Ambiguity Aversion and Preferences for Food Origin Post Fukushima Nuclear Disaster

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Introduction

A massive earthquake and the subsequent tsunami on March 11, 2011 brought about the calamitous disaster at the Fukushima Daiichi nuclear plant leaving trace amounts of radiation in its surrounding land and sea. Exposure to harmful levels of radiation and cumulative exposure have serious health consequences including elevated risks of various cancers. The residents within a 20 kilometer radius of the plant were evacuated, while other residents were left concerned about the likely radiation exposure. Even in California, the incidence of hypothyroidism was significantly higher among babies who were exposed to excess radioactive Iodine from Fukushima in the womb (Mangano and Sherman, 2013).

Agriculture is a main industry in the Tohoku region of the northern mainland Japan, accounting for 17% of the farm land in the nation. While the main crop is rice, the region is famous for apples, cherries, and other tree fruit, beef, and seafood. Fukushima prefecture in particular supplies vegetables to the Tokyo metropolitan area. As trace amounts of radiation on agricultural products were reported, not only on those produced in the Tohoku region but also in prefectures close to the Tokyo metropolitan area, consumers became apprehensive. Even consumers in the U.S. were concerned about food safety issues from the disaster. A survey of U.S. consumers conducted in June 2011 found that a third of the respondents reported reducing their seafood consumption and more than half believed that Asian seafood posed a consumer health risk due to the disaster (McKendree et al., 2013)

In response to the disaster, the Japanese government established provisional regulatory values for radionuclide levels in food and restricted farm products with amounts of radioactivity above the levels from entering the food distribution system. A year after the earthquake, the provisional levels were lowered to the Codex International Food Standard levels. They have

continued to test for radioactivity in foods and materials for agricultural production in 17 prefectures.[1] From April to December of 2013, 0.33% of tested items were found to exceed the Codex Standard levels for radionuclide (MHLW, 2013). A national poll conducted by the National Institute for Environmental Studies in November 2013 suggests that 36.1% of respondents indicated that they always or more often than not avoid purchasing farm products from the possibly radioactive production areas, while 34.9% indicated that they do not avoid them (Nikkei, 2013). A national campaign to "Support the Affected Region by Eating [their agricultural products]" is sponsored by the Japanese Ministry of Agriculture, Forestry, and Fishery (MAFF, 2013).

Japanese consumers have been known for discerning preferences for various consumer goods, and food is no exception. Japanese food traditions have valued origin-specific specialty products, much like Europe. In the recent marketplace, the growth of a market for the so-called "natural foods" that include certified organic and non-genetically modified (GM) foods and of local food systems had been robust, with many school lunch programs sourcing over 35% of their ingredients locally. Naturally, previous studies have consistently found Japanese consumers strongly preferring domestically produced foods over imports (Peterson et al., 2013). When a catastrophic disaster like the Fukushima accident strikes contaminating the very kinds of food they prefer, how are their preferences for various food attributes such as the origin affected? Anecdotally, online sales of farm products have been on the rise at the cost of decreasing purchases of local products. In Fukushima prefecture, the proportion of local foods used in school lunch dropped from about 35% before the disaster to 18% in 2012 (Fukushima Bureau of Education, 2013).

[1] Seventeen prefectures include six Tohoku prefectures (Aomori, Iwate, Akita, Miyagi, Yamagata, Fukushima), seven Kanto prefectures (Ibaraki, Tochigi, Gunma, Chiba, Saitama, Tokyo, and Kanagawa), and four Chubu prefectures that are adjacent to the Tohoku and Kanto regions (Niigata, Yamanashi, Nagano, and Shizuoka).

Numerous forms of uncertainty are associated with such a food safety breach. In contrast to risk, where the possible outcomes of a random occurrence and their probabilities are known, ambiguity refers to the uncertainly about the probability distribution over outcomes. In the case of the Fukushima disaster, most, if not all, possible health outcomes from high exposure to radiation are known, but individuals are unlikely to know the probabilities of various health outcomes from consuming a particular farm product from a certain area with recorded trace amounts of radiation. The ambiguity pertaining to the health risk distribution might in part be attributed to the individual's degree of trust of information provided from different authorities. Ambiguity aversion has been applied to technology adoption in low income countries, and has helped explained farmers' non-adoption varieties more than risk aversion (Engle-Warnick, Escobal, and Laszlo, 2006; Ward and Singh, 2013), but its application in the context of food safety risks has been limited.

