Are Individuals Consistent in their Risk Preferences across Multiple Domains?: Evidence from the Japanese Insurance Market

Yoichiro Fujii and Noriko Inakura†

Abstract

One of the most important fields in economics involves the analysis of decision making under risk and uncertainty. Within this research field, it is important to know how risk aversion varies due to the characteristics of different situations (also known as "domains," [e.g., medical expenses, savings]), or individual-difference variables (e.g., age, sex, income level). Despite this need, researchers in many applied fields of economics implicitly assume that attitudes toward risk are consistent across domains; the purpose of this paper is to test this possibility. Using micro-level data representing the Japanese population, we compare participants' risk preferences related to insurance choice to risk preferences inferred from a general, domain-free question. Based on the maximization principle, results indicate no significant consistency in respondent tendency to be risk averse.

Keywords: risk preference, domain, insurance choices

JEL classification numbers: D81, G22, I13

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1. Introduction

One of the most important fields in economics involves the analysis of decision making under risk and uncertainty. Given the importance of the analyses that comprise this field, it is important to explore individual risk aversion varies in different situations (also called "domains" [e.g., medical expenses, savings]) or individual-difference variables (e.g., age, sex, income level). Whereas a consideration of individual risk aversion across domains can inform our understanding of the consistency with which an individual avoids risk, a consideration of individual-difference variables illustrates how different individuals make different decisions within a given domain. Despite the importance of developing this understanding, many researchers of applied issues of economics (e.g., insurance economics, financial economics) assume individuals to have consistent attitudes toward risk, regardless of the domain in which the individual operates. In simpler terms, these researchers contend that individuals have a single utility function related to wealth that they apply in all domains.

In principle, risk aversion is defined by *domain-free* in kind. However, researchers often apply the definition of risk aversion to *domain-dependent* probability distributions, like insured choices about coverage options. Given the potential implications of this practice, is necessary to empirically determine whether the application of domain-dependent probability distributions is reasonable. Surprisingly, few researchers have attempted to address this question. Two notable exceptions are Barseghyan *et al.* (2011) and Einav *et al.* (2012). In the former study, the authors rejected the hypothesis that households have stable risk preferences with respect to deductible choices of auto- and home-insurance policies. The latter study showed that only 30% of individuals behaved consistently with respect to risk aversion when presented with five domains for employer-provided insurances and 401(k) portfolio choices.[1]

The purpose of this paper is to explore whether individuals' risk preferences are consistent across multiple domains. Using microeconomic data representing the Japanese populace, we

[1] In addition to these two studies, Cohen and Einav (2007) used data concerning consumer preferences for deductibles in auto-insurance contracts, and Kimball *et al.* (2009) used the Panel Study of Income Dynamics to present quantitative evidence related to risk preferences within families.

compare respondents risk preferences with two measures: risk preferences related to choosing an insurance provider, and risk preferences as inferred from a general, domain-free question. This analysis produced two key results. First, the average value of risk aversion as estimated from participants' choices of risk providers is 3.1 (Median: 2.3, Mode: 2.0); this figure is largely consistent with past work on risk aversion among Japanese subjects.[2] Second, results show no significant consistency in participants' risk aversion as estimated from answers to general questions on risk and insurance selection behaviors.

To more comprehensively describe these results and their implications, the remainder of the paper proceeds in a series of interrelated sections. In Section 2, we describe the data used to perform the analyses. Then, in Section 3, we describe a model of individual choice under conditions of risk, as well as a calibration method. We describe our methods and results in Section 4, and offer some concluding remarks in Section 5.

2. Data

To measure participants' levels of risk aversion, we utilized data from the 2016 Survey on Living Security (SLS), compiled by the Japan Institute of Life Insurance. This survey is comprised of detailed questions that gauge respondent anxiety concerning medical care and pensions, reliability of the public security system, current monetary status, private insurance contracts, and a host of other issues. The survey was distributed to men and women throughout Japan between the ages of 18 and 69. All participants were selected with a stratified two-stage random sampling method. The survey takes the form of an interview, meaning that the current survey had fewer missing values than holdback survey formats.[3] In total, 4,056 response sets were returned (though some of these were excluded; see below).

The survey used to collect data had several unique strengths. First, the survey allowed for the

[2] For example, in their study focusing on death insurance in Japan, Kamiya and Moridaira (2007) estimated participants' level of risk aversion to fall between 0.3 to 2.3.

[3] Some questions related to insurance contracts were collected using the detention method.

collection of detailed data related to the contents of each participant's contracts. Second, the survey included questions about participants' hospitalization experiences (i.e., costs incurred, amount covered by public and private insurance, length of stay). The provision of these data allowed for precise estimations of out-of-pocket expenses due to hospitalization. Third, the survey contained questions related to respondents' risk-aversion tendencies, as well as time discount rates. For example, one survey question asked about participants' personal preferences on risk-return trade-offs. Details surrounding this and other questions are described in Section 4.3.

Table 1 summarizes the sample's descriptive characteristics. Excluding response sets from participants who are teens or students or had missing values reduces the sample size to 2,608. The average age of participants is roughly 48 years old. Males comprised 42.8% of the sample, and 69.6% of respondents were. The distribution of household income among the sample is illustrated in **Figure 1**. About 79% of respondents had contracts with private insurance companies. Over 38% (16%) of male (female) participants were university graduates. Males and females differed substantially with respect to employment and personal income; about 14% of males were unemployed, but nearly 37% of women were unemployed.

