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### Changes in Equity Investment of Japan's Households After the Introduction of Defined Contribution Plans

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#### Abstract

Compared to other advanced economies, Japan's households allocate fewer financial assets to equity investment. We examine the possibility that the introduction of self-directed defined contribution plans could stimulate more equity investment by exposing investors to investment education and experience in equity investment. Using original data obtained from individual investors, we analyze factors associated with current and expected future equity allocation. Results indicate that although DC plan participation has no significant effect on current equity allocation, it significantly increases the expected future equity allocation. Financial asset holdings have a significant positive effect on current and expected future equity allocation. Interestingly, however, subjective expectations of future income and pension benefit, which are key factors in the life cycle model, do not have any significant impact.

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## **1. Introduction**

Japan's households now allocate approximately 16% of financial assets to equity investment (including stock mutual funds), which is quite low compared to the 63% equity allocation by households in the U.S.<sup>1</sup>. However, the introduction of defined contribution (DC) plans in October 2001 may change this long-standing investment behavior, because DC plans require participants to make their own asset allocation decisions. While DC plan balances are still relatively small, this self-directed feature could change the way Japan's households allocate financial assets in the future.

Many empirical studies examine the factors affecting household asset allocation decisions by using a variety of data sources. Agnew et al. (2003) examine 401(k) account data, Shum and Faig (2006) examine the more broad-based data of the U.S. Survey of Consumer Finance, and Barger and Odean (2001) analyze account data from a securities firm. However, none of these studies addresses the linkage between DC plan participation and household asset allocation. In Japan, lack of data impedes the empirical analysis of factors affecting asset allocation decisions. To overcome this limitation, we collected individual data directly from employees in the private sector, and examined whether DC plan participation affects the current and expected future equity allocation of households.

## **2. Effect of DC Plans on Asset Allocation Decisions**

We assume that when employees participate in a DC plan, the allocation to equity can increase for two reasons. First, participants receive employer-provided investment education, which promotes equity investment as the most suitable long-term investment for retirement. Second, participants are exposed to more opportunities and actual experience in stock investment. Investing in DC plans requires an appropriate level of knowledge and information, which most participants do not receive in their formal education. Thus employer-provided investment education is the first and most important form of investment education. The Ministry of Health, Education and Welfare of Japan, which supervises DC plans, has issued educational guidelines that cover three areas:

- (a) explanation about DC plans and taxation,
- (b) explanation about investment products for the plan,
- (c) basic investment knowledge (i.e., risk-return tradeoff, diversification and long-term investment).

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1 As of December 2006, based on Flow of Funds Accounts of both countries.

In practice, the education also often covers topical issues such as investment performance and the standard asset allocation by age group. All participants receive the investment education at least once since it is stipulated by law.

The second factor is that DC plans expose participants to more opportunities and actual experience in equity investment. This is because participants need to give specific directions regarding investment in mutual funds. However, as Madrian and Shea (2001) point out, default funds can affect allocation decisions in DC plans. In Japan, deposit accounts are generally the default choice. As a result, DC plan balances are actually biased toward deposit accounts. However, the NPO Institute for DC Pension Plan Investment Education of Japan (2004) reports that about 60% of participants would reallocate assets if presented the right opportunity. For these reasons, we predict that investment education and experiences can stimulate the allocation to equity not only in DC plans, but in overall financial assets.

### 3. The Data

In February 2008, we collected individual data from survey monitors (registered survey respondents) through My Voice Communications, Inc., an Internet-based survey company. We limited the survey sample to private sector male employees because men comprise approximately 80% of DC plan participants in Japan. Respondents were first asked whether they currently participate in an employer-sponsored DC plan, the length of participation, and who manages plan assets<sup>2</sup>. DC plan participants with at least one year but less than seven years of participation<sup>3</sup>, and who answered that they themselves manage plan assets, were randomly chosen for the DC-Group. Meanwhile, non-participants were randomly chosen for the NonDC-Group. However, the composition of both groups was controlled to result in almost the same average age (of 40 years old<sup>4</sup>) and number of employees. We then asked both groups to provide the following information:

- (1) expected future allocation to equity as a percentage of financial assets,
- (2) maximum subjective estimate of future income,
- (3) subjective estimate of future public pension benefit,
- (4) individual attributes, including current income,
- (5) current equity allocation as a percentage of financial assets, and

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2 We asked this question to exclude respondents who confuse DC plans with defined benefit plans.

