Defined Contribution Wealth Inequality:

Role of Earnings Shocks, Portfolio Choice, and Employer Contributions

Joelle Saad-Lessler, Teresa Ghilarducci, and Gayle Reznik

Synopsis:

Defined contribution retirement wealth for workers in the bottom 90 percent of the earnings distribution is affected more by earnings shocks, portfolio choice, and employer contributions than that of the top 10 percent. The asymmetry of impact and exposure by position in the earnings distribution may contribute to retirement wealth inequality.

Abstract: 157 words

In the two years after the Great Recession of 2007–2009, 64 percent of workers at the top of the earnings distribution, compared to 56 percent of those at the bottom, experienced increases in defined contribution (DC) retirement wealth. We condition DC wealth accumulation on workers' position in the earnings distribution using a unique 2-year panel (2009-2011) from the Survey of Income and Program Participation (SIPP). Earnings losses of 10 percent or more in a person's career; non-employment spells; lower employer contributions; and having less diversified portfolios barely affect earners in the top 10 percent of the earnings distribution, but are associated with less DC wealth accumulation for those at the bottom. These differences may contribute to a growing retirement wealth gap.

Key words: Defined contribution pensions, retirement wealth inequality

1. Introduction

In the two years after the Great Recession of 2007–2009, 64 percent of workers at the top of the earnings distribution experienced increases in their DC wealth[i] compared to a smaller share, 56 percent, of those at the bottom. That more of those at the top gained than those at the bottom implies that factors affecting their DC wealth accumulation are different. The growing retirement wealth gap (Gist and Hatch 2014) could be partially explained by economic and life events affecting those at the top differently than those at the bottom.

This study -- unlike other leading studies on DC wealth accumulation (Smith, Johnson, and Muller 2004; Johnson, Mermin, and Uccello 2006; Dushi, Iams and Tamborini 2013; Dushi and Iams 2015) -- conditions factors affecting changes in DC wealth on workers' position in the earnings distribution. This study relies on panel data that more accurately measure changes in DC wealth than cross sectional data because a panel identifies the changes in the same person's DC wealth over time. The panel also allows an investigation into how retirement wealth might be affected by particular aspects of a person's life rather than by general trends.

The key findings are: one, each instance of earnings loss of 10 percent or more experienced by lower earners over their career is associated with a loss of DC wealth of $450 between 2009 and 2011; the effect is negligible for higher earners. Two, for every week spent not employed between 2009 and 2011, lower earners' DC wealth fell an additional $55, but non-employment spells did not affect higher earning workers' DC wealth. Three, more diversification in retirement asset allocation increased the DC wealth of lower earners but had no significant effect on higher earners' DC wealth. And, four, employer contributions increased lower earners' DC wealth but had no significant impact on higher earners' DC wealth.

The first section of the paper introduces; the second describes the importance of examining changes in DC wealth by workers' earnings; section 3 describes the data; section 4 describes the estimation strategies, Section 5 displays the regression results and section 6 discusses the robustness checks; section 7 examines policy implications and concludes.

2. Factors Affecting DC wealth Differ by Earnings

Previous studies on DC wealth accumulation found workers' earnings impact participation rates and contribution rates, and significant earnings losses, defined as a decline in earnings of 10 percent or more, affect retirement savings (Dushi, Iams and Tamborini 2013, Smith, Johnson and Muller 2004, Dushi, Iams and Tamborini 2011, Dushi and Iams 2015). Poterba, Venti and Wise (2015) found unemployment spells are associated with diminished DC wealth. Ghilarducci, Saad-Lessler and Reznik (2016) found asymmetric effects of many plan features depending on whether workers' earnings fell or increased between 2009 and 2011. This study uses panel data from the Survey of Income and Program Participation (SIPP) to identify how workers' position in the earnings distribution affects their ability to save for retirement.

