Employer Retirement Wealth Inequality: 1992 and 2010

for the American Economics Association Meetings, Philadelphia January 6, 2018

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Abstract: 100 words

Though declining interest and mortality rates means older workers need more retirement wealth than they did in 1992 older workers without retirement wealth declined from 82 to 78 percent between 1992 and 2010, Mean and median total retirement wealth changed little over the period 1992-2010. Four measures of inequality Ginis, Theils, means to median ratios and box and whisker charts indicate a mixed picture for retirement wealth inequality for older workers. Past studies have understated DC and DB wealth. More research on adequacy, appropriate levels of inequality and the role of DC plans in creating inequality is needed.

This study investigates employer-based retirement wealth inequality between 1992 and 2010. Like all forms of wealth, retirement wealth inequality has grown since the 1980s for two reasons. An increasing share of older workers have no or very little wealth in employer retirement plans because employers choose not to sponsor plans and when they do they are choosing to sponsor defined contribution (DC) plans instead of defined benefit (DB) plans (GAO 2017).

We contribute to the substantial literature on retirement wealth by correcting for past mistakes in estimations and imputation rules, and by closely examining what affects the horizontal and vertical distribution of retirement wealth. People who are the same age and have the same lifetime income can have widely different account balances because of differences in employers, contributions, and investment returns caused by differences in portfolios and fees. [i] In addition, the growth in retirement wealth is lopsided toward higher income households.

Since it is the employers' decision to voluntarily sponsor retirement plans the retirement wealth gap would narrow if the DB to DC switch encouraged more employers to cover more workers. However, retirement plan coverage rates have declined over the past 26 years; from 70% coverage for households with working heads age 40-59 in 1989 to 60% in 2013 (source withheld until study released). Others found drops in coverage for various segments of the workforce (GAO, 2017; Fisher, Ghilarducci, Webb 2017, Devlin-Foltz, Henriques, Saelhaus 2016). We found the share of workers who are age 51 – 56 with any retirement wealth from current or past jobs, including IRAs, fell from 82% in 1992 to 77% in 2010.

In addition, plan design affects retirement wealth distribution vertically and horizontally Households with heads age 50 – 59 in the top 1% of the wealth distribution own 5% of all DB assets and 15% of all DC assets (Devlin-Foltz, Henriques, Sabelhaus 2016). DC wealth is more concentrated than DB plans because DB plans require all eligible employees to participate, in-service withdrawals are prohibited, and benefits are typically based on job tenure, salary, and retirement age. In contrast, DC plan participation is voluntary so the higher paid contribute more often and more, benefits depend on contributions, investment choices, and financial market returns; also, in DC plans, workers often take pre-retirement withdrawals. High-income workers have

relatively more incentives and are better equipped to navigate the 401(k) system and less vulnerable to triggers for preretirement withdrawals (Ghilarducci, Saad-Lessler, Reznik 2017).

Compared to DB plans, DC retirement wealth is more sensitive to financial market volatility and by extension when someone is born; workers who are otherwise identical except age experience very different sequences of financial returns. On the other hand, although DB plans don't have the same financial market dynamics generating retirement wealth inequality; DB formulas disproportionately reward job tenure. Workers with DB plans who are the same age and lifetime income, but who have different job tenures, will have different DB wealth.

This paper is stage one of a project to measure overall retirement wealth using data from the HRS respondents; tax records; and employer plan descriptions and thus describe plan design and inequality and rather than identify causal relationships. In later stages we aim to benchmark an appropriate level of retirement wealth inequality given Social Security's progressivity. We will also assess in later papers what share of older workers will likely not maintain their pre-retirement standard of living in retirement. This paper is emphasizes technical improvements to retirement wealth measurement using the HRS

We find that the Gini and Theil coefficients for employer based retirement wealth are stable, which is not consistent with other studies. But, measuring inequality by the ratio of the mean and median shows inequality increasing from 1992 to 2010 as more older workers have little or nothing, the mean/median ratio increased from the mean being 10% larger than the mean in 1992 to being 40% larger than the median in 2010(Table 2).

Following the introduction Section 2 review the previous literature. Section Section 3 describes the data. Section 4 explains our methodology emphasizing our improved retirement plan participation and coverage estimates. Section 5 presents results, Section 6 describes policy concerns; Section 7 concludes.

2. Literature review

Even when DB plans were the dominant retirement plan, retirement wealth (excluding Social Security wealth) was more unequally distributed than income but more equally distributed than total wealth (Mitchell and Moore, 1997; Wolff, 2011). And, DC wealth is more concentrated than DB wealth (Wolff, 2011, Devlin-Foltz, Henriques, and Sabelhaus, 2016 and 2015, Munnell, Hou, Webb, and Li, 2016) and the shift to DC retirement plans has likely increased overall retirement wealth inequality (Devlin-Foltz, Henriques, and Sabelhaus, 2016). The above studies used the Survey of Consumer Finances (SCF)using self reported wealth and imputations. Using Current Population Survey data, Karamcheva and Sanzenbacher (2010) document trends in inequality in retirement plan participation which is closely related to wealth accumulation.

Retirement wealth inequality studies suffer from four major data limitations. First, self-reported data on retirement plan type is unreliable – a comparison of what employers report – in the employer plan "summary plan documents" SPDs with what people report reveals a mismatch for more than half of Health and Retirement (HRS) retirement plan participants Gustman and Steinmeier, 2004, Gustman, Steinmeier, and Tabatabai, 2010). Levels of misreporting in the SCF are also high. The misreporting compounds. If participants misreport plan type they are still asked questions about their reported plan type when means the responses have little value. For example, workers with DB plans may report they falsely have a DC plan and then may answer a question about their account balance. Also respondents may incorrectly report they do not participate in any type of retirement plan and then are falsely counted as not having any retirement plan wealth. Importantly, respondents over time are apt to falsely report they have the dominant plan type in the market – the 401(k) which would be biasing estimates of trends (Gustman, Steinmeier, and Tabatabai, 2007). Gustman, Steinmeier, and Tabatabai (2007) describe several patterns and trends in misreporting. Since data limitations prevent comparing what people report with administrative data we do not know whether those who correctly report their plan type also correctly report their plan balance. We suspect balances may be reported with substantial error. Some participants only report a range within which their account balance lies, while the self-reported plan balances of many participants fluctuate from wave to wave by amounts that greatly exceed contributions and plausible investment returns.

The second of four limitations is not distinguishing between retirement wealth inequality among people with similar incomes and inequality between income groups. Munnell, Hou, Webb, and Li (2016) report the shares of wealth held by households within each quartile of educational attainment is becoming more unequal, but do not report within-quartile inequality which may contribute more significantly that between group inequality to total inequality. Likewise, Poterba, Venti, and Wise (2007) only report mean wealth by lifetime income decile. Devlin-Holtz, Henriques, and Sabelhaus (2016) show that ratios of average pension wealth to usual income for the bottom 50 percent, 51st to 90th and top 10 percent of households ranked by usual income have been relatively stable over the period 1983-2013, but do not explore inequality within these income groups. Wolff (2011) reports unconditional wealth inequality, but does not condition on income, likely because the dataset he uses, the Survey of Consumer Finances (SCF) reports only current income, which is only loosely correlated with lifetime income.[ii] In contrast, using HRS data, Venti and Wise (1998) report the 10th, 30th, 50th, 70th, and 90th percentile of total and financial wealth by lifetime earnings decile. They find enormous variation in total and financial wealth within lifetime earnings deciles but the data is over ten years old.