3 As of 2008, the longest possible participation in DC is seven years.

4 The actual average age of men who participate in DC plans is about 40 years old.

(6) answers to a ten-question investment quiz to test basic knowledge.

In total, the DC-Group consists of 181 respondents, and the NonDC-Group of 201 respondents. Respondents received a compensation equivalent to 200 to 500 yen.

#### 4. Analytical Method and Results

To examine whether DC plan participation affects the asset allocation decision of households, we estimated the following regression:

$$Y_i = \beta_0 + \beta_1 \cdot DC_i + \beta \cdot X_i + \varepsilon_i \quad (1)$$

Independent variable DC is a dummy variable that equals 1 when respondent  $i$  belongs to DC-Group, and 0 for NonDC-Group. We predict a positive coefficient, indicating that DC plans cause equity allocation to increase. The other independent variables  $X$  are shown in rows 2 to 11 of Table 1, where:

$$\text{Subjective replacement ratio} \equiv \frac{\text{Subjective estimate of future public pension benefit}}{\text{Current income}},$$

$$\text{Subjective income growth} \equiv \frac{\text{Maximum subjective estimate of future income}}{\text{Current income}}.$$

There are five dummy variables. House is 1 if the respondent owns a house. Child is 1 if the respondent has any dependent children. University is 1 for university graduates. Manufacturing company is 1 for employees in the manufacturing sector. Public company is 1 for employees of publicly held companies.

According to the life cycle model presented by Bodie et al. (1992), equity allocation is influenced by human capital, which is the present value of future income. When future income or the replacement ratio<sup>5</sup> increases, human capital, which is a nearly risk-less asset, also increases. To offset the decline of risk, individuals must rebalance total wealth (= human capital + financial assets) by allocating more financial assets to equities. Thus we predict positive coefficients for subjective replacement ratio and subjective income growth. Alternatively, a large expected expenditure in the near future tends to reduce equity allocation because of liquidity constraints. Thus we predict a positive coefficient for house and negative coefficient for child. In addition, we predict positive coefficients

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<sup>5</sup> Compared to the public pension in the U.S., the employees' welfare public pension in Japan provides good benefits. In addition, a government survey shows that 80% of beneficiaries rely on these benefits as their primary source of retirement income.

for manufacturing company and number of employees because manufacturers and large employers introduced DC plans relatively early on and tend to provide good investment education. We predict a positive coefficient for public company because stock ownership plans give employees experience in equity investment.

In Equation (1), dependent variable Y is either current or expected future equity allocation. The last two rows of Table 1 show that, although DC-Group and NonDC-Group share a similar value for average current equity allocation, the average expected future equity allocation is higher for DC-Group (significant at the 1% level).

**Table 1: Summary Statistics**

	DC-Group		NonDC-Group		WM-test
	Avg.	Std.	Avg.	Std.	
Num of observations	181		201		---
Subjective replacement ratio	0.26	0.15	0.29	0.22	-0.83
Subjective income growth	1.31	0.45	1.39	0.50	-1.41
Financial assets (million JPY) <sup>(+)</sup>	11.8	15.0	10.4	12.5	1.37
House <sup>(D)</sup>	68.5%	46.6%	53.7%	50.0%	2.95 **
Child <sup>(D)</sup>	65.2%	47.8%	43.3%	49.7%	4.28 **
Age	40.8	5.3	40.4	5.3	0.71
University <sup>(D)</sup>	78.5%	41.2%	74.1%	43.9%	0.99
Manufacturing company <sup>(D)</sup>	58.6%	49.4%	37.3%	48.5%	4.15 **
Public company <sup>(D)</sup>	76.2%	42.7%	61.7%	48.7%	3.06 **
Num of employees (1,000 persons)	5.6	3.7	5.1	3.0	1.18
Investment quiz score	81.0%	15.6%	78.1%	15.5%	2.17 *
DC participation years	3.32	1.42	---	---	---
Current equity allocation(×100)	25.3	25.7	21.0	24.4	1.88
Expected future equity allocation (×100)	39.4	25.2	23.3	22.5	6.70 **

[Note]<sup>(+)</sup>: 1 million JPY is about 10,000 USD. Median value of both groups is 6.0. <sup>(D)</sup>: Dummy variable. WM-test: Z value of Mann-Whitney non-parametric test. \*\*, \* denotes 1% and 5% significance level respectively.