Table 1: Participants' descriptive statistics

	All (N = 2608)	
	Mean	**Std. Dev.**
Having a life insurance policy (Yes = 1, No = 0)	0.792	0.406
Age	48.059	13.507
sex	0.428	0.495
Marrital status (Married = 1, Unmarried = 0)	0.696	0.460
Households' income (unit: yen)		
Less than 3 million yen	0.314	0.464
3 million ~ less than 5 million	0.267	0.442
5 million ~ less than 7 million	0.192	0.394
7 million ~ less than 10 million	0.135	0.342
10 million ~ less than 15 million	0.071	0.257
15 million ~ less than 20 million	0.014	0.118
20 million yen or more	0.007	0.080

	Men (N = 1184)		Women (N = 1709)	
	Mean	**Std. Dev.**	**Mean**	**Std. Dev.**
Having a life insurance policy (Yes = 1, No = 0)	0.788	0.409	0.798	0.402
Age	48.231	13.771	48.556	13.104
Marrital status (Married = 1, Unmarried = 0)	0.684	0.465	0.755	0.430
Final education				
Under high school degree	0.465	0.499	0.481	0.500
College graduates	0.151	0.358	0.351	0.477
Bachelor's degree or above	0.384	0.487	0.168	0.374
Employment status				
Working for a private company or public office	0.130	0.337	0.068	0.252
Self employed or family worker, or free lance	0.649	0.477	0.266	0.442
Temporary employees or contract employees, or part-time workers	0.078	0.268	0.297	0.457
Unemployed	0.143	0.350	0.369	0.483
Personal income (unit: yen)				
zero	0.034	0.181	0.236	0.425
Less than 1 million	0.040	0.195	0.284	0.451
1 million ~ less than 2 million	0.108	0.311	0.215	0.411
2 million ~ less than 3 million	0.181	0.385	0.113	0.317
3 million ~ less than 5 million	0.278	0.448	0.108	0.311
5 million ~ less than 7 million	0.201	0.401	0.033	0.178
7 million ~ less than 10 million	0.105	0.306	0.007	0.084
over 10 million	0.054	0.226	0.003	0.054

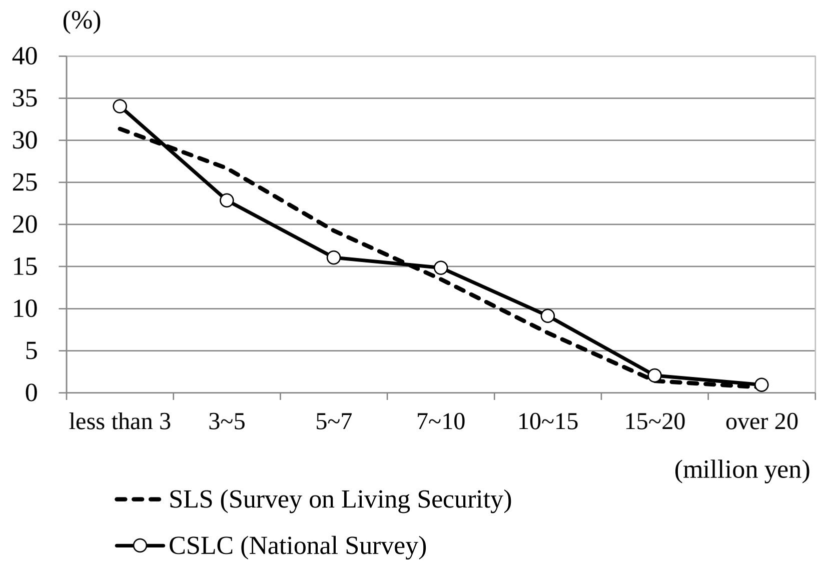

Figure 1: Income distribution

Sources: Japan Institute of Life Insurance (2016) "Survey on Living Security," Ministry of Health, Labour and Welfare (2015) "Comprehensive Survey of Living Conditions"

3. Model and Calibration Method

Consistent with work by Einav *et al.* (2012), our model estimates the behavior of individual i $(i = 1, \ldots, N)$ with respect to choosing an a hospitalization insurance coverage option j $(j = 0, \ldots, M)$ to gauge relative risk aversion γ_i. This model assumes that individuals are utility maximizers who have a single concave utility function.

In this model, individuals pay an insurance fee p_j for option j. Option 0 is "no insurance" for which the individual pays nothing when not sick, and high medical expenses when sick. Given this, individual i evaluates the expected utility v_{ij} by

$$v_{ij} = E_{\tilde{c}}[u_i(w_i - oop_j(\tilde{c}) - p_j)], \quad (1)$$

where $E_{\tilde{c}}$ denotes expectation over the random treatment cost $\tilde{c}$; u_i indicates individual i's invariant vNM utility function; w_i signifies individual i's income; $oop_j(\tilde{c})$ denotes the out-of-pocket expenditures associated with cost realization $\tilde{c}$ under coverage j; and p_j represents the premium associated with coverage option j. Consistent with many previous studies, we specifically employ the CRRA utility function defined by Equation (2) to define u_i.

$$u_i = \frac{z^{1-\gamma_i}}{1-\gamma_i}, \tag{2}$$

In Equation (2), γ_{i} is the coefficient associated with individual i's level of risk aversion. We assume that individual i faces a loss c_a with probability q_a and no loss with probability $(1 - q_a)$. The subscript a represents age, indicating that that an individual's probability of being hospitalized (and incurring costs associated with that hospitalization) depends on age. Therefore, individual i's expectations can be represented as,

$$E_{\tilde{c}}\left[u_i\left(w_i - oop_j(\tilde{c}) - p_j\right)\right] = q_a u_i\left(w_i - oop_j(c_a) - p_j\right) + (1 - q_a)u_i(w_i - p_j). \tag{3}$$

We also took steps to calibrate the estimates of relative risk aversion parameter γ_{i}. First, Equation (3) is estimated for individual i for all options from 0 to M at γ. Because γ can take any value between -∞ and +∞, Equation (3) is calculated for all options while gradually shifting the value of γ. Since individuals are assumed to act in such a way to maximize their expected utility, if individual i chooses option j, it means that Equation (3) under j is the maximum value relative to values calculated from other options. In other words, there exists a γ which maximizes Equation (3) under j for individual i; that γ represents the value of risk aversion for individual i, γ_i. So, when individuals with the exact same attributes choose different insurance options, it is reflected as a difference in their respective γ values.

