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Abstract

Many workers save for retirement through 401(k) plans. This study addresses the concern that low account balances of older workers may indicate that these vehicles are not sufficient to insure adequate retirement savings. In particular, the study shows that while they are accumulating these plans, workers are not persistent in contributing, and a weak stock market exacerbates the problem.

Inertia does not seem to hold for 401(k) saving behavior. Furthermore, the investment strategy of dollar cost averaging does not seem to hold, either. Using four biennial waves of data from the Panel Study of Income Dynamics (PSID) covering a six-year time span from 1999 to 2005, the study presents descriptive and econometric evidence about the persistence behavior of individuals with 401(k) accounts. Descriptive data show that of the sample of household heads aged 21-65 in 2005 who were employed in every time period, only about one-third (35 percent) contributed to their plan in all four waves. Job changing had an impact. However, even for individuals in the sample who did not change jobs, less than half (46 percent) contributed in all four years of the survey.

An econometric model of 401(k) contribution behavior was estimated. The statistically significant, positive coefficient on the Dow Jones Industrial Average in this model indicates that workers tended to contribute to their plans when the market was up. This investment error is called *herd investing*, where individuals get into the market when it is high and not when it is low.

These findings have important implications for the pension system and adequacy of retirement income. Projections of future retirement income readiness that assume that workers persistently contribute over their working lives greatly exaggerate the future levels of pension assets workers will have accumulated.

Key Words: private pensions, non-wage compensation, financial literacy, investment behavior, 401(k) plans, retirement savings, stock market cycle

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The Lack of Persistence of Employee Contributions to Their 401(k) Plans May Lead to Insufficient Retirement Savings

Leslie A. Muller and John A. Turner

Projections of future retirement income readiness that assume that workers persistently contribute to their 401(k) plans over their working lives greatly overstate the future levels of pension assets that workers will have accumulated. Our work suggests that many people participating in 401(k) plans are not likely to accumulate adequate retirement savings because they will not have contributed to their plans a sufficient percentage of years of their adult working lives.

Abstracting away from loans or withdrawals, the account balances in a 401(k) plan accumulate through voluntary contributions of pretax earnings by workers, by contributions of employers (if any), and by investment earnings of the portfolio in the account (which, of course, may be negative). These balances are thus substantially determined by the contribution behavior and the investment behaviors of their owners.

Behavioral economics suggests that contributions should continue systematically due to inertia. Deciding to discontinue contributions or even to change contribution levels requires action. Inertia is clearly the path of least resistance; it involves not making changes to a greater degree than would be predicted solely taking into account the transactions costs involved in making changes. However, it does not necessarily imply the complete absence of change. Presumably, if the incentives are sufficiently great, workers overcome inertia. Absent significant events in a worker's life such as job loss or health issues, however, persistence is the maintained hypothesis about contribution behavior.

Besides being predicted by inertia, persistent contributions can benefit from dollar cost averaging, which is likely to increase rates of return. Dollar cost averaging occurs when the 401(k) participant consistently contributes the same dollar amount, regardless of whether the stock market is up or down. By doing so, the participant automatically purchases more shares when the stock market is down than when it is up.

A priori, investment behavior could take several different directions. Workers with 401(k) plans could be “target savers,” offsetting any stock market declines by investing more. Or workers could be “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, finally, workers might be “inertia investors,” contributing regardless of the state of the stock market. The relative prevalence of these three types of worker-investors may have important implications for the adequacy of worker preparedness for retirement.

HYPOTHESES

In this paper, we investigate the power of inertia on worker pension contributions over a period of a number of years. In particular, we investigate the hypothesis that workers who are contributing to a 401(k) plan continue to do so without interruption due to inertia.

A major contribution of ours is to investigate the persistency of contributions to 401(k) plans over stock market cycles. Because workers may stop contributing during periods of stock market decline, examining contributions over a market cycle may provide insight into what may be a 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.

Based on the life cycle hypothesis, where workers reduce savings during downturns in their incomes, 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. 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. 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 trade-offs of present versus future consumption than upper-income workers, for whom savings for bequests is more likely to be where trade-offs occur.

While simulations that project the future retirement income of workers often assume continuous years of contributions, workers may not persist in their contributions to their plans, but instead contribute intermittently. Workers may face periods of unemployment or periods when they are out of the labor market because of family responsibilities or other reasons. Even when they are in the labor market, their pension contributions may vary over time due to whether their job provides a pension, changes in their needs, their earnings, the availability and generosity of employer matching contributions, or their perceptions as to the optimal timing of contributions over stock market cycles.