Third, studies customarily calculate the expected present value of DB wealth by discounting expected benefits at a constant rate of interest and then time apportioning discounted DB wealth to past and future service requires calculating the present value of accrued benefits, taking account of future salary increases. Interest rates have declined substantially since 1992 so using a constant interest rate understates DB wealth of more recent cohorts relative to previous cohorts. The effect on the measurement of wealth inequality is theoretically ambiguous as an across-the-board increase in DB wealth could either increase or decrease measured inequality.

Fourth, though not an issue in this paper, these studies are silent about what level of inequality would prevail if all households were adequately prepared for retirement. Workers at who are the same age should have unequal levels of retirement wealth because higher income households need higher retirement plan replacement rates because their Social Security replacement rates are lower.[iii] But if low-and moderate earners won't have enough in retirement and higher income people are using tax-advantaged

retirement plans to lower taxes and accumulate dynastic wealth among a minority of high earners (GAO 2104, Engen and Gale, 1997) then the gap is too high. Congress gave tax advantages for retirement wealth accumulation, if it the tax preference helps lower taxes for the wealthy then retirement wealth inequality erodes the tax base and does not promote retirement adequacy. [iv]

3. Data Definitions and Corrections

We use the HRS panel data employer SPDs collected by the HRS and linked tax records -- W-2 information. We calculate retirement wealth by synthesizing self-reported data, summary plan descriptions (SPDs), which specify an employers retirement plan's rules – eligibility criteria, match rates, and so on, but not the account balances of individual participants – and W-2s[v] which report employee earnings and elective deferrals and filed by employers with the Internal Revenue Service.

Self-reported data

The HRS is a nationally representative panel survey of older American households. The first cohort, those born 1931-41 and their spouses of any age were first interviewed in 1992 when they were ages 51-61. The 1942-47 birth cohort was added in 1998, the 1948-53 cohort in 2004, and the 1954-59 cohort in 2010. HRS staff attempted to obtain retirement plan summary plan descriptions (SPDs). For participants who gave permission, the data are linked to W-2 earnings records.[vi] To ensure comparability across waves, we focus on individuals ages 51-56 in 1992, 1998, 2004, and 2010 who first entered the panel on those years. This yields samples of 2171, 719, 875, and 683 workers.

SPDs and DC and DB wealth calculations

HRS staff collected plan documents (SPDs) from employers, the Department of Labor, internet searches, and starting in 2004, by asking employees to submit them. HRS has not collected DC SPDs in 2010. Relying on SPDs has two limitations: SPDs aren't collected if an individual reports that do not participate, but who may in fact be covered understating retirement wealth and second, a sizeable and increasing share of workers reporting participation are not matched to SPDs but higher income workers are more

likely to have an employer SPD matched to their record (Gustman and Steinmeier, 2004).[vii]

As mentioned above, Gustman, Steinmeier, and Tabatabai (2010) find high level of disagreement between SPDs with self-reported retirement plan type and infer worker error caused the disagreements. But the HRS likely did not collect SPDs for all of workers' plans and the HRS may match workers to incorrect plan types (Rohwedder, 2003). Our cross-tabulation of SPDs with W-2 data reveals a large number of participants with W-2 elective deferrals who were matched to DB SPDs and not a DC SPD which they should have been. We conclude that HRS staff failed to collect or match SPDs, and we instead impute DC SPDs accordingly, using both W-2 and self-reported data.

We use the HRS pension estimation program (PEP) to estimate DB benefits from the SPDs and employee-supplied data on salary and length of service (for DB plans) and elective deferrals (for DC plans) deeming, as does Cunningham, Engelhardt, and Kumar (2007) the program appropriately calculates the DB component of total retirement wealth.[viii]

The PEP DC calculations are more troublesome: 1) the user must select a time-invariant real rate of return common to all participants, with a default of 2.9 percent which disregards heterogeneity in asset allocations, investment returns, and fees. Inequality will be higher if higher income participants allocate larger shares of their portfolios to higher risk but higher return asset classes or if they face lower fees.[ix] 2) it assumes plan eligibility since the date of hire, an assumption that will overstate plan balances, given the growth in eligibility as firms introduced 401(k) plans as supplements to or substitutes for DB plans, 3) it uses self-reported earnings from the HRS interview and assumes constant real wage growth common to all participants, with a default of 1.2 percent a year , 4) it assumes a time-invariant voluntary contribution rate to 401(k)-type plans equal to the current self-reported participation rate (Fang, Butchart, Stolyarova, Nolte, and Peticolas, 2016). All these assumptions overstates the DC wealth of current contributors especially since more people have DC plans and take participation holidays.

Cunningham, Engelhardt, and Kumar (2007) improved the calculations by basing contributions on not current, but reported W-2 data on earnings and elective deferrals

supplied by the employer to the Internal Revenue Service. Instead of assuming a time invariant rate of return, they assume a user defined time varying rate of return. Their code incorporates an option of allowing this rate of return to vary across participants but does not incorporate self-reported data on asset allocations. Their computer code also invokes plan adoption and amendment dates indicated in the SPD to determine eligibility for plan features. They show that use of the PEP systematically overstates DC wealth. Their code covers the 1992 and 1998 entrants, not the 2004 or 2010 entrants.

We address 1 limitations in the CEK (Cunningham, Engelhardt, and Kumar 2007) PEP and note two. First, in contrast to the HRS PEP, which requires only SPDs, CEK also requires W-2 data, which are not available for all participants, further reducing the sample size. We instead impute SPDs for respondents not matched to these data and reweighting by the inverse of the probability of a W-2 match.

We defer to future research fixing 2 more measurement mistakes: W-2s do not capture loans, in-service withdrawals, and 401(k) loan defaults that amount to perhaps 0.5 percent of 401(k) wealth a year (Munnell and Webb, 2015).[x] About 90 percent of active participants have access to a loan feature (Vanderhei, Holden, Copeland, and Alonso, 2012) and about 18 percent of participants in plans offering loans had a loan outstanding and that loans amounted to 2 percent of plan assets (Vanguard 2014)[xi]. Second we need to model individual level heterogeneity in investment returns, conditional on asset allocation, which will contribute to retirement wealth inequality which would have a small impact if all participants held the same market portfolio, but substantial if participants held diverse portfolios.

Forms W-2

The HRS contains extracts from Form W-2 for 1980 onwards[xii] which helped us impute wealth and solve the vexing problems of state and local retirement wealth. The key was understanding three entires – Box 1, 2, and 12. Box 1 reports earnings subject to federal income tax. Box 5 reports Medicare taxable earnings. Box 12 contains a series of letter entries indicating retirement plan contributions and non-retirement related income and benefits. Importantly, employee contributions to state and local DB plans are deducted when calculating Box 1, but are not included in Box 12.