4. Methods and Results

This section consists of three interrelated subsections. Subsection 4.1 describes how to the variables in the model were constructed from the available data. In Subsection 4.2 we estimate individual γ_i values under the assumption that individuals act in such a way to maximize their expected utility. Then, in Subsection 4.3, we verify the consistency of estimated γ_i to address the aforementioned research question about general risk.

4.1. Data construction for estimating γ_i

(1) Insurance premium for hospitalization risk

Insurance products are typically sold to customers as packages. That is, one insurance contract provides protection against various risks, including death, specific illnesses, hospitalization, nursing care, and other negative outcomes.[4] For example, it is possible to add medical insurance and/or a special rider to an insurance contract that covers the insured individual's death. Conversely, it is possible to add a death insurance rider to medical insurance. So, to determine the amount that individuals are willing to pay for insurance against hospitalization, it is necessary to specify the proportion of the total premium allocated to death benefits, hospitalization benefits, and other riders.

In SLS, information on insurance contracts (i.e., insurance premiums, risks covered, benefits amounts) are available at the individual level, not the household level. **Table 2** shows the basic statistics related to the contents of the insurance contracts among respondents in our sample. When the sample is limited to respondents with positive insurance premiums, the average annual premium is 185,000 yen. Most (94.7%) of these respondents have hospitalization insurance, and the average value of disease hospitalization benefits per day is 9150 yen. Furthermore, the contract rate of individual annuity insurance is 18.4%, and the average value of these participants' pensions is 134,000 yen. On average, death insurance pays out about 10 million yen. More than 40% of riders have insurance contracts protecting against cancer and

[4] Some of these specific illnesses include cancer, acute myocardial infarction, and stroke. If insured persons become ill from these diseases, these persons can receive sums of money equivalent to the amount distributed in the event of the insured individual's death.

other specific diseases, respectively. In contrast to these relatively high percentages, the only 11.4% of respondents have special contracts giving them long-term care insurance.[5]

There exists a problem that must be resolved before one can estimate the amount individuals pay as a function of their hospitalization benefits. Because Einav (2007) analyzed insurance provided to employees by a specific company, the categories of options related to hospital benefits were predetermined a priori in that study. However, in this study, we seek to analyze respondents across Japan rather than employees of a specific company. As such, there are no predetermined categories regarding benefit levels.[6] **Figure 2** shows the distribution of daily amounts paid as benefits for disease hospitalization. We established four categories to organize data related to benefits allocated by hospitalization insurance, which are "Option 0 (No contract)", "Option 1 (~5,000 yen)", "Option 2 (5,000~15,000 yen)", and "Option 3 (15,000 yen ~).

Table 2: Basic statistics on insurance contracts

(Unit: 10 thousand yen)

	Mean	**Std. Dev.**	**Min**	**Max**
Total insurance premium per year	18.599	16.569	1	144.300
Hospitalization benefit				
Contracting = 1, No Contract =0	0.947	0.224	0	1
Amount of benefit per day	0.915	0.625	0	7
Annuity insurance				
Contracting = 1, No Contract =0	0.184	0.388	0	1
Amount of annuity per year	13.401	39.929	0	600
Amount of death benefit	1091.462	1208.076	0	9000
Contracting riders for:				
Cancer	0.492	0.500	0	1
Special disease	0.445	0.497	0	1
Nursing care status	0.114	0.318	0	1

Number of observarions = 1905

Note: Limited to respondents who have life insurance contracts and positive insurance premiums.

[5] If the insured becomes bedridden to the point of requiring care, insurance may pay out a lump sum or annuity.

[6] As of April 1, 2017, there were 41 registered life insurance companies in Japan. For more detail, please refer to the website of the Financial Services Agency (http://www.fsa.go.jp/menkyo/menkyoj/hoken.pdf).

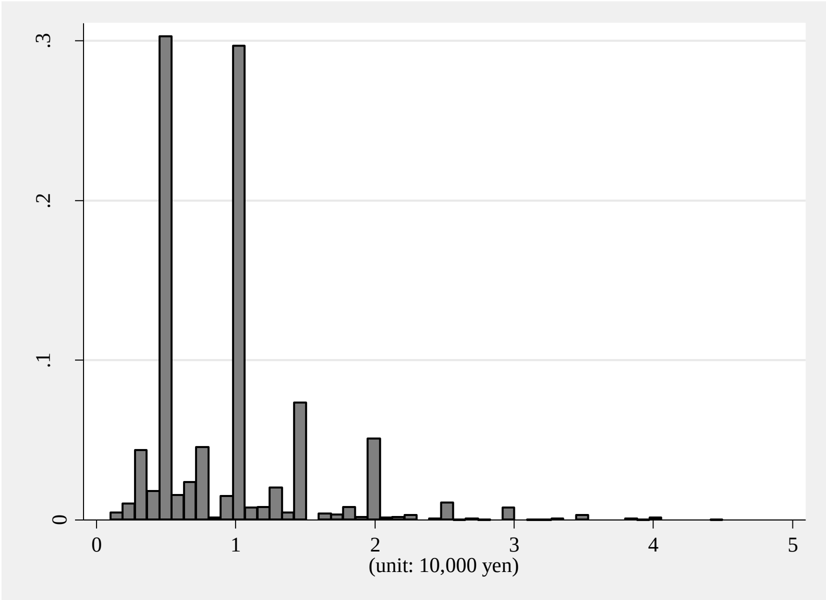

Figure 2: Distribution of daily hospitalization benefits

We next estimated the respective insurance premiums paid contracts 1, 2 and 3. First, we performed an ordinary-least squares regression using annual insurance premium as the dependent variable. Independent variables were the contract statuses for different types of insurance. This regression equation was modeled as:

