

The Persistence of Employee 401(k) Contributions
Over a Major Stock Market Cycle

Leslie A. Muller
Pension Policy Center

John A. Turner
Pension Policy Center

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I. Introduction

Have people accumulated sufficient retirement savings? Other than Social Security, middle-income workers save for retirement largely through 401(k) plans. Thus, this question leads to a question about the adequacy of worker savings through 401(k) plans. One aspect of this issue is the persistency of worker contributions. Do workers who are covered by 401(k) plans consistently contribute to those plans over their careers?

This paper uses the Panel Study of Income Dynamics (PSID) to an aspect of the issue of persistency of contributions, which is: do workers persistently contribute to 401(k) plans¹ over stock market cycles?² Because workers may change their contribution rates depending on the rate of return on their 401(k) holdings, examining contributions over a stock market cycle may provide insight into what may be a major cause of inconsistent contributions over time. The dramatic rise in the stock market over the late 1990s, followed by the dramatic decline, and then the subsequent rise to all time highs provides a particularly volatile period to examine the persistency of 401(k) contributions.

Examining persistency of contributions over this period may also provide insight into the savings behavior of workers. Are workers target savers, offsetting the stock market decline by investing more? Or are workers “herd investors,” putting money in the stock market when it is doing well, and becoming discouraged and not contributing when it is doing poorly? Or might workers be “inertia investors,” always contributing the same percentage of salary? The relative prevalence of these three types of worker-investors may have important implications for the adequacy of worker preparedness for retirement.

II. Our Study

Our research agenda has a number of goals:

- 1) It documents the density and the persistency of workers' pension contributions.
- 2) It describes how persistency varies across population groups.
- 3) Using multivariate regression analysis, it analyzes the variation in persistency across workers. What factors explain why people who are covered by pensions stop contributing to them?
- 4) It investigates the effect of changes in the stock market over time on persistency.

¹ The relevant questions in the 2005 PSID to determine the type of pension begin at P11 and P16. Because the term "401(k)" is not used when the interviewer asks about plan type, we must determine which respondents have 401(k)-type plans - that is, plans where money is accumulated in an account, contributions are made by the employee, and the contributions are not required.

² Smith, Johnson, and Muller (2004) studied contribution rates over 12 years and found that 42 percent of 401(k) participants contributed at an intermittent or fluctuating rate throughout the period. Agnew (2004) finds that during periods of low stock returns, pension participants adjust their asset allocations by moving out of stocks. Seligman & Wenger (2005) find that higher income pension participants who experience UE spells are greatly affected by the timing of unemployment relative to the equity market.

- 5) It investigates whether persistency in employee contributions over the stock market cycle is related to persistency of employer matching contributions,
- 6) It provides evidence on the prevalence of different types of investors among 401(k) participants.
- 7) It investigates the extent to which differences in participation across population groups are due to differences in persistence of contributions.

We hypothesize that contribution persistence, or “inertia” investing, is more likely when workers have stable earnings patterns and stable demographics—marital status, family size, and health. Smith, Johnson, and Muller (2004) find that result for some changes of circumstances. We hypothesize that “herd” investing, which is an investment error, is more likely to occur among lower-income people, who presumably have less financial sophistication. Previous research, reviewed in Turner (2003), found that lower-educated workers were more likely to make errors in investment decisions than more highly educated workers. We hypothesize that “target” investing is more likely to occur among lower and middle income workers than upper income workers because lower- and middle-income workers are more likely to be weighing tradeoffs of present versus future consumption than upper-income workers, for whom savings for bequests is more likely to be where tradeoffs occur.

In this paper, we address only the first of these issues. We focus on describing the density and persistency of contributions over four surveys that took place from 1999 to 2005.

III. Previous Research

Theoretical Considerations. While simulations that project the future retirement income of workers often assume continuous years of contributions, workers may not persist in their contributions to individual account pensions, but instead contribute intermittently. For example, they may face periods of unemployment or periods when they are out of the labor market because of family responsibilities. Even when they are in the labor market, their pension contributions may vary over time due to changes in their needs, their earnings, or their perceptions as to the optimal timing of contributions over stock market cycles.

These aspects of human capital risk may be correlated with the stock market so that when stock prices are low, which is a good time to buy, workers’ pension contributions are also low. Thus, human capital risk may interact with capital market risk, magnifying the effects of capital market risk. Alternatively, however, if workers have a target account balance, they may vary their contributions to offset capital market risk.

These human capital risks affect the worker’s pension accumulations through their effect on the level, density and timing of a worker’s pension contributions and pre-retirement withdrawals. The density of contributions is the proportion of the working life that he or she contributes to a pension.

