austria, France, Germany, Switzerland, Belgium, the Netherlands, Spain, Italy, and Greece; and similar ongoing or new surveys in Mexico, New Zealand, Israel, South Korea, and Japan.

[3] e.g. Mitchell (1988).

[4] See, e.g. Mitchell and Moore (1998, 2000) and Mitchell et al. (2000).

[5] See, for instance, the US Health and Retirement Study; the ELSA; the SHARE, which covers Denmark, Sweden, Austria, France, Germany, Switzerland, Belgium, The Netherlands, Spain, Italy, and Greece; and similar ongoing or new surveys in Mexico, New Zealand, Israel, South Korea, and Japan.

[6] Gustman and Steinmeier (1999), Johnson et al. (2000), and Engelhardt (2001) have analyzed pension measurement issues in the HRS.

[7] For those who entered the survey in 1992, these data include Social Security covered-earnings histories from 1951 to 1991 and W-2 earnings records for jobs held

from 1980 to 1991; for those who entered in 1998, these include covered-earnings from 1951 to 1997 and W-2s from 1980 to 1997. Unfortunately, these data are not yet available for the EBB.

[8] We refer interested readers to Rohwedder (2003) for an extensive discussion of the conceptual issues in measuring DC pension wealth from the SPDs and how those relate to the PEP and to Engelhardt et al. (2005) for detailed descriptions and comparisons of the two programs. Research that uses the Calculator to model the impact of DC pension incentives on economic behavior include Cunningham and Engelhardt (2002) and Engelhardt and Kumar (2005).

[9] Our replication is based on the original Pascal version of the Program, which since has been rewritten in Visual Basic. The (unreported) comparison based on the Visual Basic version is the same as the VB version matches the Pascal version.

[10] These anomalies were brought to the attention to and confirmed by the HRS, which addressed them in the VB version of the PEP.

[11] When parameterizing the Calculator, the user must choose which code to invoke.

[12] Specifically, we and the HRS staff compared output from the Calculator and Program and concluded that the Program's output appeared to be incorrect for these plans, but neither we nor the HRS staff could determine the root cause of the differences. Without knowledge of the underlying problem, there is no way to specify alternative calculations for these plans to override the Calculator's code.

[13] The sample size of 2,352 individuals is the set of individuals for which both the Program and Calculator produced output. In the Tables 10-3–10-5, we use a slightly larger sample of 2,383 individuals based solely on the Calculator's output.

[14] The assumed interest and inflation rates are 1992 SSA intermediate forecasts; other parameters (aggregate wage growth, etc.) are taken from the default Parameter file for the PEP. In other words, this parameterization represents the default used for Scenario 1 in the HRS-supplied Pension Values Database.

[15] These options are coded in the Pension Plan Data file but only for plans that allow for participant-directed investment of plan balances. The Pension Estimation Program does not use this information to help define rates of return; the Calculator does not either, although it does allow the user to output dummy variables indicating these investment options to the output data set.

[16] Calendar year 1991 is chosen for this comparison because it was the last year prior to the initial 1992 HRS interview, which allows solely for the use of past returns in the calculations and, from a practical perspective for the purpose of this illustration, avoids the need to forecast returns beyond 1991. In addition, 1991 is a useful year because the plan balance is recorded just prior to the initial interview, and the individual was asked to self-report the plan balance during the interview. This allows for a comparison of self-reported balances versus those implied by the Calculator.

[17] The effective and amendment dates from the SPDs were not used in the PEP because its designers implicitly assumed that a plan effective as of a particular calendar year replaced another plan of equal generosity. There is dispute in the literature about whether 401(k) plans were actually good substitutes for previously existing pension plans.

[18] It is also important to note that the zero balances in the lower percentiles in the baseline in the first row of Panel A in Table 10-4 occur because participants self-reported in the initial HRS interview that they made no voluntary contributions in 1992. Under the baseline parameterization, the Calculator assumes that the rate in

1992 was time-invariant so that if this rate is zero, then that individual was always and forever will be a noncontributor, and, thus, a zero contribution rate always held throughout the duration of employment so that the individual ends up with zero plan balance at retirement. This is what the Program would assume and calculate as well.

[19] Engelhardt et al. (2005) describe the algorithm for determining eligibility in this fashion in detail.

[20] The sample for the plan balance in 1991 is 2,306 individuals, slightly smaller than in panels A and B, because there were a small number of participants who started their jobs in 1992 and did not have coverage in 1991.