$$
\begin{aligned}
Total\ \ Premium_i = \ & \alpha_1 \times (Dummy\ \ Variable\ \ for\ \ Holding\ \ Contract1)_i \\
& +\alpha_2 \times (Dummy\ \ Variable\ \ for\ \ Holding\ \ Contract2)_i \\
& +\alpha_3 \times (Dummy\ \ Variable\ \ for\ \ Holding\ \ Contract3)_i \\
& +\alpha_4 \times (Annual\ \ amount\ \ of\ \ individual\ \ annuity\ \ insurance)_i \\
& +\alpha_5 \times (Amount\ \ of\ \ Death\ \ Benefit)_i \\
& +\alpha_6 \times (Dummy\ \ Variable\ \ for\ \ Holding\ \ Cancer\ \ Insurance)_i \\
& +\alpha_7 \\
& \times (Dummy\ \ Variable\ \ for\ \ Holding\ \ Specifc\ \ Disease\ \ Insurance)_i \\
& +\alpha_8 \times (Dummy\ \ Variable\ \ for\ \ Long-term\ \ Care\ \ Insurance)_i.
\end{aligned}
$$

Given the above, $\widehat{\alpha_1}$, $\widehat{\alpha_2}$, and $\widehat{\alpha_3}$ respectively represent the insurance premiums for Contracts 1, 2, and 3. The results of the estimation are outlined in **Table 3**.

Table 3: Determinants of total premiums

	(1)	(2)
Hospitalization benefit		
<=5000 yen	6.178***	2.547**
	(0.499)	(1.099)
<=10,000 yen	10.55***	6.999***
	(0.702)	(1.213)
> 10,000 yen	15.48***	12.05***
	(1.040)	(1.445)
Annuity insurance		
< 600,000 yen	12.50***	12.06***
	(1.378)	(1.389)
>= 60,000 yen	16.36***	15.93***
	(1.656)	(1.654)
Amount of death benefit	0.00374***	0.00365***
	(0.000394)	(0.000389)
Contracting riders for:		
Cancer	1.063	0.834
	(0.720)	(0.720)
Special disease	2.505***	2.544***
	(0.769)	(0.769)
Nursing care status	1.854*	1.838*
	(1.020)	(1.020)
Age		0.0862***
		(0.0199)
Sex		-0.885
		(0.621)
Observations	1,905	1,905
R-squared	0.689	0.693

Note) Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Because insurance premiums are partially determined by age and sex, Specification (2) included age and sex as predictors for subsequent estimations. Results indicate that the estimated insurance premiums for Contract 1, Contract 2, and Contract 3 are 25,470 yen, 69,900 yen, and 120,500 yen, respectively.

(2) Probability of hospitalization and out-of-pocket costs due to hospitalization

We used the percentage of individuals who had been hospitalized (by age) as a proxy for the likelihood that an individual had experienced hospitalization. **Figure 3** clearly indicates a positive relationship between an individual's age and his/her likelihood of being hospitalized.

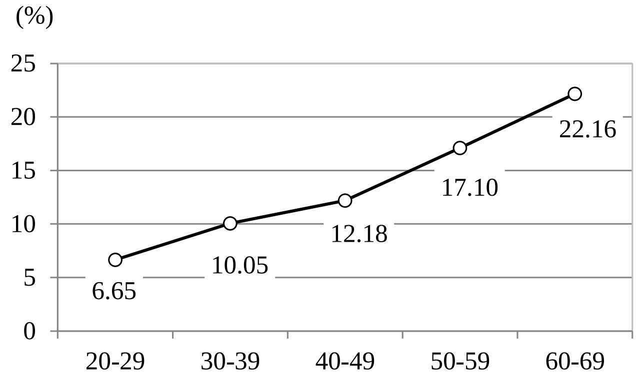

Figure 3: Five-year hospitalization rate

Source: Calculated from SLS.

To calculate out-of-pocket costs for hospitalization as accurately as possible, several pieces of information are necessary. These include (a) the direct cost paid to the hospital,[7] (b) indirect costs (e.g., meals, daily necessities, nursing transportation expenses), (c) lost income due to hospitalization,[8] and (d) the number of days the individual was hospitalized. Because all these data points are available via SLS, it is possible to calculate the average daily hospitalization cost by age. However, when limiting the sample to respondents who provided data for all four questions, the sample shrinks drastically. Therefore, after pooling the data across ages, we calculated the average value of ((a) + (b)) / (d). The results of this calculation are presented in **Table 4**. Rather than use SLS information to determine the number of days in which the individual was hospitalized, we used the average value across participants (i.e., 31.9).[9] Taken together, these calculations indicate that the total out-of-pocket cost incurred by patients due to hospitalization is ((20,000 + *Lost income per day*) × 31.9). This value will differ across patients due to individual-difference variables (i.e., age, annual income) that affect some of the measurement parameters.