3. Data

The data sample is constructed from Survey of Income and Program Participation (SIPP) data matched to the Social Security Administration (SSA) longitudinal earnings records. We merge waves 1-11 of the 2008 panel of the SIPP, collected between 2008 and 2012, and identify respondents, age 25-61, who were continuously in the sample, had some retirement savings in 2009 and worked in both 2009 and 2011. The survey contains demographic information, the number of children, marital and health status and disability histories. Information on Retirement wealth is in the assets and liabilities modules in waves 4 and 10 (collected in 2009 and 2011); while characteristics of the workers' retirement plan -- including employer contributions; whether the plan allows loans and investment choice; asset allocation of the DC wealth; and any withdrawals or rollovers were collected as part of the retirement expectation modules in waves 3 and 11 (2009 and 2011-2012). A discussion of the reliability of the SIPP data on DC wealth is included in the Appendix.

The linked SSA earnings records, based on IRS W-2 records, contain accurate information on current and lifetime earnings, as well as annual employee contributions to defined contribution retirement plans[ii]. The SSA earnings records allow us to calculate how many times a person's annual earnings fell by more than 10 percent and the volatility or standard deviation of annual earnings over a worker's career. Data from the SSA earnings records were used in the place of self-reported SIPP data whenever possible[iii].

The SIPP contains data on 36,578 persons who were in the survey continuously from 2008 through 2012 and had matched records in the administrative data. Of these, 19,017 had jobs in 2009 and 2011 and 10,554 had non-zero DC wealth in 2009, and 9,508 were ages 25-61 in 2009. We divide earners into three groups – the bottom 55 percent of the earnings distribution, the middle 33 percent, and the top 12 percent. For ease of exposition we compare the bottom with the top groups. We base the division on Social Security bend points in 2011[iv]: lower earners earn less than $53,796 and higher earners earn more than $106,800 per year.

Workers in the higher earnings group were more likely to have increased their DC wealth, with 64 percent of these workers gaining an average of $103,506 compared with 56 percent of the lower earners who gained $37,709, on average (Table 1). One reason higher earners were more likely to gain DC wealth between 2009 and 2011 is because they contributed more toward their accounts (higher earners contributed 6.11 percent of their higher earnings in 2009, on average, compared with 2.80 percent of earnings among lower earners). The employers of higher earners also contributed at a higher rate on average (2.86 percent) than the contribution rate of employers of lower earners (2.15 percent).

Insert Table 1 Summary Statistics for Higher and Lower Earners

Eighty-six percent of higher earners held risky instruments compared to 82 percent of lower earners[v]. Higher earners may be able to take on more risk because they have fewer liquidity constraints and more information. Higher earners also have more diversified portfolios than lower

earners choosing an average of two asset types compared with 1.5 types among lower earners. Diversity helps protect against losses.

Lower earners experienced more episodes (5.25) of significant earnings loss over their working lives than higher earners (4.60)[vi]. What could cause a significant earnings loss? Workers in poor health, who had more children living with them and who had more divorces suffered more episodes of significant earnings loss over their careers. But earnings losses also occurred when workers got a higher education degree – probably as they left employment to go to school. Being a higher earner, having a business degree, working full time in a large firm, having long job tenure, and being married and female decreased the likelihood of suffering episodes of earnings loss over one's career. Age is associated with more spells of earnings loss because older workers have had more time to experience such episodes. Similarly, being a recipient of transfer payment was associated with more episodes of earnings loss, but the causation is likely in the opposite direction, since workers whose earnings fall are more likely to be eligible for aid. Whites and citizens experienced more reported episodes of earnings loss than non-whites and non-citizens (see Appendix table 3) perhaps because white citizens' earnings are more likely in the formal market and reported. Non-whites and non-citizens may have volatile earnings stemming from volatility of earnings in the non-covered market.

Lower earners spent more weeks (3.37 weeks) not employed between 2009 and 2011 than higher earners (1.66 weeks). The majority (43 percent) of workers with spells of non-employment had relatively short spells lasting 1-12 weeks and only 13 percent spent more than a year out of employment. The non-employment spells were more likely time spent out of the labor force than in unemployment because 93 percent of those with non-employment spells were not unemployed between 2009 and 2011. People in poor health, who were older, and had higher education were more likely to have had non-employment spells whereas higher earners, people with longer job tenure, those who cared for more children and who earned a larger share of the household income

were less likely to have had non-employed spells between 2009 and 2011 (see Appendix Table 3).

Factors associated with low DC wealth included lower educational attainment, working at smaller firms, being female, unmarried, having experienced a higher average number of divorces in the past, being in poorer health, and being more likely to have been recipients of means-tested transfer payments, working part-time and having shorter average job tenures. Lower earners are more likely to have these characteristics than higher earners (see Table 1).