These effects on pension contributions may be correlated with the stock market price changes. When stock prices are relatively low, which is a good time to buy, workers’ pension contributions may also be low or cease. This could occur for several reasons. First, some workers may get discouraged when the stock market is declining and stop contributing. For others, their incomes may fall, such as when hours of work are reduced. Alternatively, however, if workers have a target account balance, they may vary their contributions to offset capital market changes.

We also investigate whether variability in worker earnings affects the time pattern of savings in 401(k) plans. 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 to smooth consumption is consistent with the life cycle theory of savings, but 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 also be affected by the degree of risk aversion of the pension participant. 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 equities may have greater volatility in pension contributions. Thus, variability in pension contributions over time may be partly the result of human capital risk resulting in variability in earnings and partly the result of capital market risk.

FINDINGS

We use four waves of the Panel Study of Income Dynamics (PSID), a nationally representative longitudinal survey of over 9,000 families: 1999, 2001, 2003, and 2005.¹ Our sample consists of all current workers in each wave, ages 21–65 in 2005. Workers who provided contribution amounts in response to the survey are counted as contributing to a plan. This use of

¹ The relevant questions in the 2005 PSID to determine the type of pension begin at question P11 and P16 found on the questionnaire. 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. We define a 401(k) as a plan where money is accumulated in an account, contributions are made by the employee, and the contributions are not required.

the PSID is unique to the analysis of 401(k) contribution behavior, as no previous study has a representative sample of individuals throughout a long period of time over a stock market cycle.

Considerable stock market volatility occurred during our analysis period. The majority of PSID interviews are conducted in March–June. Those months in the years 1999, 2001, and 2005 were periods of relatively high prices, while 2003 was a period of relatively low prices.

Descriptive analysis. Table 1 displays the number of workers contributing to 401(k) plans in the four analysis years. The main point to be drawn from the table is that the percentage of workers contributing to a 401(k) plan is positively correlated with the Dow Jones Industrial Average (DJIA), with a drop in the percentage of workers contributing in 2003, when the DJIA was at a low. This pattern is evidence of an error in the investment pattern of some workers not contributing when the stock market is low and contributing when the stock market is high. Such an error leads to lower accumulated assets than would be expected from a simulation that does not recognize the pattern.

Table 1 Percent of Workers Contributing to a 401(k) Plan during the Stock Market Cycle

Year	Number contributing	Percent of workers	Dow Jones - May
1999	1,043	36	10,522
2001	1,031	36	10,912
2003	936	32	8,859
2005	1,122	39	10,467

SOURCE: Authors' tabulations from PSID. Sample includes individuals who worked in all four panels. N=2,896. Sample is weighted.

Table 2 shows 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 defined here as the percentage of the four sample years in which the worker contributed. The largest group—36 percent—is people who contributed in none of the 4 waves. Among workers

who contributed, 31 percent contributed in only one year, while 20 percent contributed all four years. Thus, we find little evidence of persistency in contributions. This finding suggests that inertia plays little role, and that workers do not engage in dollar cost averaging.

Table 2 Density of Pension Contributions over Four Sample Years, 1999, 2001, 2003, 2005, for People Who Worked All Four Years

Number of years in which pension contribution was made	Frequency	Percent	Percent of contributors	Percent of contributors contributing at least x years
0	1,043	36	NA	NA
1	570	20	31	100
2	496	17	27	69
3	412	14	22	42
4	375	13	20	20
TOTAL	2,896	100.0	100.0	--

SOURCE: Authors' calculations from PSID surveys. Total number of contributors = 1,852. Sample is weighted.

In analyses shown in our working paper (Muller and Turner 2011), we examine density of contributions just for workers who contributed in 1999. Even though the density of contributions is higher for this group, the level is still low. For people starting out the period in 1999 as contributors, 85 percent contributed at least half of the years, but only 35 percent contributed all four years. Changing jobs can result in a worker who initially was able to participate in a pension plan subsequently not being able to do so. So we also examined the density of contributions for people who contributed in 1999 and who worked all four sample years without changing jobs.² Even for this group, less than half (46 percent) contributed in all four years.