[7] High-cost medical expense benefits are available to Japanese insurance holders. This means that the amount a patient pays to a hospital is capped at a certain maximum level, depending on the patient's income. The minimum amount that patients must pay is 24,600 yen (about $224), and the maximum is 140,100 yen (about $1,274). Public medical insurance is not available for highly advanced medical care.
[8] These data were obtained by the dividing the individual's annual income by 365 and multiplying the quotient by the number of days the individual was hospitalized.
[9] Taken from the Ministry of Health, Labor and Welfare (2014) "Patient Survey".

Table 4: Basic statistics: Hospitalization expenses

	Mean	Std. Dev.	Min	Max
(a) + (b) Total cost (unit: 10,000 yen)	22.131	27.805	0.4	200
(d) Number of hospital days	17.736	21.510	1	150
(a + b) / (d)	2.000	2.326	0.056	20.000

N = 364

Source) Calculated from SLS

4.2. Estimating γ_i for risk of hospitalization

By using the calibration method described in Section 3, we could estimate respondents' relative risk aversion γ_i. **Figures 4(a)** and **4(b)** show a possible range of γ_i when an individual selects insurance option j. **Figure 4(a)** illustrates estimated γ_i for individuals in their twenties (i.e., likelihood of hospitalization and out-of-pocket costs are controlled within this group). Given that individuals' probability of being hospitalized or incurring hospitalization costs are constant across this subsample, variance in insurance option selections is driven by differences in lost income and risk aversion tendency. For example, if an individual's income is between one and two million yen and that individual selects Option 1, his/her γ_i is between 1.7 and 3.7.[10] If this same individual selected Option 2, his/her γ_i would be between 3.8 and 6.1. Because Option 0 can adopt a value between -∞ and 1.6, we regard a maximum γ_i value of 1.6 as an individual's risk aversion that chooses Option 0. Because Option 3 can adopt a value between 6.2 and +∞, we regard the minimum γ_i value f 6.2 as an individual's risk aversion that chooses Option 3. The same logic applies for respondents in their sixties, whose choices are illustrated in **Figure 4(b)**.

Figure 5 shows the value of γ estimated by age and by choice of insurance option among participants with an annual income between five million and seven million yen.[11] This figure shows that (a) when income is fixed, the age and γ are inversely related, and (b) γ is lowest

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10 We executed the calibration in increments of 0.1. The accurate numerical values for Figures 4(a) and 4(b) are available from the author of correspondence.

11 See the Table in the Appendix for data related to other income levels.

for individuals that choose no insurance contract (i.e., Option 0). The value of γ increases sequentially from Option 1 to Option 3.

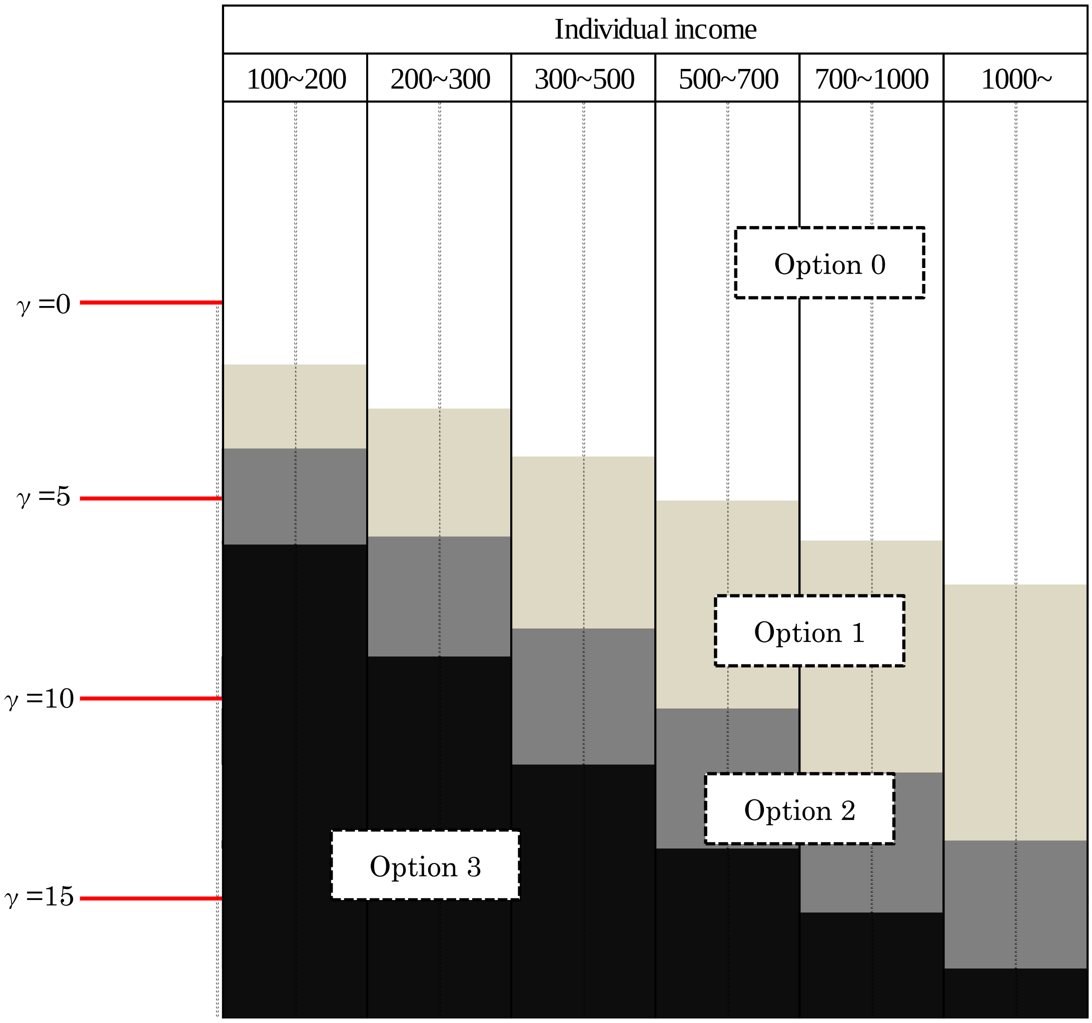

Figure 4(a): γ as a function of medical insurance choice (Participants in their twenties)

Note: These data are based on the likelihood of hospitalization for participants in their twenties (roughly 6.5%). Income is measured in tens of thousands of yen.