4. Estimation Strategies

Decomposition of Changes

The following factors affect DC wealth: employee and employer contribution rates; the earnings base; withdrawals from retirement accounts; rollovers of new funds into retirement accounts; market performance of portfolio holdings, and fees. We refer to the effect of financial performance and fees as "portfolio allocation effects." To measure the importance of each determinant on DC retirement balance changes between 2009-2011, we divide the change in DC wealth by the contribution of each factor[vii] and evaluate the relative importance of each of the channels for two groups: workers who gained and lost DC balances.

Regression analysis

An ordinary least squares (OLS) regression identifies the factors affecting DC wealth of higher and lower earners using a model described in equation (1) below:

(1) $\sinh^{-1}(Y) = a + bX + e$

Where Y is the change in DC retirement account wealth between 2009 and 2011, $\sinh^{-1}(Y)$ is the inverse hyperbolic sine (IHS) transformation of Y, and e is an error term. X are demographic and economic indicators and lifecycle events that affect the change in wealth. These include the employee contribution rate in 2009, changes in the employee contribution rate between 2009 and 2011, the employer contribution rate in 2009, changes in the employer contribution rate between

2009 and 2011, and measures of portfolio allocation in 2009. The latter reflect market gains/losses and administration fees.

Very few people withdrew funds or rolled-over their accounts in this time period. Moreover, when positive withdrawals and rollovers were reported the values were extreme. Including the few observations could bias the estimated coefficients. The model is run separately for workers in the bottom 55 percent of the earning distribution and the top 12 percent to identify how the structure of defined contribution plans and life events interact differently for higher earners compared to lower earners.

i. The "Difference In Initial Wealth" Problem

Pence (2006) noted a "difference in initial wealth" problem, which is that workers with high initial levels of DC wealth likely experience larger wealth fluctuations than those with smaller initial wealth balances. We address the difference in initial wealth by transforming changes in DC wealth using the inverse hyperbolic sine (IHS) transformation (Burbidge, Magee and Robb 1988, Pence 2006)[viii]. The IHS is similar to Poterba et. al. 2015's log transformation; but IHS allows for negative values, which is a vital feature because many people suffered DC wealth losses. Our dependent variable is negative when DC wealth falls over the sample period (for almost half the sample), making a log transformation impractical. This inverse hyperbolic sine transformation scales the change in DC wealth by the initial level of balances, and thereby reduces the influence of outlying values of the dependent variable. This also reduces the impact of measurement error in reported DC wealth and changes in DC wealth.

The coefficients estimated from equation (1) are converted into marginal effects using median values of DC wealth, which further dampens the impact of outlying values of the dependent variable. Standard errors for the marginal effects are computed using a bootstrap method (with 50 replications).

ii. Employer Contributions

Reporting errors for employer contributions arise because workers self-report their employer contributions. These errors are corrected by using average employer contribution rates for a participant's' state, industry, and education level, and the fraction of workers with non-zero employer contributions at the state and industry-education levels as instruments. The availability of multiple instruments allows us to test whether the errors in reported employer contributions induce a bias in the estimated coefficients. For the lower earner sample, we cannot reject the null hypothesis that employer contributions are exogenous, so OLS coefficients are not significantly different from IV corrected estimates; Because of that, we proceed with an OLS approach for the lower earner sample, since OLS yields more efficient estimates. For the higher earner sample, we do reject -- at the 1 percent level -- the null hypothesis that employer contributions are exogenous. So for this sample, we proceed with an instrumental variables approach.

iii. Portfolio Allocation Proxies

We supplement the two direct measures of portfolio allocation in the sample -- average risk of DC retirement investments and the number of investment types -- with indicators for a worker's risk and return preferences. Since we presume workers' past earnings experiences affect their appetite for risk and their ability to withstand negative market outcomes, we use the number of times a worker lost more than 10 percent of annual earnings over their lifetime and weeks spent not working between 2009 and 2011 as indicators of risk preferences.

