Plan-Level and Firm-Level Attributes and Employees' Contributions to 401(k) Plans

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Abstract

This study examines the determinants of employee contributions to 401(k) plans from the perspective of corporate policy and employer matching. Based on a sample of 756 401(k) plans from 2000 through 2004, we identify several significantly positive factors related to employees' contribution decisions. These factors include the presence of an employer match, especially matching by cash, the firm's growth opportunity, corporate dividend payment, stock return performance, and employees' autonomy to change their investment arbitrarily.

Key words: 401(k) plans; employee contributions; matching policy

JEL classification: G23; G32; J26

1. Introduction

A 401(k) plan, a typical type of defined contribution (DC) plan, provides workers with an account balance at retirement. The balance in a 401(k) plan is determined by employer (plan sponsor) and employee (plan participant) contributions as well as the returns earned on those contributions. Because 401(k) plans have several advantages over traditional DC plans, they have been the most

popular DC plan since the early 1980s.[1] Holden and VanDerhei (2006) estimate that around 47 million American employees held 401(k) plan accounts with $2.4 trillion in assets in 2005. Most of the savings flowing into 401(k) plans are taken out of employees' salaries, and the employees themselves decide how these savings are invested. As a match to the employees' voluntary contributions, employers make contributions to the plans either by cash or by company stock.[2]

Several papers using survey or individual data have found that both employees' participation and contribution are related to their individual attributes, such as income and education. However, if a contribution is solely related to individual attributes, then little can be done by the government to increase employees' contributions. Therefore, from a policy perspective, it is important to investigate the relationship between employees' contributions and firm-level as well as plan-level attributes to encourage employees to increase their contributions to pension plans.

Choi et al. (2004) are an exception. They use a sample consisting of 401(k) plans and find that plan designs have significant effects on saving outcome, but their sample only contains 9 companies. The main difference between the literature and our study is that we use hand-collected, plan-level data (756 observations) from Securities and Exchange Commission (SEC) filings to examine the relationship between plan-level contribution rates and the characteristics of firms and 401(k) plans.

The purpose of our study is to examine whether employers' matching policy and firm attributes affect employees' contributions. As for the participants' contributions, the results of two-limit tobit models show that the presence of an employer's match, especially cash matching, has positive impacts on participants' contributions. In addition, employees increase their contributions when their firms have good growth opportunities, pay high dividends, or exhibit good stock return performance. We also find that participants with investment choices in their 401(k) plans increase their contributions.

In sum, this study contributes to the literature regarding the improvement of employees' contributions in DC plans by using a large manually collected plan sample and exploring the relationship between employees' contribution and firm-level attributes. Since contributions contain a lower bound and an upper bound, this paper uses the two-limit tobit model to examine the determinants of employees' contributions to 401(k) plans.

The paper proceeds as follows. Section 2 reviews the literature regarding DC plans and employees' contributions. Section 3 develops the hypotheses and presents the methodology used to test the hypotheses. Section 4 describes the 401(k) data and sample characteristics. Section 5 presents the empirical results. Section 6 concludes this study.

2. Literature Review

Most of the literature on DC pension plans focuses on examining the behavior of individuals given the characteristics of the retirement plans in which they

participate. For example, Poterba (2003), Poterba (2004), and Meulbroek (2005) indicate that the costs of insufficient diversification in DC plans are substantial. In addition, several studies have tried to explain the portfolio selection puzzle, where a large proportion of employee pension wealth is invested in an undiversifed portfolio or even own company stock. For example, familiarity-based investment (Huberman, 2001), employees' excessive extrapolation of past performance (Benartzi, 2001; Huberman and Sengmueller, 2004), plan designs and investment options available to employees (Benartzi and Thaler, 2001; Liang and Weisbenner, 2002; Huberman and Jiang, 2006), loyalty-based investment (Cohen, 2009), and penalty-free 401(k) withdrawals (Choi et al., 2011) are among the factors that explain employees' under-diversification or own company stock holdings in DC plans. Rauh (2006) also finds that lowering the takeover probability by increasing employee ownership in DC plans plays a role in explaining own company stock holdings in DC plans.

