Company Stock Investment in 401(k) Pensions

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Abstract

This study provides an empirical analysis of the factors that affect own company stock investment in 401(k) pensions. The estimates suggest that individuals who work in larger companies and receive more employer matches in the pension account are more likely to hold own company stock in it, and they are less likely to hold employer stocks when the wealth outside pension account is large and other individual retirement accounts are available. In addition, this study finds that the own company stock proportion in 401(k) account is decreasing with pension wealth and total net worth.

Keywords: company stock, private pension, wealth, retirement

JEL Code: J32, G11

1. Introduction

401(k) pension is one type of defined contribution (DC) plans that are sponsored by some profit organizations. Employees in 401(k) plans not only have access to a general index of investment options, but also can make investment in their own company stocks. This paper tries to analyze the factors that affect own company stock investment in the 401(k)-type pension account.

In recent years, own company stock investments have grown rapidly in the retirement account. At many large firms, particularly those with retirement saving plans that combine elements of an Employee Stock Ownership Plan (ESOP) with a traditional 401(k), a substantial fraction of defined-contribution pension assets are held in company stock.[1] The fact of large own company stock holding in retirement accounts has come under scrutiny in recent years, in response to the sharp decline in stock prices of several firms at which employees held a large fraction of their 401(k) plan assets in company stock, including Enron, Global Crossing, Lucent, and Polaroid.[2]

The decrease in share prices and eventual bankruptcy filing of Enron resulted in huge financial losses for many of its 401(k) participants. Standard portfolio theory also suggests that there are potentially large welfare costs from holding company stock because it raises the volatility of the retirement wealth for employees and expose some workers to the prospect of very small retirement values (Meulbroek 2002; Ramaswamy 2003; Poterba 2003). Especially, holding an undiversified position in employer stock may be particularly costly because it exposes employees to idiosyncratic risk and introduces a positive correlation between labor income shocks (value of human capital) and company stock returns. When the performance of own company stock is quite poor, the employees will face a higher probability to be laid off (Davis and Willen 2000a and 2000b; Campbell and Viceira 2002; Campbell et al. 2001).

[1]The aggregate data on the share of 401(k) plan assets invested in company stock from 1998 Form 5500 filings, as reported in the Private Pension Plan Bulletin by U.S. Department of Labor in 2001, show that 15.1 percent of 401(k) plan assets were held in own company stock. A survey by the Institute of Management and Administration in 2001 of 220 large firms with defined-contribution plans also found an average of 36.1% of plan assets in company stock. The plans at these large firms, in particular, account for a substantial share of both participants and assets in 401(k)-type of pensions.

[2]At Enron, 57.73% of 401(k) plan assets were invested in company stock, which fell in value by 98.8% during 2001.

Company stock is quite risky and heavily invested in the 401(k) account, but few studies have analyzed what factors affect the employees' decisions of holding company stocks in a pension account. Most of the studies who analyze this question mainly focus on the past stock market performance of the company stock[3] and features of the employer-sponsored 401(k) plan[4]. Because of the limitation in the plan-level data, their studies do not analyze any effect of the individual characteristics (such as age, education, marriage status and risk attitude), working experience of the employees (such as labor supply decisions, tenure, and expected service time), financial information from both individual and household (such as other pension plans, spouse's retirement accounts and household non-pension wealth). However, those factors also have important effect on company stock holdings (see Holden and Van Derhei 2001; Meulbroek 2002; Ramaswamy 2003; Poterba 2003).[5]

This study provides an empirical analysis of the factors that affect company stock investment in 401(k) pensions, using the data from the Survey of Consumer Finances (2004 and 2007). The estimated results suggest that the company stock investment decision in the 401(k) account is not only affected by employment characteristics and pension designs, but also depends on individual total asset and wealth decomposition in both pension and non-pension accounts.

There are three main findings in this study. First of all, this paper examines the determinants to the decision of whether to hold any company stock in the 401(k) plan. The estimates suggest that employment status, including the company size, labor supply decisions and employer matching policies in the pension account, plays a positive role in the company stock ownership. In addition, I find that asset decomposition between pension account and non-pension account has significant impact on company stock investment decisions. The results indicate that people with lower non-pension wealth are more likely to invest in company stock in the 401(k) account, and a 1,000 dollars increase in non-pension wealth reduce the probability of company stock ownership by 0.6 percentage point. The estimates also imply that the company stock ownership is decreasing with total wealth, thus suggesting that less wealthy people are those who are more likely to be exposed to company stock risk.