We also use education, initial retirement wealth, lifetime earnings and home equity as indicators of risk tolerance and portfolio choices, because these factors affect the ability of workers to withstand bad market outcomes. The change in the number of children living in the family and the worker's responsibility for their household's wellbeing -- measured by the ratio of personal to household income -- may indicate the presence or relaxation of liquidity constraints, and therefore limit risk-taking and lead to more or less conservative portfolios.

Being at the top or bottom of the earnings distribution affects wealth accumulation in textured and complicated ways. Access to trusted and accurate financial information and networks depends on earnings class and community (Chong, Dow, and Phillips 2010). Similar to earnings class, being white is associated with relatively more access to and engagement with financial institutions and social networks, being informed about investing and may also affect the level of fees and the composition of the portfolio.

The effect of having a business degree also varies by earnings class, though it is uniformly treated as a proxy for financial literacy regardless of socio-economic class; financial literacy is linked to abilities to choose appropriate savings rates and asset allocations, discern fees, and assess risk (Lusardi and Mitchell 2014).

5. Results

Decomposition Results

The decomposition reveals that among workers who gained DC wealth, employee and employer contributions were more important than portfolio changes in explaining the total change in DC wealth. But among workers who experienced losses, the change in DC wealth was dominated by portfolio losses.

Moreover, portfolio effects were significantly more important in explaining losses for lower earners than for higher earners, with portfolio losses responsible for 373 percent of the total loss for lower earners compared with 221 percent for higher earners. At the same time, employer contributions were more instrumental in holding back losses among lower earners than among their higher earning peers; employer contributions explained -160 percent of the loss for lower earners and -86 percent of the loss for higher earners.

Withdrawals explained 6 percent of the loss for lower earners but there was no significant effect of withdrawals on retirement balance losses for higher earners (Rollovers had no impact and are not reported).

Among workers who experienced gains, the decomposition found withdrawals were more pronounced for lower earners but no other factor mattered (see Table 2).

INSERT TABLE 2 HERE

Regression Results

The asymmetry of effects by workers' position in the earnings distribution is measured by estimating the determinants of changes in DC wealth separately for each earnings group. The regression results reveal that each time a lower earning worker experienced an earnings drop of 10 percent or more over their working career, their DC wealth fell by $450 between 2009 and 2011 (see Table 3). Lower earners averaged five incidents of significant earnings over their career so their average DC wealth was lower by $2,250 due to their employment history. Note that the earnings loss effect on DC wealth is limited to lower earners.

For each week a lower earning worker spent not employed between 2009 and 2011, DC wealth fell an additional $55. Since lower earners spent an average of 3 weeks not employed between 2009 and 2011, the additional penalty to their DC wealth averaged $165. Note, again, that the negative effects of non-employment spells on DC wealth were limited to lower earners.

For each type of asset workers held in their portfolio, lower earners gained, on average, $1,194 in DC wealth, for a total improvement in DC wealth of $1,791 since the average lower earner invests in 1.5 asset types. This diversification effect was only significant for lower earners. Being a white citizen improved DC wealth of both lower and higher earners by $4,054 and $11,118, respectively. We attribute the effect of being a white citizen to portfolio allocation because being a white citizen implies access to a network of people who can advise the worker on portfolio choices (Chong, Dow and Phillips 2010)[ix].

Each percentage point difference in employee contribution rates was associated with a change in DC wealth of $729 and $1,077 for lower and higher earners, respectively. Since lower earners contribute 2.8 percent and higher earners 6.1 percent, on average, higher employee contribution

rates were associated with an increase in DC wealth of $2,041 for lower earners and $6,570 for higher earners. The change in employee contribution rates between 2009 and 2011 led to an additional $47 increase in the DC wealth of lower earners over the period.

Each percentage point difference in employer contribution rates was associated with significantly higher DC wealth for lower earners only — increasing their wealth by $182 with every percentage point of employer contribution. Since the average employer contribution rate was 2.15 percent, the total increase for lower earners is $391. Moreover, the change in employer contribution rates between 2009 and 2011 contributed an additional $65 to the DC wealth of lower earners. That the level of employer contribution rates and the increases in employer contribution rates significantly affect the DC wealth of lower earners highlights the importance of employers in helping lower earners save for retirement.

Higher education led to a $14,439 increase in DC wealth for higher earners, but the effect was a much smaller $1,669 for lower earners. Interestingly, having attained a business degree did not boost DC wealth.