Starting in 1990, the HRS reported the sum of the Box 12 retirement related deferrals, but only for the 2004 and 2010 consenters. Starting in 2004, the HRS restricted data also contains the individual Box 12 letter code entries.

From 1984 onwards, employee contributions to retirement accounts were excluded from federal income tax but subject to Social Security (FICA) payroll tax. We identify the DC contributions of 1) 1992 consenters made 1984-1991 and 2) 1998, 2004, and 2010 consenters made 1984-1989 by comparing Medicare taxable earnings (box 5 on the W-2) with earnings subject to income tax (box 1 on the W-2). But this approach cannot be applied to those with high earnings above the Medicare taxable maximum. For years prior to 1991, the Medicare tax was capped at the Social Security maximum taxable income ($51,300 in 1990). In 1991, 1992, and 1993 the cap was progressively lifted to $125,000, $130,200, and $135,000, before being eliminated in 1994. Nor can the approach be applied to any earnings prior to 1984 because elective deferrals were deducted when calculating Medicare taxable earnings.

Dushi and Honig (2010) discarded individuals with earnings exceeding the above limits which leads to downward biases in retirement wealth inequality. Cunningham Engelhardt and Kumar (2007) retained high earners unless their earnings were above the taxable maximum in all years. For remaining high earners, they assumed the contribution rate equaled the rate in years it was observed.[xiii]

The CEK approach may overstate deferrals of high earners because, at least in the 1980s and 1990s, both eligibility and participation rates conditional on eligibility trended upwards over time. Therefore, we, instead, impute contribution commencement dates for high earners, using non-capped high earners as our donor pool.[xiv]

The lack of data prior to 1984 is less of a problem. Although enacted in 1978, 401(k) effectively became available in 1981 when the IRS issued clarifying regulations. Thus, relatively few workers contributed to 401(k)s through 1981-83 although others may have contributed to other types of DC plans.[xv]

Measuring state and local employees contributions is difficult because some state and local employees are not subject to Medicare. For those subject to Medicare taxation, we can, in theory, calculate deferrals by comparing Box 1 with Box 5. The problem is that this share has declined over time. State and local workers have relatively generous

retirement plans, so excluding workers not covered by Medicare will bias time trends. Second, state and local DB retirement plans require employee contributions which are excluded from Box 12, they are excluded from Box 1 and included in Box 5 and thus appear in calculations of deferrals using these boxes. As calculations for earlier years are based on these boxes, estimates of time trends in deferrals will be biased upwards, a point seemingly overlooked by Dushi and Honig (2010). Third, the rules on deferral of tax on contributions to 457 plans (the state and local government equivalent of 401(k) plans) differ from those for 401(k) and 403(b) plans. Specifically, elective deferrals do not appear on form W-2 until there is no longer substantial risk of forfeiture (Cunningham and Engelhardt, 2002). For this reason, Cunningham and Engelhardt (2002) excluded 457 participants from their analysis. Our enquiries indicate that 457 deferrals are almost invariably entered on the W-2 for the year of deferral.

Dushi and Honig (2015) discard state and local government workers -- identified from their W-2 records and those who self-report employment in public administration. Cunningham and Engelhardt (2002) also excluded "government employees." We agree with Gustman, Steinmeier, and Tabatabai (2013) that it is not possible to identify state and local government workers with any precision, especially in the early years. But we should not throw them out of the sample. We back into estimates of state and local contributions. [xvi]

Finally, we identified many anomalies in the Box 1 and Box 5 data.[xvii]

4. Methodology Improving Retirement Wealth Calculations

Our study makes five contributions to the retirement wealth literature.

First, we update the Cunningham, Engelhardt, and Kumar (2007) program that calculates 1992 and 1998 DC retirement wealth from summary plan descriptions to 2004 and places that code in the public domain for use in future studies.

Second, by comparing SPD with W-2 data, we show that DC contributions estimates based on the SPD significantly understate DC coverage and wealth.

For knowledgeable participants, self-reported DC wealth data should be more accurate than estimates based on SPDs and W-2s. But, self-reported data have practical problems: many HRS participants appear to misreport participation, plan type, and

benefit entitlements (Gustman and Steinmeier, 2004, Gustman, Steinmeier, and Tabatabai, 2010).

Cunningham, Engelhardt, and Kumar (2007) addressed three drawbacks in the Health and Retirement Study Pension Estimation Program (HRS-PEP) – 1) anomalies that overstates DC wealth 2.) extrapolating past 401(k) deferrals based on current earnings and deferrals; 3) assuming the same rate of return for all participants over time -- by creating a different pension estimation program (CEK-PEP) that applies the SPD rules to employer reported earnings – from the W-2 data on earnings and elective deferrals – and the person's reported date of they stopped working. By requiring both SPDs and forms W-2s, the program calculates retirement wealth for a smaller share of workers than the HRS-PEP. And the CEK-PEP only runs on data from the 1992 and 1998 waves of the HRS, not the 2004 or 2010 waves.

We extend the CEK-PEP to cover 2004, impute SPDs for whom these data are unavailable, and reweight by the inverse of the probability of a W-2 match. The HRS did not prioritize the collection of 2010 DC SPDs, and we rely solely on forms W-2 when calculating 2010 DC wealth.

Our third contribution is carefully comparing entries in different parts of the tax forms – the W-2 --- to correct prior studies that substantially overstate DC coverage by incorrectly classifying employee contributions to state and local DB plans as DC elective deferrals

Fourth, instead of focusing on the subset of workers for whom SPDs or both SPDs and forms W-2 are available as does others and excluding IRA wealth, we calculate total retirement wealth for all workers. SPD-based calculations miss IRA wealth which is holds most 401(k) wealth (Munnell and Webb, 2015) and thus, severely underestimates DC wealth. To correct we add self-reported data on IRA balances. [xviii]

Fifth, we to add to retirement wealth studies by decomposing employer retirement inequality trends into between and within income group components.

Below, we describe how we calculate each of these components; how we deal with individuals not matched to SPDs and forms W-2; DC investment return assumptions; and our Gini and Theil calculations. Retirement wealth equals the sum of DB and DC wealth from current and past jobs and IRA wealth.

DB wealth from current job; PEP and imputation

We use the HRS pension estimation program (PEP) to calculate DB wealth for workers for whom DB SPDs are available. We assume gender specific population average mortality for the relevant birth cohort, discount by the prevailing interest rate on investment grade corporate bonds, and time apportion to past and future service. We assume that workers retire at the plan's normal retirement age, as specified in the SPD.

We impute DB SPDs to workers matched only to a mandatory or voluntary contribution DC SPD but who have no W-2 deferrals and who report DB coverage. Our covariates include self-reported plan type, industry, and W-2 deferrals.

