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The context effect in the choice of earthquake insurance contracts in Japan[1]

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Abstract: In this paper, we investigate the context effect in the choice of public and private earthquake insurance contracts using data from a questionnaire survey completed by an identical set of approximately 2,000 households in 2008 and again in 2009. According to the 2008 survey, the public earthquake insurance (PEI) was not popular among those who felt that the premiums were too high. On the other hand, the 2009 survey demonstrates that the choice of earthquake insurance changed substantially when a hypothetical private earthquake insurance contract, much more expensive than the PEI, was added to a choice menu. In particular, those who had initially felt that PEI was too expensive tended to find it less expensive relative to private insurance, and worth purchasing. A crucial advantage of the above choice architecture is that including additional options helps private insurance companies to develop market activities.

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1. Introduction

As documented in previous empirical literature, consumers frequently reveal little interest in catastrophe insurance.[3] Those living in earthquake-prone areas seem reluctant to acquire a proper understanding of natural disaster insurance. Such a pattern in insurance demand is often observed even when insurance premiums are publicly subsidized. The public earthquake insurance (PEI), which is managed jointly by the government and private non-life insurance companies in Japan, shares these features of insurance demand.

In this paper, we demonstrate that the context effect matters in the choice of PEI and private earthquake insurance, and that potential demand for earthquake insurance, both public and private, may be realized by adding a private contract to existing choice menus as either a decoy choice or a relevant alternative. In addition, we interpret the inclusion of additional options in choice menus as an example of the choice architecture, which is designed to manipulate mildly individual preferences such that their liberty may be still respected (Thaler and Sunstein, 2009). However soft it is, such choice architecture is frequently regarded as a serious hindrance to market activities.[4] In our case, however, a change in choice menus does not obstruct information aggregation among private agents, but instead helps to correct consumers' misperception about earthquake insurance. At the same time, private insurers may be interested in developing complementary market activities together with PEI.

In Japan, a standard fire insurance policy offered by private non-life insurance companies does not cover a policyholder for fire damage resulting from natural disasters such as earthquakes, volcanic eruptions, or tsunamis. Since 1966, the Japanese Government has managed the PEI scheme jointly with private insurance companies to compensate for the absence of private coverage for fire damage resulting from earthquakes. Under the PEI program, a policyholder has the option of attaching PEI to a private fire insurance contract. The PEI program covers not only fire damage, but also damage resulting from collapsed buildings during earthquakes.

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[3] Schwarcz (2010) discusses the observation of weak demand for catastrophe insurance as an example of anomalies, citing McClelland, Schulze, and Coursey (1993), Krantz and Kunreuther (2007), Kunreuther et al. (1978), Kunreuther and Pauly (2004), and Slovic et al. (1977).

[4] Many papers point out several potential problems borne by the choice architecture. For example, Sugden (2008) discusses that market activities still dominate paternalistic policies even when individual preferences are incoherent, while Glaeser (2006) argues that governments may make serious mistakes in employing the choice architecture as a policy instrument. Carlin, Gervais, and Manso (2009) also point out that setting default options may result in slow information aggregation in markets.

However, PEI covers a maximum of half the house value appraised in a master fire insurance contract. For example, when a master fire insurance contract covers a house worth 50 million yen, the house can be insured for up to 25 million yen against fire and collapse due to earthquakes under PEI.

We have observed two puzzling phenomena associated with PEI since its introduction in 1966. First, consumers do not necessarily exercise the option of attaching it to their own private fire insurance, although being largely publicly subsidized PEI is inexpensive relative to corresponding private earthquake insurance. The percentage of households that had PEI was 12 percent in 1995 (fiscal year), 16 percent in 2001, and 23 percent in 2009. The proportion of private fire insurance contracts with PEI options remained at 34 percent in 2001 and 47 percent in 2009.

Second, private earthquake insurance has not been popular among consumers, although there should be potential demand for private earthquake insurance to cover the half of a house's value that cannot be covered by PEI. In addition, private non-life insurance companies are not necessarily interested in selling earthquake insurance as their own products, and carry only a modest range of earthquake insurance products for consumers. For some reason, private insurance companies seem to have a low opinion of the potential of earthquake insurance markets for households.[5]

In this paper, we address the abovementioned phenomena. We first investigate why consumers do not choose PEI offered on quite favorable terms, and secondly why there is no active market for private earthquake insurance designed for households. For this purpose, we focus particularly on the *context effect* as a behavioral aspect of insurance choice. Such a context effect has been widely studied in behavioral economics. If any bias is observed in choice behavior, we explore how consumers may be *nudged* into being interested in public and private earthquake insurance.

According to Simonson and Tversky (1992) and others,[6] the background effect and the local effect are presented as the effects of contexts on choice. In either effect, a consumer is likely to choose a particular option if it appears more attractive by comparison with either past experiences (the background effect) or with currently available alternatives (the local effect). In this paper, we pay close attention to both types of context effect.

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[5] In contrast, there have been relatively active markets for natural disaster insurance designed for private corporations in Japan.

[6] Huber, Payne, and Puto (1982) and Simonson (1989) report experimental studies to examine the effect of context on choice. DellaVigna (2009) conducts a survey of field studies of several topics in behavioral economics including context effects.

The basic idea underlying our study is quite simple. On one hand, we explore how the choice of earthquake insurance changes if a decision maker has learning experience. On the other hand, we examine whether a particular choice of insurance is more appealing to a decision maker if it is located in a different menu context.

For this purpose, we conducted an internet-based questionnaire survey completed twice by an identical set of approximately 2,000 house owners in December 2008 and November 2009. From the 2008 questionnaire survey, we indeed observe that a substantial number of respondents felt PEI to be too costly, and were accordingly unwilling to purchase it. They seemed to have little knowledge of PEI, and had distorted perceptions of it.

Therefore, the next question arises: How can we nudge such unwilling consumers into purchasing public and private earthquake insurance? In the 2009 questionnaire survey, we asked the same set of respondent householders whether they were interested in PEI in a realistic setup. Then, we investigated the possibility that those who were unwilling to purchase PEI in December 2008 preferred the public program when they had learned about insurance through the 2008 survey.

In addition, the respondent households in the 2009 survey were offered various choice menus in which not only PEI but also hypothetical private earthquake insurance contracts were included with a list of insurance premiums. We computed insurance premiums as realistically as possible. We then explored the possibility that those who initially felt PEI to be too costly would participate in the public program if they revised their initial belief by comparing insurance premiums on a different choice menu. There may even be a case where a respondent household was interested in purchasing not only PEI but also private earthquake insurance.

At this point, we note that the context effect investigated in the present paper is broadly defined compared with conventional studies in the marketing literature. A more conventional version of the context effect focuses purely on the effect of a change in background experiences or alternative menus by keeping the information set held by a respondent intact before and after a particular environmental change.[7] On the other hand, our study considers the case in which respondents revise their information sets upon a change in experiences or menus.[8]

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[7] As in Huber, Payne, and Puto (1982), for example, the decoy alternative is obviously inferior to the target, and can be regarded as an irrelevant choice. Barbos (2010) proposes a theoretical model that account for the effect of inferior options on choice behavior.

[8] Luce (1959) presents a case where an additional option in a restaurant menu may

The paper is organized as follows. In Section 2, we briefly describe how the PEI works in Japan. Section 3 reports the results and estimation of the questionnaire survey in 2008. In Section 4, we explain how hypothetical choice menus are constructed in the 2009 follow-up survey. In Section 5, we investigate whether the background context effect is present by comparing the 2008 and 2009 surveys, and whether the local context effect is significant by analyzing how households responded to an irreversible sequence of alternative choice menus of insurance. Section 6 explores policy implications from our exercise particularly in the context of the choice architecture.

2. Public earthquake insurance in Japan

As explained in the Introduction, standard fire insurance policies offered by private non-life insurance companies do not cover damage resulting from a natural disaster such as an earthquake, volcanic eruption, or tsunami. In 1966, the PEI program was introduced to compensate for the absence of private coverage for fire damage caused by natural disasters.

This public program has the following features.[9] First, a PEI contract is not offered alone, but is provided as an option with a private fire insurance policy. That is to say, one cannot purchase PEI alone. Second, it covers both structural damage and damage to household goods. The coverage is up to a half of that in a master policy for fire insurance. The maximum benefit is 50 million yen for housing construction and 10 million yen for household goods, respectively. Third, PEI covers damage from both fire and collapse due to an earthquake, whereas master insurance covers only fire damage.

The PEI scheme falls under the public earthquake insurance law as follows. The national government and private non-life insurance companies jointly manage the reinsurance part of this scheme, while private insurance companies are responsible for

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bring about more information concerning the overall quality of a chef at the restaurant. Prelec, Wernerfelt, and Zettenmeyer (1997) present an experimental study in which decision makers make inferences about their own preferences from what is available in a given choice menu.