Only the DC wealth of lower earners were affected by their lifetime earnings. Higher lifetime earnings increased lower earners' DC wealth by $66 for every $10,000 in lifetime earnings, resulting in a total change of $5,412.

An increase in the number of children living in the family between 2009 and 2011 was associated with a $1,568 increase in the DC wealth of lower earners for each additional child, but not for higher earners. Previous studies (Turner and Muller 2011, Butrica and Smith 2012) also found that the birth of a child positively impacts retirement savings.

A higher household income ratio indicates the worker contributes a larger share of household income and thus may indicate a liquidity constraint that decreases retirement wealth. For each additional percentage point increase in the household income ratio, balances fell by $28, for a total drop in balances of $1,633. This result was also limited to lower earners whose investment choices are more limited by liquidity constraints.

Higher initial DC wealth was associated with larger losses, with lower earners suffering a total loss of $7,165 and higher earners' DC wealth dropping by $5,454, a result also found in Gustman, Steinmeier and Tabatabai (2012).

Finally, every $10,000 of home equity was associated with a $199 and $367 increase in DC wealth for lower and higher earners respectively, resulting in a total increase of $880 and $3,940 for each group based on their average home equity values.

INSERT TABLE 3 Inverse Hyperbolic Sine Results

(Full results, including non-HIS-transformed results are in appendix tables 4 and 5)

6. Robustness checks

We test for the robustness of the findings by dividing the sample by age group and examining whether the results remain significant. Among workers ages 25-49, each spell of significant earnings loss reduces DC wealth by $550, while each week spent not employed over the sample period reduces DC wealth by an additional $92. An increase in the number of asset types also increases DC wealth by $785. These results are limited to lower earners, as is the case when the sample is not restricted by age (see Table 4a). Among 50-61 year old workers, each spell of significant earnings loss reduces DC wealth by $398. Weeks spent not employed have no significant impact on DC wealth for this group. An increase in the number of asset types increases DC wealth by $1,946, a much larger impact than for younger workers who have less money put away. Again, these results are limited to lower earners (see table 4b). Other robustness checks are available from the authors upon request.

INSERT TABLES 4a and 4b HERE

7. Discussion of the Results and Policy Implications

Defined contribution plans require workers and employers to voluntarily contribute to their retirement account and then construct portfolios from the investment vehicles the employers

choose for the 401(k) (or similar) plan. These design features work best for higher earning workers with stable lives and are not as complementary with the lives of lower earning workers who experience earnings and job insecurity, lack financial literacy, financial networks, and face liquidity constraints. The defined contribution system as designed in the United States means lower earners are more likely than higher earners to lose DC wealth.

Earnings volatility is associated with a decrease in DC wealth for lower earners, but not for higher earners. Dushi, Iams and Tamborini (2013) found that earnings volatility and non-employment spells caused workers to decrease their contributions and likelihood of participating right after the recession of 2007-2009. Our results suggest that non-employment spells and career earnings losses could have a long lasting impact on workers' DC wealth. It may be that workers who suffer a significant earnings loss cannot maximize their portfolio performance by buying when the stock market is low, since those are the times when they are more likely to lose earnings (Weller and Wenger 2009).

Workers who experience episodes of earnings decline may reasonably come to prefer liquidity and not invest in what is perceived to be a less liquid retirement account. Declines in earnings may also instill fear in workers that they will be strapped for cash in the future, which hamstrings their willingness to tie up their earnings in retirement savings vehicles (Ghilarducci, Saad-Lessler and Reznik 2016). Regardless of the pathway, the finding that past incidents of significant earnings loss permanently affect DC wealth informs policy makers that career risks are faced by all workers, but especially by lower earners, and these risks work against lower earners' ability to save for retirement.

Since a more diversified portfolio is associated with higher DC wealth, workers may benefit from more vigorous enforcement of regulations requiring employers to provide better choices or may benefit from prepackaged portfolios that are better managed and cheaper than target date funds (Skarbeck 2009, Grant 2014).

The finding that higher educational attainment is correlated with increases in DC wealth for all earners may indicate that formal education proxies for financial literacy, as it is assumed that financial literacy helps promote higher balances. However, having a degree in business had no impact on the change in DC wealth, implying that having a degree in business may not be a good measure of financial literacy.