Contributions to individual account pension plans tend to grow less rapidly, or decline, over business downturns compared to business upturns for a number of reasons. First, fewer workers are working in firms offering plans, due to layoffs and reduced hires. Second, real earnings may be reduced. Third, employers may reduce, suspend, or end their matching contributions. Fourth, the participation rate of employees declines during business cycle downturns in firms offering plans. Fifth, the contribution rate of employees declines for employees making contributions. Sixth, employees make “negative” contributions, taking pre-retirement withdrawals or loans from the plans. All of these issues may be complicated by the effects of volatility of family earnings as well as of own earnings. Finally, workers may adjust their retirement date depending on the performance of the assets in their individual account plan.

Variability in earnings affects the time pattern of savings. When workers have uneven earnings profiles, they may reduce their savings during periods when their earnings are relatively low to maintain their consumption levels during those periods. This cyclical pattern of savings is at odds with the approach recommended for investing of dollar-cost averaging investments by investing the same amount each period, regardless of the state of financial markets.

Variability in pension contributions over time may be affected by the degree of risk aversion of the pension participant (Blake, Cairns and Dowd 2008). If participants have a target level of pension assets and their level of assets declines, they may contribute more to offset the decline. If so, then participants with greater holdings in equity may have greater volatility in pension contributions. Thus, variability in pension contributions over time may be partly the result of human capital risk and partly the result of capital market risk.

Empirical Research. When the stock market declines and the economy is doing poorly, some people reduce their pension contributions to smooth their consumption over time, attempting to maintain their level of consumption. A study by Putnam investors finds that in 2008, 21 percent of 401(k) plan participants had reduced their contributions and 4 percent had stopped contributing due to the economic downturn (O’Connor-Grant 2008). On the other hand, surveys indicate that some older people nearing their target retirement date increase their contributions to reach their target level of savings before retirement (Mincer 2008).

While a number of studies have examined determinants of pension contributions in the United States and in the United Kingdom, far fewer have examined the persistency of workers’ contributions. Many employees do not consistently contribute to their defined contribution plans, as the Health and Retirement Study (HRS) in the United States shows (Mitchell and Phillips 2006; Mitchell et al. 2000). One study finds that contributors generally persisted in making contributions, but that the contribution rate tended to vary over time. Smith, Johnson, and Muller (2004) use the Survey of Income and Program Participation (SIPP) to look at the persistency of employee contributions to 401(k) plans for up to 12 years. Nineteen percent of contributors were intermittent (i.e. had breaks in their contributions), 24 percent were rising contributors (increasing their contribution rate

over time), 8 percent were falling contributors, and 23 percent were fluctuating contributors. Only 27 percent of individuals were steady contributors (i.e. made persistent contributions at a stable contribution rate). While the study finds that workers raise their contribution rates after reaching significant life course milestones, such as the birth of a child, it did not find changes in contributions associated with negative income shocks or changing consumption needs.

Smith (2001), using a sample of tax returns from 1987-1996, finds a high rate of initial drop off in pension contributions to Individual Retirement Accounts (IRAs). Of those contributing in 1987, only 45 percent were still contributing in 1992, with 40 percent contributing through 1996. Smith (2006) uses the British Household Panel Survey to examine the issue of persistency of contributions to individual account defined contribution plans. Her results suggest a link between pension contributions and changes in an individual's income needs, measured by financial circumstances, health, having a baby, and moving to a new house.

Data from Canada indicate that between 1991 and 1993, about half of participants in Registered Retirement Savings Plans (RRSPs, similar in some respects to Individual Retirement Accounts (IRAs)), contributed in only one or two of the three years (Maser 1995). A more recent study for Canada has found that contributions to RRSPs varied considerably from year to year as workers' earnings varied (LeBlanc 2002). The same study finds that people with significant earnings reductions during working years accounted for most of the withdrawals from RRSPs before retirement.

Employer contributions also may vary. During the stock market decline of 2001-2002, some U.S. companies that were especially hard hit, such as Ford and Bethlehem Steel, suspended their employer contributions to save money (Marquez 2008).

III. Data

The research design involves creating longitudinal records for workers at four points: 1999, 2001, 2003, and 2005. Our sample consists of all current workers in each wave, ages 21-65 in 2005. Workers who gave contribution amounts are counted as contributing to a plan.

Table 1 presents information on the monthly average closing prices for the Dow Jones Industrial Average for the period over which the data was collected. The majority of interviews are conducted in the months March through June.ⁱ It indicates that during the survey months of 1999, 2001, and 2005 there were periods of relatively high closing prices, while 2003 was a period of relatively low closing prices. The data point for 1999 corresponds to a point near the peak of the stock market, 2003- a point near the bottom, and 2005 - a point representing a substantial rebound.