This paper examines the role of ambiguity aversion in explaining the changes in Japanese consumers' preferences for foods of differing origins in response to the Fukushima nuclear disaster. An Internet-based survey was developed to collect information on the self-reported changes in their purchases of selected agricultural food products of different origins from a national sample of individuals. The survey included instruments to elicit these preferences toward risk and ambiguity, with question formats based on technology adoption studies (Engle-Warnick, Escobal, and Laszlo, 2006; Ward and Singh, 2013, and studies cited within). Self-reported changes in consumption of domestic foods, even of those from the affected Tohoku region, were slight, but the changes in perceived safety levels of foods were significantly associated with the degrees of ambiguity aversion. Moreover, the closer the respondent was

located to the affected area, the worse the respondent perceived the safety level of food from the Tohoku region had changed after the disaster.

Related Literature

Many consumer studies on food safety have addressed the question how much individuals are willing to pay to avoid food-borne illnesses, such as E. coli and Salmonella by estimating the value consumers place on preventative measures such as irradiation (e.g., Fox, Hayes, and Shogren 2002). Some food safety studies have estimated the value consumers are willing to pay to avoid attributes with unknown health consequences such as growth hormones or genetically modified crops (e.g., Loureiro and Umberger 2007). Other studies have looked at food safety regulations (e.g., Antl 1996).

Risk of becoming ill through food-borne pathogens or in this case, nuclear radiation, is inherently ambiguous (Antl 1996; Melkonyan and Schubert 2009; Kivi and Shogren 2010). The distinction of ambiguity with unknown probabilities from risk with specified probabilities is attributed to Knight (1921), and Ellsberg (1961) empirically established its impact on decision making. While several empirical studies have subsequently confirmed ambiguity aversion in insurance purchases, investment decisions, or technology adoption (e.g., Einhorn and Hogarth 1986, Dow and Werlang 1992; Engle-Warnick, Escobal, and Laszlo 2006), Kivi and Shogren (2010) examined the concept in the context of food safety by asking subjects to choose between unambiguous and ambiguous lotteries with the same expected payoff. They found that these college students were averse to ambiguity for losses with very low probabilities (0.1 to 0.0000001) on average were willing to pay to avoid ambiguity.

Several studies have developed aversion measures from elicitation to predict behavior. Engle-Warnick, Escobal, and Laszlo (2006) elicited risk and ambiguity preferences through field

experiments to explain Peruvian farmer's choice of potato varieties, reporting that individuals who revealed ambiguity aversion were less willing to diversity across varieties. Ward and Singh (2013) designed field experiments with real payouts to elicit risk and ambiguity preferences to explain adoption of new rice seeds in rural India. They found only a limited degree of ambiguity aversion among their subjects but ambiguity averse individuals were less likely to adopt the new seeds.

Survey Instrument

The survey consisted of 40 questions. The first question was used to screen individuals who had no regular experience purchasing fresh groceries. A series of question inquired their food purchasing patterns, including how many meals they prepared at home and how frequently they purchased various categories of fresh food (i.e., fresh produce, organic and chemical-free produce, fresh meats, fresh seafood, and lightly processed food items). In this context, the respondent was asked if their household changed the quantities they consume of these food categories in light of the nuclear incident. The respondent was also asked to express their levels of knowledge of various farming practices and trust of various food labels. Another series of questions inquired how their perceived safety levels of foods (varying in category and origin) have changed in light of the nuclear incident.

The survey included choice experiment to explore how Japanese consumers value produce of various origin based on where they lived. At random, the respondent received a version asking them to select *kabocha* (a common type of winter squash in Japan) or snow peas with varying attributes. The items varied by price, origin (four domestic and two foreign), and production processes (unlabeled, organic, and chemical-free). Price levels were specified following retail conventions, as 98, 128, or 158 yen per 250 grams (about a quarter) for kabocha

and 68, 98, or 128 yen per 100 grams for snow peas. Domestic origins were labeled as domestic (without specifying a region in Japan), Tohoku (the region where the nuclear plant is located), Chubu (the central region of the main island between Tokyo and Osaka metropolitan areas), and Kyushu (the region consisting of the island southwest of the main island). Foreign origins were selected based on the grocery ads in January 2014: New Zealand and Mexico for kabocha, and Thailand and China for snow peas.