Higher employer contributions helped lower earners increase their DC wealth. This highlights the role of employers in helping lower earners save for retirement. But since employers are not required to contribute to their workers' DC accounts, the retirement savings system puts lower earners at a particular disadvantage.

In sum, there seem to be three reasons higher earners are more likely to have gained DC wealth over this particular two-year time period. First, lower earners frequently experienced more spells of non-employment between 2009 and 2011, and periods of earnings losses of 10 percent or more in their lifetime.

Second, lower earners had less diversified portfolios; higher earners have an average of two asset types compared with 1.5 types among lower earners.

Third, higher earners had higher employee and employer contribution rates (higher earners contributed 6.11 percent of their higher earnings in 2009 compared with 2.80 percent of earnings among lower earners and employers of higher earners contributed 2.86 percent of pay compared to 2.15 percent for lower earners[x].)

These findings show that design features of DC retirement plans – voluntary employee and employer contributions and individual direct investments -- affect people differently based on their economic experiences. Since economic experiences are dictated by economic privilege, the effectiveness of defined contribution retirement plans as designed depends on where a worker is in the earnings distribution. We find stark differences in the savings behavior of those at the top 10 percent of the distribution compared to those at the bottom 50 percent. The results imply that the current design of DC plans disadvantages lower earners in their efforts to save for retirement.

Appendix

The SIPP Panel Data

The data on retirement wealth derive from SIPP survey questions about the market value of IRA, KEOGH and 401(k), 403(b) or Thrift accounts held by respondents in 2009 and in 2011 (SIPP 2008 Panel, waves 4 and 10). Data on pension plan details, including plan type, employer contribution and the availability of loans and choice over investment allocation derive from the Retirement Expectations and Pension Plan Coverage module, which was fielded in waves 3 and 11. Previous SIPP panels only fielded the Retirement Expectations and Pension Plan Coverage module once. Because the 2008 SIPP panel fielded the Retirement Expectations and Pension Plan Coverage module in two waves, it allowed us to get panel data on every aspect captured in this rich module.

The SIPP asks respondents to check their records before they begin answering questions regarding their income.[xi] Respondents can report the value of their retirement accounts as a number or a range, and when the answer is a range, the value is imputed. The table below displays the fraction of values reported for IRA, KEOGH, and 401(k)/Thrift accounts that are imputed.

INSERT APPENDIX TABLE 1 HERE

This indicates that data on IRA accounts are the most reliable, because they contain the fewest instances of imputation, followed by data on 401(k)/403(b)/Thrift accounts and Keogh accounts. The majority of respondents owned non-zero 401(k)/403(b)/Thrift accounts (84 percent in 2009, 75 percent in 2011). A smaller fraction owned IRA accounts (45 percent in 2009, 43 percent in 2011) and a negligible fraction owned KEOGH accounts (3 percent in 2009 and 1 percent in 2011). Non-imputed data on retirement balances is preferred but the SIPP panel is the best quality panel data on workers ages 25-61 available because it includes demographic information, as well

as characteristics of the person's retirement plan, asset allocation and contribution rates and levels.

Examining reported initial balances for each account type (Appendix Table 2), we find the highest retirement savings balances were in DC accounts, followed by IRA and KEOGH accounts respectively. Not surprisingly, the largest average nominal changes occurred in DC accounts, followed by IRA accounts and Keoghs.

INSERT APPENDIX TABLE 2 HERE

Bibliography

Adams P, Hurd MD, McFadden D, Merrill A, Ribeiro T. 2003. "Healthy, Wealthy, and Wise? Tests for Direct Causal Paths between Health and Socioeconomic Status." Journal of Econometrics 112(1):3–56

Burbidge, J. B., Magee, L., & Robb, A. L. 1988. "Alternative Transformations to Handle Extreme Values of the Dependent Variable." Journal of The American Statistical Association, 83(401), 123.

Butrica B.A. and K. E. Smith (2014). '401(k) Participant Behavior in a Volatile Economy,' *Journal of Pension Economics and Finance*: pp 1 – 29, Available on CJO 2014 doi:10.1017/ S1474747214000250

Chong J., Dow Jr, J.P. and Phillips, G.M. 2010. "Neighborhood Effects and Asset Allocation." The Journal of Interdisciplinary Economics, 2010, Vol. 23, pp. 37-52.