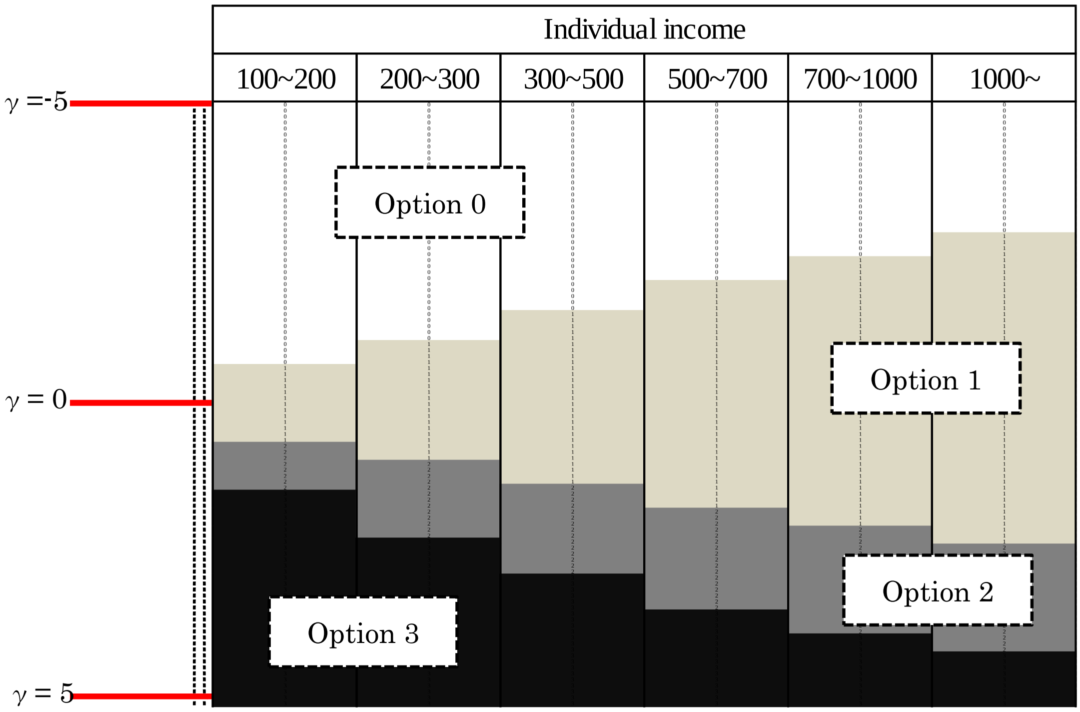

Figure 4(b): γ as a function of medical insurance choice (Participants in their sixties)

Note: These data are based on the likelihood of hospitalization for participants in their sixties (roughly 22%). Income is measured in tens of thousands of yen.