Following Engle-Warnick, Escobal, and Laszlo (2006), series of four and five questions were written to measure the degrees of loss aversion and ambiguity aversion (see Appendix). For loss aversion, the respondent was asked to choose between 50-50 odds lotteries that were increasing in expected payoff and stake, starting with 10,000 yen (roughly US$100). For ambiguity aversion, the respondent was presented with binary lotteries with identical stakes, but in one lottery, the probabilities of the outcomes were specified as 50-50, while in the other, they were left vague. Unlike the field experiments with real payoffs, these elicitations occur in hypothetical settings. To minimize the chances that respondents may dismiss the stakes as trivial, a statement was included at the beginning of these series of question that if the national average number of hours worked by a part-time employee (25.6 hours/week) and hourly pay of 1,000 yen are assumed, people can earn 25,600 yen in a week.

Data

The survey was administered by a Japanese research firm in February 2014 to a sample of respondents stratified by gender, age, and nine regions of the country to match the 2010 Japanese Population Census. There were a total of 2,412 responses collected (1,205 and 1,207 completing the kabocha and snow peas versions, respectively). We deleted responses completed by individuals who indicated that they shopped for fresh produce less than once a month, on average

ate less than one meal per week at home, and reported no personal or household income, which left 2,192 usable responses for the analysis. All variables are defined in Table 1 and their sample statistics are summarized in Table 2.

Our main variables of interest are self-reported changes in household consumption of food possibly affected by the nuclear disaster. We selected self-reported changes in consumption of domestic fresh produce and domestic fresh seafood after the nuclear disaster compared to before (*DQPROD* and *DQSEAFD*, respectively). The variables were recorded as 0 if they selected the response "no change," -1 and -2 for responses "decreased" and "decreased considerably," respectively, and 1 and 2 for responses "increased" and "increased considerably," respectively. Our original hypothesis was that Japanese consumers would have shifted away from consuming domestic foods toward imported foods in light of the nuclear disaster. However, the summary statistics suggest that these self-reported changes were minimal with the averages of -0.01 and -0.04 for *DQPROD* and *DQSEAFD*, respectively (Table 1). The proportions of respondents who indicated some decreases for these food groups were 5.2% and 6.4%, respectively.

Even if a relatively few have decreased their overall purchases of domestic foods, it is possible that they are sourcing foods from regions of the country that are far from the affected area. To explore this possibility, self-reported changes in perceived safety of food items of various origin were also considered for the analysis. Specifically, the changes in perceived safety of produce from Tohoku region (*DSFTOHOKU*) and of domestic food in general (*DSFJAPAN*) were selected and coded in a similar way as the consumption changes. Summary statistics suggest that the perceived safety of Tohoku produce was compromised for more individuals (average score of -0.38) but not so much for the overall safety of domestic food items (average

score of -0.07). About one in three (34.2%) lowered their perceived safety of Tohoku produce, while 12% lowered their assessment of domestic foods in general.

Our key explanatory variable was the two aversion measures. Loss aversion of individuals was measured in scale of 1 to 5, with greater values corresponding to lower degrees of loss aversion. The scale corresponds to how many iterations it took for the respondent to choose the choice with lower expected payoff and smaller loss. Given the hypothetical nature of the questions, the concern was whether the respondent may casually choose ones with higher stakes. But, the majority (84.4%) scored the loss aversion level of 1, with the average loss aversion score of 1.36. The proportions of respondents with higher loss aversion scores declined linearly to 1.3% scoring 4 then bumped up to 5.5% scoring 5. This clump would likely have been less prominent had we continued to ask questions with greater stakes.

