Corporate-Sponsored Pensions and Employee Choice of Annuities in Japan

Wakako Taniguchi and Satoshi P. Watanabe
Graduate School of Business Sciences, University of Tsukuba
Research Institute for Higher Education, Hiroshima University

INTRODUCTION

Low fertility rates, extended longevity and an aging population are raising concern for sustainability of a pay-as-you-go public pension system in modern Japanese society. As a consequence, post-retirement income sources that supplement public pension benefits are strongly needed.

Corporate pension plans cover about one half of the entire full-time working population in Japan, making it an important supplementary income source. While shifts from the defined benefit (DB) scheme to defined contribution (DC) pensions are seen in many countries, the majority of Japanese employers maintain DB pensions as their primary corporate sponsored pension plans. As a result, private DB pensions continue to play an important role in securing post-retirement income sources for many Japanese workers.

However, the actual benefits of corporate pensions differ greatly depending on whether a retiree takes pension allowances in the form of a lump-sum or annuity. According to a survey conducted by the Pension Fund Association, the ratio of retiring Japanese workers who chose to take all of their benefits as a lump-sum reached 59 percent in 2006.

What drives Japanese employees to prefer a lump-sum payout to a more beneficial annuity? Since Yaari (1965) pointed out that lifetime annuities offer a valuable means to minimize outliving one's wealth, economists have paid great attention to factors that might cause disparity between the economic theory and unpopularity of annuity in the real world. Despite rich contributions dealing with the "annuity puzzle" in an individual annuity market, there exists little literature that have empirically studied annuitization choice in corporate pension plans.

Testing rationality of employee choice of payout options in corporate pension plans and a clear understanding of factors affecting the choice is crucial to strengthen the role of corporate pension systems for the Japanese workforce. In order to address these issues, we set hypotheses, conduct data analysis, and draw some policy implications. The paper is organized as follows: Section 2 provides a brief overview of related empirical literature that deal with "annuity puzzle". Section 3 discusses implementation of lifecycle measure of annuity value. Section 4 describes the data and assumptions for the analysis. Hypotheses and analysis results are presented in Section 5, and Section 6 provides the conclusion.

LITERATURE REVIEW

Literature on individual choice of annuity originates with Yaari's (1965) study, which argues individuals without bequest motives always choose to annuitize all of their wealth if the annuity market is actuarially fair. Despite this clear finding, the phenomenon of individual annuity markets being small in most countries is called the "annuity puzzle" and has attracted great attention among economists.

The annuity puzzle is explained by an actuarially unfair annuity market due to adverse selection and load factors (Mitchell et al., 1999), bequest motives (Bernheim, 1991), precautionary savings for out-of-pocket medical expenditures (Turra and Mitchell, 2008), the role of risk sharing within families (Kotlikoff and Spivak, 1981; Brown and Poterba, 2000), and the existence of pre-

annuitized wealth in the form of public pension and corporate sponsored pensions (Bernheim, 1991; Dushi and Webb, 2004).

Among the existing literature on the annuity puzzle, to the best of our knowledge, there are only three studies that deal with individual choice of annuity in corporate pension plans. The first is Hurd et al. (1998), who found that workers with low income are more likely to cash-out pension capital at job change and retirement, analyzing Health and Retirement Study (HRS) in the U.S. The second is by Brown (2001), who introduced a risk dependent measure of annuity value in analyzing intended annuitization of DC pension capital in HRS data. The third, Buetler and Teppa (2007), was the first to analyze real annuitization behaviors using administrative data of Swiss occupational pension plans. All these studies revealed persistent employee preferences for a lump-sum payout, although the latter two contributions found annuity choice is also influenced by utility based annuity value.

As for Japan, the only comparable study is Kaneko (1999), who analyzed the middle-aged employee savings behavior of lump-sum payment using simple demographic characteristics. Kaneko finds that employees under 50 are more likely to save a lump-sum, concluding that these workers have saving motives for financing expenditures such as purchasing houses and educational expenditures for their children.

This paper contributes to the existing literature in that it tests rationality of annuity choice in corporate pension plans, focusing on the influence of liquidity constraints, precautionary-savings, and risk sharing within families on annuitization, which was made possible by rich information on individual backgrounds.

LIFECYCLE MODEL AND ANNUITY EQUIVALENT WEALTH

To analyze the demand for annuity in corporate pension plans, we use a measure of annuity value called annuity equivalent wealth (AEW), developed by Brown and Poterba (2000) and Brown (2001). By estimating the influence of AEW on individual annuity choice, we test the rationality of their choice.