DC wealth from current job; PEP and imputation

We constructed our own Pension Estimation Program (PEP) to calculate DC wealth for workers for whom the HRS collected a DC SPD. The technical appendix (forthcoming) explains how we impute DC SPDs to workers who are making elective deferrals (identified from the W-2s); but, for whom, the HRS did not collect an SPDs of the relevant type.

DB wealth from past job: self report

We use self-reported data to calculate DB wealth from past jobs. The HRS did not collect SPDs for past jobs in 2004 and 2010 and only partially so for the 1992 and 1998 waves, In 1992, only 26 percent of workers reporting they will get future benefits from a defined benefit plan from a past job were matched to an SPD.

DC wealth from past jobs and IRA wealth: self report

We use imputed values from the RAND income and wealth to compute IRA wealth instead of piecing together information from past jobs.

Workers can withdraw their 401(k) plan balance, roll the money into an IRA or, rarely, into a new employer's 401(k), or leave the money invested in the old plan,[xix] or a combination.[xx] HRS participants are asked how much was in their account when they left their employer, which of the above options they chose, and if they rolled over the balance into an IRA or left it in the original plan, how much is in the account now.[xxi]

The HRS collected SPDs for some previous jobs. In theory, one can calculate current wealth from past jobs using W-2 and SPD data, making an adjustment for

cashouts at job separation. We chose not to use this approach for two reasons. First, significant leakages and transfers occur not at job separation and afterwards. Second, older workers who have changed jobs several times during their career and others often comingle rollovers from past jobs with direct contributions in IRAs (Munnell and Webb, 2015) so using W-2 and SPD data for some past jobs would misidentify the share of the IRA balance related to that job. Workers' error in reporting error current DC wealth from past jobs than SPD and W-2 - based calculations.

Missing W-2 data: reweight

Since the share of workers matched to forms W-2 is small -- varies from 38.6 percent in 1992 to 29.7 percent in 2010 – we reweight our data using HRS supplied weights that equal the inverse of the probability of a worker being matched instead of imputing W-2s to workers.

DC investment returns: random assignment

In 1992, 1998, and 2004, participants in 401(k) plans report whether the money in their account is invested mostly in stocks, mostly in interest earning assets, or is about evenly split. In 2010, they are asked to report the percentage invested in stocks.[xxii] We impute missing asset allocations for 2010 and calculate unweighted averages for participants who have multiple plans. For 1992, 1998, and 2004, we decided against assuming individuals giving the same response to the asset allocation question had the same asset allocation because this would assign many with the same portfolio and investment returns. Instead, we imputed asset allocations by randomly drawing from the 2010 allocations lying in the range zero to 40 percent stocks for those who reported they were mostly in bonds in their primary DC plan, the range 40-60 percent for those who reported they were about evenly split, and 60-100 percent for those who reported they were mostly in stocks. We further assume that participants never changed their asset allocations and that they rebalanced annually.

Measuring inequality

Armed with retirement DB and DC wealth for each worker aged 51 – 56 we used three indicators of wealth inequality trends: Gini's[xxiii], Theil, box and whiskers figures and the ratio of mean wealth to median wealth in every year.

A Theil index [xxiv] supplements the Gini coefficient because the Gini does not indicate where inequality occurs within the distribution and it is not additive across groups -- the total Gini of a society does not equal the sum of the Ginis for its sub-groups.

The Theil index is additive across different subgroups in the population, so that we can decompose in the between-group and within-group components of dispersion.

Although the Theil coefficient takes the value zero when there is perfect equality, it otherwise lacks the straightforward representation of the Gini coefficient. It also suffers from the disadvantage of the Gini coefficient in that it does not indicate where dispersion occurs within the distribution. \

5. Results

First, we report coverage rates for workers ages 51-56 in 1992, 1998, 2004, and 2010, for current jobs (Table 1 upper panel). We then adopt a broad definition of coverage, including workers who held IRA or DC wealth or who were currently receiving or anticipated receiving DB income from a current or past job (Table 1 lower panel). The overall coverage rate from a current or past job declined from 82 to 78 percent. The share covered only by a DC plan increased from 26 to 39 percent, mostly reflecting declines in the shares covered by a DB plan.

The mean and median DB wealth (n 2016 dollars) from current and past jobs of workers with DB wealth changed little over the period 1992-2010 (Table 2). In contrast, the mean and median DC and IRA wealth of workers with DC or IRA wealth increased substantially, with the median increasing from $23300 to $56500. But even in 2010, median DC and IRA wealth was substantially less than median DB wealth. As a result, mean and median total retirement wealth, conditional on owning any wealth changed little over the period 1992-2010, reflecting the shift from DB to DC.

A finding of stagnant real wealth is concerning because workers in 2010 need more wealth than in 1992 to produce the same amount of retirement income because interest rates and mortality rates are falling. And they need more wealth to maintain replacement rates since workers ages 51-56 in 2010 enjoyed higher lifetime real earnings than those 56 in 1992.

The mean to median ratios have increased for all workers indicating more inequality (Table 2) but not for those with retirement wealth revealing the rise of older workers with no retirement wealth is contributing to retirement wealth gaps.

Gini coefficients for DB, DC, and total retirement wealth show DC wealth was more unequally held than DB wealth (Table 3 and b),[xxv] confirming others (Devlin-Foltz, Henriques, and Sabelhaus, 2016 and 2015, Munnell, Hou, Webb, and Li, 2016, Wolff 2011) and measured inequality trends depend on the sample. A bootstrapped sample with no weights shows inequality rose between 1992 and 2010 (Table 3a and 3b).

Theil coefficients decompose the shares of retirement wealth inequality resulting from inequality between lifetime income [xxvi] deciles and that resulting from within lifetime income decile inequality. For workers with retirement wealth the Theil coefficients for DB, DC, and total retirement wealth in 1992-2010 show the greater inequality of DC than DB wealth results from both an increased concentration of DC wealth among high lifetime earners and greater inequality of DC wealth within lifetime income decile. Within each plan type, the level and composition of inequality has changed little over the 18-year period. The final row of Table 4 reports Theil retirement wealth coefficients for all workers regardless if they have some retirement wealth indicate rising inequality.

But neither Gini nor Theil coefficients tell us where dispersion is occurring within the distribution. Figures 1, 2 and 3 show box and whisker charts for DC, DB, and total retirement wealth in 2010. The charts report the interquartile range (the box) and the range from the 5^{th} to 25^{th} and the 75^{th} to the 95^{th} percentile (the whiskers), by lifetime income decile. For DB and DC participants, the interquartile range is substantially higher in higher income deciles but the dispersion in DCs are much greater than DBs. Among DC participants, the interquartile range is dramatically higher in higher income deciles, and the difference between the 75^{th} and 95^{th} percentile (the height of the upper whisker) is much greater, particularly in upper income deciles. We conclude that a move to DC plans creates more inequality.