[9] The Non-Life Insurance Rating Organization of Japan (2008) illustrates the practice of the PEI program of Japan in detail. Saito (2002) and Sato (2009) discuss the economic role played by the PEI system in sharing natural disaster risks. Froot (1999) presents several cases in which a reinsurance capacity for natural disaster insurance is supported by a public program in the U.S.

selling earthquake insurance contracts when marketing their fire insurance products. The private insurance companies deposit the premiums they collect from households in both their own accounts and a special government account after deducting operational costs. They are not allowed to earn profit under the nonprofit principle, which is stipulated by the law. In March 2010, the total outstanding reserves of the private insurance companies amounted to 969 billion yen, while the governmental special account had accumulated 1.260 trillion yen.

In the reinsurance scheme, the private insurance companies offer protection against lower-layer risks, while the government provides the capacity for higher-layer risks. More specifically, the insurance companies are solely responsible for a low layer to 115 billion yen. For a medium layer between 115 billion and 1.925 trillion yen, the government and insurance companies divide the payment obligation into halves. For a high layer between 1.925 and 5.5 trillion yen, the government bears 95 percent of the payment burden, and the insurance companies share only five percent. For example, in the case of the Southern Hyogo Earthquake (Hanshin-Awaji Earthquake), the government bore 177.5 billion yen, and the private insurance companies shared 292.5 billion yen.

Under the above scheme, the layer above 5.5 trillion is not covered at all. This ceiling corresponds to the projection of the total payment obligation when there is an earthquake equivalent to the Great Kanto Earthquake in terms of physical damage.[10] When the payment obligation exceeds the outstanding amount of the special account, the government can issue public bonds to finance the resulting deficits under the PEI law.

The insurance premium is basically set by individual prefectures. That is, the premium reflects an interprefectural difference in earthquake risk, but no intraprefectural difference. More specifically, the premium is classified into four grades according to the historical frequency of earthquakes in each prefecture. For example, prefectures such as Tokyo and Shizuoka, where a severe earthquake is expected to occur in the near future, is classified as fourth grade or the highest degree of risk.

The premium also depends on whether housing is constructed of wood (more expensive) or nonwooden materials. In addition, premiums are discounted by 10

[10] Note that the payment schedule along with the ceiling applies to one earthquake event. An earthquake that occurs more than 72 hours after the initial event is counted as another event.

percent when an insured house was built after 1981, when a new construction code was enforced, and by as much as 30 percent when a property is highly earthquake resistant. With respect to a house built in the fourth grade area after 1981, the annual insurance premium for coverage of 10 million yen is 16,900 yen for buildings of nonwooden construction and 31,300 yen for those of wooden construction as of 2009. Once the risk is switched from the fourth grade to the first, the premium is reduced to 5,000 yen for a nonwooden house and 10,000 yen for a wooden one.

Due to the publicly supported reinsurance capacity and a nonprofit principle, PEI premiums are rather inexpensive relative to underlying risk from an actuarial perspective.[11] In addition, most of the annual premium is deductible from national and local taxation. Nevertheless, as our 2008 survey shows, it has not been recognized among households that the premium is much less expensive than those on a commercial basis, and that it is mostly deductible from annual income. Consequently, on the national average, only 23 percent of households purchased PEI in 2009, although the participation ratio among households increased slowly from 12 percent in 1995 and 16 percent in 2001. The ratio of private fire insurance policies supplemented by PEI was 34 percent in 2001 and 47 percent in 2009.

Below, we investigate the kinds of factors that may be responsible for the abovementioned unpopularity of the PEI, and the kind of mild intervention that may promote participation in the scheme.

3. Demand for PEI: An analysis of the 2008 survey

3.1. An overview of the 2008 survey

As mentioned in the Introduction, in December 2008 we conducted a questionnaire survey of 2,553 house-owning households[12] that responded through a website. The questions covered their socioeconomic characteristics such as income, financial wealth, and age of housing. Some questions to ascertain the respondents' knowledge and perceptions of PEI were also included. We entrusted the Nomura Research Institute (NRI) with conducting the internet-based survey mainly because the NRI had a relatively large nationwide panel of households with a reasonable

[11] The premium for PEI is computed as an actuarially fair value under the assumption that government finances will suffer losses over a long period of time.

[12] In addition to 2,553 house owners, the 2008 questionnaire survey included 828 lessee householders, who were asked whether they had purchased PEI for household goods, but the current study excludes them from the sample.

proportion of high-income earners.

According to the 2008 survey, the sample house owners did not participate actively in the PEI scheme. Only 31 percent of the sample households held PEI for a residential building. Participation in the PEI program increases with household income. The participation ratio for the annual income class below 2.5 million yen (between 2.5 and 5 million yen) is 11.6 percent (19.7 percent), much lower than the average rate of 31 percent.

The participation rate also depends on the age and resistance to seismic intensity of houses. Only 17 percent of houses built prior to 1981 were insured under the public program; the participation rate is even lower, at eight percent, for houses built before 1960. On the other hand, 34 percent of houses constructed after 1981 were insured under PEI.

However, such a low participation rate does not necessarily imply that the sample households were not aware of earthquake risks. Among the respondents, 31 percent thought that a large-scale earthquake was likely, while 48 percent thought that it would probably occur. That is, about four out of five households took the likelihood of a large-scale earthquake into consideration. Reflecting such considerable concern over earthquake risks, even 48 percent of those who did not hold a PEI policy wished they did, while only 17 percent did not think it necessary. The remainder did not consider the public program to be necessary.

The 2008 survey asked those who did not join the PEI program why they did not wish to. Each respondent was allowed to choose multiple responses. Half believed that the insurance premium was too expensive, and another quarter felt that it was a little expensive. This tendency is even stronger among those with lower incomes. As another reason for not purchasing the PEI, 22 percent considered coverage provided by the program rather insufficient because only half the value of a master fire insurance policy could be covered; those with higher incomes tended to feel this way.

For both holders and nonholders of PEI, the survey asked about alternative tools to insure against possible damage resulting from a large-scale earthquake, including public aid, withdrawal from deposits, borrowing, and family support; each respondent was allowed to choose two alternatives. Among PEI policyholders, 80 percent considered PEI a primary tool, and only 22 percent expected to rely on public relief programs. Among the nonholders, on the other hand, 32 percent depended on public aid, and 64 percent considered relying on their own savings as their main instrument.

The 2008 survey also asked the respondents about their understanding of how the PEI program worked. About 80 percent of the respondent house owners showed a relatively good understanding that a standard private fire insurance policy cannot cover earthquake damage. However, the sample householders did not fully understand how the program compensates for the absence of private coverage. For example, only 38 percent of the householders in the sample knew that the insurance premium was largely at a bargain level thanks to public assistance. More than 50 percent of the entire sample did not know that the premium was substantially discounted for earthquake-resistant houses, or that the premium was income tax deductible.

In the final section of the 2008 survey, we asked respondents whether they had improved their understanding of PEI through participating in the 2008 questionnaire. Among those who did not have PEI, 76 percent felt that their understanding had been improved. What is more, 70 percent of those who understood better were more interested in participating in the PEI program. In Section 5, we exploit a change in perceptions of PEI that were driven by the questionnaire experience to identify whether the background context effect influences choice behavior for earthquake insurance.

3.2. Estimation results from probit analysis

In this subsection, we explore which factor is responsible for holding a PEI policy using a probit specification. To focus on choice behavior for PEI, we exclude the house owners who held earthquake mutual insurance policies offered by the agricultural cooperative association. The sample size is thus reduced slightly from 2,553 to 2,397.

A dependent variable takes a value of one if a respondent held insurance, and is otherwise zero. A set of explanatory variables were included as household characteristics: the age of the head of household, the log of annual income, the log of balance of financial assets, and the presence of a housing loan. We employ some variables to represent earthquake resistance of housing, including a dummy variable for wooden structure, one for the age of a house (one for a house built prior to 1981 or under the old building code), and the degree of prefectural risk measured between one (safest) and four (highest risk).

For the variables associated with *ex post* financing of earthquake damage, we adopt a series of Yes (1)/No (0) answers to questions such as whether a respondent

plans to withdraw funds from deposits, whether he/she expects public assistance, and whether he/she understands how the public disaster relief program works. For the last question, we note that the public program is not very generous; the current disaster relief program operated by the central government [13] provides only a maximum of three million yen for earthquake victims who plan to rebuild damaged houses.

In addition, explanatory variables include Yes (1)/No (0) answers to questions such as whether a respondent feels that the PEI premium is too high, whether the respondent or family members have ever experienced large-scale earthquakes in the past, and whether he/she expects an earthquake to occur in the near future.

We make one comment on a peculiar feature of housing loans. The standard type of housing loan in Japan is a recourse loan rather than a nonrecourse loan. Accordingly, even if a collateralized house is severely damaged by a natural disaster, a debtor is still obliged to repay the outstanding loan. That is, a debtor is forced to bear all disaster risks. In this special respect, a household with a housing loan may have stronger demand for natural disaster insurance.