Ambiguity aversion was measured in scale of 0 to 5, with greater values corresponding to lower degrees of ambiguity aversion. The scale corresponds to the number of choices out of 5 that the respondent chose the one with unknown probabilities of stakes. The average ambiguity score was 2.24, and the responses were more dispersed across the scores than the loss aversion with the mode score of 1 (28.4%). A cluster at 5 is observed similarly to the loss aversion scores, where the percentage of respondents jumped to 19.6% from 9.5% scoring 4. It is possible that some of these respondents were indifferent or preferred ambiguity in this context. Since this is a continuous scale, it is difficult to compare, but Kivi and Shogren (2010) found between 19 and 29% of their subjects who were indifferent at very low probabilities (less than one in 100,000).

The sample is well balanced in terms of gender. The average age of the respondents is 48, which is younger than the average age of people over 20 in Japan as of October 2013 of 52.9 years. This is caused by the fact that the research company specifies the oldest age groups as age

50 and older, due to the smaller number of individuals in their 70s and older who are on the Internet. Half of our respondents are age 50 and older, compared to 44.8% in the population. Slightly less than half of the sample (45.6%) has a bachelor degree. Household income, which was elicited using ranges and calculated using mid-points of the range, was 5.89 million yen, which is comparable to the 2012 official average of 5.48 million yen. About 28% of the respondents were living with minors.

In addition to the demographic variables, the number of meals prepared and eaten at home (*NAHMEALS*) and the distance from the nuclear plant (*DFFUKUSHIMA*) to the prefectural capital of residence were included as household characteristics. Individuals from households that consume more meals at home are likely to be more concerned about the quality of grocery items they purchase, including safety levels. Similarly, households that reside in proximity to the nuclear plant are likely more concerned about the safety of food products from affected regions. For reference, the nuclear plant is about 50 kilometers from the city of Sendai, which is the largest city in Tohoku region. It is about 200 kilometers to parts of Tokyo. Lastly, the self-reported degrees of how frequently they check origin labeling information (*FRQORIGIN*) and of how much they trust origin information on domestic food items (*TRORIGIN*) were included to control for innate differences among respondents in their use of origin information.

Estimation Results

Four variables of interest were regressed in turn on the aversion, demographic, and other household/respondent characteristic variables using OLS. Squared terms were included for age and distance to Fukushima to allow for their relationships to be nonlinear. The results are reported in Table 3. As suspected from the initial inspection of data, there was not enough

variability in the self-reported changes in the amounts consumed of fresh produce (*DQPROD*) to be associated statistically with the model variables. Respondents were more concerned about seafood being sourced from the surrounding sea. Particularly female respondents and if the respondents regularly check the origin information and trust its accuracy, they reported reducing their consumption of fresh seafood labeled from being sourced domestically (*DQSEAFOOD*).

The results for the changes in the perceived safety levels are more interesting. The directional impacts of factors were the same for both Tohoku and Japan models. But, the statistical significance of the factors differed. In both models, loss aversion did not explain the changes in the perceived safety levels, but ambiguity aversion was statistically significant at the 1% level for the Tohoku model. Consistent with our hypothesis, folks with stronger aversion to ambiguity (lower *AMBAV* values) downgraded their perception of how safe foods that originated from the Tohoku region, holding everything else constant.

There was no statistical difference among respondents of different gender, household income levels, or whether they lived with children in how they changed their safety perceptions toward Tohoku and Japanese foods, but the *AGE* terms were statistically significant at the 5% level in the Japan model. Respondents younger than 43.7 perceived that domestic foods were less safe but at a decreasing rate as they were older. Older respondents were increasingly more resistance to lower their assessment of safety. The *BPLUS* term was statistically significant in the Tohoku model, implying that college educated respondents, compared to their counterparts, had downgraded their safety perceptions toward Tohoku foods.

There were no systematic changes in safety perception of domestic foods overall based on how close the respondents resided to the affected area, but the relative location certainly mattered for foods originating from the Tohoku region (*DFFUKUSHIMA*). Respondents lowered

their safety assessments at a decreasing rate until 923 kilometer radius from the Fukushima nuclear plant, which pretty much engulfs the entire nation except for the southern Kyushu Island.