An individual who has wealth at retirement (W_0), public pension (S_t), corporate pension(A_t), and income from labor(L_t) decides consumption (C_t) for each period under non-negativity constraint on wealth. The individual's wealth evolves as follows.

$$W_{t+1} = (W_t - C_t + S_t + A_t + L_t)(1 + r)$$

In our analysis, because of lack of information on actual wealth at retirement (W_0), we assumed W_0 to be equal to the largest of current financial assets and present value of assumed future income from financial assets. Also, if an individual chooses to take a lump-sum payment at retirement, the amount of lump-sum is added to wealth at retirement(W_0).

Under the above constraints, individuals decide consumption in each period to maximize value function $V_t(W_t)$ which is the discounted value of utility from consumption.

$$V_t(W_t) = \max \sum_{t=0}^{T-age} \frac{P_t u(C_t)}{(1+\rho)^t}$$

$u(C_t)$ denotes utility from consumption, P_t denotes surviving probability until period t, ρ denotes individual discount rate.

The maximum ages for consumption are assumed to be 112 for males, and 116 for females based on the 19th mortality table released from Ministry of Health, Labour and Welfare in Japan in 2000. Surviving probability in each period (P_t) is also based on the same table.
The value function above satisfies the following recursive Bellman equation.

$$V_t(W_t) = \max u(C_t) + \frac{P_{t+1}}{1+\rho} V_{t+1}(W_{t+1})$$

If individuals have options of annuity or lump-sum for their corporate pension capital, utility (V^*) gained when their wealth (W^*) is fully annuitized is larger than the utility (V) gained when they choose to take full lump-sum. As a result, with additional wealth ΔW which the individual has to receive to reach the same utility V^*, annuity equivalent wealth is expressed as follows.

$$AEW = \frac{W^* + \Delta W}{W^*}$$

In calculating AEW, we assumed the CRRA (constant relative risk aversion) utility function, interest rates (r) and individual discount rates (ρ) to be 2 percent, and coefficient of relative risk aversion to be 0.2.

As for public pension (S_t), we estimated each individual's two-pillar benefits in the Japanese public pension scheme. In Japan, the first pillar offers a fixed amount benefit, and the benefit from the second pillar is proportional to annual income in the working years. In the estimation, due to lack of information on individual history of annual income, we used average income history by gender and by educational attainment from national wage statistics, "Chingin Kōzō Kihon Tōkei Chōsa" released from Ministry of Health, Labour and Welfare in 2002. We estimated the second pillar benefit based on the income history and conversion factor which is different by the individual's birth year. We assumed the individual's participation period for the pension scheme to be the maximum 480 months.

DATA

The data source used for this study is the Survey on Employer Sponsored Fringe Benefits 2002, which was conducted by the Japan Institute of Life Insurance. The original data collection targeted full-time workers employed in small to medium-sized private firms. The data set contains individual characteristics of 1,802 full-time employees, with extensive information on their pension eligibility status, available corporate retirement plan types as well as chosen plans. The final sample used in this study consists of 621 male employees with valid responses to all the necessary variables.

In estimating amount of annuity which individuals receive after retirement, we converted the anticipated amount of lump-sum payment into annuity using discount rate of 5.5%, which is most commonly used by Japanese small to medium-sized corporate pension plans. Among 621 samples, 147 individuals were able to explain the details of their annuity option, including whether they were offered lifetime annuity or terminal annuity, and the term of the annuity if offered terminal annuity. For individuals who answered they were offered both lifetime annuity and terminal annuity, we assumed that the amount of lump-sum payment was divided equally to provide these annuities. On the other hand, for 474 individuals without knowledge of the annuity, we assumed they were offered 10-year terminal annuity. We considered 10-year annuity to be the most common annuity option offered by small to medium-sized private firms, depending on national statistics of retirement benefit "Shūro Jōken Sōgō Chōsa", released from Ministry of

Health, Labor and Welfare in 2002. The amount of annuity was calculated based on the information above for all individuals.

HYPOTHESES

For the first step, this study examines the impact of AEW on individual choices of a lump-sum payout or annuity in corporate pension plans. The AEW measures the utility gain by determining how much additional wealth would need to be given to an individual without annuities to make him as well off as if he had annuities. If an employee choice of annuity or a lump-sum is determined rationally, AEW has a positive impact on annuity choice.

We then examine the validity of other factors, which was found to have an impact on employee choice of annuity in previous studies. The findings permit us to identify some factors impeding individual choice of annuity. Specifically, the following five hypotheses are tested.