Table 1 reports the estimation result for the probit model analysis. The estimated coefficients for all explanatory variables except past experience are statistically significant at either the one or five percent levels.

The probability of holding PEI increases with both household income and financial wealth. That is, rich households had strong demand for earthquake insurance. Stronger demand among households with housing loans is consistent with the abovementioned fact that in Japan a housing loan is of the recourse type.

Households in places with higher risk had stronger demand for the insurance. The estimated coefficient on the cross-term of the degree of land risk and a dummy variable for wooden construction, however, imply that a householder owning a wooden house in a place with greater risk yielded weaker demand for the insurance. Householders who built a house prior to 1981 also had less demand for insurance. As mentioned in Section 2, insurance premiums are more expensive for wooden buildings and old houses. Thus, these estimation results may be interpreted to mean that costly premiums depress insurance demand to some extent. Another interesting finding is that insurance demand depends strongly on concerns about future

[13] In addition to the central government program, local governments offer disaster victims similar financial assistance. See the Cabinet Office (2009) for details of several versions of the government disaster relief program.

earthquakes, but not on past experiences of family members.

In terms of *ex post* financing of repairs to earthquake damage, householders who planned to cover damage by withdrawal from deposits had weaker demand for earthquake insurance. That is, self-insurance works as a substitute for earthquake insurance. Householders who prefer to rely on public assistance also yielded weaker demand. This result may imply that a form of time inconsistency problem impedes the development of the PEI program.

Those who had a good understanding of how the public disaster relief program worked tended to prepare for earthquakes by purchasing insurance. This result may indicate that such households recognized a severe limitation of the public program, and wanted to compensate for financial shortages by holding earthquake insurance. In this regard, those who understood the public programs correctly behaved quite differently from those who expected public assistance in a vague manner.

From the viewpoint of our study, one of the most important estimation results is that those who felt that the PEI premium was too expensive were less likely to hold it. Their perception of insurance costs is somewhat groundless because the premium is cheap relative to the underlying risks, mainly because of both the nonprofit principle and public involvement in the reinsurance scheme. Conversely, once the above misperception of insurance costs is corrected by some form of intervention, potential demand for earthquake insurance may be realized.

4. The 2009 questionnaire survey

4.1. A sequence of choice menus

Using the identical sample of 2,397 house owners used in the 2008 survey,[14] we conducted an internet-based questionnaire survey in November 2009.[15] To identify the context effect in insurance choice, the 2009 survey focused purely on how respondents changed their choice of earthquake insurance in response to a variation between one hypothetical choice menu and another. The choice menu included not only PEI, but also a hypothetical private earthquake insurance contract with a list of insurance premiums.

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[14] For the same reason as above, we exclude from the sample the respondent householders who held an earthquake mutual insurance contract offered by the agricultural cooperative association.

[15] The NRI was again entrusted with conducting the 2009 survey.

As described in detail in the next subsection, we computed a respondent-specific premium for PEI as realistically as possible by exploiting the household information we obtained through the 2008 survey. For a hypothetical private earthquake insurance contract, we referred to the premiums of the earthquake insurance products sold by two major non-life insurance companies. We also computed a premium for a hypothetical public earthquake insurance contract by making some heroic assumptions.

A basic idea in our study was to pin down the background context effect by a difference in choice behavior between the 2008 and 2009 surveys, and to identify the local context effect by the change in choice behavior between hypothetical choice menus.

For this purpose, we prepared a sequence of choice menus as follows. The **first choice menu** offered to a respondent in that sequence includes a private fire insurance contract with coverage of 20 million yen, and PEI with coverage of 10 million yen as an option. As mentioned in Section 2, PEI can provide only half the coverage of a master fire insurance contract, while it covers damage not only from fire, but also from collapse.

The menu was offered to each respondent together with a list of insurance premiums. We could compute quite a realistic list of respondent-specific insurance premiums for both a private fire insurance contract and PEI by exploiting the household information obtained through the 2008 survey. Once the first choice menu was presented, each respondent household was asked to choose either (1) only private fire insurance, (2) both private fire insurance and PEI, or (3) neither.

We consider that the menu presented to respondents in the 2009 survey is quite similar to that faced by a typical consumer when considering choosing PEI. As mentioned in the Introduction, in Japan private insurance companies are not greatly interested in selling their own earthquake insurance products to households, and they carry only a rather modest range of earthquake insurance products for consumers. Accordingly, they often only offer consumers PEI as a possible option for earthquake insurance.

The 2008 survey shows whether each respondent householder actually held PEI as of December 2008. Therefore, by comparing the two surveys, we can observe changes in respondent households' choice behavior regarding PEI between December 2008 and November 2009. We attribute a change in the choice behavior between 2008

and 2009 to respondents' experiences in the intervening period. Such experiences include responding to the 2008 survey. In this way, we may identify the **background context effect** through comparison of the 2008 and 2009 surveys.

In the second to the fourth choice menus, we included hypothetical private earthquake insurance contracts as additional options, and even a hypothetical public earthquake insurance contract in the fourth menu. The **second choice menu** added a hypothetical private earthquake insurance contract with coverage of 10 million yen for fire/collapse damage resulting from earthquakes as an additional choice. That is, such a hypothetical private earthquake insurance contract differs from the PEI only in terms of premiums, and holding both public and private insurance provides full coverage, or 20 million yen, for earthquake damage. As discussed in the next subsection, we computed a premium for the above hypothetical insurance contract as realistically as possible. Without public subsidy, the hypothetical private earthquake insurance is much more expensive than PEI.

Once the second choice menu was presented, each respondent household was asked to choose either (1) private fire insurance only, (2) both private fire insurance and PEI, (3) private fire insurance, PEI, and the hypothetical private earthquake insurance, or (4) no insurance. Given the price advantage of PEI, there was no reason to believe that respondents were interested in private fire and earthquake insurance contracts without PEI.

The inclusion of the above hypothetical private insurance yields two possible effects in terms of earthquake insurance choice. First, by comparing premiums for public and private earthquake insurance, consumers may recognize that PEI is indeed cheap relative to the private alternative. That is, if a consumer initially believes that PEI is costly, he/she may revise this initial belief immediately after observing a list of premiums, and reconsider purchasing it. In this regard, we are particularly interested in respondent householders who did not choose PEI from the first choice menu but did so from the second as convincing evidence for the **local context effect**.

Second, private earthquake insurance compensates for insufficient coverage provided by PEI. Consequently, its inclusion may realize potential demand for private earthquake insurance. In this regard, we are particularly interested in respondent householders who chose both public and private earthquake insurance from the second choice menu. We call the potential impact of a choice menu a **market-enhancing effect**. Such effects have nothing to do with context effects, but

may be significant for Japanese private insurance companies that have been fairly passive in the market for natural disaster insurance for households.

In constructing the third and fourth choice menus, we consider private and public earthquake insurance contracts covering damage from fires but not collapse. A major reason for this consideration is that consumers who purchase private fire insurance contracts may only be interested in cover for fire damage resulting from earthquakes, and an insurance contract with excessive coverage may hinder the choice of earthquake insurance.

In the **third choice menu**, a hypothetical private earthquake insurance contract covers only fire damage. It is assumed that a consumer must hold this private insurance together with PEI against earthquake risk, and cannot purchase private insurance alone. As described below, we could compute a premium for the above hypothetical private insurance as realistically as possible.

Once the third choice menu was presented, each respondent household was asked to choose either (1) private fire insurance alone, (2) both private fire insurance and PEI, (3) private fire insurance, PEI and hypothetical private earthquake insurance, or (4) no insurance. The menus were constructed in such a way as to prevent respondents from choosing private fire and earthquake insurance contracts only.

In this choice menu, consumers could consider private earthquake insurance with moderate coverage a reasonable choice, and be interested in it. In other words, potential demand for private earthquake insurance is more likely to be realized. We also consider this impact of a choice menu a market-enhancing effect.

The **fourth choice menu** excludes PEI from the third choice menu, and instead includes a hypothetical public earthquake insurance contract that covers only fire damage. That is, in the fourth choice menu, not only private but also public insurance covers only fire damage resulting from earthquakes.

Once the fourth menu was presented, respondent households were asked to choose either (1) private fire insurance only, (2) both private fire insurance and the hypothetical public earthquake insurance, (3) private fire insurance, hypothetical public earthquake insurance, and the hypothetical private earthquake insurance, or (4) no insurance. Given the price advantage of the hypothetical public earthquake insurance, there was no reason to believe that respondents were interested in holding private fire and earthquake insurance only.

In this case, a consumer who does not purchase PEI from the first choice menu

may be interested in purchasing the above hypothetical public earthquake insurance not only because the premium is reasonable, but also because of its coverage. Here, we have an opportunity to identify both local context effects and market-enhancing effects.

To identify local context effects and market-enhancing effects as precisely as possible, we constructed the 2009 questionnaire survey so that a series of choice menus was offered to each respondent in a fixed sequence. That is, respondents could not jump back to any question they had already answered.