6. Policy Implications for Retirement Wealth Adequacy

Retirement wealth inequality should, perhaps, not be concern policy makers if it merely reflects differences in preferences of rational far-sighted people. But inequality caused by policies that unwittingly or on purpose benefit higher income households and produce retirement income inadequacy is. Many economists conclude many households have insufficient wealth to maintain their standard of living in retirement, (GAO 2017, Munnell, Hou, and Webb, 20140 although there are some dissenting voices (for example, Scholz, Seshadri, and Khitatrakun, 2006).[xxvii] Of social and political importance is that a third to a half of middle class older workers will descend from the middle class to near poverty in old age (Ghilarducci, Papadopoulos, and Webb, 2017 and a source that has not been released yet). Even many high earners are not served well; 15% of older workers in the top 10% of the earnings distribution have no retirement savings (Ghilarducci, Papdopolous, and Webb 2017) and a significant share of the top third of earners will not able to maintain their standard of living in retirement (Munnell, Hou, and Webb, 2014).

Another justification for public policy concerns about retirement wealth inequality is that the substantial tax expenditures at the federal and state levels for retirement wealth are neither effective, equitable, nor efficient (Ghilarducci and Cid-Martinez 2015, Batchelder, Goldberg, and Orzag, 2006, Weller and Ghilarducci, 2015) – the expenditure disproportionately benefit high earners who may substitute what they would have saved in taxed accounts for savings in retirement tax-deferred accounts and who would have likely saved for retirement without incentives (Chetty, Friedman, Leth-Petersen, Nielsen, and Olsen, 2013).[xxviii] Tthe presence of excessive fees suggest tax expenditures benefits accrue to the financial services industry, compounding the regressivity of the tax system if low earners are at greater risk of predation.

Policy options include mandating retirement savings plans (Ghilarduci and James 2018), taking steps to lower fees, allowing people to make additional Social Security contributions (Ghilarducci, Papdapolous, Sun, Webb, 2018), eliminating or reducing opportunities for pre-retirement withdrawals, providing refundable tax credits or low-income savers credits. Although financial education can help some workers (Lusardi, Michaud, and Mitchell, 2017), policymakers need not depend on changing workers but designing a system that works for workers, including most who by circumstance, intellect or temperament (Laibson 1997) won't have optimal saving.

7. Conclusions

Since the 1980s, the U.S. retirement savings system has become increasingly financialized -- retirement wealth accumulation has increasingly become intermediated by the financial services industry, rather than being managed by employers through their sponsorship of defined benefit, money purchase, or profit sharing plans. A DC system may have increased inequality by variation in wealth because variation in financial returns because of one's age cohort, because one faces the risk of choosing a bad portfolio, or paying excessive fee risk, or having an employer who does not sponsor a plan or who chooses bad investment alternatives. DB plans insure against longevity risk, whereas DC participants face inferior choices in voluntary annuity markets. Reduced risk pooling may increase in retirement wealth inequality. Heterogeneity in investment outcomes may reflect lack of portfolio diversification and investment opportunities, rather than differences in households' preferred location on the risk-reward frontier. Most households are not capable of selecting an optimal portfolio allocation or detecting excessive fees or predatory actions. Predation and excessive fees may have contributed to the high levels of retirement wealth inequality reported in this study.

And, inequality across birth cohorts reflects the luck of being born into a cohort that experiences good or bad investment returns over the accumulation phase. For those who annuitize, these variations in investment returns are not offset by variations in annuity rates (Munnell, Webb, and Golub-Sass, 2008).

We find that retirement wealth is highly unequally distributed. We also found that mean and median total retirement wealth, conditional on owning any wealth changed little over the period 1992-2010 despite older workers needing more wealth. A shift from DB to DC was associated with an increase in retirement wealth inequality over the period from 1992 to 2010, reflecting the rise in share of older workers who have no retirement wealth.

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Tables and Figures

Table 1: Share of Workers 51-56 with Retirement Wealth 1992-2010

	1992	1998	2004	2010
Current job				
Based on self-reported data				
DB only	28%	21%	15%	16%
DC only	16%	22%	33%	32%
Both DB and DC	22%	21%	21%	21%
Any retirement wealth	66%	65%	69%	69%
Based on SPDs, Self-Reported Plans and W-2s				
DB only	20%	12%	11%	9%
DC only	18%	27%	34%	34%
Both DB and DC	30%	31%	25%	29%
Any retirement wealth	68%	70%	70%	71%
Current or past job				
Based on self-reported data				
DB only	18%	16%	14%	11%
DC only	26%	28%	37%	39%
Both DB and DC	38%	35%	29%	27%
Any retirement wealth	82%	79%	81%	77%
Based on SPDs and W-2s				
DB only	14%	11%	11%	7%
DC only	26%	31%	37%	39%
Both DB and DC	42%	40%	32%	32%
Any retirement wealth	82%	82%	80%	78%

Source: Authors' calculations.

Notes: HRS sample weights adjusted for selection into W-2 matching. Workers are treated as having current job DC wealth if they are a current or past contributor in their current job. They are treated as having current or past job DC wealth if they have current job DC wealth, IRA wealth, or a DC account from a past job, and current or past DCB wealth if they have current or vested deferred benefits from a past job.

Table 2: Mean and Median Retirement Wealth 1992-2010 for Workers 51-56 (in 2016 dollars)

	1992	1998	2004	2010
Conditional on coverage				
Mean				
DB only	134700	156500	147800	106700
DC only	67400	116100	97500	99500
Both DB and DC	271300	303100	358700	284900
Any retirement wealth	183200	212400	210200	175500
Median				
DB only	62000	82600	66100	52900
DC only	23300	29400	37700	49800
Both DB and DC	160200	236400	237400	185000
Any retirement wealth	79100	109300	107100	93900
RATIOS OF MEAN TO MEDIAN	**2.3**	**1.9**	**2.0**	**1.9**
Unconditional on having any retirement wealth				
Mean				
DB	98100	95900	85900	62100
DC	51900	78800	82400	74500
Any retirement wealth	150100	174700	168300	136700
Median				
DB	12800	2500	0	0
DC	9300	11700	15300	19500
Any retirement wealth	49400	63000	54200	52800
RATIOS OF MEAN TO MEDIAN	**1.1**	**1.3**	**1.5**	**1.4**

Source: Authors' calculations.

Notes: See Table 1. All amounts are in $2010. DB wealth is valued using prevailing investment grade corporate bond interest rates and cohort mortality tables.

Table 3a: Retirement Wealth Gini Coefficients 1992-2010 for Workers 51-56 (Falling Ginis)

	1992	1998	2004	2010
Conditional on coverage				
DB - whether or not DC	0.59	0.52	0.57	0.57
DC - whether or not DB	0.70	0.68	0.68	0.61
Any retirement wealth	0.63	0.59	0.63	0.59
Unconditional on having any retirement wealth				
Any retirement wealth	0.70	0.67	0.70	0.68

Source: Authors' calculations.