Secondly, conditional on company stock ownership, this study finds that the actual company stock investment amount and proportion in the pension account are not affected by employment features, but depend on asset decomposition between the pension and non-pension accounts. Given all others constant, individuals with more 401(k) balance tend to invest a less proportion of retirement wealth in own company stock, so do the people with more total net worth. The estimated results show that a 1,000 dollars increase in the assets reduces the company stock proportion by 7 percentage points, and an increase of net worth by 1,000 dollars would decrease the company stock proportion by 0.2 percentage point. This finding further suggests that, as a special type of risky asset, company stock is more heavily invested by less wealthy individuals.

Thirdly, I analyze the roles of holding company stock in asset allocation decisions in 401(k) pensions. Since company stock and other stocks are substitute, the company stock investment will decrease the holdings of other stocks in the 401(k) account. But people with company stocks in their financial portfolios are investing a larger fraction of pension wealth in equities, and are more likely to hold full-equity portfolio in the pension account.
The rest part of this paper is organized as follows. Section 2 provides a description of the data from the Survey of Consumer Finances. The estimation and results are discussed in Section 3, and conclusion is drawn in Section 4.

2. Data

The data set used in this paper is from the Survey of Consumer Finances (SCF), collected in 2004 and 2007. The surveys are conducted by the Board of Governors of the Federal Reserve System and cover a substantial cross-section of U.S. households in each survey year. There are 17,874 individuals (from 8,973 households) in the survey studied in this paper.[6]

[3]Even and Macpherson (2005) and Benartzi(2001) find that the level of company stock holdings responds positively to recent stock performance. Their estimates suggest that investors overweight recent stock performance, and fail to rebalance portfolios.
[4]Liang and Weisbenner(2002), using panel data for nearly 1,000 companies during 1991 to 2000, find that the number of investment alternatives offered, and whether the company requires some of the match to be in company stock are key factors of the share of total contributions in company stock.
[5] For instance, Holden and VanDerhei (2001) suggest that the company stock holdings in the pension account vary with different age levels. And some studies also point out the risk of company stock investment will decrease by increasing the relative size of non-pension wealth (see Meulbroek 2002; Ramaswamy 2003; Poterba 2003).
[6]Among the observations, there are 4,519 households studied in 2004, and 4,418 in 2007. And the numbers of individual observations in 2004 and 2007 are 9,038 and 8,836 respectively.

The survey asks a wide array of questions on every aspect of household financial situation---amount and type of liquid and illiquid assets, nature and value of proprietary business holdings, availability and price of credit, sources of earnings, and so forth. Of particular value for studies of household portfolio composition is the fact that the SCF oversamples wealthy households, which tend to have richer portfolio structures. Each survey makes available a set of sampling factors that allow one to re-weight the sample to produce population statistics. Unless otherwise noted, all descriptive statistics utilize population weights.

Compared with previous waves in SCF and other surveys, SCF 2004 and 2007uncovers precise composition of household financial portfolios, including the information of own company stock in both pension and non-pension assets. To analyze the exact amount of company stockholding of each respondent, I have to treat each observation as one individual rather than one household. In the survey of this study, 2,875 individuals have 401(k)-type plans and are still working, among which 335 families have two observations, and 1,021 participants have multiple retirement plans. While company characteristics, working experience, pension accounts, and individual characteristics are reported for each observation, non-pension wealth is collected on a household level. Table 1 describes the statistics of individuals who have at least one 401(k)-type account.

Table 1: Variable Names and Descriptive Statistics (in 2004 dollars)

Variables	Description	Mean	S.D.
Equity in 401(k)	Equity amount in 401(k) ($1000)	39.63	95.3
Equity Share in 401(k)	Equity amount/Balance in 401(k)	0.569	0.377
Company Stock in 401(k)	Own company stock amount in 401(k) ($1000)	5.336	60.70
Company Stock Share in 401(k)	Own company stock amount/Balance in 401(k)	0.038	0.135
Company Size (>500)	No. of employees is more than 500	0.549	0.498
Company Size (100-499)	No. of employees is 100-499	0.191	0.390
Company Size (10-99)	No. of employees is 10-99	0.211	0.408
Company Size (<10)	No. of employees is less than 10	0.049	0.216
Wages	Annual wage ($1000)	77.21	84.99
Weeks	Weeks worked per year	51.12	3.905
Tenure	Years worked in this company	12.68	10.44
Providing Match	"1" if employer provides some match	0.243	0.429
Employer Match Rate	Employer match for $100 employee's contribution	18.60	51.70
Investment Choice	"1" if self-reported having investment choice in 401(k)	0.796	0.403
Balance in 401(k)	In $1000	56.51	133.8
No. of Pensions	No. of pension plans	1.317	0.518
Have IRA	"1" if having IRA	0.381	0.485
Have DB	"1" if having a DB pension	0.046	0.210
Non-401(k) Pension[1]	Household retirement wealth excluding 401(k) balance of the respondent ($1000)	70.15	170.1
Non-pension Wealth[2]	Household non-pension financial wealth ($1000)	130.1	578.0
Financial Wealth[3]	Sum of non-pension and pension wealth	253.7	913.2
401(k) Share	Ratio of 401(k) balance to financial wealth	0.414	0.313
Net Worth[4]	All wealth minus debt ($1000)	546.9	2385
Age		43.39	10.87
Male	"1" if male	0.546	0.491
High School	"1" if have high school diploma	0.249	0.433
Some College	"1" if have some college education	0.173	0.378
College Degree	"1" if have college degree	0.534	0.499
White	"1" if white	0.582	0.493
Married	"1" if married	0.752	0.432
Family Size	No. of family members	1.069	1.170
Risk Aversion[5]	Self-reported risk tolerance	2.733	0.786
No. of Observations		2875	