As for employees' participation and contribution behavior in DC plans, Kusko et al. (1994) find little change in either participation or contribution behavior in response to large changes in an employer's matching provisions. In contrast, Papke and Poterba (1995) find that participation rates are higher when employers provide a match. They find that the link between participation rates and the level of match rates is statistically significant, while the link between contribution rates and the level of match rates is much weaker. Papke (1995) finds that substantial increases in contributions occur when an employer moves from a zero to a moderate match rate, and a negative relationship between contributions and match rates exist at a high level of match rates. Clark and Schieber (1998) find a positive effect of the match rate on both participation and contribution rates. Huberman et al. (2007) find that participation rates, contribution rates, and savings rates increase with compensation and the availability of an employer matching policy. However, their studies indicate that the presence of a match seems to have no effect on the contributions of low-income employees and has a negative effect on the contributions of middle to higher income participants. Morrin et al. (2012) investigate which format of 401(k) plans can increase plan participation rates, especially for those people with low levels of financial knowledge. They find that participation decreases with the number of funds for investment and increases if the fund menu is grouped by asset class rather than listed alphabetically. They also find that participation increases when fund descriptions include star ratings.

3. Hypothesis Development and Methodology

In this section, we develop the hypotheses about employees' contribution rates from the perspective of 401(k) plan design and company policy. We also discuss model specifications.

3.1 Hypotheses about Plan Characteristics

3.1.1 Employer's Matching Contributions

The literature has indicated that the employer's matching policy can affect employees' contributions (Papke, 1995; Clark and Schieber, 1998; Huberman et al., 2007). If employers offer matching contributions to plan participants, employees are more likely to join the pension plan because of the additional compensation. Therefore, we develop the employer's matching contributions hypothesis as follows:

Hypothesis 1: Due to additional compensation, employees contribute more to their 401(k) plan if their employers match their contributions.

Employees are generally allowed to direct their contributions. However, it is common to have some restrictions on the disposal of the employer's contributions, especially when the employer's match is in company stock. One example of such restrictions is a prohibition on employees selling company stock during a certain time period. Employees with stock matching usually do not allocate the matching contributions. With cash matching, however, employees can allocate the employer's matching contributions to the various investment options at their discretion. In addition, employees may be concerned that stock matching results in holding high-risk asset portfolios—their pension assets and their human capital in one company—after they have seen the retirements wrecked by Enron, Lucent, WorldCom, Tyco, Xerox, and the enormous graveyard of high-tech companies. Therefore, we develop the second hypothesis as follows:

Hypothesis 2: Employees contribute more to their 401(k) plans if their employers match contributions by cash rather than company stock.

3.1.2 Investment List

Papke (2004) finds that investment choice substantially increases employee contributions to DC plans. She reports that participants with choice contribute over 8.5% more annually to their DC plans than comparable participants without choice. On the other hand, Huberman and Jiang (2006) argue that participants usually allocate their contributions evenly across the funds they chose. Furthermore, participants usually choose three to four mutual funds, and the number of funds used is not sensitive to the number of funds offered by the plan. Therefore, based on the previous literature, we develop our next hypothesis, which states that:

Hypothesis 3: Employees with a selectable investment list contribute more to their 401(k) plans, but their contributions are not sensitive to the number of investment options.

3.2 Hypotheses about Firm Characteristics

3.2.1 Growth Opportunities

The literature (e.g., Poterba, 2003; Poterba, 2004; Meulbroek, 2005) has indicated that employees usually overinvest their contributions in company stock. Therefore, employees may have concerns about their firm going bankrupt. Employees in firms with good growth opportunities usually have fewer concerns about bankruptcy risks than those in firms with fewer growth opportunities. Therefore, they are more likely to contribute their compensation to a self-directed

pension account, especially employees who allocate their contributions to company stock. Our proxy for the growth opportunities of the firm (research and development (R&D) expense) has an advantage in that it potentially reflects future growth opportunities. On the other hand, the literature has indicated that firms can signal future profitability by paying dividends (see Ambarish et al., 1987). Therefore, we use R&D expense and dividends to proxy for the growth opportunities and use leverage as the proxy for bankruptcy risk. Thus, we formulate the following hypothesis:

Hypothesis 4: Because of the lower bankruptcy risks, employees in firms with good growth opportunities contribute more to their retirement plans.

