Tax Literacy, Time and Risk Preference, and Retirement Planning in Japan

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Abstract

Facing the decreasing benefit of the public pension system in aging society, Japanese government offers various preferential tax breaks for encouraging individuals to have personal pension investments. However, effects of those tax breaks on individual decisions can depend on understanding level about tax benefits, as well as time and risk preference. Using our unique dataset of middle aged Japanese, we investigate the role of tax literacy and time and risk preference in decision of having different types of personal pension investments. First, we found that those with high tax literacy are more likely to have personal pension investments, such as individual-type Defined Contribution pension plan and personal pension insurance as well as non-purpose specified investments, such as Nippon Individual Saving Account and individual security accounts. Furthermore, those with high time discount rate are less likely to have individual-type Defined Contribution pension plan only if they have high tax literacy. Risk-averse individuals are more likely to get personal pension insurance and tax literacy strengthens the tendency.

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1. Introduction

Japan has decided to adopt Macro-Economic slide formula for its public pension system in 2004, which can decrease benefits under the aging society so that people are required to take more responsibility for their own retirement plans. Japanese government offers various tax advantages for encouraging individuals to have personal pension investments. However, effects of those tax breaks on individual decisions can depend on understanding level about tax benefits, as well as behavioral characteristics such as time and risk preference.

Previous studies show that financial literacy plays an important role in increasing probability of having retirement saving plans in Japan while Japanese have relatively low financial literacy (Sekita 2011). On the other hand, since there are quite variety of financial literacy measurements (Hung et al. 2009), further investigation is needed on various aspects of financial literacy for better policy implications including tax literacy which is especially important when we consider the efficiency of tax breaks. Nonetheless, tax literacy has not been included in measurement of financial literacy in many studies and there have not been any studies focusing on the role of tax literacy on retirement planning in Japan. In addition, while there have been studies investigating the role of financial literacy on asset allocations controlling for preferences (Liao et al. 2018; Ohtake and Akesaka 2017), there have not been any studies considering the impact of financial/tax literacy on personal retirement plans depending on time and risk preferences.

To bridge these gaps in the literature, we investigate the role of tax literacy and time and risk preference in decision of having different types of investments using a unique dataset obtained by our original web survey targeting 40 to 64 years old Japanese residents. We uncover two important findings. First, we found that those with high tax literacy are more likely to have personal pension investments, such as individual-type Defined Contribution pension plan (iDeco) and pension insurance as well as non-purpose specified investments, such as Nippon Individual Saving Account (NISA) and individual security accounts. Furthermore, those with high time discount rate are less likely to have iDeco only if they have high tax literacy. Risk-averse individuals are more likely to get personal pension insurance and the tax literacy strengthens the tendency.

2. Methods
2.1 Data

We conducted original web survey in March 2018 targeting 40 to 64 years old residents in Japan who are monitor members of an internet research company, MyVoice Communications Inc, and got 3,685 responses. Taking into account the fact that household budgets come from salary of employed workers in most of working generation families who consider retirement saving plans, we only target those whose household budget mainly comes from salary of employed workers. Furthermore, to avoid extreme cases of having too low salary to consider about retirement plans, or having so high salary that they have different unique options for retirement plans, we refine our target respondents to only those whose household income is higher than 3 million yen and lower than 15 million yen. In addition,

we gathered responses following pre-defined allocation according to age, sex, and marital status.

Questions in the survey include general demographic characteristics such as age, sex, marital status, living prefecture, income and spouse income, and educational achievement. Also, we include some questions to objectively measure financial literacy and tax literacy (see Table 1). In addition to three questions about compound interest effect, bond price and diversified investment that are used in previous studies (Lusardi and Mitchell 2011; Sekita 2011), we include a question about foreign exchange since foreign investment is one of the most important aspects for long-term diversified investments in Japan. We define financial literacy variable as a number of correct answers out of these four questions. 11 percent of the respondents answered all the four questions correctly while 28 percent of the respondents did not get any correct answers. As to tax literacy measurement, we include two questions about income credit following Clark et al. 2014 and one question about tax advantage of iDeco. In same way as financial literacy, we define a tax literacy variable as a number of correct answers out of these three questions. 8 percent of the respondents answered all the three questions correctly and 41 percent of the respondents did not get any correct answers. Questions used for measuring financial and tax literacy, answer choices and distributions of responses are available in Table 1.