Table 2 shows the results of the Tobit regression with left censored at 0% and right censored at 100% for Equation (1)<sup>6</sup>. In (A), where the dependent variable is current equity allocation, regression coefficients are not statistically significant either for DC, subjective replacement ratio, or subjective income growth, indicating that these factors do not affect asset allocation decisions. The coefficient for financial assets is positive and statistically

<sup>6</sup> Panel A of Appendix A shows the Quantile-Normal plot of residual of current equity allocation from the Tobit model. Panel B of Appendix A shows that of expected future equity allocation. Those residuals are calculated from uncensored data only. For comparison, OLS results are shown in Appendix B. Both the Tobit and OLS results show the same tendency.

significant, which is consistent with previous studies. Age has no effect, perhaps because we limited respondents to men in their 30s and 40s, and university degree also has no effect. The coefficient for public company is positive and significant. Meanwhile, in (B), where the dependent variable is expected future equity allocation, the coefficient for DC is positive and statistically significant (1% level). This indicates that DC plan participation boosts the expected future equity allocation by approximately 19.3%. However, similar to (A), both subjective replacement ratio and subjective income growth have no effect, while financial assets have a positive effect. Admittedly, the effect on expected future equity allocation for DC-Group may partly be attributable to the menu effect, such as the 1/N rule discussed by Benartzi and Thaler (2001). However, we note that the average investment quiz score for DC-Group is higher than for NonDC-Group (significant at the 5% level; see row 12 of Table 1). Thus, investment education may have helped boost equity allocation.

**Table 2: Tobit Regression Results**

	(A)		(B)	
Regression	Tobit		Tobit	
Dependent variables	Current		Expected future	
Independent variables	equity allocation ( $\times 100$ )		equity allocation ( $\times 100$ )	
	Coef.	Std. Err.	Coef.	Std. Err.
DC	5.13	(3.57)	19.28	(3.06) **
Subjective substitution rate	6.90	(9.67)	0.97	(8.23)
Subjective income growth	-3.53	(4.15)	-1.03	(3.44)
Financial assets	4.67	(1.26) **	2.37	(1.09) *
House	1.48	(3.89)	1.40	(3.33)
Child	-5.69	(3.76)	-7.15	(3.23) *
Age	0.09	(0.36)	0.31	(0.31)
University	0.88	(4.17)	1.34	(3.55)
Manufacturing company	-0.48	(3.54)	0.20	(3.03)
Listed company	12.15	(3.99) **	6.00	(3.37)
Num of employees	0.14	(0.53)	-0.13	(0.46)
Constant	1.46	(17.12)	3.98	(14.68)
Observations	382		382	
left-censored observations	108		61	
uncensored observations	271		310	
right-censored observations	3		11	
Chi <sup>2</sup>	36.34 **		57.52 **	
Pseudo R <sup>2</sup>	0.013		0.018	

[Note] \*\*, \* denotes 1% and 5% significance level respectively.