Notes: See Tables 1 and 2. DB and DC wealth are each inclusive of wealth from past jobs

Table 3b: Retirement Wealth Gini Coefficients 1992-2010 Workers 51-56 (flat to rising Ginis)

Bootstrapped - No sampling weights				
Conditional on coverage				
DB - whether or not DC	0.59	0.53	0.56	0.57
	(0.012)	(0.015)	(0.019)	(0.017)
DC - whether or not DB	0.69	0.69	0.68	0.65
	(0.015)	0.017	(0.03)	(0.018)
Any retirement wealth	0.63	0.6	0.62	0.63
	(0.011)	(0.012)	(0.02)	(0.014)
Unconditional				
Any retirement wealth	0.70	0.67	0.70	0.72
	(0.1)	(0.011)	(0.017)	(0.012)

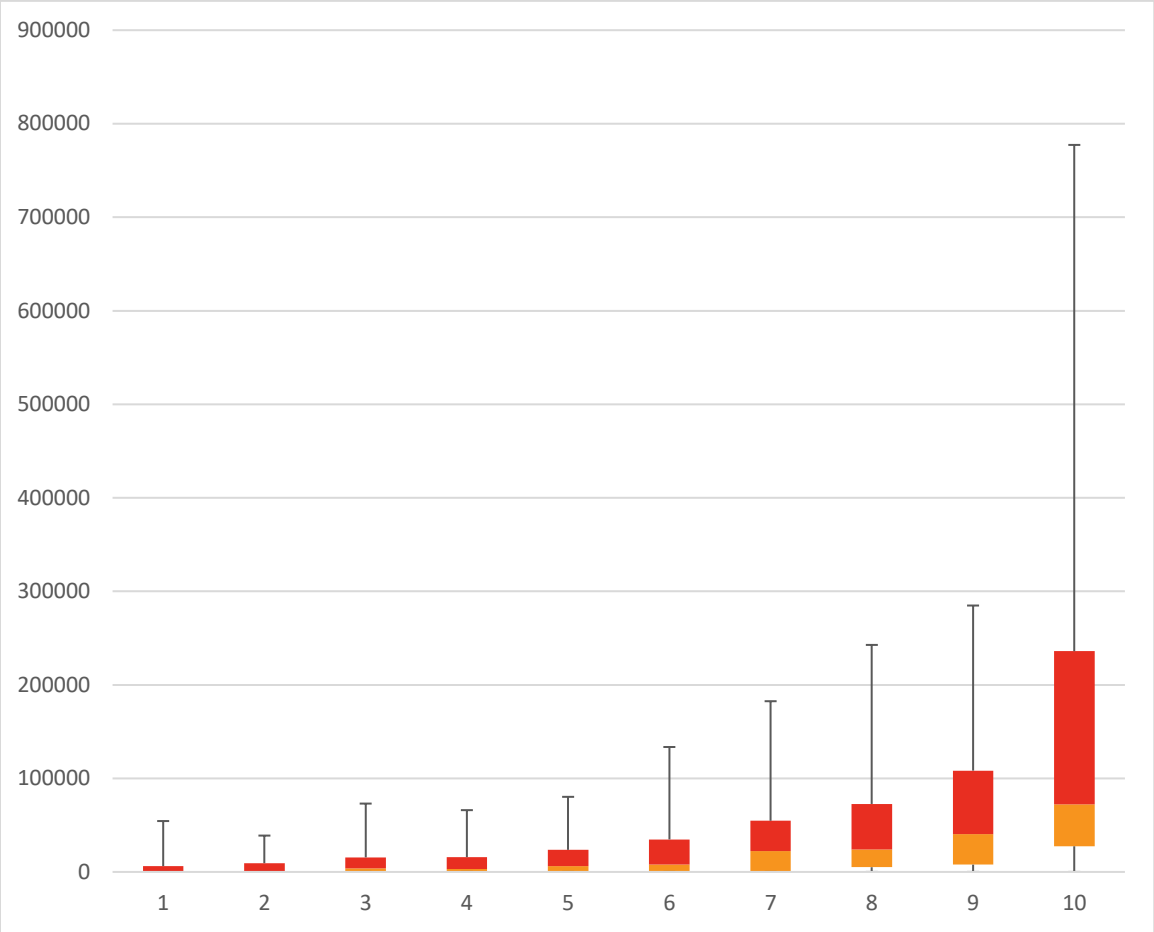
Source: Authors' calculations.

Notes: See Tables 1 and 2. DB and DC wealth are each inclusive of wealth from past jobs. No Sampling Weights. Bootstraped standard errors in parentheses

Table 4: Retirement Wealth Theil Coefficients 1992-2010 Workers 51-56

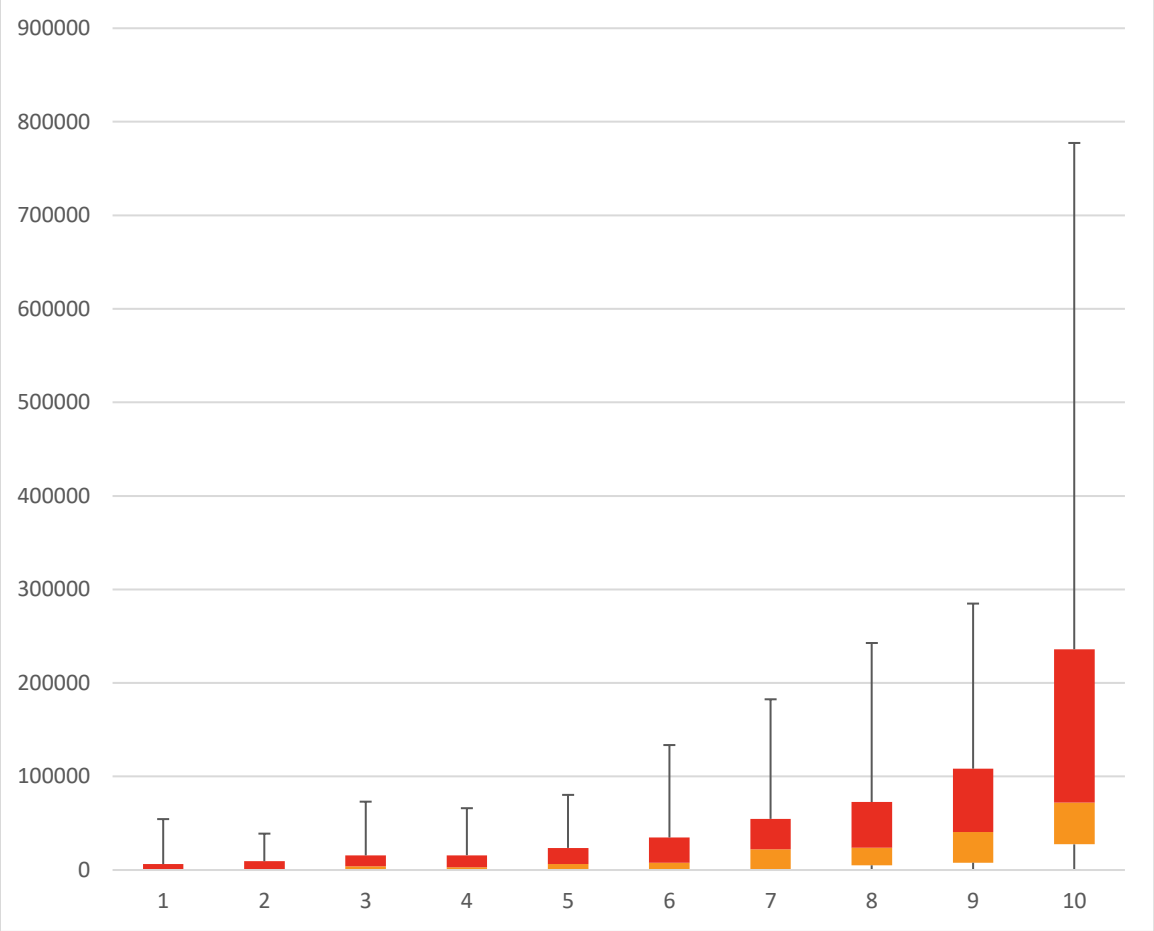
	1992	1998	2004	2010
Conditional on coverage				
DB - whether or not DC				
Total	0.65	0.46	0.59	0.57
Between lifetime income decile	0.16	0.05	0.14	0.09
Within lifetime income decile	0.49	0.41	0.45	0.47
DC - whether or not DB				
Total	1.05	0.89	1.05	0.66
Between lifetime income decile	0.35	0.23	0.34	0.23
Within lifetime income decile	0.71	0.66	0.71	0.43
Any retirement wealth				
Total	**0.77**	**0.61**	**0.79**	**0.62**
Between lifetime income decile	0.28	0.16	0.26	0.17
Within lifetime income decile	0.49	0.45	0.52	0.45
Unconditional				
Any retirement wealth				
Total	**FtF**	**0.81**	**1.02**	**0.87**
Between lifetime income decile	0.40	0.26	0.41	0.34
Within lifetime income decile	0.58	0.54	0.61	0.53
Source: Authors' calculations.				
Notes: See Tables 1 and 2.				