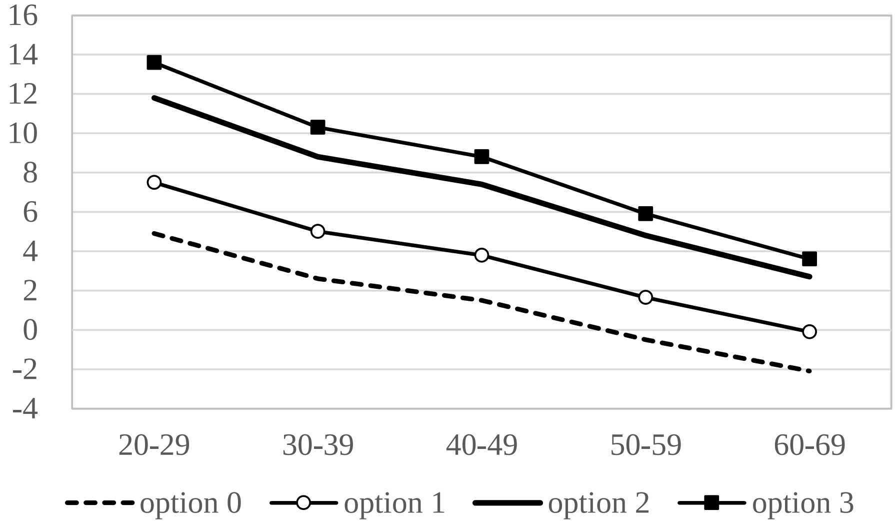

Figure 5: γ for each contract option by age

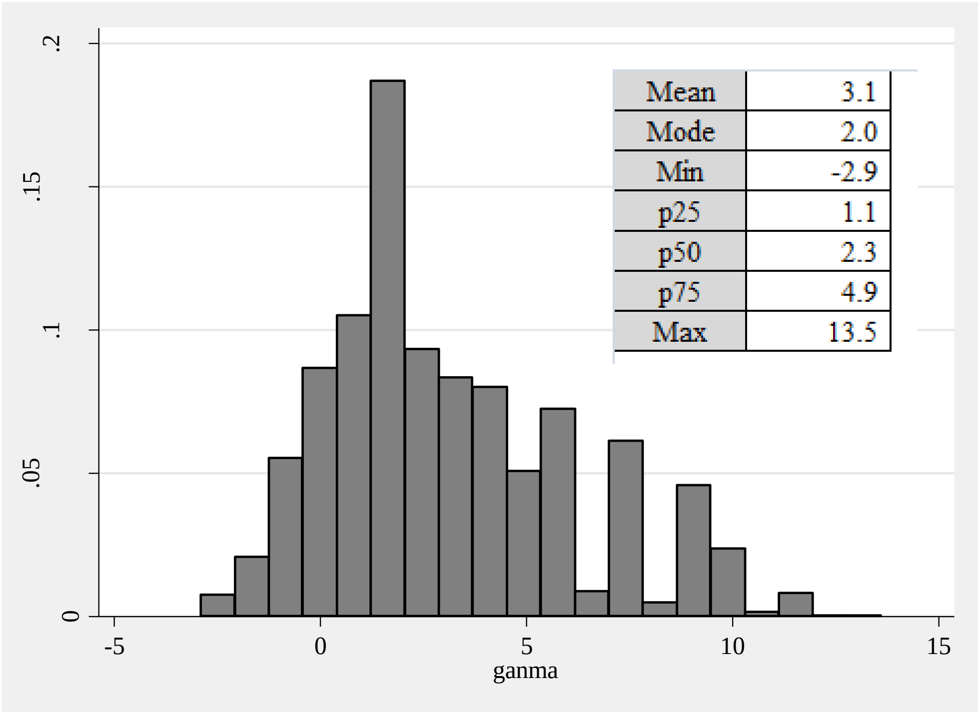

Figure 6: Distribution of γ_i

We next merged γ values that had been estimated by age, annual income, and insurance option selection. Because the γ associated with Options 1 and 2 is a value with a range, we adopted an intermediate value. **Figure 6** shows the distribution of γ_i. The mean (median) value for γ_i is 3.1 (2.3). In the next subsection, we examine how the obtained values for γ_i relate to general questions on risk aversion.

4.3. Comparing risk aversion across two domains

We compared participants' preferences for risk in response to two distinct domains. In the first domain (outlined in Subsection 4.2), we inferred participants' levels of risk aversion in relation to a task in which they select an insurance contract. In the second domain, outlined in this subsection, participants simply responded to general questions their attitudes towards risk. More specifically, participants were asked to respond to the following question:

Question: Do you prefer Option A or Option B?

A: High profits with a possibility of loss is preferable.

B: Low profits without a possibility of loss is preferable.

Participants were asked to select Option A, Option B, "near" Option A, "near" Option B, or indicate that they didn't know. Figure 7 shows the relative frequency with which participants selected these various responses. It is immediately apparent that participants largely gravitated towards Option B—the option that can be interpreted as the most risk averse. Does this result suggest that the average value of γ is highest among those who answered B? If this is not the case, then participants' risk aversion tendencies are not consistent across domains (assuming they seek to maximize utility).

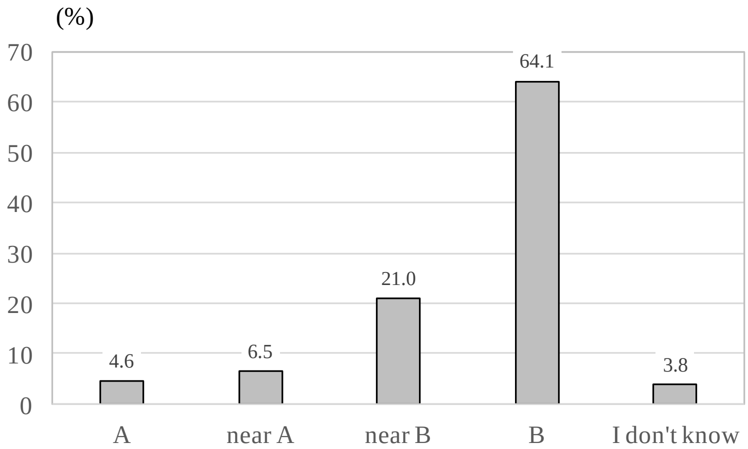

Figure 7: Response to general question about risk aversion

Source: Japan Institute of Life Insurance 2016 Survey on Living Security.
Note: Limited to respondents with contracted insurance and have an annual income over one million yen.

Table 5 shows the results of statistical tests of difference between the average value of γ and participants' responses to the general question regarding risk aversion. To test this association, we treated γ_i as the outcome variable and responses to the general question as the predictor variable. Further, we treated "near B" as the base case in comparing participants' responses to the general question. As such, the coefficients associated with "A," "near A," "B," and "I don't know" indicate deviation from near B.

Specification (1) (i.e., Spec (1)) includes all respondents; Spec (2) includes only respondents with insurance. In Specs (1) and (2), the coefficient associated with choice B is negative and statistically significant, indicating that participants who answered "B" tend to have a lower γ than participants who selected "near B". This result indicates that respondents who were more risk averse in response to the general question tended to have lower γ values. However, because Specs (1) and (2) contain participants of all age groups, γ may vary as a function of age. To eliminate the influence of age on the value of γ, Specs (3-1) to (3-5) replicated the comparison independently for the different age groups represented in the sample. For respondents in their twenties, the mean value of γ for those who answered "near A" or "A" was significantly higher than those who answered "near B." There were no significant differences between responses to the general question for respondents in their thirties, forties, or fifties.

In Specs (4-1) to (5-3), participants were delineated according to their occupations and final academic records. In none of these cases was the average value of γ for those who selected "B" (the most risk-averse option) significantly higher than the base case. These results suggest that asking participants general questions about risk can provide empirical support that they sometimes deviate from utility optimizing behavior.