3.2.2 Company Stock Performance

In general, employees are also the shareholders of the firm for which they work. Therefore, the company stock performance is always an employee focus. Applying representativeness to company stock, Benartzi (2001) argues that employees might excessively extrapolate past performance, and the disproportionate allocations to company stock for plan participants might be attributed to the role of excessive extrapolation. Following his arguments, employees might conclude that high past performance is representative of future performance and contribute more compensation to their pension account, especially for company stock. However, we do not exclude the notion that high past stock performance signals the future operating performance of the firm. Therefore, based on the previous arguments, we develop our last hypothesis, which states that:

Hypothesis 5: Since employees might excessively extrapolate past performance or good stock performance as a signal of the operating performance in the future, employees in firms with better stock performance contribute more to their retirement plans.

3.3 Model Specification

A two-limit tobit model is used to explore the decision making of employees regarding their contributions to 401(k) plans because the employees' contribution is censored at both $0 and $10,500. Our two-limit tobit model is specified as follows:

$$y_i^* = x\beta + u_i,$$

$$y_i = \begin{cases} L_{1i} & if \ y_i^* \leq L_{1i} \\ y_i^* & if \ L_{1i} < y_i^* < L_{2i} \\ L_{2i} & if \ L_{2i} \leq y_i^*, \end{cases} \tag{1}$$

where y_i^* is the latent variable and y_i is the observable employee contributions between $0 and $10,500. Here L_{1i} and L_{2i} are the lower limit of $0 and the upper limit of $10,500, respectively.

The likelihood function is given by:

$$L\left(\beta,\sigma \mid y_i, x_i, L_{1i}, L_{2i}\right)$$

$$= \prod_{y_i = L_{1i}} \Phi\left(\frac{L_{1i} - x\beta}{\sigma}\right) \prod_{y_i = y_i^*} \frac{1}{\sigma} \varphi\left(\frac{y_i - x\beta}{\sigma}\right) \prod_{y_i = L_{2i}} \left[1 - \Phi\left(\frac{L_{2i} - x\beta}{\sigma}\right)\right], \qquad (2)$$

where Φ is the standard cumulative normal distribution and φ is the standard normal density function.

4. Data and Sample Characteristics

The main data used in this study are collected manually from the form 11-k of S&P 500 firms. Form 11-k is an annual disclosure form that some companies must file with the SEC.[3] Only companies that offer employees the choice of investing their own contributions in company stock and that issue new shares for the plan, rather than purchase shares on the open market, are required to file a form 11-k.[4]

The sample in our study covers the five-year period beginning in 2000 and ending in 2004. The regulatory restriction and selection criteria result in the initial sample containing 1,068 companies, which include 201, 170, 219, 228, and 250 companies for the year 2000, 2001, 2002, 2003, and 2004, respectively.[5] We collect the following data for each year from the form 11-k: the employer matching method, maximum rate of employer matching contributions, total amount of employees' and employers' contributions, total assets available for 401(k) plan participants, total assets in the plans invested in employer stock, percentage of employees' contributions in the plans, transfers in and out of the plans, and the number of investment options from which participants can choose.

We also obtain information about equity share prices and associated financial variables of the companies by merging the data in the forms 11-k with data from the Center for Research in Securities Prices (CRSP) and COMPUSTAT, respectively. We collect the monthly stock returns from CRSP for each S&P 500 firm to calculate the mean and standard deviation of monthly stock returns. We collect firm-specific financial information from COMPUSTAT.

After merging the data sets, we exclude firms for which we do not know whether they have contribution matching and firms with missing data. This sample selection procedure yields a data set of 756 firm-year observations from 2000 through 2004. Among the 756 firm-year observations, the plan sponsors of 27 firms do not offer contribution matching but 729 firms do. Employers can match employees' contributions by cash, company stock, or both.[6] Among the 729 matching firms, 8 firms do not clearly show which matching method is used. Most of the firms match employees' contribution either by cash or by stock. Furthermore, 41 firms match contributions using both methods. To explore the difference between cash matching and stock matching, we therefore exclude the 8 observations with an unknown matching method and the 41 observations using both matching methods. We then divide the remaining sample into two subgroups, which are called the cash matching and stock matching subsamples, according to their matching policy in the

subsequent analyses. The division results in 405 cash matching firms and 275 stock matching firms from 2000 through 2004.