1. Non-401(k) pension wealth include non-401(k) pension wealth of the respondent, such as IRA and DB plans, and pension wealth of the spouse if married.
2. Non-pension wealth is the sum of cash, bonds, bills, stocks, and mutual funds within a household, except for the part in any pension account.
3. Financial wealth is the sum of non-pension wealth, non-401(k) pension wealth, and the account balance in 401(k) plan.

4. Net worth is defined as the sum of financial wealth, the value of all proprietary business, housing and other real estate minus various types of debt including mortgages and consumer loans within a household.
5. Risk Aversion ranges from 1 to 4, a higher value indicating a lower level of risk tolerance.

The variables can be divided into four categories. Those are information within 401(k) account, other pension and company characteristics, individual demographics, and household asset value. In 401(k) account, similar to the other empirical studies of DC pensions, most of the participants hold a positive amount of equity. Figure 1 shows the distribution of equity share in 401(k) plan. Among the observed group, more than 80 percent of the sample holds some stock in 401(k) account, and more than 30percent invests all account balance in risky assets. Most of the participants put 401(k) assets in three ways, all in relatively safe assets (like bonds), all in risky assets (like stocks), and split evenly between bonds and stocks. Compared with stock holding, the observed distribution of company stock investment looks different. About 18.3 percent of the sample hold some company stock in the 401(k)-type account, and the distribution of those investors is shown in Figure2. Around 15 percent of this subsample holds more than 50 percent 401(k) assets in own company stock, and about 35 percent of the individuals hold between 20 to 50 percent pension assets in company stock.

Figure 1: Equity Shares Distribution in 401(k) Pensions

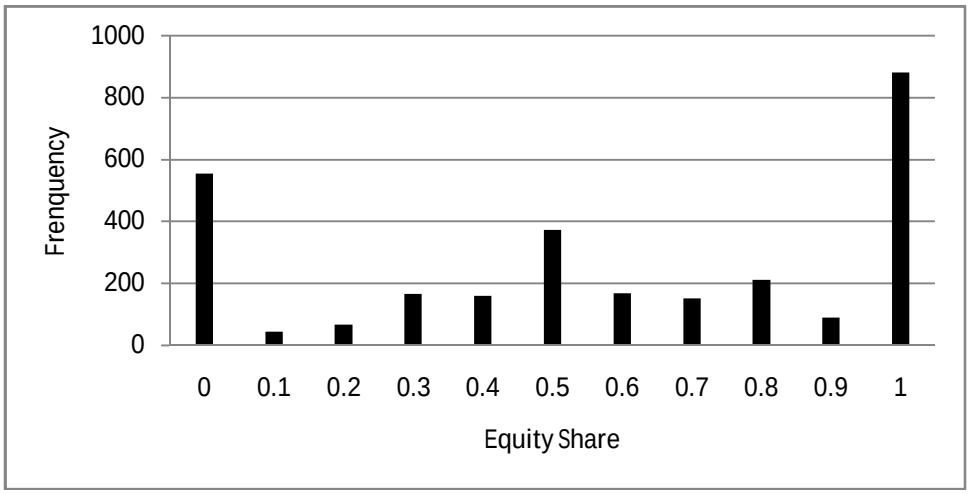
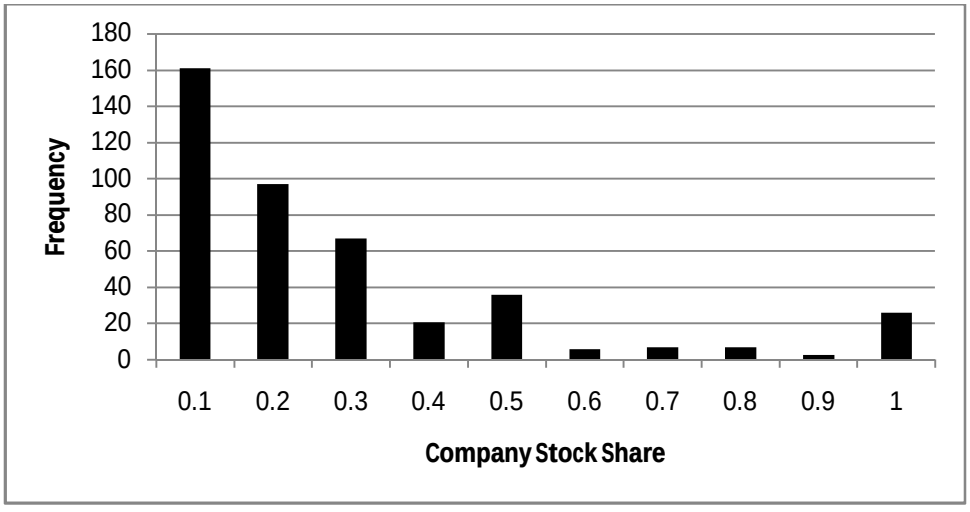