4.2. Computation of insurance premiums

We now describe how the premiums for fire and earthquake insurance contracts, including hypothetical ones, are calculated. We assume that the benefits of fire and earthquake insurance contracts included in each choice menu are uniform among respondent households. Specifically, the benefit from private fire insurance is 20 million yen, while that of any kind of earthquake insurance is 10 million yen. That is, the PEI covers the first 10 million yen, and a hypothetical private earthquake insurance contract is responsible for another 10 million yen.

We referred private insurance premiums to Tokyo Marine Nichido Fire and Marine Insurance (Tokyo Marine) and Sompo Japan Insurance (Sompo Japan), two major Japanese insurance companies. The fire insurance market is quite competitive, and there is no significant difference in premiums between the two insurance companies. A fire insurance premium is determined according to whether a residential building is wooden or nonwooden, and if wooden, whether it is fireproof,[16] and if nonwooden, whether it is a detached house or condominium. Thus, there are four premium patterns in private fire insurance.

Under PEI, on the other hand, a premium depends mainly on whether a residence is wooden or nonwooden, and whether it was built prior to or after 1981 (when the new building code came into effect). In addition, a premium is classified into four grades, from Grade 1 (least risk) to Grade 4 (greatest risk), depending on the prefecture in which the residence is located.[17] Therefore, there are sixteen premium patterns in PEI.

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[16] A wooden 2 × 4 structure is regarded as fireproof.

[17] To be precise, the insurance premium for PEI differs slightly among prefectures with the same degree of risk. We apply the insurance premium for the most populous prefecture. For example, the premium for Tokyo is applied to Grade 4 prefectures, while the premium for Saitama/Osaka is applied to Grade 3 prefectures.

It is relatively easy to compute a premium for both private fire insurance and PEI for each respondent household by exploiting the household information obtained through the 2008 survey.

The more difficult part is to compute premiums for hypothetical private earthquake insurance contracts. As mentioned in the Introduction, Japanese non-life insurance companies have only a modest range of earthquake insurance products for households, and they market these products mainly in the Tokyo metropolitan area. It is thus extremely difficult to compute premiums for private earthquake insurance contracts for the sample of respondent households located throughout Japan.

Here, we use two earthquake insurance products as a reference point, one provided by Tokyo Marine and the other by Sompo Japan. Tokyo Marine sells an earthquake insurance policy that covers both fire and collapse damage in Tokyo. Given limited information, we assume that premiums for insurance products depend on whether a residential building is wooden or nonwooden, whether it was built under the old building code or the new one, and if wooden, whether it is fireproof.

Sompo Japan markets a different type of earthquake insurance in Tokyo, covering only fire damage resulting from earthquakes. Here, we assume that the premium for this insurance depends mainly on whether the structure is fireproof. Both the Tokyo Marine and Sompo Japan products assume that the policyholder participates in the PEI program.

We make a large assumption in computing insurance premiums for private earthquake insurance products sold in prefectures other than Tokyo. That is, we assume that the premium for a private earthquake insurance contract differs to the same extent as that for PEI among prefectures, from Grade 1 to Grade 4. For example, for a nonwooden (wooden) house, the PEI premium in Fukushima (Grade 1) is 30 percent (32 percent) of that in Tokyo (Grade 4 prefecture). Accordingly, we multiply the premium of the above products sold in Tokyo by 0.3 (0.32) to compute a premium for a nonwooden (wooden) house located in Fukushima.

How can we calculate the premium for a hypothetical public earthquake insurance contract covering only fire damage? For this purpose, we again make rather generous assumptions. We assume that for identical coverage, the ratio of a public relative to a private premium is constant among all types of earthquake insurance. In our context, the fixed ratio can be computed from PEI premiums and the Tokyo Marine product, both of which cover fire and collapse damage.

For example, in the case of a nonwooden (wooden) house in a Grade 4 prefecture such as Tokyo, the premium for PEI is 56 percent (61 percent) that of the Tokyo Marine product. Then, we multiply the premium for the Sompo Japan product covering only fire damage by 0.56 (0.61), thereby computing a premium for a hypothetical public earthquake insurance contract with the same coverage. In addition, we assume that the prefectural relative difference in premiums is identical between actual PEI and the above hypothetical public earthquake insurance.

Table 2 summarizes the pattern of annual insurance premiums for public and private fire/earthquake insurance. Table 3 reports a sequence of choice menus in the case where a house is detached, wooden, fireproof, built under the new building code, and located in a Grade 4 prefecture.

According to Table 3, in the first choice menu private fire insurance with 20 million yen coverage costs 20,000 yen per year, while PEI with 10 million yen coverage costs 28,200 yen. When the first menu is offered, a respondent may gain the mistaken impression that PEI is more expensive with less coverage by comparing private fire insurance and PEI. In the second choice menu, however, a respondent recognizes that PEI (28,200 yen per year) is much less expensive than the hypothetical private earthquake insurance (50,400 yen per year). When the first menu is replaced by the second, respondents who believe that PEI is too expensive may reconsider their previous judgment. In this study, such a behavioral change is interpreted as evidence for the local context effect.

5. Identification of context effects and market-enhancing effects: An analysis of the 2009 survey

5.1. Evidence for background context effects

Of the 2,397 house-owning householders who responded to the 2008 survey, 2,047 respondents participated in the 2009 questionnaire survey. Let us first compare the 2008 and 2009 surveys. As discussed in the previous section, we attribute the observed differences in the choice behavior regarding the PEI to experiences in the corresponding period, including the respondents' participation in the 2008 survey. Through such a comparison, we may identify the background context effect.

Among the 2,047 respondents who participated in both the 2008 and 2009 surveys, 34 percent, or 693 households, actually held PEI in December 2008.

Responses to the first choice menu in the 2009 survey reveal that 49 percent or 994 households preferred PEI in November 2009. Although the 2009 questionnaire only asked about possible preference, not actual holdings, the above comparison implies that preference for PEI was much stronger among respondent householders.

According to Table 3, 21 percent of the sample of 1,354 households that did not hold PEI in December 2008 revealed a preference for PEI in the 2009 survey. The number of respondents who adopted it (428 households) is much greater than the number of respondents who abandoned it (127 households).

To focus on the effect of the survey experience on choice behavior, we conducted a probit analysis for choice behavior regarding PEI using the 2009 survey data. In addition to a nearly identical set of explanatory variables as before, we adopted a dummy variable for whether a respondent had improved his/her understanding of PEI through their participation in the 2008 survey.

Table 5 reports the estimation results of the probit analysis. The estimation results are generally comparable to those of the probit analysis of the 2008 survey. However, we observe the following differences.

First, the choice probability does not increase, but decreases with the degree of earthquake risk. It indicates that prefectural differences in earthquake risk, which is the most important determinant of premiums, may dampen insurance preferences as a substantial cost factor. Second, choice probability no longer depends on the age (old or new building codes) or construction (wooden or nonwooden) of a house. Third, choice probability shows no statistically significant increase with financial wealth. Fourth, choice probability no longer depends on respondents' recognition of public disaster relief. It may be inferred that most respondents had already recognized such public assistance by responding to the 2008 survey.

One of the most important findings is that choice probability increases with a respondent's knowledge of PEI. According to Table 5, the probability increases by about 11 percent with a better understanding of insurance products. We may interpret this finding as evidence for the background context effect.

5.2. Evidence for local context effects and market-enhancing effects

We now carefully examine the difference in choice behavior regarding earthquake insurance among various choice menus. Among the 2,047 householders who responded to a fixed sequence of choice menus in the 2009 survey, 994 or 49 percent

revealed a preference for PEI as an option to private fire insurance. On the other hand, 38 percent (768 respondents) revealed a preference for private fire insurance alone, and 14 percent (285 respondents) were not interested in either.

Given the second choice menu including as an additional option hypothetical private earthquake insurance against both fire and collapse damage, some of the respondents who were not interested in PEI in the first choice menu revealed a preference for it. Specifically, according to Table 6-1, 20 percent (155 respondents) of the households (768 respondents) expressed a preference for the public program. Among these, 44 respondents were also interested in the hypothetical private earthquake insurance.

As suggested in the previous sections, inclusion of the hypothetical private earthquake insurance would allow each respondent to reconsider the PEI as a reasonable insurance instrument. We interpret this finding as evidence for the local context effect in insurance choice.

We also observe the market-enhancing effect from a difference in the behavior between the first and second choice menus. Among those who revealed a preference for PEI in the first choice menu (994 respondents), 26 percent (263 respondents) also revealed a preference for a hypothetical private earthquake insurance in the second. As mentioned above, 44 respondents who were not interested in PEI in 2008 revealed a preference for the private policy in the second choice menu. These findings suggest that a change in choice menus generates potential demand for private products.

There were 33 respondents who abandoned PEI. Because it is difficult to rationalize such behavior, we exclude those respondents from estimation exercises. The same treatment was applied to the responses to the third and fourth choice menus.