Figure 1: Distribution of Defined Contributions Wealth by Lifetime Income Decile



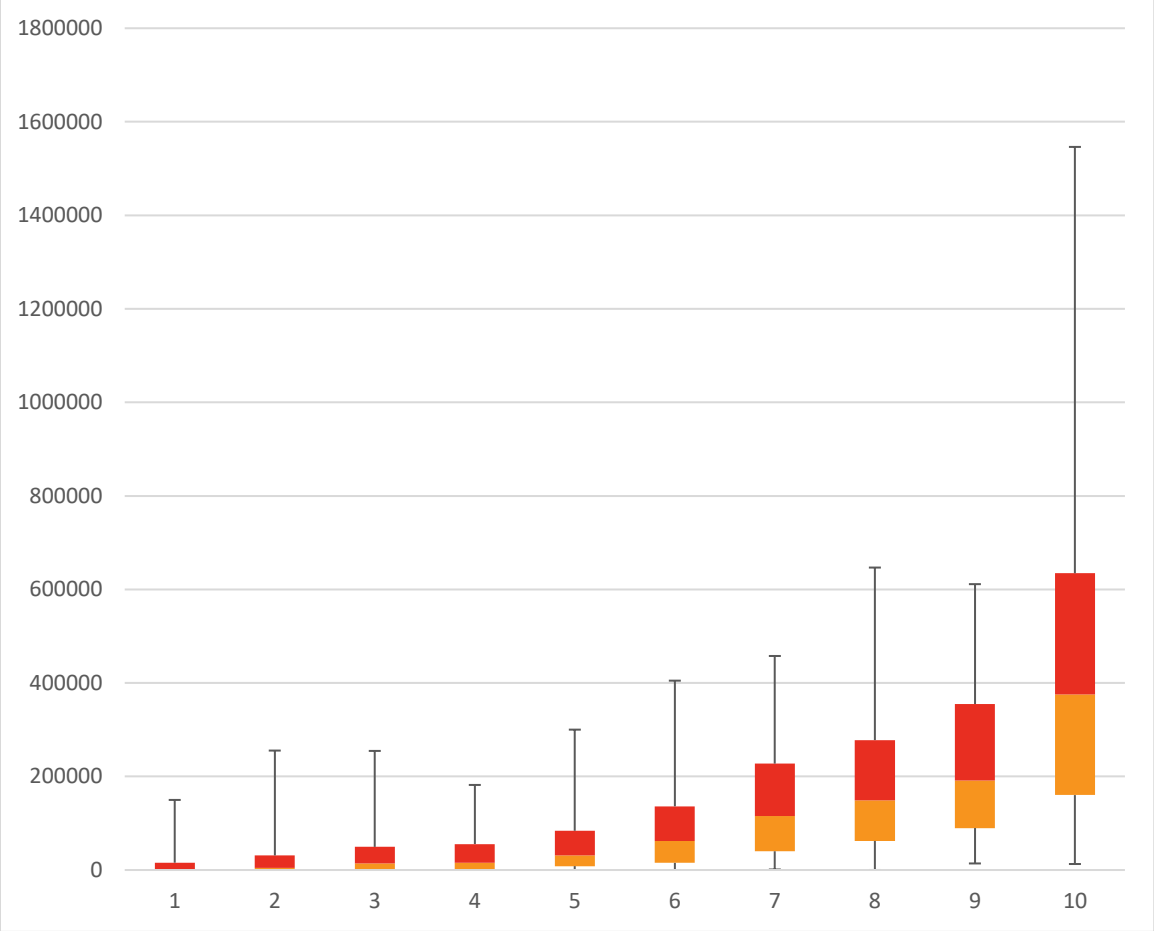
Source: Authors' calculations:
Notes: HRS sample weights adjusted for selection into W-2 matching Sample includes workers ages 51 to 56. Defined contributions wealth calculated for plans from a current or past job and includes IRAs. 1992 data expressed in 2010 dollars. Boxes indicate the 25th to 75th percentile of wealth and whiskers the 5th to 95th percentile.

Figure 2: Distribution of Defined Benefits Wealth by Lifetime Income Decile



Source: Authors' calculations.
Notes: HRS sample weights adjusted for selection into W-2 matching. Sample includes workers ages 51 to 56. Defined contribution wealth is calculated for plans from current and past jobs. 1992 data expressed in 2010 dollars. Boxes indicate the 25th to 75th percentile of wealth and whiskers the 5th to 95th percentile.

Figure 3: Distribution of Retirement Wealth by Lifetime Income Decile



Source: Authors' calculations.
Notes: HRS sample weights adjusted for selection into W-2 matching. Sample includes workers ages 51 to 56. 1992 data expressed in 2010 dollars. Boxes indicate the 25th to 75th percentile of wealth and whiskers the 5th to 95th percentile.

ENDNOTES (To be converted into a Technical Appendix)

[i] The shift to DC plans might increase employer – based retirement wealth inequality between-income groups if DC plan features disadvantage low-and moderate-income workers who are less likely to participate, more likely to take pre-retirement withdrawals and earn lower returns net of fees. Inequality among individuals with approximately the same income may be caused by differences in savings preferences, investment returns, and exposure to economic shocks that cause withdrawals.