Hypothesis 1: Employees who have received information on their corporate retirement benefits from employers are more likely to choose annuity.

As Mitchell (1988) points out, an employee cannot make a rational decision without appropriate information on pension annuity and the entailing merits. Few individuals included in the data set were able to explain the details of their corporate pension plans. Accordingly, the variable on whether employees received information from employers on their private retirement programs is used as a proxy for the level of corporate pension knowledge.

Weaker demand for pension annuity could result from risk-sharing behaviors among household members, particularly in a household of double earners with full-time income jobs (Kotlikoff and Spivak, 1981, Brown and Poterba, 2000). Thus, our second hypothesis is:

Hypothesis 2: An employee with a spouse with a full-time job is more likely to choose a lump-sum payout and less likely to choose annuity.

Kaneko (1999) assumed that a lump-sum retirement cash-out in Japan is primarily used for the payment of mortgage loan and financing education for children. As a consequence, employees under liquidity constraints due to mortgage loans and dependent children are more likely to choose a lump-sum.

Moreover, Turra and Mitchell (2008) point out the importance of medical expenses in the post-retirement period in annuity choice. Longevity in Japan raises a serious concern for an increase in medical expenses. As a result, it is expected that the coverage by private medical insurance plans alleviate the needs of precautionary savings for future medical expenses. Therefore, employees with a medical insurance coverage are more likely to choose annuity rather than a lump-sum payment.

Hypothesis 3: Liquidity constraints, due to mortgage loan and financing for children's education, impose a negative impact on annuity choice, and precautionary savings for future medical expenses have a positive impact on the choice of annuity.

A typical Japanese company provides an S-shaped compensation path, with employee's salary and retirement payout increasing rapidly after a certain period of service length. In particular, the eligibility to receive a retirement benefit in the form of annuity is given to employees with a certain years of service to the company. Therefore, an employee with longer tenure is likely to have an annuity option. As a result, long tenure is expected to have a positive impact on the choice of annuity, whereas individuals with higher turnover, particularly those who voluntarily quit from previous employers, are expected to choose a lump-sum payout.

Hypothesis 4: Employees with longer tenure are more likely to choose annuity than those with short tenure. Employees with a higher inclination to change jobs are less likely to choose annuity.

In Japan, employers in financial difficulty could reduce retirement benefits if they succeed in reaching an agreement with the majority of employees. As a result, it is assumed that individuals who have concern for the continuity of their employers tend to choose lump-sum in fear of future reduction in their annuity.

Hypothesis 5: Employees with concern for their employer's continuity are more likely to choose a lump-sum payout and less likely to choose annuity.

The following section examines the above hypotheses based on multivariate estimation results.

ESTIMATION RESULTS

An empirical investigation of annuity choice involves the standard bivariate probit estimation. The dependent variable is set to equal 1 if an employee expects to receive partial or full pension benefit in the form of annuity, and 0 if one chooses a lump-sum. The first column in Table 1 shows that the AEW has a positive impact on annuity choice, even after controlling for employees' age, marital status, college graduation status and occupation types, which is consistent with the theory and previous findings. Older workers are more likely to choose a lump-sum, and married managers are more likely to choose annuity compared to unmarried clerical workers.

The second and third columns in Table 1 show the robustly positive and significant effect of AEW on annuity choice, regardless of the inclusion of the abovementioned demographic controls and employee's knowledge of retirement benefit plans. The employee's knowledge shows a positive and significant effect even after controlling for the demographic variables. The result indicates that dissemination of information may have a positive impact on individual annuity choice through enhancement of related knowledge. The result supports our first hypothesis.

In order to examine the impact of risk-sharing within families on individual annuity choice, a binary variable for existence of a "spouse with a full-time job" is included in the estimation. The fourth and fifth column in Table 1 show the opposite result to our hypothesis. Coefficient for the existence of a spouse with a full-time job is positive and significant, although the significance disappears when the demographic variables are controlled. The result indicates that there is not enough intra-familiy risk-sharing within Japanese households, presumably because of interrupted careers of Japanese female workers.

The first and second column in Table 2 examine the impact of liquidity constraints, due to mortgage loan and children's educational expenses, on individual choice of annuity. The result in the first column shows an intuitively opposite coefficient, indicating that employees with mortgage loans are more likely to choose an annuity. This may be due to financial knowledge obtained by individuals who managed to purchase houses. The second column in Table 2 shows the effect of dependent children in a household on individual annuity choice, as a proxy for another source of liquidity constraints. The result indicates a positive but insignificant effect on the choice of annuity. Consequently, our findings suggest that the liquidity constraints from mortgage loans and children's educational expenses have little impact on individual choice of annuity.