Because the respondent households responded to the third choice menu after the second choice menu, they had already understood that PEI was quite reasonable relative to the hypothetical private policy with the same coverage. Thus, the local context effect is expected in the third choice menu. The local context effect is indeed slightly stronger in the third choice menu than in the second choice menu. According to Table 6-2, the number of respondents joining the public program increased from 155 to 193 (including those who were considering even a private policy).

In the third choice menu, the hypothetical private earthquake insurance contract covers only fire damage. With such modest coverage of a private insurance, the market-enhancing effect is expected to be stronger for private insurance products.

According to Table 6-2, among the respondents interested in PEI in the first choice menu, those who revealed a preference for private insurance increased from 263 (in the second choice menu) to 370.

In the fourth choice menu, even public earthquake insurance is hypothetical in the sense that it is assumed to cover only fire damage. Thus, by observing the response to the fourth choice menu, we can explore whether the market-enhancing effect works for both private and public products with such modest insurance coverage. According to Table 6-3, the number of respondents who adopted public products increased from 155 (in the second choice menu) or 193 (in the third choice menu) to 338 (including those who were considering even a private policy). On the other hand, the total number of respondents who revealed a preference for private earthquake insurance increased from 313 (in the second choice menu) or 449 (in the third choice menu) to 634.

5.3. Estimation results based on the multinominal logit model

In this subsection, we explore changes in choice behavior in earthquake insurance between choice menus using a multinominal logit model. We specify four alternatives for each set of choice menu items as follows.

(i) First alternative: A respondent who revealed a preference for PEI in the first choice menu, and who chose both PEI and private earthquake insurance from the second, third, or fourth choice menu.
(ii) Second alternative: A respondent who revealed a preference for PEI in the first choice menu, and who chose only PEI from the second (third or fourth) choice menu.
(iii) Third alternative: A respondent who revealed no preference for PEI in the first choice menu, but did so in the second (third or fourth) choice menu.
(iv) Fourth alternative: A respondent who revealed no preference for PEI in either choice.

Here, the fourth alternative is set as a reference.

As mentioned above, for the purpose of estimation we exclude those respondents who revealed a preference for PEI in the first choice menu, but not in subsequent choice menus. In addition, we exclude any observation with missing explanatory

variables.[18] We employ the same set of explanatory variables as in Section 5.1. However, we exclude the dummy variable for recognition of public disaster relief, because most respondents who completed the 2008 survey had already recognized public assistance to some extent.[19] The estimation results are reported in Tables 7-1 to 7-3.

Before discussing the estimation results, we remark that the multinominal logit model is the proper specification in our context. In the main text, we employ the multinominal logit specification in which each alternative is independent. In the appendix, we consider sequencing, by which the second (third or fourth) choice menu appears after the first choice menu using the nested logit model. Specifically, for the second and third choice menus, the first and second alternatives are classified into one group where a respondent is interested in PEI in the first choice menu, while the third and fourth alternatives are categorized into another group where respondents are not at all interested. As shown in the appendix, the multinominal logit model as a null hypothesis cannot be rejected against that of a nested specification.

For the fourth choice menu, on the other hand, the first to third alternatives are categorized into one group in the nested logit model. The reason for this specification is that the hypothetical public earthquake insurance at the second stage differs from PEI at the first stage, and there is no reason to classify the four alternatives in a hierarchical manner depending on the choice behavior at the first stage. As shown in the appendix, the multinominal logit model as a null hypothesis cannot be rejected against the above nested specification as an alternative hypothesis.

Let us begin with the estimation results based on the behavior in the second choice menu (see Table 7-1). It is possible to infer the local context effect from the estimated coefficients for the third alternative. One of the most appealing findings for the local context effect is that it is strong among those who felt that PEI was costly when they responded to the 2008 survey. In addition, the local context effect is also significant among those who were younger, expected public assistance in the case of an earthquake, or planned to compensate for earthquake damage from savings. Another important finding is that the local context effect does not depend on respondents' wealth; that is, the local context effect seems to work across income classes.

The estimated coefficients associated with the first alternative, on the other hand,

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[18] There are 11 observations from which the financial balance is missing.
[19] An estimation procedure often fails to converge once this dummy variable is included in a list of explanatory variables.

suggest a market-enhancing effect or the realization of potential insurance demand. According to Table 7-1, the market-enhancing effect is strong among those who expected an earthquake in the near future. It is also significant among old and wealthy respondents. Conversely, the market-enhancing effect is weak among those who expected public assistance in the event of a crisis, relied on self-insurance, or lived in a wooden house.

As Table 7-2 shows, the estimation result based on behavior in the third choice menu is similar to that reported in Table 7-1. One important difference is that the market-enhancing effect is even stronger, with more significant coefficients associated with the first alternative. Unlike the result in Table 7-1, the market-enhancing effect is present among those who held housing loans, or whose house was built under the old building code. Another notable finding is that the local context effect is much more obvious in the estimated coefficient for the third alternative. That is, almost independently of household characteristics, the local context effect appears only among those who felt that a PEI contract was too costly.

As discussed in the previous section, from the choice behavior in the fourth choice menu, we can infer a market-enhancing effect for not only private but also public products. According to Table 7-3, the estimated coefficients associated with the first and third alternatives, if significant, are larger in most cases than those reported in Table 7-1, implying that the market-enhancing effect is stronger with modest coverage in both private and public insurance products. One interesting finding is that stronger demand for the hypothetical public earthquake insurance with coverage for fire damage alone is realized among those living in wooden houses.

6. Conclusion

One of the most important findings is that PEI and private earthquake insurance products work in a complementary manner. From a private product in a choice context, a consumer properly recognizes the relative advantage of PEI in terms of its premium. Comparison of PEI and the private product disproves a consumer's belief that PEI is too expensive. Adding private insurance products to an existing menu, on the other hand, compensates for the insufficient coverage of PEI, thereby realizing potential demand for earthquake insurance.

In addition, the above market-enhancing effect is further amplified by proper

insurance coverage. According to our findings, there seems to be strong demand for coverage against fire damage, but not collapse damage. From the behavioral change observed in the two surveys, we also find that greater demand is likely to be realized with better learning experiences.

From a normative perspective, our study uses context effect as a policy instrument to nudge consumers toward better decisions. That is, a proper combination of public and private insurance presented in a menu would aid in realizing potential insurance demand. In this sense, what we have demonstrated here may be regarded as an example of the choice architecture proposed as an effective policy tool by Thaler and Sunstein (2009). The contribution of our paper is the application of context effects, which have been employed intensively in marketing practice, to the choice architecture, for which previous studies have used default options, reference dependence, and framing effects as driving policy instruments.[20]

What is more important, our case does not yield any adverse effects on market activities. As pointed out by Carlin, Gervais, and Manso (2009), the choice architecture such as setting default options may slow information aggregation among private agents. In our case, however, including additional options helps private insurance companies to develop markets activities. Consequently, private insurers themselves have a potential incentive to add their own products to choice menus. In this sense, it is not necessarily governments, but private agents that practice the choice architecture in our case.

What then are the policy implications from our empirical exercise? It may not be useful to expand the PEI program in terms scale and scope of coverage. Instead, there is ample room for private companies to compete to compensate for the insufficient coverage offered by PEI. With respect to scope, the current program seems to provide rather excessive coverage. The PEI program should add at least one alternative contract covering only fire damage resulting from an earthquake. With coverage of modest scale and scope, PEI would stimulate Japanese earthquake insurance markets in collaboration with a wide range of private products.

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[20] For example, Madrian and Shea (2001) show that the contribution rates in 401(k) depend on whether the default is nonparticipation or participation in retirement savings. As a survey by Krishna and Slemrod (2003) confirmed, Schelling (1981) attributes a difference in taxpayers' responses to tax exemption and tax surcharge to reference-dependence behavior, while Gourville (1998) indicates periodic tax payments over lump-sum tax payments as an example of framing effects.

Appendix: Estimation by the nested logit model

This appendix reports the estimation result based on the nested logit model in which the hierarchical nature of choice behavior is considered. First, we classify the four alternatives according to whether a respondent revealed a preference for PEI. That is, we classify the first and second alternatives into one group and categorize the third and fourth alternatives into another group. We call the former Group Y and the latter Group N.

For instance, the probability of participating in the PEI program in the first choice menu is formulated as follows.

$$P(Group\_Y) = \frac{\left[\exp\left(\frac{x\beta_1}{\rho}\right) + \exp\left(\frac{x\beta_2}{\rho}\right)\right]^{\rho}}{\left[\exp\left(\frac{x\beta_1}{\rho}\right) + \exp\left(\frac{x\beta_2}{\rho}\right)\right]^{\rho} + \left[\exp\left(\frac{x\beta_3}{\rho}\right) + 1\right]^{\rho}}$$

Similarly, the probability of not participating in the PEI program in the first choice menu is formulated as follows.

$$P(Group\_N) = \frac{\left[\exp\left(\frac{x\beta_3}{\rho}\right) + 1\right]^{\rho}}{\left[\exp\left(\frac{x\beta_1}{\rho}\right) + \exp\left(\frac{x\beta_2}{\rho}\right)\right]^{\rho} + \left[\exp\left(\frac{x\beta_3}{\rho}\right) + 1\right]^{\rho}}$$

If ρ is equal to one under the above specification, then the nested logit model is reduced to the multinominal logit model. Tables A-1 to A-3 report the estimation results.