[ii] For example, among HRS participants aged 51-56 in 92 for whom we had W-2 earnings histories, the correlation of current with lifetime income was 0.83.

[iii] Higher earners will still target higher retirement plan replacement rates and higher financial wealth to income ratios because of their substantially lower Social Security replacement rates.

[iv] Workers likely pay for both retirement benefits and health insurance premiums in the form of lower cash wages. Increases in retirement wealth inequality may reflect crowd-out effects of rising health care costs.

[v] Summary plan descriptions and forms W-2 are available to qualified researchers on a restricted basis.

[vi] The SPD and W-2 data are available to qualified researchers under restrictive conditions designed to prevent reidentification of participants.

[vii] Gustman and Steinmeier (2004) report that across all pension plans, blacks, those with more schooling, homeowners, those with the shortest planning horizons, those with the longest tenure,and those with jobs in nonmanufacturing, are more likely to have a pension match. Those with the highest assets and earnings, those from firms employing fewer than 100, those in management jobs, and those who report they are covered by DC plans, are less likely to have a matched plan description.

[viii] Although DB plans are low risk, they are not risk-free, particularly for high earners (Bodie, Marcus, and Merton, 1988). Participants face the risk of job-separation prior to their planned retirement age and even small reductions in the rate of salary growth can have a large effect on wealth at retirement, due to benefit formulas based on final salary. HRS data indicate older DB participants typically experience wage growth that at least matches inflation and are at relatively low risk of job-separation prior to their plan's early retirement age. We therefore follow the literature and assume DB plans are risk-free for older workers.

[ix] In market downturns, lower income participants might enjoy higher returns.

[x] These data are reported on form 1040 (the annual tax return). But the HRS does not link to forms 1040 and in any case, the taxable unit in the United States is the household and it would not be possible to allocate withdrawals between spouses.

[xi] We gainsay deducting loans would increase retirement wealth inequality but do not investigate because the HRS survey instrument does not ask specifically about retirement plan loans.

[xii] Data for 1978 and 1979 are incomplete and are not used in our analysis.

[xiii] For these individuals, they further assumed deferrals commenced at the self-reported date the employment commenced or the date calculated by reference to the rules set out in the SPD if later. The Cunningham, Engelhardt, and Kumar (2007) code contains multiple options, not all of which are based on W-2s.

[xiv] A full description of the technique is forthcoming in a forthcoming Appendix.
[xv] Among our 1992 sample of workers matched to W-2s and who made elective deferrals in 1991, self-reported data show that only 71 percent were working for the same employer in 1984, and our calculations based on W-2 data show that, of these, 67 percent made elective deferrals in that year.
[xvi] We impute deferrals of workers with zero Box 5 entries, based on deferrals in later years when the incidence of zero Box 5 entries was much lower. We also adjust the plans. We do this by comparing the Box 12 entry with the Box 5 Box 1 calculation for the first year that Box 12 data are available, attributing the difference to state and local defined benefit plan contributions, and assuming that the contribution rate was the same in earlier years. We drop workers without any Box 12 data (those that only consented in 1992 and 1998) and reweight.
[xvii] Our treatment of these anomalies is discussed in the technical appendix.
[xviii] Previous HRS-based studies that compared SPDs with self-reported data assumed that the SPDs were correct and that mismatches reflected mis-reporting by HRS participants (Gustman, Steinmeier, and Tabatabai, 2007, 2010). Our cross-tabulation of SPDs with W-2 data reveals a large number of participants with W-2 elective deferrals who were matched to DB SPDs, indicating that their employers were contacted by the HRS, but were not matched to DC SPDs.
[xix] Rollover to a new employer's plan requires the consent of the new plan. Plan sponsors can only compel closure of accounts with less than $5,000 but must deposit distributions between $1,000 and $5,000 in an IRA or another employer plan, unless the participant elects otherwise.
[xx] Vanguard (2014) and authors' analyses of HRS data.
[xxi] The question wording changed over time. In 1992, those who left the money to accumulate and those who rolled it over into an IRA are both asked how much is in the account now and not if they cashed out. In 2010, only those who left their money in the account are asked.
[xxii] Since we have data from 2004 and 2010 but not 1992 and 1994 we did not use answers to whether workers ever changed their investment allocation and whether they increased or decreased their stock allocation. In 2010, about half reported they had changed were more likely to have reduced their stock allocation, perhaps a reaction to the financial crisis.
[xxiii] Gini coefficient is the most commonly used measure of earnings inequality. The coefficient for year *t* is calculated as follows:

$$Gini_t = \frac{\sum_{i=1}^{n_t}\sum_{j=1}^{n_t} |wealth(i)_t - wealth(j)_t|}{2n_t^2 m_t}$$

where $wealth(i)_t$ is the wealth of worker i at year t, n_t is the total number of workers in year t, and m_t is the average wealth of all workers at time t. The Gini coefficient equals zero if all wealth is owned equally and equals one if all wealth is owned by one individual.

[xxiv] The Theil index, an alternative measure of dispersion is defined as follows:

$$Theil_t = \frac{1}{n_t}\sum_{i=1}^{n_t}\left(\frac{wealth(i_t)}{m_t}\log\left(\frac{wealth(i)_t}{m_t}\right)\right)$$

where $wealth(i)_t$ is the wealth of worker *i* at year *t*, n_t is the total number of workers in year *t*, and m_t is the average wealth of all workers in year *t*.
is the average earning of all workers at year *t*.

The within income group dispersion of wealth for the Theil index for year t is defined as follows:

$$Dwin_t = \sum_{c=1}^{n_c}\left[\frac{m_{c,t}n_{c,t}}{m_t n_t}\right]Theil_{c,t}$$

where $m_{c,t}$ is the average wealth of income group c at time t and $n_{c,t}$ is the number of individuals in income group c at time t. Dispersion between groups equals total dispersion, $Theil_t$ minus within groups dispersion, $Dwin_t$.

[xxv] When calculating Gini coefficients for DB and DC wealth, we exclude workers with zero wealth of the relevant type. Otherwise, DC wealth will appear to be becoming less unequally distributed as workers switch from having a zero to a non-zero balance and conversely DB wealth will appear to be becoming less equally distributed.

[xxvi] The W-2 data are only available from 1980. The HRS also has summary earnings records going back to 1951. These records are top coded at the Social Security taxable maximum. Relative to earnings, this taxable maximum was much lower in the 1960s and 1970s, so that the top-coded data understate lifetime earnings for a large share of the sample. We use W-2 data for 1980 onwards as a proxy for lifetime earnings and plan, in a subsequent version of this paper, to impute earnings above the taxable maximum for years prior to 1980.

[xxvii] According to the life cycle model, households should smooth the expected marginal utility of consumption. Households may behave optimally yet experience declines in consumption in retirement as a result of bad financial or labor market realizations.

[xxviii] Retirement tax expenditures disproportionately benefit high earners and are inequitable if the regressivity are not offset by progressivity elsewhere for the same people. They are undoubtedly inequitable because households eligible to participate in retirement plans get the benefit and those who aren't do not.