We now turn to the definitions of variables used in this study, as follows. *Employee's contribution* is the total annual compensation contributed by all participants of a 401(k) plan. *Employer's contribution* is the total annual matched contributions paid by an employer. To control for the size effect of 401(k) plans, we divide the total employee's and employer's contributions by the number of employees and report the *employee's contribution per employee* and *employer's contribution per employee*.[7] *Max match rate* is the maximum rate of the employer's matching contributions, expressed as a percentage of the employee's compensation. *Plan asset* is the total net asset available for benefits in a 401(k) plan. *Investment list* is the number of investment options available to plan participants. *Only stock* is an indicator variable that equals one when the investment options only contain employer's stock and zero otherwise. *Match* is an indicator variable that equals one if the employer matches employees' contributions and zero otherwise. *Matched by cash* is an indicator variable that equals one when the employer matches contributions by cash and zero when the employer matches contributions by stock in the 401(k) plan.

As for firm characteristics, all financial variables are computed or collected at the end of the fiscal year prior to the year of contribution matching. *Assets* is total assets (6) net of cash and cash equivalents (1) (numbers in parentheses are COMPUSTAT data item numbers). This study also collects *R&D expenditures* (46), which are assigned to zero if missing. *Dividends* are measured as common dividends paid (21). *Leverage* is defined as the market debt ratio, calculated as total debt (9+34) over the sum of total debt and the market value of equity. The market value of equity is defined as the number of shares (54) multiplied by the stock's closing price at the fiscal year-end (199). *Employee* is defined as the number of employees (29).

Table 1 presents summary statistics for the 756 firm-year 401(k) sample and the subsamples classified by the method of contribution matching. For plan characteristics, the average employee contribution per year for the whole sample is about $74.1 million, with employers' contribution of about $31 million, plan assets of about $1.5 billion, number of investment options of about 20, and the ratio of plans with only stock to choose of about 1.2%.

The mean (median) amount of employees' contributions for firms with cash matching is $75 (32) million, compared to a mean (median) employee contribution of $67 (37) million for stock matching firms. The average (median) amount of employers' matching contributions for cash matching firms is also larger than that for stock matching firms. The pattern indicates that some employers that matched contributions by cash have relatively larger pension plans (the maximum plan asset is $29.9 billion) than employers with stock matching (the maximum plan asset is $13.7 billion).

Table 1. Summary Statistics

Panel A: Plan Characteristics

	All				Cash matching				Stock matching			
	Mean	Median	Max.	Min.	Mean	Median	Max.	Min.	Mean	Median	Max.	Min.
Employee's contribution (million)	74.1	36.4	1171.2	0.0	75.4	32.0	1171.2	0.1	67.2	36.7	414.8	0.00
Employer's contribution (million)	31.0	15.0	706.1	0.0	35.8	15.7	706.1	0.0	24.3	15.3	212.3	0.00
Employee's contribution per employee (thousand)	2.4	2.0	27.1	0.0	2.4	2.0	27.1	0.0	2.2	1.9	25.3	0.00
Employer's contribution per employee (thousand)	1.1	0.8	13.7	0.0	1.3	0.9	13.7	0.0	1.0	0.7	5.9	0.00
Max match rate (%)	3.6	3.0	305.0	0.0	3.3	3.0	8.0	0.0	3.3	3.0	12.0	0.00
Plan asset (billion)	1.5	0.6	29.9	0.0	1.5	0.5	29.9	0.0	1.5	0.7	13.7	0.01
Investment list	20.3	14.5	270.0	0.0	19.9	14.0	262.0	1.0	21.5	16.0	270.0	1.00
Only stock (%)	1.2	0.0	100.0	0.0	0.3	0.0	100.0	0.0	2.6	0.0	100.0	0.00
Sample size		756				405				275		

Panel B: Firm Characteristics

	All				Cash matching				Stock matching			
	Mean	Median	Max.	Min.	Mean	Median	Max.	Min.	Mean	Median	Max.	Min.
Assets (billion)	33.3	9.7	627.6	0.2	29.1	7.6	627.6	0.2	33.5	11.9	624.8	0.7
R&D Expense / Asset (%)	2.9	0.0	61.2	0.0	3.5	0.0	61.2	0.0	2.0	0.0	24.2	0.0
Dividend / Asset (%)	2.0	1.1	55.5	0.0	1.7	0.8	55.5	0.0	2.4	1.4	31.0	0.0
Leverage	0.3	0.2	0.9	0.0	0.2	0.2	0.9	0.0	0.3	0.3	0.9	0.0
Ret_3year (%)	1.0	0.9	10.7	-10.5	1.0	0.9	9.1	-10.5	1.0	0.9	5.7	-3.5
Std_ret_3year (%)	11.1	10.1	34.7	3.6	11.6	10.4	33.2	3.6	10.5	9.9	32.3	4.3
Employees (thousand)	53.1	22.1	1500.0	0.4	53.1	20.0	1500.0	0.4	49.9	22.4	388.0	0.6
Sample size		756				405				275		

Notes: All financial variables are collected or computed at the end of the fiscal year prior to the year of contribution matching.