Table 1. Dow Jones Industrial Average closing prices				
Year	Dow Jones Industrial Average		DJIA Monthly	
	May	June	March to June	High Low
1999	10,522	10,971	10,971	9,786
2001	10,912	10,502	10,912	9,878
2003	8,859	8,985	8,985	7,992
2005	10,467	10,275	10,503	10,193

Source: Yahoo Finance
<http://finance.yahoo.com/q/hp?s=%5EDJI&a=02&b=1&c=1999&d=11&e=31&f=2005&g=m>

IV. Research Design

We examine the density and persistence of worker contributions. This use of the PSID is unique to the analysis of 401(k) contribution behavior, as no previous study of this sort has a representative sample of individuals throughout a long period of time. Smith, Johnson and Muller (2004) examined the persistency of 401(k) contributions using the 1996 SIPP and W-2 data on contributions from 1990-2001, but only have cross-sectional data on net wealth and availability of an employer match for 1997.

V. Results

This section presents exploratory results examining the persistency of pension contributions over a stock market cycle. It examines responses to the question “What amount or percent of pay do you voluntarily contribute currently?” This measure provides a better measure of persistency than examining whether the person contributed at all during the year. The question was asked between March and November of the sample years, with over three quarters of the surveys done between March and June.

Percent Contributing at the Time of the Survey

Table 2 presents basic descriptive statistics on the number of workers contributing in different years. There is a general pattern of increasing numbers of people contributing over the period studied, with a big jump in 2003 and a slight decline in 2005. We find that in the year with the worst stock market performance, the percentage of workers contributing was the highest for any of the survey years. This finding is unexpected, and in future work we will investigate possible explanations for it.

The general upward trend in the percent contributing may be due to two factors. First, The sample is getting successively older in each subsequent survey. Pension participation

rates tend to increase with age. Second, The coverage rate of 401(k) plans has continued to grow over time.

Year	Number contributing	Percent of workforce in each year contributing
1999	430	12.0
2001	492	13.9
2003	730	21.2
2005	660	19.3

Source: Authors' calculations from the PSID

Density of Contributions

Table 3 provides descriptive statistics for the density of pension contributions over the years 1999, 2001, 2003, and 2005 for workers who worked in each of the four years. The density of pension contributions is the percentage of the four sample years in which the worker contributed. The largest group - 59 percent - is people who contributed in none of the sample months for the 4 waves. Among workers who contributed, half (50 percent) contributed in only one year, while roughly only 6 percent contributed all four years. Thus, we find no evidence of persistency in contributions. This finding suggests that inertia plays little role, and that workers do not engage in dollar cost averaging. In the following tables, we explore this finding further.

Number of years in which pension contribution was made	Frequency	Percent	Percent of contributors	Percent of contributors contributing at least x years
0	1,703	58.8	NA	NA
1	597	20.6	50.1	100.0
2	383	13.2	32.1	50.0
3	144	5.0	12.0	17.9
4	69	2.4	5.8	5.8
TOTAL	2,896	100.0	100.0	--

Source: Authors' calculations from PSID surveys. Total number of contributors = 1,193

Table 4 repeats Table 3 but for the sample of people contributing in 1999. Even though the density of contributions is higher for this group, it still indicates a low density of contributions. For people starting out the period in 1999 as contributors, about two-thirds (69 percent) contributed at least half of the years, but less than 20 percent (19 percent) contributed all four years. Thus, this table presents strong evidence against inertia causing

persistence in contributions, even among people who worked in all four sample periods and began the portion of the PSID studied as contributors.

Table 4. Density of pension contributions over four sample years for persons contributing in 1999, for people who worked all four years			
Number of years in which pension contribution was made	Frequency	Percent	Percent of contributors contributing at least x years
1	115	30.8	100.0
2	100	26.8	69.2
3	89	23.9	42.4
4	69	18.5	18.5
TOTAL	373	100.0	--

Source: Authors' calculations from PSID surveys

Changing jobs can result in a worker who initially was able to participate in a pension plan subsequently not being able to do so. Table 5 examines the density of contributions for people who contributed in 1999, who worked all four sample years and did not change jobs.³ Even for this group, only about a quarter (27 percent) contributed in all four years.