Figure 2: Company Stock Shares Distribution in 401(k) Pensions



Among the variables in 401(k) plan, three of them capture the plan characteristics, which are providing employer match, employer match rate, and investment choice. Providing employer match is a dummy variable, which equals 1 if the employer matches the employee's first dollar contribution, and zero otherwise. Employer match rate measures the relative size of employer contribution. If the employer matches 2dollars for every 1 dollar contribution from the employees, then the match rate is 200. Among the sample in analysis, about 24.3 percent of the observations have an employer contribution in the 401(k) plan, and the average matching rate is about 18.6.

Investment choice indicates self-reported value of participant discretion of portfolio choices, which equals 1 when the participant self-reports not restricted by any plan designs. About 79.6 percent of the sample report that they have investment choice.[7] To analyze the features of own company stock investors, I divide the sample into two groups, one of which is those with some company stock **i**nvestment in 401(k) plan and the other is those without any company stock holding. The statistical comparison is shown in Table2. Based on the mean values, there is no much difference between the two groups in wages, financial wealth (sum of pension and non-pension), and most individual characteristics (like age, gender, education, and risk aversion), but they do have different levels of business and housing, consequently the total net worth. The group with company stock holdings in the 401(k) account has less investment in business and housing, which may result from the background risk of the non-tradable wealth. Two additional types of information are shown in this table. On the one hand, some factors seem to play significant role in the employee's decision of holding own company stock, such as plan and company characteristics. For instance, participants with positive company stock holding generally have the plan with employer contribution, higher employer match rate, more likely with investment choice and from a larger company.

Table 2: Comparison: With and Without Company Stock Investment in 401(k)

	Company Stock>0		No Company Stock	
	Mean	S.D.	Mean	S.D.
Equity in 401(k) ($1000)	44.27	(96.54)	30.52	(93.40)
Equity Share in 401(k)	0.702	(0.27)	0.497	(0.40)
Company Stock in 401(k) ($1000)	19.23	(57.80)	-	-
Company Stock Share in 401(k)	0.273	(0.27)	-	-
Company Size (>500)	0.824	(0.38)	0.5	(0.50)
Company Size (100-499)	0.12	(0.33)	0.204	(0.40)
Company Size (10-99)	0.053	(0.23)	0.247	(0.43)
Company Size (<10)	0.002	(0.05)	0.048	(0.22)
Wages	71.4	(102.20)	70.92	(183.80)
Weeks	51.75	(1.77)	50.99	(3.97)
Tenure	11.35	(9.76)	10.02	(8.80)
Employer Match Rate	27.54	(41.78)	19.01	(39.89)
Investment Choice	0.794	(0.41)	0.71	(0.45)
Balance in 401(k)	63.75	(142.10)	54.26	(131.10)
No. of Pensions	1.453	(0.59)	1.275	(0.49)
Have IRA	0.279	(0.45)	0.334	(0.47)
Have DB	0.034	(0.18)	0.044	(0.21)
Non-401(k) Pension	70.39	(157.10)	70.07	(174.00)
Non-pension Wealth	103	(896.30)	115	(791.80)
401(k) Share	0.423	(0.30)	0.411	(0.32)
Net Worth	419.8	(1566.00)	586.6	(2587.00)
Age	43.27	(10.83)	43.56	(10.88)
Male	0.518	(0.50)	0.555	(0.50)
High School	0.262	(0.44)	0.245	(0.43)
Some College	0.199	(0.40)	0.165	(0.37)
College Degree	0.523	(0.50)	0.538	(0.50)
White	0.567	(0.50)	0.547	(0.50)
Married	0.74	(0.44)	0.756	(0.43)
Family Size	1.024	(1.14)	1.083	(1.18)
Risk Aversion	2.799	(0.72)	2.874	(0.82)
No. of Observations	431		2444	