According to these tables, the p value of the likelihood ratio test in which the null hypothesis is $\rho = 1$ is 86.1 percent for the second choice menu and 14.6 percent for the third choice menu, and thus the null hypothesis cannot be rejected for these cases. Moreover, if the parameter ρ is set differently for Groups Y and N, the p value of the likelihood ratio test in which the null hypothesis is $\rho_Y = \rho_N = 1$ is 21.9 percent for the second choice menu and 84.4 percent for the third choice menu. Again, the multinominal logit specification fails to be rejected. In sum, the multinominal logit model is the proper specification for the second and third choice menus.

On the other hand, the p value of the likelihood ratio test in which the null hypothesis is $\rho = 1$ is 0.06 percent for the fourth choice menu, and the null hypothesis is strongly rejected. Moreover, if a parameter ρ is set at different values for the two groups, the p value of the likelihood ratio test in which the null hypothesis is $\rho_Y = \rho_N = 1$ is 0.01 percent. Again, the null hypothesis is strongly rejected.

In the case of the fourth choice menu, however, the sequential nature disappears immediately after the actual PEI product is switched to a hypothetical one. Thus, we alternatively classify the first to third alternatives as Group Y, and the fourth alternative as Group N. That is, the probability of belonging to Group Y is formulated as follows.

$$P(Group\_Y) = \frac{\left[\exp\left(\frac{x\beta_1}{\rho}\right) + \exp\left(\frac{x\beta_2}{\rho}\right) + \exp\left(\frac{x\beta_3}{\rho}\right)\right]^{\rho}}{\left[\exp\left(\frac{x\beta_1}{\rho}\right) + \exp\left(\frac{x\beta_2}{\rho}\right) + \exp\left(\frac{x\beta_3}{\rho}\right)\right]^{\rho} + 1}$$

Similarly, the probability of belonging to Group N is formulated as follows.

$$P(Group\_N) = \frac{1}{\left[\exp\left(\frac{x\beta_1}{\rho}\right) + \exp\left(\frac{x\beta_2}{\rho}\right) + \exp\left(\frac{x\beta_3}{\rho}\right)\right]^{\rho} + 1}$$

If ρ is equal to one under the above specification, the nested logit model is reduced to the multinominal logit model. As Table A-4 reports, the p value of the likelihood ratio test in which the null hypothesis is $\rho = 1$ is 74.9 percent, and the null hypothesis cannot be rejected.

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Table 1: Estimation results of a probit specification for the 2008 questionary

	Parameter estimates		Estimated marginal effects	
A dummy of a household with a housing loan	0.3796	***	0.1329	***
	(0.0648)		(0.0225)	
Constucted under the old building code	-0.2075	**	-0.0700	**
	(0.0877)		(0.0283)	
Having earthquake experiences	0.0222		0.0078	
	(0.0737)		(0.0261)	
Expecting earthquakes in the near future	0.3765	***	0.1236	***
	(0.0766)		(0.0232)	
Covering losses by savings	-0.5251	***	-0.1881	***
	(0.0658)		(0.0237)	
Hoping for public assistance	-0.5007	***	-0.1650	***
	(0.0695)		(0.0211)	
Recognition of the public disater relief	0.7922	***	0.3058	***
	(0.2194)		(0.0842)	
Having sense of expensiveness in public insurance	-0.5044	***	-0.1847	***
	(0.0627)		(0.0235)	
Degree of land riskiness	0.1051	***	0.0369	***
	(0.0286)		(0.0100)	
Degree of land riskiness x Wooden house dummy	-0.0404	**	-0.0142	**
	(0.0175)		(0.0062)	
Age of a household head	0.0103	***	0.0036	***
	(0.0027)		(0.0009)	
Household income in logarithm	0.1515	***	0.0532	***
	(0.0551)		(0.0193)	
Household financial assets in logarithm	0.2429	***	0.0852	***
	(0.0615)		(0.0216)	
Constant	-3.5620	***		
	(0.4171)			
Number of sample	2036			
Chi-square statisitics	327.94			
(p-value)	0.0000			
Pseudo R-square	0.1086			

1. The standard errors are given in parentheses.
2. *, **, and *** indicate statistical significance at 10%, 5%, and 1% levels respectively.

Table 2: Pattern of annual premiums for public and private earthquake insurance

Pattern	Construction	Fireproof	Building Code	Land Riskiness	Private fire insurance premium for 20 mill. yen coverage	Public earthquake insurance premium for 10 mill. yen coverage		Private earthquake insurance premium for 10 mill. yen coverage	
						Covering both collapses and fire	Covering fire damges only	Covering both collapses and fire	Covering fire damges only
1	Wooden	Fireproof	Old	1	20,000	10,000	2,176	35,752	3,834
		Non-fireproof			30,800	10,000	3,253	35,752	5,815
2	Wooden	Fireproof	Old	2	20,000	12,700	2,829	45,404	4,869
		Non-fireproof			30,800	12,700	4,131	45,404	7,385
3	Wooden	Fireproof	Old	3	20,000	18,800	4,569	67,213	7,208
		Non-fireproof			30,800	18,800	6,116	67,213	10,932
4	Wooden	Fireproof	Old	4	20,000	31,300	7,354	111,902	12,000
		Non-fireproof			30,800	31,300	10,182	111,902	18,200
5	Wooden	Fireproof	New	1	20,000	9,000	2,176	16,087	3,834
		Non-fireproof			30,800	9,000	3,253	16,087	5,815
6	Wooden	Fireproof	New	2	20,000	11,430	2,829	20,431	4,869
		Non-fireproof			30,800	11,430	4,131	20,431	7,385
7	Wooden	Fireproof	New	3	20,000	16,920	4,569	30,244	7,208
		Non-fireproof			30,800	16,920	6,116	30,244	10,932
8	Wooden	Fireproof	New	4	20,000	28,170	7,354	50,354	12,000
		Non-fireproof			30,800	28,170	10,182	50,354	18,200
9	Non-wooden	Detached	Old	1	20,000	5,000	2,176	16,318	3,550
		Condominium			7,200	5,000	2,176	16,318	3,550
10	Non-wooden	Detached	Old	2	20,000	6,500	2,829	21,213	4,615
		Condominium			7,200	6,500	2,829	21,213	4,615
11	Non-wooden	Detached	Old	3	20,000	10,500	4,569	34,267	7,456
		Condominium			7,200	10,500	4,569	34,267	7,456
12	Non-wooden	Detached	Old	4	20,000	16,900	7,354	55,153	12,000
		Condominium			7,200	16,900	7,354	55,153	12,000
13	Non-wooden	Detached	New	1	20,000	4,500	2,176	7,343	3,550
		Condominium			7,200	4,500	2,176	7,343	3,550
14	Non-wooden	Detached	New	2	20,000	5,850	2,829	9,545	4,615
		Condominium			7,200	5,850	2,829	9,545	4,615
15	Non-wooden	Detached	New	3	20,000	9,450	4,569	15,419	7,456
		Condominium			7,200	9,450	4,569	15,419	7,456
16	Non-wooden	Detached	New	4	20,000	15,210	7,354	24,818	12,000
		Condominium			7,200	15,210	7,354	24,818	12,000

Table 3: An example of the annual premium pattern

(detached, wooden construction, fireproof, new building code, the riskiest area)

The first choice menu

Private fire insurance for 20 mill. yen coverage **20,000 yen**	Public earthquake insurance for 10 mill. yen coverage **28,200 yen**

The second choice menu: Both public and private earthquake insurance cover collapses as well as fire damages.

Private fire insurance for 20 mill. yen coverage **20,000 yen**	Private earthquake insurance for another 10 mill. yen **50,400 yen**
	Public earthquake insurance for 10 mill. yen coverage **28,200 yen**

The third choice menu: Public earthquake insurance covers collapses as well as fire damages, but private insurance covers fire damages only.

Private fire insurance for 20 mill. yen coverage **20,000 yen**	Private earthquake insurance for another 10 mill. yen coverage **12,000 yen**
	Public earthquake insurance for 10 mill. yen coverage **28,200 yen**

The fourth choice menu: Both public and private earthquake insurance cover fire damages only.