The third specification in Table 2 examines the effect of precautionary savings for future medical expenses on employees' choice of annuity. A variable showing whether an employee purchased a voluntary medical insurance is used as a proxy for the existence of precautionary savings for future medical expenses. The result shows a positive and significant effect of precautionary savings on annuity choice, supporting our hypothesis.

The impacts of long tenure and job change on annuity choice are examined in the fourth column in Table 2. The result shows that employee's tenure has positive but insignificant effect on annuity choice, whereas employees with a higher inclination to change jobs are significantly more likely to choose a lump-sum. These findings partly support our hypothesis.

Finally, the impacts of employee concern for their employer's continuity on annuity choice is examined in the last column in Table 2. The result shows that employee's concern has negative but insignificant effect on annuity choice, indicating that employees may make decisions based on financial conditions surrounding their employers. These findings weakly support our hypothesis.

CONCLUSIONS

This paper analyzes the role of corporate pensions and tested the rationality of employee choice of payout options in the Japanese corporate pension plans. Using the data set which contains information on individual backgrounds, we find strong impact of annuity value, employee knowledge of pension plans, and precautionary savings on individual choice of annuity. Estimation results indicate that preference for annuity would be enhanced by improving worker knowledge of the benefit and their financial literacy. We find no evidence that home purchase and educational expenditure for children, which are generally thought to be primary reasons for choosing lump-sum in Japan, has negative impact on annuity choice. From our findings, we conclude that individual annuity decisions are made rationally.

In order for corporate pension plans to further supplement the public pension benefits in Japan, employee knowledge of pension systems and financial literacy need to be improved; introduction of voluntary medical insurance would also enhance employee choice of annuity. Our findings also reveal that employees with high job turnover tend to choose a lump-sum payment. If the observed patterns of individual pension payouts is the result of the sorting effect (Ippolito, 1997), employers may implement a pension scheme, e.g., DB or DC pension, which optimizes the pension costs and employee turnover.

REFERENCES

Bernheim, D.D. (1991). How Strong Are Bequest Motives? Evidence Based on Estimates of the Demand for Life Insurance and Annuities. The Journal of Political Economy, 99(5), 899-927.

Brown, J. R. (2001). Private Pensions, Mortality Risk and the Decision to Annuities. Journal of Public Economics, 82, 22-62.

Brown, J.R. and Poterba, J.N. (2000). Joint Life Annuities and Annuity Demand by Married Couples. Journal of Risk and Insurance, 67(4), 527-553.

Buetler, M. and Teppa, F. (2007). The Choice Between an Annuity and a Lump Sum: Results from Swiss Pension Funds. Journal of Public Economics, 91, 1944-1966.

Dushi, I. and Webb, A. (2004). Household Annuitization Decisions: Simulations and Empirical Analysis. Journal of Pension Economics and Finance, 3(2), 109-143.

Hurd, M., Lillard, L., and Panis, C. (1998). An Analysis of the Choice to Cash Out Pension Rights at Job Change or Retirement. RAND Discussion Paper DRU-1979-DOL.

Ippolito, R. A. (1997). Pension Plans and Employee Performance: Evidence, Analysis and Policy. The University of Chicago Press.

Kotlikoff, L.J. and Spivak, A.(1981). The Family as an Incomplete Annuities Market. Journal of Political Economy, 89(2), 372-391.

Mitchell, O.S., Poterba, J.M., Warshawsky, M., and Brown, J.R. (1999). New Evidence on the Money's Worth of Individual Annuities. American Economic Review, 89(5), 1299-1318.

Mitchell, O.S. (1988). Worker Knowledge of Pension Provisions. Journal of Labor Economics, 6(1), 21-39.

Turra, C. M. and Mitchell, O.S. (2008). The Impact of Health Status and Out-of-Pocket Medical Expenditures on Annuity Valuation. in Recalibrating Retirement Spending and Saving. Oxford University Press, 227-250.

Yaari, M. (1965). Uncertain Lifetime, Life Insurance and the Theory of the Consumer. Review of Economic Studies, 32,137-150.

Kaneko, Y. (1999). Chūkōnensha no Tenshoku to Kigyō Nenkin no Shito - Kigyō Nenkin no Chochiku Bunseki, Nenkin to Koyō ,17(4), 13-21.