Similar to the total employee contributions, the per capita employee contribution for cash matching firms is larger than that of stock matching firms. The

average (median) plan asset for cash matching firms is $1.5 (0.5) billion, compared to the average (median) plan asset of $1.5 (0.7) billion for stock matching firms. The average (median) number of investment options is 20 (14) for cash matching firms and 22 (16) for stock matching firms. The average ratio of plans with only stock to choose for cash matching firms is 0.3%, which is lower than 2.6% of stock matching firms.

Furthermore, Panel B of Table 1 presents firm characteristics. To save space, we briefly compare the difference between the two subgroups. The average (median) asset size is $29.1 (7.6) billion for cash matching firms compared to $33.5 (11.9) billion for stock matching firms. The average (median) ratio of R&D expense to assets is 3.5% (0%) for cash matching firms compared to 2.0% (0%) for stock matching firms. The mean (median) leverage ratio is 0.2 (0.2) for cash matching firms compared to 0.3 (0.3) for stock matching firms. For the firm's return, the average (median) monthly return is 1.0% (0.9%) for both cash matching and stock matching firms.

From Table 2, it is clear that matching contributions by cash is more popular in later years. Although the number of firms with stock matching also increases in later years, the percentage change is much smaller than that of cash matching. On average, employees' contributions increase over the sample period for both groups. Employers' contribution rates of cash matching firms exhibit an increasing trend, but the trend for stock matching firms is volatile over the sample period.

Table 2. Annual Distribution of Matching Policy

Panel A: Cash matching

	2000	2001	2002	2003	2004
Employee's contribution	76.27	39.13	68.01	89.52	83.19
(million)	[30.77]	[19.37]	[23.63]	[40.22]	[37.55]
Employers contribution (million)	27.37	20.43	29.57	41.48	46.39
	[15.51]	[10.78]	[14.12]	[16.45]	[17.82]
Employee's contribution per	2.09	2.10	2.32	2.64	2.56
employee (thousand)	[1.85]	[1.39]	[2.11]	[2.19]	[2.22]
Employer's contribution per	0.92	1.17	1.30	1.38	1.45
employee (thousand)	[0.76]	[0.88]	[0.92]	[0.98]	[1.02]
Max match rate (%)	2.92	3.06	3.24	3.55	3.48
	[3.00]	[3.00]	[3.00]	[3.15]	[4.00]
Plan asset (billion)	1.69	0.60	1.16	1.83	1.88
	[0.61]	[0.30]	[0.36]	[0.62]	[0.68]
Investment list	19.92	16.63	19.02	22.60	19.55
	[11.00]	[13.00]	[14.00]	[15.00]	[15.00]
Only stock (%)	0.00	2.04	0.00	0.00	0.00
	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]
Sample size	59	49	82	104	111

Table 2. Annual Distribution of Matching Policy (Continued)

Panel B: Stock matching

	2000	2001	2002	2003	2004
Employee's contribution	61.14	60.57	67.30	61.27	81.31
(million)	[30.71]	[38.09]	[48.27]	[30.53]	[43.24]
Employer's contribution	25.36	22.45	21.96	23.13	27.63
(million)	[14.92]	[16.77]	[14.66]	[13.76]	[15.79]
Employee's contribution per	1.83	2.10	2.56	2.08	2.40
employee (thousand)	[1.63]	[1.78]	[2.03]	[1.69]	[2.07]
Employer's contribution per	0.91	1.00	0.93	1.02	1.09
employee (thousand)	[0.68]	[0.66]	[0.67]	[0.61]	[0.75]
Max match rate (%)	3.80	3.43	3.28	3.28	2.95
	[3.00]	[3.00]	[3.00]	[3.00]	[3.00]
Plan asset (billion)	1.72	1.36	1.20	1.51	1.86
	[0.79]	[0.73]	[0.68]	[0.66]	[0.83]
Investment list	20.98	21.98	17.36	21.97	24.86
	[11.00]	[14.50]	[14.00]	[18.00]	[18.00]
Only stock (%)	6.00	2.38	1.72	1.69	1.52
	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]
Sample size	50	42	58	59	66

Notes: The median value of the variables is reported in brackets.