Table1. Answer distributions of questions measuring financial and tax literacy

Questions for measuring financial literacy				
1. Assume that you have 1 million JPY in your ordinary saving account. Yearly interest rate of the account is 1 percent and yields compound interest rate. How much will be the balance after 5 years (if you do not transfer any money from/to this account)?				
(1) More than 1 .05 million JPY	(50%)	(2) 1.05 million JPY		(11%)
(3) Less than 1.05 million JPY	(23%)	(4) Don't know		(16%)
2. Assume that current interest rate is 1 percent. What happens to the value of 10 year fixed rate government bonds with 1 percent interest rate if interest rate rose to 3 percent in future?				
(1) Value increases	(19%)	(2) Value does not change		(20%)
(3) Value decreases	(28%)	(4) Don't know		(32%)
3. Assume you have 1,000 USD in your foreign currency account in Japan. What happens to the value of this saving in Japan when JPY depreciate toward USD?				
(1) Value increases	(44%)	(2) Value does not change		(6%)
(3) Value decreases	(24%)	(4) Don't know		(26%)
4. Which is less risky asset in terms of volatility, stock of one company or index fund reflecting the Nikkei Stock Average?				
(1) Stock of one company	(5%)	(2) No difference		(13%)
(3) Index fund reflecting the Nikkei Stock Average	(38%)	(4) Don't know		(44%)
Questions for measuring tax literacy				
1. Which of the followings are correct about tax advantages of iDeco?				
(1) It has tax breaks for stakes	(13%)	(2) It has tax breaks for profit		(14%)
(3) It has tax breaks for both stakes and profit	(25%)	(4) Don't know		(48%)
2. Assume that tax rate on your income is 20 percent. How much your income tax decreases if you save 100,000 JPY to a special account which all the savings get tax exemption instead of saving in an ordinary saving account with same interest rate?				
(1) 100,000 JPY decreases (4%) (2) 80,000 JPY decreases (5%) (3) 20,000 JPY decreases (36%)				
(4) Doesn't change (13%) (5) Don't know (41%)				
3. Assume that tax rate on your income is 20 percent. If you buy a financial plan for retirement with 100,000 JPY which get full tax exemption, how much is your net expenditure for the financial plan after considering the tax advantage?				
(1) 100,000 JPY (16%) (2) 80,000 JPY (34%) (3) 20,000 JPY (13%)				
(4) 0 JPY (4%) (5) Don't know (34%)				

Notes) Correct answers are underlined. Percentage in parenthesis indicates proportion of those who chose each answer choice.

Measurements for time and risk preference are also included in the survey, which are another focus of our study. We used two traditional multiple price list questions for measuring individual time discount rate. One question gives price choice between 7 days later and 1 year later and the other one gives price choice between 7 days later and 14 days later. We take the yearly discount rate as the rate

right before respondents' switch their choice of options and define the time discount rate as the average rate of the yearly discount rates from the two multiple price list questions following Meier and Sprenger (2009). To measure risk preference, we used a question as follows. "There is a lottery which has 1 percent probability of winning 1 million JPY and 99 percent probability of losing so that you do not get anything. How much will you pay to buy this lottery?" We define the level of risk aversion as (10,000 - answered price)/10,000, so that higher number represents stronger level of risk aversion.

2.2 Analysis

First, to test if tax literacy increases probability of having different types of investments including personal pension investments, we estimate the following linear probability model.

(1) $Y = \beta_0 + \beta_1 tax + \beta_2 fin + \beta_3 time + \beta_4 risk + \boldsymbol{X}\gamma + \varepsilon$

where Y is a dummy variable taking 1 if they have different types of investments and 0 otherwise. Here, different types of investments include iDeco, personal pension investment, NISA and individual security accounts. *tax* indicates the level of tax literacy and *fin* indicates the level of financial literacy. *time* and *risk* are time discount rate and level of risk aversion, respectively. As this is a cross sectional study without instrument, preference parameters take important role as control variables to measure the effect of tax literacy. $\boldsymbol{X}$ is a set of control variables including age, sex, education level, household income and marital status.

Second, to take into account the heterogeneous effects of tax literacy depending on time and risk preference, we estimate the following linear probability model with interaction terms.

(2) $Y = \beta_0 + \beta_1 tax + \beta_2 fin + \beta_3 time + \beta_4 risk + \beta_5 tax \times time + \beta_6 tax \times risk + \boldsymbol{X}\gamma + \varepsilon.$

Here, we can capture the heterogeneous impact of tax literacy depending on time and risk preference by testing H_0: $\beta_5 = 0$ and H_0: $\beta_6 = 0$.

3. Empirical Results

Table 2 presents estimation results of equation (1) and Table 3 presents estimation results of equation (2). All of the tax literacy and financial literacy coefficients show positive significance, which indicates positive effects of tax literacy and financial literacy on increasing probability of having personal pension investments such as iDeco and personal pension insurance, non-purpose specified investments with tax advantages such as NISA and general security accounts.[1] We can also observe that high time discount rate decreases probability of having personal pension investments and high level of risk aversion increases probability of having personal pension insurance while it

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[1] We asked parents' education level to use as instruments for tax literacy, but the association of parents' education level with tax literacy was so weak. Therefore, though the instrumental variable estimation result verifies significant impact of tax literacy on increasing probability of having different types of investments, instrumental variable estimation results are not presented here because of too large relative bias.

decreases probability of having general security accounts.