Clearly, workers are not inert in their 401(k) plan contribution behaviors. At most, a minority of workers contributed in all four waves of data. Next, we examine a related concept:

² The sample is restricted to workers who reported six or more years of tenure in 2005.

the persistency of contributions, where persistency is defined as 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 3 indicates that of those working in 1999, 81 percent worked all four sample years.

Table 3 Persistency of Work

Year	Percent who worked in year x and in all subsequent sample periods up to:		
	2001	2003	2005
1999	92	86	81
2001	--	91	90
2003	--	--	92

SOURCE: Authors' calculations from PSID surveys. Sample is weighted.

Table 4 examines evidence on the persistency of contributions. It provides evidence as to a low level of persistency of contributions, but one that also varies over time. We also examine a slightly different concept from density or persistency. That concept is the percentage of workers who contributed in 1999 who also contributed in a particular subsequent year. Sixty-three percent of workers who contributed in 1999 also contributed in 2001.

Table 4 Persistency of Contributions, for People Who Worked All Four Years

Year in which contribution was made	Percent of workers in year x that contributed in year x and in all subsequent sample periods up to:		
	2001	2003	2005
1999	67	44	36
2001	--	59	46
2003	--	--	71

Source: Authors' calculations from PSID surveys. Sample is weighted.

When we examine persistency of contributions for workers in the same job for all four panels, in Table 5, as expected we see a much higher persistency with workers in the same job. When we examine this measure of persistency by race, the frequencies showed that persistency for whites over the period is consistently considerably higher than for blacks. This finding would explain lower participation rates in 401(k) plans for blacks than whites and lower accumulated account balances. The sample sizes for Hispanics and “other” races are too small to provide separate estimates.

Table 5 Persistency of Contributions, for Workers in the Same Job over All Panel Years

Year in which contribution was made	Percent of workers in year x that contributed in year x and in all subsequent sample periods up to:		
	2001	2003	2005
1999	71	53	46
2001	--	66	61
2003	--	--	81

SOURCE: Authors' calculations from PSID surveys. Sample is weighted.

When we investigated persistency by gender, we found that there was little difference by gender for workers not changing jobs. When we investigated persistency by education level, we also found little difference across education levels. Fifty-one percent of college graduates contributed over the four panels, while 48 percent of high school graduates did. Workers with lower levels of education may have lower persistency because educated individuals may see a higher value in dollar cost averaging and saving for the future. That effect may be offset to some extent if more educated individuals are more adept at making changes in their pension status.

Family income is correlated with persistency. Table 6 displays persistency by quartile of family income. As theory would predict, higher levels of family income are consistent with

higher persistency. These effects are considerably larger than the effects found for differences in education level.

Table 6 Persistency of Contributions , by Quartile of 1999 Family Income, for Workers in the Same Job over All Panel Years

Year in which contribution was made	Percent of workers in year x that contributed in year x and in all subsequent sample periods up to:											
	2001				2003				2005			
	<u>Q1</u>	<u>Q2</u>	<u>Q3</u>	<u>Q4</u>	<u>Q1</u>	<u>Q2</u>	<u>Q3</u>	<u>Q4</u>	<u>Q1</u>	<u>Q2</u>	<u>Q3</u>	<u>Q4</u>
1999	55	68	69	78	48	51	54	56	42	48	53	49
2001	---	---	---	---	60	57	73	67	49	53	70	63
2003	---	---	---	---	---	---	---	---	73	78	83	85

SOURCE: Authors' calculations from PSID surveys. First quartile includes family income of \$0–\$40,000; second quartile \$40,001–\$60,000; third quartile \$60,001–\$90,000; fourth quartile \$90,001 and over. Sample includes individuals who worked all four years. 1999 sample size for: 1st quartile (75), 2nd quartile (120), 3rd quartile (147), 4th quartile (212). Sample is weighted.

Multivariate analysis. From the descriptive data presented in Table 1, it appears that there is a positive relationship between 401(k) participation and prices in the stock market. The marked drop in participation in 2003 coincides with the low in the stock market in that year. To test this relationship, we have estimated a regression model that controls for other variables that may also affect participation.

We begin with specifying a general model for 401(k) participation, and then amend the model to include our variable of interest, the DJIA. Over the years, economists have identified numerous motives for saving, including life cycle consumption smoothing, precautionary motives, and bequest intent. These theories identify personal characteristics that may affect the saving decision, including risk aversion, future discount rate, and liquidity constraints. More recent research adds to the list by identifying other effects on the saving choice, such as financial education and/or knowledge, trust, lack of self control, inertia and procrastination, and childhood upbringing.