Copeland, C. 2012. "Individual Retirement Account Balances, Contributions, and Rollovers, 2010: The EBRI IRA Database™." EBRI Issue Brief, Number 371. [Online] Available at SSRN: http://ssrn.com/abstract=2070748

Dushi, I. & Iams, H. 2015. "The Impact of Employment and Earnings Shocks on Contribution Behavior in Defined Contribution Plans: 2005-2009." The Journal of Retirement, Vol. 2, No. 4: pp. 86-104

Dushi, I., Iams, H. & Tamborini, C.R. 2013. "Contribution dynamics in defined contribution pension plans during the great recession of 2007-2009." Social Security Bulletin, Vol. 73, No. 2, pp. 85-102

Dushi, I., Iams, H. & Tamborini, C.R. 2011. "Defined contribution pension participation and contributions by earnings levels using administrative data." Social Security Bulletin, Vol. 71, No. 2.

Ghilarducci, T., Saad-Lessler, J. & Reznik, G.L. 2016. "Earnings Volatility and 401(k) Contributions." SCEPA working paper.

Ghilarducci, T. and Saad-Lessler, J. 2015. "Explaining the Decline in Retirement Account Coverage between 2003–2012." Industrial Labor Relations Review
Vol. 68 (4): 807-832.

Gist, J.R. and Hatch, M.E., 2014. Retirement Replacement Rates and Retirement Wealth Inequality among Baby Boomer and Other Birth Cohorts. *The Journal of Retirement*, *2*(1), pp.55-69.

Grant, T. 2014 (March 7). "Financial advisers warn of potential 'land mine' in bond portion of target date funds." Pittsburgh Post-Gazette (PA).

Gustman, Alan L. and Steinmeier, Thomas L. and Tabatabai, Nahid 2012. "How Did the Recession of 2007–2009 Affect the Wealth and Retirement of the Near Retirement Age Population in the Health and Retirement Study?" Social Security Bulletin 72(4): 47-66.

Johnson, Richard W., Gordon B.T. Mermin, and Cori E. Uccello. 2006. "When the Nest Egg Cracks: Financial Consequences of Health Problems, Marital Status Changes, and Job Layoffs at Older Ages." Washington, DC: The Urban Institute.

Lusardi, A. and Mitchell, Olivia. 2014. The Economic Importantce of Financail Literacy Theory and Evidence http://gflec.org/wp-content/uploads/2014/12/economic-importance-financial-literacy-theory-evidence.pdf

Muller, Leslie A, and John A. Turner. 2011. "The Persistence of Employee 401(k) Contributions over a Major Stock Market Cycle: Evidence on the Limited Power of Inertia on Savings Behavior." UpJohn working paper 11-174. Kalamazoo, MI: W.E. UpJohn Institute for Employment Research.

Pence, K. M. 2006. "The Role of Wealth Transformations: An Application to Estimating the Effect of Tax Incentives on Saving." B.E. Journal of Economic Analysis & Policy: Contributions to Economic Analysis & Policy, 5(1), 1-26.

Poterba, J., Venti, S. & Wise D.A. 2015. "What Determines End of Life Assets? A Retrospective View." NBER working paper # 21682.

Skarbeck, K. (2009). "More reforms sought for target-date funds." Indianapolis Business Journal, 30(17), 26A.

Smith, JP. 2003. "Consequences and Predictors of New Health Events." presented at the NBER conference on economics of aging, Boulder, Arizona

Smith, K. E., Johnson, R. & Muller, L. 2004. "Deferring Income in Employer Sponsored Retirement Plans: The Dynamics Of Participant Contributions." National Tax Journal. 57(3): 639-670

Stevens, A.H. & Moulton, J.G. 2013. "Effects of Late-life Job Loss on Wealth and Labor Supply" in Lifecycle Events and their Consequences: Job Loss, Family Change, and Declines in Health, edited by Couch, K. A. , Daly, M. C. and Zissimopoulos, J. M. Stanford University Press, Stanford, California.