Table2. Estimation results of equation (1)

Dependent variable :	(1) iDeco	(2) NISA	(3) Personal pension insurance	(4) One of (1) to (3)	(5) General security account
tax (tax literacy)	0.0224***	0.0276***	0.0259***	0.0459***	0.0533***
	(0.00520)	(0.00802)	(0.00941)	(0.00983)	(0.00889)
fin (financial literacy)	0.00780**	0.0677***	0.0229***	0.0618***	0.0978***
	(0.00343)	(0.00585)	(0.00686)	(0.00725)	(0.00649)
time (time discount rate)	-0.000285**	-0.000247	-0.00142***	-0.00169***	-0.000859***
	(0.000130)	(0.000203)	(0.000245)	(0.000263)	(0.000223)
risk (level of risk aversion)	-0.0000816	-0.00284	0.00488***	0.000250	-0.00620*
	(0.000887)	(0.00369)	(0.00113)	(0.00383)	(0.00372)
N	3452	3452	3452	3452	3452
adj. R-sq	0.032	0.090	0.041	0.094	0.175

Notes) Robust standard errors in parenthesis. Dependent variables are binary variables that take one when they have presented options. Constant term is not presented. Other control variables omitted from the table are age, sex, marital status, educational achievement and household income. Those coefficients are not reported in the table but are available from the authors upon request.
    * Significant at 10% level, ** Significant at 5% level,*** Significant at 1% level

Coefficients of interaction terms report heterogeneous effect of tax literacy depending on time discount rate and the level of risk aversion as we can see in Table 3. The interaction term of tax literacy and time discount rate in column (1) reports negative significance, which indicates that time discount rate decreases probability of having iDeco when one's tax literacy increases. Also, the interaction term of tax literacy and the level of risk aversion in column (3) shows positive significance, which indicates that tax literacy boosts the probability of individuals with high level of risk aversion to have personal pension insurance.

Table3. Estimation results of equation (2)

Dependent variable :	(1) iDeco	(2) NISA	(3) Personal pension insurance	(4) One of (1) to (3)	(5) General security account
tax (tax literacy)	0.0329***	0.0306***	0.0200*	0.0382***	0.0546***
	(0.00695)	(0.0115)	(0.0118)	(0.0129)	(0.0122)
fin (financial literacy)	0.00774**	0.0677***	0.0230***	0.0618***	0.0979***
	(0.00342)	(0.00585)	(0.00686)	(0.00725)	(0.00649)
time (time discount rate)	0.0000359	-0.0000699	-0.00141***	-0.00179***	-0.000619**
	(0.000157)	(0.000224)	(0.000292)	(0.000312)	(0.000247)
risk (level of risk aversion)	0.000160	-0.00368	0.00266***	-0.00139	-0.00831***
	(0.000476)	(0.00447)	(0.000911)	(0.00421)	(0.00210)
tax × time	-0.000422***	-0.000228	-0.00000856	0.000137	-0.000305
	(0.000150)	(0.000240)	(0.000257)	(0.000279)	(0.000249)
tax × risk	-0.000914	0.00275	0.00736**	0.00547	0.00688
	(0.00285)	(0.00677)	(0.00304)	(0.00627)	(0.00675)
N	3452	3452	3452	3452	3452
adj. R-sq	0.034	0.090	0.041	0.093	0.175

Notes) Robust standard errors in parenthesis. Dependent variables are binary variables that take one when they have presented options. Constant term is not presented. Other control variables omitted from the table are age, sex, marital status, educational achievement and household income. Those coefficients are not reported in the table but are available from the authors upon request.
    * Significant at 10% level, ** Significant at 5% level,*** Significant at 1% level

4. Concluding Remarks

Facing the decreasing benefit of the public pension system in aging society in Japan, our results have certain policy implications. First, our results show the positive impact of tax literacy and financial literacy on various types of investments including personal pension investments even after controlling for behavioral characteristics such as time and risk preferences. It is crucial to invest on

tax and financial literacy education as well as getting tax benefits of personal pension investments across people for improving participations in personal retirement investments. As Clark et al. (2014) reports, the possibility of having retirement saving plans increases with simple opportunity of receiving its advertisement, but people might not participate if they lack the financial literacy to appreciate the benefit. Second, our findings of heterogeneous tax literacy impact on getting iDeco and personal pension insurance imply that tax literacy help people to reflect their preferences into their personal pension investment that can help individuals to improve their overall welfare.

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