Since the total employee contribution for the cash matching sample increases over the period 2000–2004, the per capita employee and employer contributions tend to increase at the same time. Except for 2002, the per capita employee contribution for the group of cash matching is higher that of stock matching. In addition, the per capita employee contribution for the group of stock matching is volatile in the later period. We expect participants in plans with cash matching to contribute more based on the preliminary results.

5. Empirical Results

Table 3 presents the difference tests between the 405 cash matching and 275 stock matching observations for plan- and firm-level variables from 2000 through 2004. In Panel A of Table 3, the differences between the two subgroups for most of the variables related to 401(k) plans are not significant simultaneously for both mean and median values. For example, the average amount of employer matching contributions for cash matching firms is larger than that for stock matching firms, but the difference in median values is not significant. In contrast, the mean (median) per capita employer contribution for cash matching firms is $1,290 (910), compared to a mean (median) per capita employer contribution of $1,000 (670) for stock matching firms. Employers who matched contributions by stock, on average,

are more likely to supply company stock as the only investment choice (2.55%) than employers that match contributions by cash (0.25%).

Table 3. Difference Tests

Panel A: Plan Characteristics

	Cash matching	Stock matching	Difference test
Employee's contribution (million)	75.40	67.22	0.81
	[32.04]	[36.73]	[-1.43]
Employer's contribution (million)	35.81	24.26	2.69 ***
	[15.73]	[15.27]	[1.03]
Employee's contribution per employee (thousand)	2.41	2.22	1.08
	[2.03]	[1.93]	[0.80]
Employer's contribution per employee (thousand)	1.29	1.00	2.88 ***
	[0.91]	[0.67]	[3.03] ***
Max match rate (%)	3.32	3.32	-0.01
	[3.00]	[3.00]	[0.49]
Plan asset (billion)	1.54	1.54	-0.02
	[0.50]	[0.74]	[-3.46] ***
Investment list	19.93	21.51	-0.76
	[14.00]	[16.00]	[-1.49]
Only stock (%)	0.25	2.55	-2.74 ***
	[0.00]	[0.00]	[-2.73] ***
Sample size	405	275	

Panel B: Firm Characteristics

	Cash matching	Stock matching	Difference test
Assets (billion)	29.14	33.51	-0.76
	[7.61]	[11.88]	[-2.31] **
R&D Expense / Asset (%)	3.47	1.97	3.41 ***
	[0.00]	[0.00]	[2.32] **
Dividend / Asset (%)	1.74	2.39	-2.03 **
	[0.81]	[1.41]	[-4.42] ***
Leverage	0.23	0.31	-5.11 ***
	[0.16]	[0.26]	[-5.23] ***
Ret_3year (%)	1.01	0.98	0.20
	[0.86]	[0.92]	[-0.23]
Std_ret_3year (%)	11.56	10.47	3.35 ***
	[10.38]	[9.92]	[3.04] ***
Employees (thousand)	53.07	49.89	0.36
	[19.95]	[22.43]	[-1.28]
Sample size	405	275	

Notes: The table reports means with medians in brackets or t-statistics with z-statistics in brackets. The symbols ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively.

Panel B of Table 3 presents the firm's financial characteristics. The median asset size for cash matching firms is significantly smaller than that of stock matching firms. The normalized R&D expenses by asset for cash matching firms are significantly larger than those of stock matching firms. The mean (median) normalized dividend by asset for cash matching firms is 1.74% (0.81%) of assets, compared to a mean (median) ratio of 2.39% (1.41%) for stock matching firms. This supports the hypothesis that paying high dividends and matching contributions by cash may crowd out each other. The mean (median) leverage for cash matching firms is 23% (16%), compared to a mean (median) leverage of 31% (26%) for stock matching firms. This also suggests that firms with more debt may prefer matching by stock to matching by cash. In addition, the standard deviation of company monthly return for cash matching firms is significantly larger than that of stock matching firms. This suggests that volatile firms tend to match contributions by cash.