Private fire insurance for 20 mill. yen coverage **20,000 yen**	Private earthquake insurance for another 10 mill. yen coverage **12,000 yen**
	Public earthquake insurance for 10 mill. yen coverage **7,400 yen**

Table 4: A comparison between the 2008 and 2009 questionaries

		The 2009 questionary	
		Interested in participating	Not interested in participating
The 2008 questionary	Participants	**566 (27.7%)**	**127 (6.2%)**
	Non-participants	**428 (20.9%)**	**926 (45.2%)**

Table 5: Estimation results of a probit specification for the 2009 questionary

	Specification 1		Specification 2	
	Parameter estimates	Estimated marginal effects	Parameter estimates	Estimated marginal effects
A dummy of a household with a housing loan	0.2348 ***	0.0934 ***	0.2313 ***	0.0920 ***
	(0.0660)	(0.0261)	(0.0660)	(0.0261)
Constucted under the old building code	0.0674	0.0269	0.0711	0.0284
	(0.0841)	(0.0335)	(0.0842)	(0.0336)
Having earthquake experiences	-0.0112	-0.0044	-0.0080	-0.0032
	(0.0757)	(0.0302)	(0.0768)	(0.0306)
Expecting earthquakes in the near future	0.5249 ***	0.2032 ***	0.5275 ***	0.2041 ***
	(0.0760)	(0.0279)	(0.0762)	(0.0280)
Covering losses by savings	-0.2965 ***	-0.1179 ***	-0.2965 ***	-0.1179 ***
	(0.0664)	(0.0262)	(0.0664)	(0.0262)
Hoping for public assistance	-0.2661 ***	-0.1054 ***	-0.2652 ***	-0.1051 ***
	(0.0675)	(0.0265)	(0.0675)	(0.0265)
Recognition of the public disater relief	0.3145	0.1241	0.3129	0.1235
	(0.2401)	(0.0924)	(0.2404)	(0.0925)
Having sense of expensiveness in public insurance	-0.3032 ***	-0.1204 ***	-0.2999 ***	-0.1191 ***
	(0.0658)	(0.0259)	(0.0659)	(0.0259)
Degree of land riskiness	-0.0826 ***	-0.0329 ***		
	(0.0295)	(0.0117)		
Degree of land riskiness x Wooden house dummy	-0.0037	-0.0015		
	(0.0181)	(0.0072)		
Land riskiness 2 (moderately safe)			-0.1144	-0.0455
			(0.1081)	(0.0429)
Land riskiness 3 (moderately risky)			-0.2258 **	-0.0893 **
			(0.1148)	(0.0449)
Land riskiness 4 (risky)			-0.2744 ***	-0.1090 ***
			(0.1010)	(0.0399)
Wooden house			-0.0351	-0.0140
			(0.0595)	(0.0237)
Age of a household head	0.0083 ***	0.0033 ***	0.0083 ***	0.0033 ***
	(0.0027)	(0.0011)	(0.0027)	(0.0011)
Household income in logarithm	0.1515 ***	0.0604 ***	0.1517 ***	0.0605 ***
	(0.0551)	(0.0219)	(0.0551)	(0.0219)
Household financial assets in logarithm	0.0785	0.0313	0.0774	0.0309
	(0.0626)	(0.0250)	(0.0626)	(0.0250)
Improved understanding of public insurance due to the 2008 questionary	0.2853 ***	0.1127 ***	0.2849 ***	0.1125 ***
	(0.0704)	(0.0273)	(0.0705)	(0.0274)
Constant	-2.0260 ***		-2.0605 ***	
	(0.4191)		(0.4271)	
Number of sample	2036		2036	
Chi-square statisitics	164.41		165.00	
(p-value)	0.0000		0.0000	
Pseudo R-square	0.0583		0.0585	
Log-likelihood	-1328.27		-1327.98	

1. The standard errors are given in parentheses.
2. *, **, and *** indicate statistical significance at 10%, 5%, and 1% levels respectively.

Table 6-1: The number of subjects at the fisrt and second stages

The second choice menu: Both public and private earthquake insurance cover collapses as well as fire damages.

At the first stage		At the second stage			
		Priticiparing in public earthquake insurance	Participating in both public and private earthquake insurance	Participating in private fire insurance	Not participating in either insurance
(1) Participating in public earthquake insurance	994	700	263	26	5
	48.6%	70.4%	26.5%	2.6%	0.5%
(2) Pariticipating in private fire insurance only	768	111	44	594	19
	37.5%	14.5%	5.7%	77.3%	2.5%
(3) Not pariticipating in either private fire insurance or public earthquake insurance	285	12	6	14	253
	13.9%	4.2%	2.1%	4.9%	88.8%

Table 6-2: The number of subjects at the fisrt and second stages

The third choice menu: Public earthquake insurance covers collapses as well as fire damages, but private insurance covers fire damages only.

At the first stage		At the second stage			
		Priticiparing in public earthquake insurance	Participating in both public and private earthquake insurance	Participating in private fire insurance	Not participating in either insurance
(1) Participating in public earthquake insurance	994	591	370	25	8
	48.6%	59.5%	37.2%	2.5%	0.8%
(2) Pariticipating in private fire insurance only	768	124	69	554	21
	37.5%	16.2%	9.0%	72.1%	2.7%
(3) Not pariticipating in either private fire insurance or public earthquake insurance	285	16	10	20	239
	13.9%	5.6%	3.5%	7.0%	83.9%

Table 6-3: The number of subjects at the fisrt and second stages

The fourth choice menu: Both public and private earthquake insurance cover fire damages only.

At the firt stage		At the second stage			
		Priticiparing in public earthquake insurance	Participating in both public and private earthquake insurance	Participating in private fire insurance	Not participating in either insurance
(1) Participating in public earthquake insurance	994	441	508	33	12
	48.6%	44.4%	51.1%	3.3%	1.2%
(2) Pariticipating in private fire insurance only	768	226	112	408	22
	37.5%	29.4%	14.6%	53.1%	2.9%
(3) Not pariticipating in either private fire insurance or public earthquake insurance	285	22	14	19	230
	13.9%	7.7%	4.9%	6.7%	80.7%

Table 7-1: Estimation results of a multi-nominal logit specification for the case where public and private insurance cover collapses as well as fire damges

	Participation in public at the 1st stage, and private at the 2nd stage		Participation in public at the 1st stage, but not private at the 2nd stage		Chage from non-participation to participation in public	
	Estimated marginal effects		Estimated marginal effects		Estimated marginal effects	
A dummy of a household with a housing loan	0.0232		0.0740	***	0.0082	
	(0.0163)		(0.0254)		(0.0144)	
Constucted under the old building code	0.0145		0.0151		0.0103	
	(0.0235)		(0.0333)		(0.0196)	
Having earthquake experiences	0.0145		-0.0215		-0.0143	
	(0.0198)		(0.0291)		(0.0158)	
Expecting earthquakes in the near future	0.0575	***	0.1464	***	0.0020	
	(0.0160)		(0.0257)		(0.0161)	
Covering losses by savings	-0.0309	*	-0.0868	***	0.0382	***
	(0.0174)		(0.0256)		(0.0134)	
Hoping for public assistance	-0.0721	***	-0.0381		0.0340	**
	(0.0149)		(0.0252)		(0.0163)	
Having sense of expensiveness in public insurance	-0.0314	*	-0.0961	***	0.0414	***
	(0.0172)		(0.0257)		(0.0126)	
Land riskiness 2 (moderately safe)	-0.0100		-0.0176		-0.0215	
	(0.0273)		(0.0409)		(0.0204)	
Land riskiness 3 (moderately risky)	-0.0328		-0.0409		-0.0067	
	(0.0259)		(0.0425)		(0.0225)	
Land riskiness 4 (risky)	0.0028		-0.0891	**	-0.0278	
	(0.0259)		(0.0384)		(0.0213)	
Wooden house	-0.0293	*	0.0150		-0.0032	
	(0.0151)		(0.0228)		(0.0130)	
Age of a household head	0.0013	*	0.0022	**	-0.0011	**
	(0.0006)		(0.0010)		(0.0005)	
Household income in logarithm	0.0433	*	0.0347		0.0158	
	(0.0230)		(0.0337)		(0.0195)	
Dummy of a high income household	0.0131		-0.0410		0.0076	
	(0.0271)		(0.0410)		(0.0227)	
Household financial assets in logarithm	0.0155		0.0174		-0.0062	
	(0.0155)		(0.0242)		(0.0137)	
Improved understanding of public insurance due to the 2008 questionary	0.1689		0.1013	***	-0.0013	
	(0.0168)		(0.0256)		(0.0154)	
Number of sample	2005					
Chi-square statisitics	237.70					
(p-value)	0.0000					
Pseudo R-square	0.0492					
Log-likelihood	-2298.91					

1. The standard errors are given in parentheses.
2. *, **, and *** indicate statistical significance at 10%, 5%, and 1% levels respectively.