What types of food consumer respondents were also affected how they changed their perceived levels of food safety regardless of origin. Specifically, the more meals the respondent's household prepared at home, the more they perceived that safety of domestic and Tohoku foods was compromised (*NAHMEALS*). Similarly, the more frequently the respondent checked origin labeling (*FRQORIGIN*) and the more they trusted the labeled information (*TRORIGIN*), they downgraded their safety assessments. For Tohoku foods, the level of trust toward food origin labeling was not as statistically significant as for domestic foods, but the frequency had more than double the impact. The findings are consistent with respondents downgrading their safety assessment toward Tohoku foods more comprehensively with less discernment than toward domestic foods in general.

Conclusion

This version of the paper is work in progress. We were surprised at a small number of respondents self-reporting that they have changed the consumption of domestically sourced food in favor of foreign sourced food in light of the unknown hazard of radiation. Consumers have either very strong habitual pattern, they trust the government handling and regulation of food risks, and/or they have unwavering preferences toward domestic food. Had this been a foreign source, the reaction would likely have been much more drastic. Indeed, many foreign citizens residing in Japan at the time left the country in the name of keeping their families safe from the unknown nuclear hazard.

Even if it has not led to the changes in the overall consumption, the regional impact is clear if the attention is turned to how the safety of food is perceived. Instead of loss aversion,

ambiguity aversion is a behavioral factor that was statistically the most relevant in explaining the changes in these safety perceptions. This is a promising tool that can be used to explain other choices in the presence of risk in food choices.

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Table 1. Variable Definition

Variable	Definition
DQPROD	Changes in amounts purchased of domestic fresh fruit and vegetable after the Great East Japan Earthquake and Fukushima Daiichi nuclear disaster (-2=decreased considerably, -1=decreased, 0=no change, 1=increased, 2=increased considerably)
DQSEAFOOD	Changes in amounts purchased of domestic fresh seafood after the Great East Japan Earthquake and Fukushima Daiichi nuclear disaster (-2=decreased considerably, -1=decreased, 0=no change, 1=increased, 2=increased considerably)
DSFTOHOKU	Changes in perceived levels of safety of foods from the Tohoku region after the Great East Japan Earthquake and Fukushima Daiichi nuclear disaster (-2=worsened considerably, -1=worsened, 0=no change, 1=improved, 2=improved considerably)
DSFJAPAN	Changes in perceived levels of safety of foods sourced domestically after the Great East Japan Earthquake and Fukushima Daiichi nuclear disaster (-2=worsened considerably, -1=worsened, 0=no change, 1=improved, 2=improved considerably)
LOSSAV	Number of risky choices in binary gamble
AMBAV	Number of time chose to pay to avoid ambiguity in binary with ambiguous
GENDER	Gender (1 = female; 0 = male)
AGE	Years
BPLUS	Educational attainment (1=baccalaureate or higher; 0 otherwise)
HINC	Annual gross household income in million yen (2=less than 3, 4=3 to 5, 6=5 to 7, 8.5=7 to 10, 12.5=10 to 15, 20=over 15)
WKIDS	Household with kids (1= at least one member is younger than 18; 0 otherwise)
NAHMEALS	Average number of meals prepared at home per week (1=none, 2=1-2 times per week, 3=3-4 times per week, 4=5-6 times per week, 5= more than once a day)
DFFUKUSHIMA	Distance from the Fukushima prefectural capitol to the prefectural capitol of residence (kilometer)
FRQORIGIN	Frequency of checking place of origin food labels at point of purchase (1=never, 2=typically not, 3=half of the time, 4=more often than not, 5=always)
TRORIGIN	The level of trust of origin labels on domestic foods (1=completely distrust, 2=distrust, 3=can't say one way or the other, 4=trust, 5=completely trust)

Table 2. Summary Statistics (n = 2,192)