Table 5. Density of pension contributions over four sample years for persons contributing in 1999, for people who worked all four years and did not change jobs during that time period			
Number of years in which pension contribution was made	Frequency	Percent	Percent of contributors contributing at least x years
1	38	21.7	100.0
2	41	23.5	78.3
3	48	27.4	54.8
4	48	27.4	27.4
TOTAL	175	100.0	--

Source: Authors' calculations from PSID surveys

Table 6 drops the restriction that the respondent worked in all four years. Thus, in this table some workers may not persist in contributing to a pension because they have stopped working. In this larger group of workers, less than half (35 percent) who contributed in 1999 only contributed that year, and less than 5 percent (4 percent)

³ The sample is restricted to workers who reported six or more years of tenure in 2005.

contributed in all four years. Thus, this data shows a very low density of pension contributions, due in part to lack of persistency of work.

Table 6. Density of pension contributions over four sample years for persons contributing in 1999, including people who did not work in all four years			
Number of years in which pension contribution was made	Frequency	Percent	Percent of contributors contributing at least x years
1	149	34.7	100.0
2	114	26.5	65.3
3	93	22.5	38.8
4	70	16.3	16.3
TOTAL	430	100.0	--

Source: Author's calculations from PSID surveys

Persistency of Contributions

In this section, we examine the persistency of contributions to 401(k)-type plans. Persistency indicates the percentage of workers contributing in a base year who continue to contribute in consecutive subsequent years.

To persist in contributing, it is necessary to persist in working. Therefore, we first examine persistency in working. Table 7 indicates that of those working in 1999, roughly 80 percent worked all four sample years. For workers in most of the sample years, roughly 7 percent were not working in the following sample year at the time of the survey.

Table 7. Persistency of work			
Year	Percent who worked in year x and in:		
	2001	2003	2005
1999	92.6	85.9	81.1
2001	--	91.5	90.4
2003	--	--	92.6

Source: Author's calculations from PSID surveys

Table 8 examines evidence the persistency of contributions. It provides evidence as to a low persistency of contributions, but one that also varies over time. For any year, less than half of those contributing at the time of the previous sample were contributing at the time of the subsequent sample.

Year in which contribution was made	Percent of workers in year x that contributed in year x and in:		
	2001	2003	2005
1999	42.9	26.7	16.2
2001	--	49.7	26.2
2003	--	--	46.8

Source: Author's calculations from PSID surveys

Table 9 examines a slightly different concept from density or persistency. It examines what percentage of workers who contributed in 1999 also contributed in a particular subsequent year. Less than half (46 percent) of workers who contributed in 1999 also contributed in 2001. In none of the subsequent years did as much as half of the workers who contributed in 1999 also contribute.

Year in which contribution was made	Frequency	Percent
1999	373	100.0
2001	172	46.1
2003	57	15.3
2005	143	38.3

Source: Author's calculations from PSID surveys

VI. Future Work

Future work will extend the current research in the following ways. First, the pattern of contribution rates (relative to the participant's earnings) will be described for different segments of the population. With the descriptive statistics, we determine what proportion of different population groups are target savers, inertia savers, and herd savers, and what other patterns are observed over time, such as increasing or decreasing contribution rates. Multivariate regressions - using both pooled OLS and fixed effects - will be estimated to determine what factors are correlated with different savings patterns and if contribution rates fluctuate over the stock market cycle.

We plan to examine the results by demographic and economic groupings, including gender, age and income. Examining the results by demographic and economic groupings

may provide insight on the reasons for the low level of persistency in pension contributions.

Along with standard demographic variables, we will also examine the effects of the presence of other current and past pension plans, availability of an employer match, own and household income, net wealth, and job tenure for each data point. Additional information on life course events - such as the birth of a child or the purchase of a home - will also be examined using available data from each wave, as well as the 2003 Event History Calendar. We will include an indicator for the state of the stock market in each year.

We also plan to further investigate the accuracy of the responses to see if that could account for the surprisingly low persistency of contributions.

VII. Conclusions

We find little evidence of persistency in contributions. Thus, we strongly reject the hypothesis that inertia in contributions is the main motivating force. Rather, we find a low density and low persistence in contributions over a fairly short period of time.

We also find unexpectedly that in the year with the worst stock market performance, more workers contributed than in the other years. We will investigate reasons for this result in future work.

These findings have important implications for the functioning of the pension system, with its reliance on 401(k) plans. Projections of future retirement income readiness that assume that workers persistently contribute over their working lives will greatly overstate the future levels of pension assets that workers will have accumulated. Our work suggests that many people participating in 401(k) plans will not have accumulated adequate resources because they will not have contributed a sufficient percentage of their adult working lives.

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ⁱ The interviews in 2001 were conducted in: March-June (81%) with only 4% of interviews conducted Sept-Nov, when market was very low.