[7]Generally speaking, in addition to voluntary choices in 401(k) plan, participants are restricted in investment choice to different degrees. Actually, not every participant in 401(k) plan has investment discretion. Some of them face a limited menu of investment funds, and some do not have control over employer contributions. One potential shortage of using SCF is that all the plan features in pension account are self-reported, and the survey does not fully distinguish the effect of different plan designs. For instance, the survey has question asking whether the employee in 401(k) has investment choice over assets. The answer to it is "yes or no". But the respondent can evaluate investment choice indifferent way. Some answered "no" because they think the investment options provided by the employer is not well-diversified, while others only because they do not have any control over employer contribution (mandatory company stock match). Therefore, what I can analyze in this study is the role of participant discretion in 401(k) plan.

In addition, people with own company stock investment are likely to have more 401(k) balance and less non-pension wealth. The higher balance in401(k) may contribute to some generous respect of the plan features, while less non-pension wealth indicate poorer people are more likely to invest company stock in pension accounts. Moreover, investors who have some investment in company stock behave differently from others. The statistics show that the group with positive company stock in 401(k) plans invests more aggressively in risky asset in the pension account, not only in absolute values but also in proportions.

As suggested by other studies (Even and Macpherson 2005; Benartzi 2001; Liang and Weisbenner 2002), employees choose company stock other than general risky equities may result from some special features of the employer and the designs of 401(k) plan. To give the plan characteristics a closer look, I report the company and plan characteristics across company stock proportions in Table 3. The second column is the company size variable which ranges from 1 to 5, showing the number of employees as 0-9, 10-19, 20-99, 100-499, and greater than 500. The rest of the variables are all about plan features. The statistics suggest that people with larger company stock investment are more likely to work in lager companies, and receive more generous employer match from the employer. But the investment choice does not show clear pattern in this tabulation.

Table 3: Company and Plan Characteristics over Company Stock Share Level

Company Stock Share	Company Size	Investment Choice	Proving Match	Employer Match Rate
0-0.25	4.715	0.813	0.336	25.376
	(0.67)	(0.39)	(0.47)	(47.32)
0.25-0.50	4.747	0.781	0.467	35.8
	(0.63)	(0.41)	(0.50)	(45.98)
0.50-0.75	4.918	0.821	0.527	44.715
	(0.34)	(0.39)	(0.50)	(46.46)
>0.75	4.623	0.716	0.474	28.403
	(0.76)	(0.45)	(0.50)	(42.03)

3. Estimation and Results

This section describes the regression results of the impact of different factors on the company stock investment in 401(k) pensions. First, I report the Probit estimation results of the factors that affect company stock ownership, and compare them with the factors that influence general stock ownership. Second, conditional on positive ownership, the determinants to company stock investment amount and proportions are discussed. Lastly, I explore the effects of company stock holdings on the overall individual financial planning in both pension and non-pension accounts.

3.1 Company Stock Ownership

Table 4 column one displays the Probit estimation results of determinants to company stock ownership in 401(k) pension accounts. The dependent variable is a discrete choice variable, which is equal 1 if the company stock holding is positive and 0 otherwise. The regressors comprise of three categories, including employer features (working environment and 401(k) plan designs), wealth information (asset locating inside pension and outside pension), and individual characteristics (demographics and risk preference). In column two, I also report the determinants of general stock ownership, as a comparison to company stock ownership decisions.

According to the estimates in the first panel of Table 4, the employment characteristics are important to the decision of company stock ownership. First of all, the coefficients of company size indicate that the larger the company the more likely the employees hold some own company stocks. This result, on the one hand, can be explained by the fact that larger companies are more likely to have a publicly-traded company stock, and on the other hand, the company stocks in large companies tend to be more stable than those in small firms, thus in turn more attractive in investment. Second, the results show that individuals who work more time in a year are more likely to hold own company stock. The probability of investing in own company stock will increase by 0.9 percentage point, if the respondent works one more week annually. This finding can be explained by the fact that employees tend to connect the company stock performance with their own contribution to the firm. Third, I analyze the impact of 401(k) pension characteristics on company stock ownership. The employer matching rate has a significant positive effect, and a one percentage point increase in the matching rate can increase the probability of holding company stocks by 0.031 percentage point.