Table 6: Statistical difference in γ due to responses to general question on risk

	(1)	(2)	(3-1)	(3-2)	(3-3)	(3-4)	(3-5)
			Age				
	All	**Limited to life insurance policyholder**	20-29	30-39	40-49	50-59	60-69
A or Near A	0.346	0.334	2.084***	-0.206	0.285	-0.0380	0.104
	(0.279)	(0.318)	(0.707)	(0.566)	(0.542)	(0.472)	(0.316)
B	-0.738***	-0.848***	0.375	-0.351	-0.419	-0.155	-0.267
	(0.175)	(0.200)	(0.529)	(0.459)	(0.320)	(0.292)	(0.248)
I don't know	-0.911**	-0.755	2.026**	-0.649	0.177	-0.600	-0.630*
	(0.397)	(0.498)	(0.956)	(0.902)	(0.767)	(0.802)	(0.343)
Constant	3.586***	4.372***	5.974***	5.999***	4.984***	3.025***	1.317***
	(0.154)	(0.174)	(0.425)	(0.392)	(0.270)	(0.256)	(0.235)
Observations	1,807	1,303	137	238	335	264	329
R-squared	0.020	0.024	0.090	0.003	0.010	0.003	0.017

	(4-1)	(4-2)	(4-3)	(4-4)	(5-1)	(5-2)	(5-3)
	Job				Final education		
	Self employed	Employee	Temporary staff etc.	Unemployed	Under high school degree	College graduate	Bachelor's degree or above
A or Near A	0.544	0.439	0.912	-0.497	0.432	0.897	-0.125
	(0.896)	(0.379)	(0.618)	(0.559)	(0.442)	(0.627)	(0.621)
B	-1.038*	-0.416*	-0.260	-0.656	-0.929***	-0.414	-0.801**
	(0.579)	(0.239)	(0.399)	(0.409)	(0.270)	(0.384)	(0.402)
I don't know	0.533	0.230	-0.955	-1.273***	-0.0934	-0.0486	-2.236**
	(2.335)	(0.575)	(0.754)	(0.484)	(0.689)	(1.001)	(0.961)
Constant	3.817***	5.013***	2.322***	1.977***	3.834***	4.299***	5.148***
	(0.501)	(0.202)	(0.368)	(0.389)	(0.238)	(0.327)	(0.345)
Observations	140	813	189	161	628	300	375
R-squared	0.045	0.011	0.034	0.033	0.036	0.021	0.022

Notes: Base case is "near B." From Spec (2) to Spec (5-3), respondents are limited to those who have a life insurance policy. All values estimated via the ordinary least squares method. Robust standard errors are in the parentheses.
***p < 0.01, **p < 0.05, *p < 0.1

5. Conclusion

We used unique data concerning health insurance contracts in Japan to test whether individuals' risk preferences remain stable across domains. Based on the assumption that individuals act to maximize utility, the data (derived from individual choices of hospitalization insurance) produced a plausible distribution of γ_i. A comparison of γ_i to answers to a general question about risk showed no evidence of consistency across domains with respect to risk preference. Stated simply, the results of our analyses did not support the hypothesis that individuals are consistent in their risk aversion.

Although this study has done much to advance our understanding of risk aversion in multiple context, there remains a substantial amount of work for future researchers to undertake. First, our analyses assumed that respondents of the same age are equally likely to be hospitalized and incur the same expenses for that hospitalization. Of course, there exist other factors that affect an individual's risk of hospitalization. These factors include employment status, past hospitalization, and optimism/pessimism towards the future. Future researchers would benefit from exploring the effects of some of these other factors.

Second, it may be useful for future work to perform similar investigations in other domains (e.g., annuity insurance for living expenses incurred during old age). Relative to the risk of hospitalization, risks associated with old-age costs are likely to be perceived as temporally distant. Therefore, it would be meaningful for researchers to investigate the consistency of moderate- and long-term risk aversion in this domain.

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Appendix: γ for each contract by age and income level

age_cat	income	option 0	option 1	option 2	option 3
20-29	150	1.50	2.65	4.90	6.10
	250	2.60	4.25	7.35	8.90
	400	3.70	5.90	9.75	11.50
	600	4.90	7.50	11.80	13.60
	850	5.80	8.75	13.35	15.10
	1250	6.90	10.10	14.85	16.50
30-39	150	0.80	1.80	3.70	4.70
	250	1.40	2.85	5.50	6.80
	400	2.00	4.00	7.30	8.70
	600	2.60	5.00	8.80	10.30
	850	3.10	5.85	10.00	11.50
	1250	3.70	6.75	11.15	12.60
40-49	150	0.50	1.40	3.10	4.00
	250	0.80	2.20	4.60	5.70
	400	1.20	3.05	6.10	7.40
	600	1.50	3.80	7.40	8.80
	850	1.80	4.45	8.40	9.80
	1250	2.20	5.15	9.35	10.70
50-59	150	-0.20	0.60	2.00	2.70
	250	-0.30	0.95	3.00	3.90
	400	-0.40	1.30	3.95	5.00
	600	-0.50	1.65	4.80	5.90
	850	-0.50	1.95	5.45	6.60
	1250	-0.60	2.20	6.05	7.20
60-69	150	-0.70	0.00	1.10	1.60
	250	-1.10	-0.05	1.70	2.40
	400	-1.60	-0.05	2.20	3.00
	600	-2.10	-0.10	2.70	3.60
	850	-2.50	-0.15	3.05	4.00
	1250	-2.90	-0.20	3.35	4.30