While some of these characteristics can be explicitly controlled for in an econometric model, many of them are unobservable or difficult to measure.³ Hence, estimation using an unobservable effects model allows the individual unobservables to be controlled for, leading to consistent estimates. Following the notation in Wooldridge (2002), our model is

$$(1) \quad y_{it} = x_{it}\beta + c_i + u_{it},$$

where i denotes each individual and t denotes the time period, where $t = 1999, 2001, 2003, 2005$. The dependent variable y_{it} is a binary choice variable modeling whether the worker participated in the 401(k) plan or not. The matrix x_{it} includes independent variables thought to affect the participation decision. The variable c_i is the time-invariant individual unobservable effect. The idiosyncratic error term is u_{it} .

The independent variables in our model include demographic variables: age, marital status, and number of children.⁴ We also control for financial variables such as family income, net wealth, and whether the person currently has another pension plan. Unfortunately, the PSID does not provide data on whether a nonparticipant is eligible for participation in a pension plan. Hence, we include part-time status as a control variable, since part-time employees are less likely to be eligible for a plan. Tenure acts much like age, as a proxy for stage in the life cycle, and may affect eligibility in the 401(k) plan. Starting in an individual's twenties until ages closer to retirement, we would expect a positive relationship between tenure and participation. To proxy for precautionary saving motives, we also include a binary variable describing whether the

³ Net wealth can proxy for liquidity constraints, and age and/or tenure for stage in the life cycle (discount rate). Whether the person has had financial education can be controlled for explicitly, however, a suitable proxy for financial knowledge has not been established.

⁴ By construction, in order for fixed-effects to control for the unobservable effects, it also differences out the time-invariant variables. Hence, we are unable to include race, gender, and education in the model.

individual considers himself in good health or not. Finally, due to the strong housing market throughout the stock market cycle under consideration, we control for this alternative investment to the 401(k) plan with state housing price indices for all panel years.

To investigate the correlation between changes in the stock market and persistency in participation and contribution rates, we add to Equation (1) a continuous variable, z_t , which represents the natural log of the DJIA:

$$(2) \quad y_{it} = x_{it}\beta + \delta z_t + c_i + u_{it},$$

where z_t varies across time, $t = 1999, 2001, 2003, 2005$.

We estimated Equation (2) for two overlapping samples: individuals who worked in all four waves and individuals who worked in the same job in all four waves. In both samples, the relationship between the DJIA and the probability of participating in a 401(k) plan is positive and statistically significant at the 1 percent level. This is true whether a worker changes jobs or remains in the same position throughout the panel. The higher the DJIA, the more likely the worker is to participate in the company 401(k) plan, even controlling for factors such as the fluctuations within the housing market.

If inertia is the driving force behind contribution decisions, the inclusion of the stock market variable should be statistically insignificant. This is not the case. Instead, workers are more likely to participate if the stock market is higher. This type of behavior can be described as “herd” investing, where individuals get into the market when it is high and get out when it is low. This is an investment error, as the worker is getting into the stock market when it is high and getting out when it is low.

As expected, the effect of family income on participation is positive and highly statistically significant in our estimation results. The estimate on whether the worker has another pension plan is also positive and highly significant. This result suggests that even after taking into account unobservable tastes for saving, workers who have one pension plan are likely to see value in participating in the 401(k) plan.

CONCLUSIONS

We reject the hypothesis that inertia in contributions is the main motivating force for workers. Multivariate analytical results show a positive, statistically significant effect of the level of the DJIA on 401(k) participation over time. We also find a low density and low persistence in contributions over a fairly short period of time. This result varies across demographic and economic groups in predictable ways, with workers in the same job over the period and with high education or high income having relatively high persistency, but other groups we analyzed not having a high degree of persistency. Lack of persistency occurs both when workers change jobs and when they don't. Generally, lack of persistency because of job changes accounts for less than half of the lack of persistency among workers initially contributing to a pension.

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 greatly overstate the future levels of pension assets that workers will have accumulated. Our work suggests that perhaps many individuals participating in 401(k) plans will not have accumulated adequate resources because they will not have contributed to their plans a sufficient percentage of their adult working lives.

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