This result is consistent with the empirical results discussed in Benartzi (2001) and Liang and Weisbenner (2002), who show that employer stock matches cause participants to hold more company stocks in the pension account. Li(2009) also find theoretical evidence that when labor income is positively correlated with stock returns, employer matching policy can boost the stock ownership in the pension account. One thing needs to note is that the investment choice coefficient, although positive, does not indicate significant effect on the company stock ownership. However, this variable has a significant positive impact on general stock ownership, which is consistent with the results in Papke (2004) who find participant-direction in DC pensions boosts the equity investment in that account. This finding can be explained by the fact that people with freedom in the investment decisions are more likely to choose equities for the higher returns, but they do not prefer company stock because of its potential high risk from the positive correlation with labor income.

Table 4: Probit Estimation Results: Determinants to Company Stock and General Stock Ownership (Marginal Effects are reported)

	Company Stock>0		*Stock>0*	
	Coef.	S.D.	Coef.	S.D.
Asset Location				
Balance in 401(k) (10^3)	0.015	(0.031)	0.024	(0.035)
No. of Pension	0.054***	(0.017)	0.002	(0.021)
Have IRA	-0.038*	(0.021)	-0.016	(0.025)
Have DB	-0.057*	(0.029)	-0.007	(0.055)
Non-401(k) pension(10^3)	-0.042	(0.036)	0.034	(0.032)
Non-pension wealth(10^3)	-0.006*	(0.003)	-0.001	(0.003)
Non-pension wealth^2 (10^{10})	0.326**	(0.143)	-0.039	(0.135)
Net worth(10^6)	-0.746	(1.050)	1.100	(0.633)
Employer Characteristics				
Company size (>500)	0.319***	(0.080)	-	-
Company size (100-499)	0.278**	(0.134)	-	-
Company size (10-99)	0.119	(0.111)	-	-
Weeks	0.009**	(0.005)	-	-
Employer match rate	0.031**	(0.015)	0.038	(0.028)
Investment choice	0.014	(0.022)	0.236***	(0.031)
Individual Characteristics				
Age	-0.013**	(0.006)	0.004	(0.007)
Age^2	0.014**	(0.006)	-0.006	(0.007)
High School	0.149**	(0.085)	0.015	(0.049)
Some College	0.185**	(0.095)	0.013	(0.053)
College Degree	0.104*	(0.050)	0.005	(0.050)
Male	-0.035	(0.026)	-0.070***	(0.025)
White	0.010	(0.026)	0.066**	(0.030)
Married	0.010	(0.023)	0.072***	(0.029)
Risk Aversion[8]	-0.005	(0.012)	-0.074***	(0.015)
Adjusted R^2	0.1537		0.1286	

Note: *** 1% significant level; ** 5%; * 10%.

In addition to employer characteristics, company stock ownership is also significantly affected by asset location decisions. From the estimates in the second panel of Table 4, one can analyze those effects from three types of accounts: employer-sponsored DC pensions, non-DC pensions (such as DB plans and IRAs), and non-pension wealth (taxable saving and investment accounts). First of all, the employer-sponsored DC pensions are captured by two indicators, one of which is the balance in 401(k) account, and the other is the number of employer-sponsored DC pensions the individual may have. The estimates show that although 401(k) balance has a positive but insignificant effect on company stock ownership, the number of employer-sponsored pensions plays a significantly positive role in that decision. It shows that adding one more pension account increases the probability of holding company stocks by 5.4 percentage points.

[8] Risk Aversion ranges from 1 to 4, a higher value indicating a lower level of risk tolerance.

This result can be interpreted as that the higher number of pensions implies the more generosity of employer policies, which in turn makes employees more likely to hold company stocks. Second, the non-DC pensions, both IRAs and Defined Benefit (DB) plans, have a negative effect on company stock ownership. The reason is that the accessibility to other retirement saving account (IRAs and DB plans) provides more saving and investment opportunities, thus making individuals less likely to choose company stock. The same effects can also be found on the general stock ownership (column 2 in Table 4). Lastly, I find that, conditional on the fixed pension wealth, a lower non-pension wealth implies a higher probability of holding company stocks in the 401(k) account. The results suggest that a 1,000 dollars increase in non-pension wealth reduce the probability of company stock ownership by 0.6 percentage point. This finding is consistent with the theoretical prediction in Amromin (2003) and Li (2009), who suggest that because of the precautionary saving incentives, people with lower taxable (non-pension) wealth would like to hold safe assets outside pension and hold more risky asset in the pension account. They also point out that when the risky asset return is positively correlated with the labor income shock, like the case of company stocks, people tend to hold even more equities in the pension account. Moreover, the negative coefficient of net worth reinforce this fact by showing that people with lower total wealth level are more likely to invest in company stock.