[21] We follow Cunningham and Engelhardt (2002) and Engelhardt and Kumar (2005) in using administrative earnings to construct career earnings, based on the parameter estimates from an annual earnings equation using all HRS individuals with matched Social Security earnings histories. The following model is estimated using a two-limit Tobit model to account for the censoring imposed from below by zero earnings from labor force nonparticipation and from above by the FICA cap on all person-year observations in the Social Security earnings database:

$$\ln(y_{it}) = \kappa_{1t} + \sum_{g=1}^{G} \kappa_{2gt} D_i^{\text{OwnEduc g}} + \kappa_{3t}\text{Age}_{it} + \kappa_{4t}\text{Age}_{it}^2 + \kappa_{5t}\text{Age}_{it}^3 + \kappa_{6t} Age_{it}^4 + \kappa_{7t} D_i^{\text{White}} + \kappa_{8t} D_{it}^{\text{GovtJob}} + \theta \mathbf{Z}_i + \eta_{it} \quad (1)$$

The dependent variable, $\ln(y)$, is the natural log of real covered-earnings (nominal covered-earnings from the database deflated into 1992 dollars by the all-items Consumer Price Index, or CPI). The earnings equation is estimated separately by sex and HRS cohort and employs a flexible functional form that allows for (reading the terms on the right-hand side of the equation from right to left in order) calendar-year effects; time-varying returns to the respondent's education, measured by educational attainment group, g (high school graduate, some college, college graduate, graduate degree); time-varying quartic age-earnings profiles; time-varying white-non-white earnings gaps; and time-varying returns to government jobs. In addition, the specification includes a vector of explanatory variables, **Z**, which include a large set of time-invariant differences in earnings that are interpreted as part of the individual's human capital endowment: an indicator for whether US born; sets of indicators for mother's and father's education, respectively, measured by educational attainment group (high school graduate, some college, college graduate, and education not reported); own Census region of birth; and interactions of race, education, and region of birth.

[22] Actual earnings were used from the calendar year the respondent turned 20 through 1979, for those person-year observations with actual earnings below the FICA cap; for those observations with earnings above the FICA cap, the larger of the predicted value from the earnings equation and the cap was used. For 1980 through the year prior to the entry year, the actual uncapped earnings were taken from the W-2 database for all observations. Finally, earnings were forecast for years beginning with the entry year and future years up until the quit date, producing a real earnings history from age 20 until the quit date. For respondents who did not give consent, the predicted values from the estimation based on their

socio-demographic characteristics were used to calculate an earnings growth rate from each single year of age, starting at 20, to the age in the survey entry year. Then using the respondent-reported annual earnings in the survey entry year, annual earnings were backdated using these growth rates. Finally, earnings were forecasted from the survey entry year to the quit date.

[23] For those individuals having matched earnings records, the voluntary contributions were taken from the W-2 data; for those lacking a match, voluntary contributions were those self-reported in the in-person interview.

Appendix

TABLE 10A-1 Annual Real Returns and Inflation, 1972–91, in %

Year	*Annual Real Return on a Portfolio of*			
	(1)	*(2)*	*(3)*	*(4)*
	Inflation	*100% Stocks*	*100% Bonds*	*50% Stocks, 50% Bonds*
1972	3.2	14.0	3.6	8.8
1973	6.0	−24.3	−7.3	−15.8
1974	10.5	−42.3	−14.7	−28.5
1975	8.7	24.9	6.9	15.9
1976	5.6	16.7	12.4	14.5
1977	6.3	−14.0	−4.8	−9.4
1978	7.3	−2.3	−8.7	−5.5
1979	10.8	4.4	−16.8	−6.2
1980	12.7	16.4	−14.4	1.0
1981	9.8	−13.6	−9.8	−11.7
1982	6.0	15.6	31.6	23.6
1983	3.2	16.6	2.4	9.5
1984	4.2	2.2	11.7	6.9
1985	3.5	24.2	22.6	23.4
1986	1.8	15.8	17.0	16.4
1987	3.6	0.8	−4.6	−1.9
1988	4.1	11.2	5.8	8.5
1989	4.7	22.8	10.5	16.7
1990	5.3	−9.2	0.7	−4.2
1991	4.1	23.6	15.1	19.4
1972–91 mean	6.1	5.2	2.6	4.1
1984–91 mean	3.9	11.4	9.8	10.6

Notes: This table shows the real asset returns for three representative portfolios and inflation for the twenty years prior to the 1992 HRS. Real returns calculated by Ibbotson (2003). Bonds are defined as Aaa corporate bonds. Stock returns are based on the S&P 500. Inflation was calculated by the authors from government sources for the CPI-U.

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