We now examine the relationship between plan-level per capita employee contributions and firm features as well as plan attributes (Table 4). To control for the size effect, we use the per capita employee contribution rather than total employee contributions as the dependent variable. Since the annual employee contributions are constrained by $10,500 or 25% of compensation, we use a two-limit tobit model to investigate the determinants of per capita employee contributions. We expect employee contribution rates to increase if the employers match employees' contributions (*Match*) (Huberman et al., 2007). At the same time, employees may prefer cash matching to stock matching because they can direct the employer's contributions following their discretion (*Matched by cash*). As discussed earlier, the evidence to date is mixed regarding the impact of the employer match rate (*Max match rate*) on employee contributions.[8]

In addition, the natural logarithm of plan assets (*LnPlan_asset*) tends to be positively associated with the employee contribution rates because of the size effect. We also include the number of investment options (*Investment list*) as an independent variable and expect that employee contributions are not affected by the number of investment options (Huberman and Jiang, 2006). Following Papke (2004), we expect employees to decrease their contributions if the company stock is the only investment instrument in 401(k) plans (*Only stock*). Furthermore, good investment opportunities (*R&D expense*) and dividend (*Dividend*) are expected to be positively associated with employee contributions. In contrast, higher liabilities (*Leverage*) are expected to lead employees to decrease their contributions.

Since the literature indicates that employees usually overinvest in the employer's stock and Benartzi (2001) argues that employees might excessively extrapolate past performance, this implies that per capita employee contribution increases with the average 3-year monthly return (*Ret_3year*) and decreases with the 3-year standard deviation (*Std_ret_3year*) of the employer's stock. Finally, we include year and two-digit main Standard Industrial Code (SIC) dummies to control for the time trend and industrial effects.[9]

Table 4. The Relationship between Employees' Contributions and Firm's Characteristics

	All (1)		Cash and stock matching (2)		Cash matching (3)		Stock matching (4)	
	Coeff	z-stat.	Coeff.	z-stat.	Coeff.	z-stat.	Coeff.	z-stat.
Intercept	0.052	0.05	0.579	0.56	-0.909	-0.67	2.576	1.79 *
Match	0.559	1.80 *						
Matched by cash			0.243	1.88 *				
Max match rate (×10)	0.004	0.07	-0.266	-0.80	-0.999	-2.01 **	0.603	1.45
LnPlan_asset	0.119	2.74 ***	0.115	2.42 **	0.189	3.00 ***	0.031	0.46
Investment list (×10)	-0.004	-0.16	0.005	0.22	-0.011	-0.33	-0.002	-0.07
Only stock	-2.124	-3.94 ***	-2.558	-4.04 ***	0.800	0.46	-3.119	-5.29 ***
R&D expense / asset	8.244	6.38 ***	7.768	5.74 ***	6.975	4.20 ***	10.086	4.32 ***
Dividend / asset	3.230	2.09 **	3.935	2.45 **	5.710	2.68 ***	1.433	0.61
Leverage	0.096	0.27	0.118	0.30	0.575	0.96	0.418	0.90
Ret_3year	10.546	3.05 ***	10.752	2.88 ***	15.217	3.11 ***	5.286	0.94
Std_ret_3year	1.694	1.13	1.024	0.62	1.240	0.56	-2.106	-0.90
Year & SIC Dummies	Included		Included		Included		Included	
N	756		680		405		275	
Pseudo R^2	0.071		0.067		0.059		0.142	

Notes: The symbols ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively.

Model (1) of Table 4 uses the whole 401(k) sample, including 729 observations with employer contribution matching and 27 observations without employer contribution matching, to test the hypotheses. Model (1) reports a significantly positive coefficient on *Match* and supports *Hypothesis* 1. The evidence suggests that employees with employer contribution matching are more likely to contribute more to their 401(k) plans and is consistent with Huberman et al. (2007). In line with the mixed results reported in earlier studies, the coefficient on *Max match rate* is not significant. In addition, the coefficient on *LnPlan_asset* is significantly positive, indicating that employees are more likely to contribute more when they participate in large 401(k) plans. The reasons may be that larger retirement plans enjoy the benefits of economies of scale, have greater bargaining power, offer more investment options, or pay lower expense ratios applied to specific institutional class shares.

The insignificant coefficient on *Investment list* supports our argument and is consistent with Huberman and Jiang (2006), who find that participants choose to invest their savings in a small number of funds. The significantly negative coefficient on *Only stock* is consistent with Papke (2004), who argues that investable choice substantially increases contributions. Both results support *Hypothesis* 3, which states that employees who have a selectable investment list contribute more, but their contributions are not sensitive to the number of investment options.