At last, I analyze the effect of individual characteristics on company stock ownership in 401(k) plans. The estimates show that company stock ownership is decreasing with ages; with an increasing speed (the coefficient of the square of age is significant and positive). This result is consistent with the literature about the age-pattern of company stock holdings. For instance, Holden and VanDerhei (2001) find that 401(k) participants between the ages of 20 and 29 hold an average of 15.4 percent of their 401(k) in company stock, compared with 19.7 percent for workers between the ages of 40 and 49, and 16.3 percent for workers over the age of 60. In addition, education experience at and above high school seems to have significant influence on company stock ownership, which may reflect the fact that higher-educated people are more likely to work in public-traded companies and can enjoy company stock benefits. Among the different education groups, individuals with college degree have the lowest probability to invest in company stock. The explanation of this finding might be that college graduates are more financial sophisticated and have better knowledge about the riskiness of company stock investments. Moreover, there is an important implication from the coefficient of risk aversion indicator. Since a higher number represents a lower level of risk tolerance, the negative coefficient in the stock ownership regression suggests that risk-averse people are less likely to invest in risky assets. However, this variable does not have significant effect on company stock ownership, which tells us that risk preference is not one of the main reasons for which people choose company stocks.

3.2 Conditional Company Stock Holdings

While I explore the factors that influence company stock ownership in the previous section, this section analyzes the determinants to company stock investment amount and proportions in 401(k) pensions conditional on the company stock ownership. Table 5 displays the estimates of OLS regressions of company stock amount (column one) and proportion (column two) on a list of variables. The estimated results also comprise three panels: employer features, asset allocation and location information, and individual characteristics. The effects of employer characteristics are displayed in the first panel, which includes the coefficients of employer matching rate and investment choice in 401(k) plan. Different from the results of company stock ownership, both of the two variables do not display significant effects on conditional company stock investment. This finding tells us account characteristics in 401(k) pensions influence the individual decision of whether to invest in company stock, but not the actual amount of the company stock they hold in that account.

The estimated results in the second panel indicate that the wealth levels of the individuals and the decomposition between pension account and non-pension account have significant effects on how much company stock invested in the 401(k) plan. First of all, people who have more savings would like to invest a higher amount of company stock. Given others constant, the estimates show that individual who has more non-pension wealth and other pension alternatives (IRA and DB plans) will investment more money in the company stock. However, since people with more assets will also increase the investment in other type of equities too, this change may not increase the proportion of company stock invested. In particular, the findings suggest that people with more balance in 401(k) account actually hold less fraction of its asset in company stock. The coefficient of 401(k) balance shows that a 1,000 dollars increase in the assets reduces the company stock proportion by 7 percentage points.

Since company stock is a special risky type of asset, it is reasonable to believe that agents might diverse their portfolios when they have more balance in the 401(k) account. Second, consistent with the previous findings, individuals who have lower net worth and higher proportion of 401(k) wealth tend to have more investment in company stock. The estimates imply that a decrease of net worth by 1,000 dollars would increase the company stock proportion by 0.2 percentage point. In addition, an increase of one percentage point in the 401(k) out of total wealth ratio would increase the company stock investment by about 40 dollars. Those results further suggest that less wealthy individuals hold more proportion of 401(k) wealth in company stock, which may tend to increase the riskiness of their retirement wealth.

Table 5: Determinants to Company Stock Investments (Conditional on Positive Company Stock Holdings)