Weller, C. E., & Wenger, J. B. 2009. "What Happens to Defined Contribution Accounts When Labor Markets and Financial Markets Move Together?" Journal of Aging & Social Policy, 21(3), 256-276.

Wu, Stephen. 2003. "The Effects of Health Status Events on the Economic Status of Married Couples." Journal of Human Resources, 38(1): 219-230.

Endnotes

End Notes

[i] Authors' findings using SIPP data.

[ii] The earnings prior to 1981 only include earnings from Social Security covered employment and only earnings below the taxable maximum.

[iii] Annual employee contributions for 2009, 2010, and 2011 are available in administrative data. Employer contributions rates are self-reported in the SIPP data in 2009 and 2011. The contribution rate in 2010 is interpolated as the average between the 2009 and 2011 rate. The employer contribution rates are applied to self-reported earnings data for each month between 2009 and 2011 to yield employer contributions for 2009, 2010, and 2011. Withdrawals and rollovers, as well as retirement wealth balances in 2009 and 2011 are available from self-reported SIPP data.

[iv] The Social Security benefit formula calculates the primary insurance amount (PIA) using average indexed earnings from the workers' 35 highest earning years. The formula calculates a benefit amount in 2011 equal to 90 percent of the average indexed earnings that are less than $8,928 per year, 32% of average indexed earnings between $8,929 and $53,796, and 15% of average indexed earnings between $53,797 and the earnings cap of $106,800. The formula yields a progressive benefit structure. For a low-earning worker Social Security replaces about 80% of final earnings, for a middle-earning worker about 40% and for a higher earner about 25%.

v The SIPP survey asks respondents where their retirement wealth in IRA, KEOGH and 401k-403b-Thrift (DC) accounts is invested. For each of these accounts, the survey allows respondents to report up to four investment choices, but it does not track how much money workers invest in each asset type; this limits our knowledge of workers' portfolio allocation. Given this data limitation, we create a variable that measures if respondents invested in instruments involving some degree of risk by classifying the investment choices as 'safe' or 'involving some risk.' Instruments considered safe are: "Certificates of deposit or other saving certificates," "Money market funds," "U.S. Government securities" and "U.S. Savings Bonds." Investments involving some risk include: "Municipal or corporate bonds," "Stocks or mutual fund shares" and "other assets." We also use the number of investment types reported to indicate diversification in a portfolio.

vi To put these numbers in perspective, only 4.5% of workers in the sample had zero episodes of significant earnings loss over their lives, while 61% experienced 4 or more such episodes.

vii We assume portfolio allocation effects are in the residual.

viii Specifically, $g(y_t,q)=\log(q\, y_t + (q^2\, y_t^2 + 1)^{1/2})/q=\sinh^{-1}(qy_t)/q$ where $q=0.0005$

ix The measures of asset allocation we use are limited because our sample includes many workers who invest in more than one investment type and there is no information in the data about the amounts invested in each investment type. That limits our ability to measure asset allocation fully. To get around this, we looked at workers who indicated only one asset type and compared their allocation choices. We found that white citizens were much more likely to invest in riskier investment types than non-whites or non-citizens. Since asset allocation differs substantially by white citizenship status and our measure of asset allocation does not adequately capture the effects of asset allocation, the measured impact of white citizenship is likely a proxy for the unobservable asset allocation differences by white citizenship status.

x Another way higher earners do better than lower earners is that higher income workers automatically receive a higher net of tax return on every dollar invested in a DC plan. Higher earners receive a higher implicit subsidy via the state and federal tax deduction for retirement contributions. A person in the highest tax bracket returns 39.6 cents from the federal and on average, 7 cents, from a state deduction for retirement contributions. If the higher income worker also pays lower fees because of scale economies and has better-structured portfolios because of better advice and less risk averseness, then the rate of return is higher every period for the higher earner and the retirement wealth balances of the high-income worker will pull away from the lower earner contributor. This is good research for future papers.

xi If a respondent says "Hold on while I get my records," then the field representative (Census employee asking the questions) is instructed to let them do so. As for specifically probing them about searching for records, earlier in the instrument the field representative states: "The next part of the interview is about your income since [first reference month] 1st. We want to be as accurate and efficient as we can, so it would be very helpful if you could refer to any records you might

have." This may or may not spur the respondent to collect asset records along with income records.