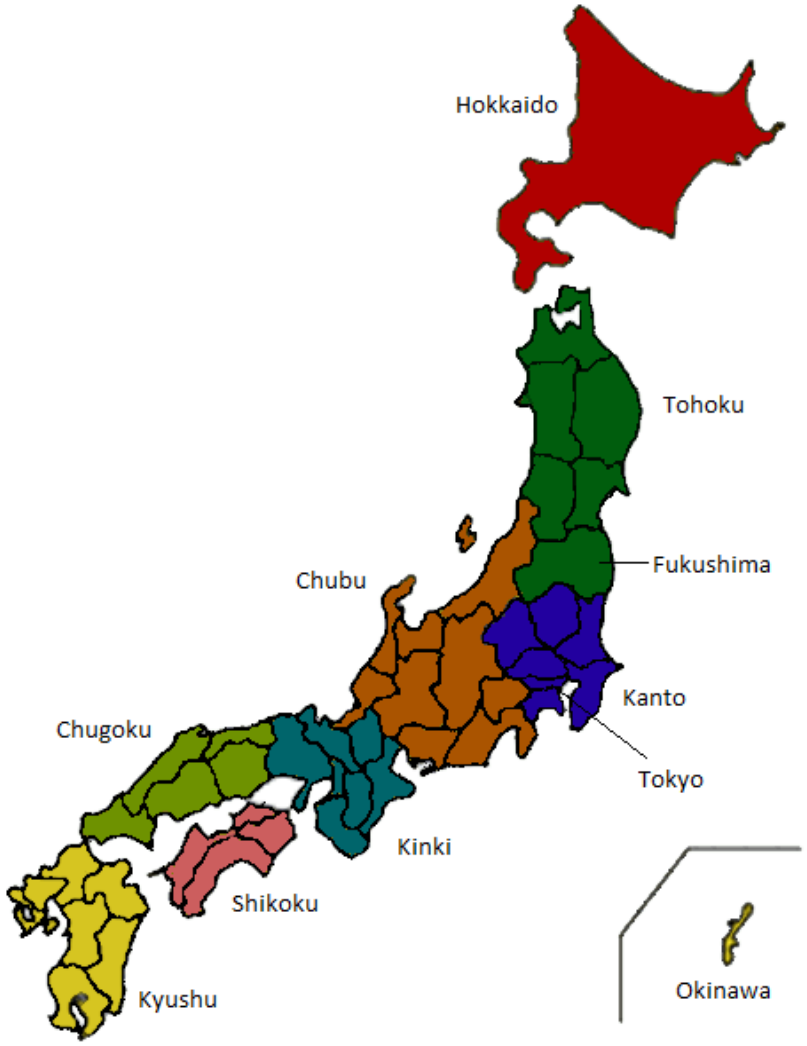
Variable	Mean	Std. Dev.	Min	Max
DQPROD	-0.01	0.37	-2.00	2.00
DQSEAFOOD	-0.04	0.39	-2.00	2.00
DSFTOHOKU	-0.38	0.68	-2.00	2.00
DSFJAPAN	-0.07	0.46	-2.00	2.00
LOSSAV	1.36	1.00	1.00	5.00
AMBAV	2.24	1.79	0.00	5.00
GENDER	0.52	0.50	0.00	1.00
AGE	48.02	13.29	20.00	79.00
BPLUS	0.46	0.50	0.00	1.00
HINC	5.89	3.58	2.00	20.00
WKIDS	0.28	0.45	0.00	1.00
NAHMEALS	4.58	0.83	2.00	5.00
DFFUKUSHIMA	465.75	289.84	1.00	1756.40
FRQORIGIN	3.99	0.96	1.00	5.00
TRORIGIN	3.66	0.89	1.00	5.00

Table 3. OLS Regression Results

	DQPROD		*DQSEAFOOD*		*DSFTOHOKU*		*DSFJAPAN*	
	Coefficient	Std. Error	Coefficient	Std. Error	Coefficient	Std. Error	Coefficient	Std. Error
Intercept	-0.0686	0.1131	-0.0648	0.1211	0.3023	0.2064	0.2079	0.1410
GENDER	-0.0259	0.0175	-0.0463 ***	0.0187	-0.0002	0.0318	-0.0184	0.0218
AGE	0.0000	0.0040	0.0011	0.0043	-0.0031	0.0074	-0.0114 **	0.0050
AGE2	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001 **	0.0001
BPLUS	0.0257	0.0170	0.0116	0.0182	-0.0701 **	0.0310	-0.0308	0.0212
HINC	0.0004	0.0023	0.0021	0.0025	0.0020	0.0042	0.0011	0.0029
WKIDS	-0.0137	0.0186	-0.0129	0.0199	-0.0555	0.0340	-0.0106	0.0232
NAHMEALS	-0.0059	0.0100	-0.0117	0.0107	-0.0416 **	0.0182	-0.0310 **	0.0125
DFFUKUSHIMA	0.0000	0.0001	0.0000	0.0001	-0.0004 **	0.0002	0.0001	0.0001
DFFUKUSHIMA2	0.0000	0.0000	0.0000	0.0000	0.0000 **	0.0000	0.0000	0.0000
FRQORIGIN	0.0021	0.0085	-0.0219 **	0.0091	-0.1254 ***	0.0155	-0.0487 ***	0.0106
TRORIGIN	0.0134	0.0090	0.0323 ***	0.0096	0.0299 *	0.0164	0.0689 ***	0.0112
LOSSAV	0.0108	0.0081	0.0125	0.0086	0.0071	0.0147	0.0048	0.0100
AMBAV	-0.0046	0.0044	-0.0058	0.0047	0.0211 ***	0.0080	0.0070	0.0055
No. observations	2192		2192		2192		2192	