	Company Stock Amount		*Company Stock Share*	
	Coef.	S.D.	Coef.	S.D.
Asset Location				
Balance in 401(k) (10^3)	25.11	(21.04)	-0.077***	(0.029)
No. of Pension	13.37	(9.451)	0.056*	(0.031)
Have IRA	19.83***	(7.159)	-0.040	(0.043)
Have DB	106.7*	(57.68)	0.156	(0.113)
Non-401(k) pension(10^3)	0.010	(0.022)	0.097	(0.066)
Non-pension wealth(10^3)	0.001***	(0.000)	0.002***	(0.000)
401(k) balance/total wealth	43.21***	(13.63)	0.003	(0.057)
Net worth(10^3)	-0.171	(0.273)	-0.002***	(0.000)
Employer Characteristics				
Employer match rate	10.49	(6.941)	0.043	(0.042)
Investment choice	-2.339	(4.675)	-0.046	(0.046)
Individual Characteristics				
Age	-1.717	(2.127)	-0.002	(0.014)
Age^2	2.984	(2.661)	0.006	(0.015)
High School	17.08**	(8.099)	0.077	(0.081)
Some College	13.88*	(8.042)	0.107	(0.082)
College Degree	25.07***	(8.367)	0.106	(0.083)
Male	3.927	(6.339)	-0.026	(0.038)
White	0.435	(1.277)	-0.046	(0.037)
Married	7.275	(7.755)	-0.005	(0.041)
Risk Aversion	-12.04	(7.690)	-0.014	(0.024)
Constant	-21.63	(36.72)	0.145	(0.313)
Adjusted R^2	0.4226		0.0932	

Note: *** 1% significant level; ** 5%; * 10%.

The third panel in Table 5 displays the coefficients of individual characteristics. Among all the variables, only education levels have significant effects on company stock amount, which reflect the fact that, given all other factors constant, higher-educated people may have a deeper insight of the company development, thus holding more own company stock.

3.3 The Effects of Company Stock Investment

Since company stock is a special investment opportunity, many studies try to analyze the consequences of holding company stocks in the overall portfolio decision. Some empirical evidence shows that higher employer stock holding reduces the investment in other stocks (Even and Macpherson 2005; Heaton and Lucas 2000; Pratt and Zeckhauser 1987), but these studies only focus on the non-pension assets. In this section, I try to explore the effect of company stock holdings in the 401(k) account on the asset allocation and location decisions, which includes the decision of how much savings in the pension account and non-pension account, as well as how much equity to hold in each account. Table 6 shows the impact of company stock holdings on the individual portfolio choices and wealth allocation decisions. After controlling for employer features, wealth information and individual characteristics, the estimates indicate that a higher company stock holding in 401(k) account significantly reduce other stock investment, which is reasonable because company stock and other stocks are close substitutes.

More importantly, the results suggest that the company stock holding boost the overall equity holding of each individual, and also increase the probability of 100 percent equities in the 401(k) account. The estimate shows that a one percentage point increase in the company stock proportion in 401(k) plan would increase the overall equity proportion by 0.5 percentage point and the probability of full equity holdings in 401(k) account by 1.363 percentage points. I conjecture that this effect may result from good performance of the financial market during the survey years.

Table 6: Estimation Result: The Role of Own Company Stock[1,2]

	Company Stock amount		Company Stock share	
Dependent Variables	Coef	S.D.	Coef.	S.D.
Amount of Equities other than company stocks	-0.621***	(0.215)		
Share of Equities other than company stocks			-0.494***	(0.041)
Amount of all equities	0.380*	(0.215)		
Share of all equities			0.506***	(0.041)
100% equity investment in 401(k)			1.363***	(0.223)
Share of 401(k) to retirement wealth			-0.02	(0.046)
Share of 401(k) to financial wealth			-0.035	(0.042)

1. *** 1% significant level; ** 5%; * 10%.
2. All regressions are controlled by company and plan characteristics, demographics, and household financial information.

4. Conclusion

This paper explores the factors that affect company stock investment decisions in the 401(k) pension. I empirically analyze the effects of employment features, household financial wealth information and individual characteristics on company stock ownership, as well as the conditional company stock investment amount and proportion. The estimated results suggest that employment status, such as company size, labor supply decisions and pension plan designs, has significantly effect on the decision of whether to hold any company stock, but does not significantly influence the actual company stock amount individuals invest. The wealth decomposition in pension and non-pension account plays an important role in both the decisions of company stock ownership and conditional company stock investment amounts in the pension account. In particular, I find that people with lower non-pension wealth are more likely to hold company stock in the pension account, and those with lower 401(k) balance and lower total net worth tend to hold a higher proportion of pension wealth in company stock. The results imply that less wealthy individuals are those who are more likely to get impacted by company stock investment. Since less wealthy people who heavily invest in company stock in their 401(k) pensions have a higher risk to lost their retirement wealth, this study provides some evidence that highlight this risk, thus raising the question of whether and how to modify the pension policies that boost company stock investment in the pension account. Future studies can closely evaluate the role of each 401(k) design on the individual asset allocation decisions, and the possible welfare loss (or gain) from the modification of those policies. This type of analysis might be done in a theoretical model with saving and portfolio choices.

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