## 5. Conclusion

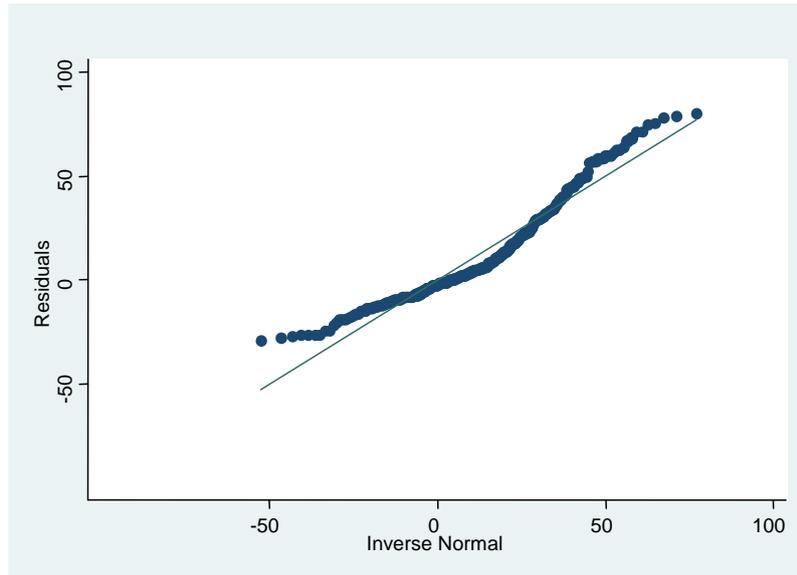
Our results show that while current equity allocation is not affected by DC plan participation, expected future equity allocation tends to increase more among DC plan participants. This result is especially remarkable considering that the survey took place in the midst of a stock market decline not only in Japan but globally. In addition, we found that although current financial assets affect the equity allocation decision, expected future income and pension benefit do not. Although the results confirm future intentions rather than actual equity investment decisions, we find them intriguing in terms of predicting future changes.

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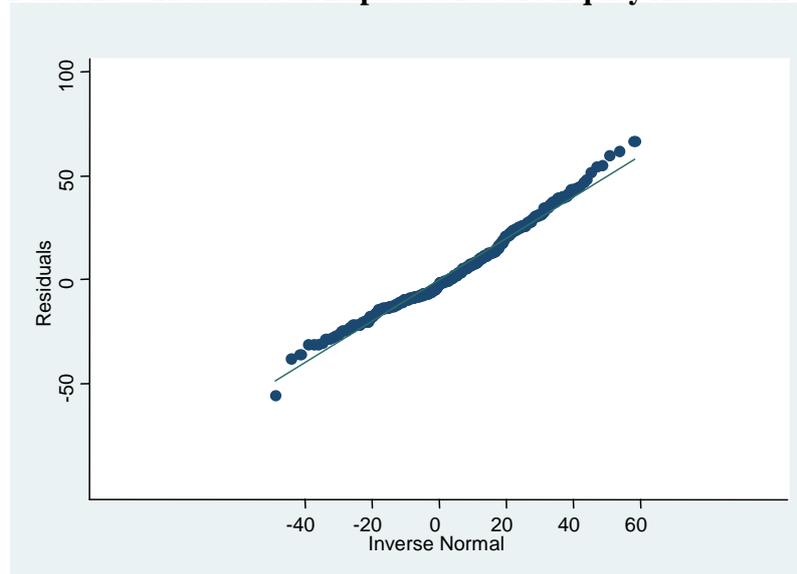
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## Appendix A: Quantile-Normal Plot of Residuals of Tobit Model

### Panel A: Residuals of Current Equity Allocation



### Panel B: Residuals of Expected Future Equity Allocation



[Note] Residuals are calculated from uncensored data only. The number of observations in Panel A is 271 and that of Panel B is 310.

### Appendix B: OLS Regression Results

	(C)		(D)	
Regression	OLS		OLS	
Dependent variables	Current equity allocation (×100)		Expected future equity allocation (×100)	
Independent variables	Robust		Robust	
	Coef.	Std. Err.	Coef.	Std. Err.
DC	3.45	(2.72)	16.41	(2.56) **
Subjective substitution rate	2.81	(6.83)	0.80	(6.52)
Subjective income growth	-2.18	(2.76)	-1.50	(2.93)
Financial assets	3.11	(0.88) **	1.79	(1.01)
House	0.68	(2.67)	1.26	(2.71)
Child	-4.08	(2.71)	-6.69	(2.79) **
Age	0.05	(0.26)	0.26	(0.25)
University	-1.23	(3.36)	0.38	(3.31)
Manufacturing company	-0.12	(2.65)	-0.46	(2.44)
Listed company	6.68	(2.75) **	4.45	(2.8)
Num of employees	0.35	(0.41)	-0.08	(0.39)
Constant	14.39	(11.97)	12.69	(11.93)
Observations	382		382	
F	3.04 **		5.20. **	
R <sup>2</sup>	0.007		0.140	

[Note] \*\*, \* denotes 1% and 5% significance level respectively.