Note: ***, **, and * represent significance at the 1%, 5%, and 10% level, respectively.

Figure 1. Map of Japan



Source: http://de.wikipedia.org/wiki/Bild:Regionen_japans.png; modified by Authors.

Appendix: Questions Used to Elicit Loss and Ambiguity Aversion

The following series of questions concern your preferences toward uncertainty. For reference, the weekly average hours of a part-time worker is 25.6 hours, and if we assume the average hourly pay to be 1,000 yen, the worker earns 25,600 yen in a week.

Q1. Suppose there is a lottery that you can participate with 10,000 yen. If you pay 10,000 yen, then with 50% chance you can earn 13,375 yen, and with 50% chance you can earn 7,750 yen. What would you do?

(a) Keep the 10,000 yen.

(b) Pay 10,000 yen to participate in the lottery (50% chance of winning 13,375 yen; 50% change of winning 7,750 yen).

If respondents chose (a), skip to Q5. If respondents chose (b),

Q2. The lottery you selected is the lottery that you can participate by paying 10,000 yen and can earn 13,375 yen with 50% chance and 7,750 yen with 50% chance. Suppose there is an alternative lottery where you can earn 16,750 yen with 50% chance and 5,500 yen with 50% chance. What would you do?

(a) Choose to participate in the original lottery (50% chance of winning 13,375 yen; 50% change of winning 7,750 yen).

(b) Participate in the alternative lottery (50% chance of winning 16,750 yen; 50% change of winning 5,500 yen).

If respondents chose (a), skip to Q5. If respondents chose (b),

Q3. … Suppose there is an alternative lottery where you can earn 20,125 yen with 50% chance and 3,250 yen with 50% chance….

If respondents chose (a), skip to Q5. If respondents chose (b),

Q4. … Suppose there is an alternative lottery where you can earn 23,500 yen with 50% chance and 1,000 yen with 50% chance….

In the following 5 questions, you are asked to choose from two lotteries as before. In the first lottery, the chances of the amounts you earn are unknown. In the second lottery, those chances are known.

Q5. If you can participate in one of the two lotteries, which would you choose?

a. You pay 10,000 yen to participate and can earn 10,000 yen with some probability and 10,000 yen with the remaining probability.
b. You pay 10,000 yen to participate and can earn 9,800 yen with 50% chance and 9,800 yen with 50% chance.

Q6. If you can participate in one of the two lotteries, which would you choose?

a. …can earn 7,750 yen with some probability and 13,375 yen with the remaining probability.
b. .. can earn 7,550 yen with 50% chance and 13,175 yen with 50% chance.

Q7. If you can participate in one of the two lotteries, which would you choose?

a. …can earn 5,500 yen with some probability and 16,750 yen with the remaining probability.
b. .. can earn 5,300 yen with 50% chance and 16,550 yen with 50% chance.

Q8. If you can participate in one of the two lotteries, which would you choose?

a. …can earn 3,250 yen with some probability and 20,125 yen with the remaining probability.
b. .. can earn 3,050 yen with 50% chance and 19,925 yen with 50% chance.

Q9. If you can participate in one of the two lotteries, which would you choose?

a. …can earn 1,000 yen with some probability and 23,500 yen with the remaining probability.

b. .. can earn 800 yen with 50% chance and 23,300 yen with 50% chance.