The coefficient on *R&D expense* is significantly positive in all models, suggesting that employees are more likely to increase their contributions in firms

with good growth opportunities. Since paying dividends can signal the future profitability or decrease the agency problem (La Porta et al., 2000), employees' contributions increase with dividend size. Both results support *Hypothesis* 4, which states that employees in firms with good growth opportunities contribute more because of the lower bankruptcy risks. Furthermore, the significantly positive coefficient on *Ret_3year* indicates that employees are more likely to increase their contributions when the stock performance of their firm is good. In contrast, the coefficient on *Std_ret_3year* is not significant. These results support *Hypothesis* 5 and are consistent with Benartzi (2001), who suggests that employees pay much more attention to stock returns than to the standard deviation of returns.

The sample of Model (2) of Table 4 consists of 405 pure cash matching and 275 pure stock matching observations. We replace the variable *Match* by *Matched by cash* to investigate whether employer matching by cash increases participants' contributions. The significantly positive coefficient on *Matched by cash* supports *Hypothesis* 2 that participants increase their contributions when their employer matches employee contributions by cash rather than stock. The reason may be that employees with cash matching plans allocate their employer's contributions among the various investment options at their discretion.

Both Model (3) and Model (4) use the same specification as Model (2) but restrict the sample to pure cash matching and pure stock matching, respectively. These two models help in understanding the difference in determinants between pure cash matching and pure stock matching. Most of the results in Model (3) are consistent with those of Model (2). For the pure cash matching sample, the significantly negative coefficient on *Max match rate* suggests that potentially higher employer cash matching rates tend to reduce the participants' contributions, which is consistent with Papke (1995). In Model (4), the significantly negative coefficient on *Only stock* suggests that employees decrease their contributions when their employer matches contributions by stock and company stock is the only investable asset in the 401(k) plan. The reason may be that participants perceive a risk in tying labor income and retirement income to firm performance without much diversification.

6. Conclusion

We use a manually collected sample of 756 401(k) plans from S&P 500 firms covering 2000–2004 to explore the determinants of employees' contribution rates in 401(k) plans. From the policy perspective, understanding how the firm and plan features interact with employees' contribution rates in pension plans is important to improve employee retirement safety.

We find that employees contribute more if employers offer contribution matching. Furthermore, cash matching is more helpful to promote employees' contributions than stock matching. We also find that a company's high dividend payments, good growth opportunities, and good stock performance are positively associated with employees' contribution rates. Finally, participants with investable options in their 401(k) plan contribute more to their retirement plan.

Notes

1. The most important advantage is that a 401(k) plan allows employees to make voluntary contributions in the form of pre-tax instead of post-tax dollars. See Even and Macpherson (2005) for details.

2. Most employers match employees' elective contribution. For example, the Hewlett-Packard (HP) Company contributes an amount equal to the employee's deferral for the first 3% of salary and an amount equal to half of the employee's deferral for the next 2% of salary deferred in 2000. Contributions above 5% of an employee's pay are not matched by HP and the maximum contribution that employees can make is 6% of their deferred salary. However, some companies offer a fixed contribution rate no matter how much the employee's contribution is. For example, Capital One Financial Company contributes 3% of the salary deferred to the plan for every employee.

3. Because the SEC has required public companies to make their filings available in electronic format since 1994, we manually collect information on forms 11-k from EDGAR (www.sec.gov).

4. Huberman and Sengmueller (2004) discuss the detailed regulatory issues regarding form 11-k.

5. Our sample size is comparable to that in Benartzi (2001). He uses 219 forms 11-k of the S&P500 firms in 1993 to test whether employees excessively extrapolate the past performance of company stocks.

6. Similar to Brown et al. (2006), our sample firms rarely change their matching policy. In our sample, only 77 of 756 firm-year observations change their matching method.

7. Huberman et al. (2007) show that, on average, only 71% of employees choose to participate in the plans. Therefore, we may underestimate the per capita employees' contribution and employer's contribution if we use the number of employees rather than the number of participants to calculate the variable. However, this does not affect our conclusions qualitatively because our purpose is to control for the size effect.

8. There is no consensus as to whether employees respond to the level of the match rate once a positive match is provided. Kusko et al. (1994), Papke and Poterba (1995), Papke (1995), and Munnell et al. (2001/2002) find a weak or negative effect of the match rate on employee contributions. However, Clark and Schieber (1998) find the opposite result.

9. The two-digit main SIC codes include mining (10-14), construction (15-17), manufacturing (20-39), transportation and communications (40-48), wholesale (50-51), retail (52-59), and services (70-89).

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