Table 1. Impact of pension knowledge and intra-family risk-sharing on annuitization

n = 621	Spec. 1	Spec. 2	Spec. 3	Spec. 4	Spec. 5
AEW	12.36 ***	11.98 ***	12.07 ***	12.16 ***	12.22 ***
	(6.63)	(6.59)	(6.49)	(6.67)	(6.55)
Age dummies(omitted = under 29)					
30-39 years old	-.145 **	-.094	-.149 **	-.094	-.142 **
	(-2.04)	(-1.40)	(-2.10)	(-1.40)	(-1.99)
40-49 years old	-.175 **	-.066	-.180 **	-.066	-.169 **
	(-2.25)	(-0.97)	(-2.31)	(-0.97)	(-2.16)
50-59 years old	-.205 **	-.081	-.220 ***	-.080	-.209 **
	(-2.45)	(-1.13)	(-2.61)	(-1.11)	(-2.46)
Over 60 years old	-.481 ***	-.460 ***	-.484 ***	-.462 ***	-.484 ***
	(-3.71)	(-3.24)	(-3.77)	(-3.28)	(-3.74)
Pension know ledge (Yes = 1)		.095 **	.099 **	.096 **	.100 **
		(1.99)	(2.04)	(2.01)	(2.06)
Spouse w ith full-time job (Yes = 1)				.135 *	.104
				(1.88)	(1.40)
College degree and over (Yes = 1)	.010		-.001		-.006
	(0.22)		(1.02)		(-0.12)
Married (Yes = 1)	.109 **		.110 **		.093 *
	(2.04)		(2.05)		(1.69)
Occupation dummies (omitted = Clerical):					
Manager	.096 *		.090		.092
	(1.70)		(1.60)		(1.62)
Sales	-.090		-.098		-.092
	(-1.42)		(-1.53)		(-1.44)
Engineer	-.072		-.086		-.092
	(-0.83)		(-0.99)		(-1.04)
Specialist	-.016		-.021		-.018
	(-0.18)		(-0.23)		(-0.20)
Other	.124		.123		.130
	(0.62)		(0.62)		(0.65)
Log likelihood	-388.62	-393.44	-386.54	-391.66	-385.55
Pseudo R^2	.096	.085	.101	.089	0.103

Reported coefficients are the marginal effect of the probit. Numbers in parentheses are t-ratios.
*** significant at the .01 level; ** significant at the .05 level; * significant at the .10 level.

Table 2. Impact of liquidity constraints, precautionary savings, job turnover and company credit risk on annuitization

n = 621	Spec. 1	Spec. 2	Spec. 3	Spec. 4	Spec. 5
AEW	12.16 ***	12.15 ***	11.93 ***	11.10 ***	11.11 ***
	(6.46)	(6.45)	(6.34)	(5.89)	(5.89)
Pension knowledge (Yes = 1)	.100 **	.101 **	.099 **	.076	.076
	(2.04)	(2.06)	(2.02)	(1.53)	(1.53)
Spouse with full-time job (Yes = 1)	.106	.110	.099	.097	.094
	(1.43)	(1.46)	(1.31)	(1.26)	(1.23)
Mortgage loan (Yes = 1)	.131 **	.128 **	.130 **	.120 *	.121 *
	(2.13)	(2.06)	(2.09)	(1.90)	(1.92)
Future plan × Mortgage loan	-.092	-.089	-.097	-.090	-.091
	(-1.36)	(-1.32)	(-1.43)	(-1.31	(-1.32)
Number of children at home		.009	.010	.003	.003
		(0.34)	(0.36)	(0.11)	(0.11)
Medical insurance (Yes = 1)			.108 **	.104 **	.103 **
			(2.09)	(2.00)	(1.98)
Tenure				.002	.002
				(1.10)	(1.08)
Job change (Yes = 1)				-.133 ***	-.134 ***
				(-2.85)	(-2.86)
Concern for employer's continuity (Yes = 1)					-.026
					(-0.60)
Married (Yes = 1)	.069	.059	.052	.067	.066
	(1.22)	(0.91)	(0.80)	(1.02)	(1.02)
Age dummies	Yes	Yes	Yes	Yes	Yes
Education dummies	Yes	Yes	Yes	Yes	Yes
Occupation dummies	Yes	Yes	Yes	Yes	Yes
Log likelihood	-383.27	-383.21	-381.02	-375.84	-375.66
Pseudo R^2	.109	.109	.114	.126	.126

Reported coefficients are the marginal effect of the probit. Numbers in parentheses are t-ratios.
*** significant at the .01 level; ** significant at the .05 level; * significant at the .10 level.