Table 7-2: Estimation results of a multi-nominal logit specification for the case where public insurance covers collapses as well as fire damges, but private insurance convers only fire damges

	Participation in public at the 1st stage, and private at the 2nd stage		Participation in public at the 1st stage, but not private at the 2nd stage		Chage from non-participation to participation in public	
	Estimated marginal effects		Estimated marginal effects		Estimated marginal effects	
A dummy of a household with a housing loan	0.0515	***	0.0489	**	-0.0020	
	(0.0198)		(0.0244)		(0.0163)	
Constucted under the old building code	0.0480	*	-0.0201		-0.0027	
	(0.0289)		(0.0313)		(0.0212)	
Having earthquake experiences	0.0043		-0.0072		-0.0063	
	(0.0228)		(0.0279)		(0.0185)	
Expecting earthquakes in the near future	0.0907	***	0.1149	***	0.0276	
	(0.0187)		(0.0246)		(0.0171)	
Covering losses by savings	-0.0685	***	-0.0495	**	0.0259	*
	(0.0210)		(0.0246)		(0.0157)	
Hoping for public assistance	-0.0983	***	-0.0116		0.0282	
	(0.0177)		(0.0244)		(0.0177)	
Having sense of expensiveness in public insurance	-0.0420	**	-0.0831	***	0.0427	***
	(0.0205)		(0.0249)		(0.0148)	
Land riskiness 2 (moderately safe)	-0.0097		-0.0128		-0.0166	
	(0.0323)		(0.0388)		(0.0252)	
Land riskiness 3 (moderately risky)	-0.0400		-0.0350		-0.0003	
	(0.0314)		(0.0401)		(0.0276)	
Land riskiness 4 (risky)	-0.0092		-0.0796	**	-0.0298	
	(0.0305)		(0.0367)		(0.0250)	
Wooden house	0.0079		-0.0217		-0.0087	
	(0.0176)		(0.0220)		(0.0149)	
Age of a household head	0.0016	*	0.0021	**	-0.0010	
	(0.0008)		(0.0010)		(0.0007)	
Household income in logarithm	0.0821	***	-0.0026		0.0317	
	(0.0269)		(0.0324)		(0.0222)	
Dummy of a high income household	-0.0458		0.0124		-0.0085	
	(0.0331)		(0.0389)		(0.0264)	
Household financial assets in logarithm	0.0294		0.0073		-0.0122	
	(0.0187)		(0.0232)		(0.0157)	
Improved understanding of public insurance due to the 2008 questionary	0.0432	**	0.0747	***	0.0193	
	(0.0196)		(0.0246)		(0.0166)	
Number of sample	2003					
Chi-square statisitics	242.99					
(p-value)	0.0000					
Pseudo R-square	0.0475					
Log-likelihood	-2437.88					

1. The standard errors are given in parentheses.
2. *, **, and *** indicate statistical significance at 10%, 5%, and 1% levels respectively.

Table 7-3: Estimation results of a multi-nominal logit specification for the case where both public and private insurance conver only fire damges

	Participation in public at the 1st stage, and private at the 2nd stage		Participation in public at the 1st stage, but not private at the 2nd stage		Chage from non-participation to participation in public	
	Estimated marginal effects		Estimated marginal effects		Estimated marginal effects	
A dummy of a household with a housing loan	0.0514	**	0.0452	**	0.0092	
	(0.0229)		(0.0223)		(0.0208)	
Constucted under the old building code	0.0036		0.0256		-0.0237	
	(0.0304)		(0.0301)		(0.0254)	
Having earthquake experiences	-0.0162		0.0147		-0.0299	
	(0.0258)		(0.0259)		(0.0231)	
Expecting earthquakes in the near future	0.1421	***	0.0656	***	-0.0174	
	(0.0216)		(0.0227)		(0.0238)	
Covering losses by savings	-0.0728	***	-0.0422	*	0.0423	**
	(0.0237)		(0.0225)		(0.0201)	
Hoping for public assistance	-0.0715	***	-0.0355	*	0.0507	**
	(0.0219)		(0.0216)		(0.0222)	
Having sense of expensiveness in public insurance	-0.0755	***	-0.0534	**	0.0584	***
	(0.0237)		(0.0227)		(0.0195)	
Land riskiness 2 (moderately safe)	-0.0199		-0.0159		0.0489	
	(0.0367)		(0.0342)		(0.0391)	
Land riskiness 3 (moderately risky)	-0.0385		-0.0486		0.0626	
	(0.0373)		(0.0340)		(0.0428)	
Land riskiness 4 (risky)	-0.0444		-0.0519		0.0247	
	(0.0350)		(0.0328)		(0.0334)	
Wooden house	0.0205		-0.0288		0.0383	**
	(0.0204)		(0.0201)		(0.0185)	
Age of a household head	0.0021	**	0.0014		-0.0004	
	(0.0009)		(0.0009)		(0.0008)	
Household income in logarithm	0.0698	**	0.0116		-0.0158	
	(0.0310)		(0.0295)		(0.0277)	
Dummy of a high income household	-0.0253		-0.0035		0.0167	
	(0.0374)		(0.0356)		(0.0329)	
Household financial assets in logarithm	0.0283		0.0034		0.0023	
	(0.0217)		(0.0210)		(0.0198)	
Improved understanding of public insurance due to the 2008 questionary	0.0590	**	0.0567	***	0.0412	**
	(0.0231)		(0.0220)		(0.0209)	
Number of sample	1991					
Chi-square statisitics	225.90					
(p-value)	0.0000					
Pseudo R-square	0.0417					
Log-likelihood	-2598.45					

1. The standard errors are given in parentheses.
2. *, **, and *** indicate statistical significance at 10%, 5%, and 1% levels respectively.

Table A-1: Estimation results of a nested logit specification for the case where public and private insurance cover collapses as well as fire damges

	Participation in public at the 1st stage, and private at the 2nd stage	Participation in public at the 1st stage, but not private at the 2nd stage	Chage from non-participation to participation in public
	Parameter estimates	Parameter estimates	Parameter estimates
A dummy of a household with a housing loan	0.4782	0.4828 **	0.5401
	(0.3184)	(0.2367)	(1.1937)
Constucted under the old building code	0.2630	0.1361	0.3114
	(0.4483)	(0.1764)	(0.6408)
Having earthquake experiences	0.1190	-0.1652	-0.3834
	(0.5293)	(0.3844)	(0.8281)
Expecting earthquakes in the near future	1.0237 **	0.9274 ***	0.6768
	(0.4463)	(0.2218)	(1.3600)
Covering losses by savings	-0.4202	-0.3937	0.4708
	(0.2828)	(0.2188)	(1.0985)
Hoping for public assistance	-1.0909	-0.1843	0.3113
	(1.2845)	(0.5407)	(0.6793)
Having sense of expensiveness in public insurance	-0.4467 **	-0.4332 **	0.5101
	(0.2277)	(0.2070)	(0.8684)
Degree of land riskiness	-0.0059	-0.2066	-0.2551
	(0.2358)	(0.1996)	(0.5446)
Wooden house	-0.3862	0.0343	-0.1098
	(0.6021)	(0.2184)	(0.2844)
Age of a household head	0.0179	0.0103	-0.0129
	(0.0125)	(0.0103)	(0.0284)
Household income in logarithm	0.6919	0.3176 *	0.6458
	(0.7175)	(0.1874)	(1.4551)
Dummy of a high income household	0.1946	-0.1980	0.0425
	(0.8272)	(0.3100)	(0.4794)
Household financial assets in logarithm	0.2168	0.1023	-0.0158
	(0.2396)	(0.1355)	(0.2863)
Improved understanding of public insurance due to the 2009 questionary	0.3582	0.5989 **	0.3241
	(0.4022)	(0.2739)	(0.5649)
Constant	-9.4010	-3.7442	-7.2945
	(10.3749)	(1.2709)	(15.5437)
□	1.5534		
	(3.1600)		
Chi-square statisitics	0.03		
(p-value)	0.8607		
Number of sample	2005		
Chi-square statisitics	145.12		
(p-value)	0.0000		
Log-likelihood	-2301.16		

1. The standard errors are given in parentheses.
2. *, **, and *** indicate statistical significance at 10%, 5%, and 1% levels respectively.

Table A-2: Estimation results of a nested logit specification for the case where public insurance covers collapses as well as fire damges, but private insurance convers only fire damges

	Participation in public at the 1st stage, and private at the 2nd stage		Participation in public at the 1st stage, but not private at the 2nd stage		Chage from non-participation to participation in public	
	Parameter estimates		Parameter estimates		Parameter estimates	
A dummy of a household with a housing loan	0.3966	***	0.3973	***	-0.0010	
	(0.1085)		(0.1084)		(0.0017)	
Constucted under the old building code	0.1061		0.1078		-0.0002	
	(0.1391)		(0.1390)		(0.0012)	
Having earthquake experiences	-0.0049		-0.0049		0.0005	
	(0.1238)		(0.1238)		(0.0013)	
Expecting earthquakes in the near future	0.8385	***	0.8393	***	-0.0040	
	(0.1265)		(0.1265)		(0.0056)	
Covering losses by savings	-0.4697	***	-0.4710	***	-0.0000	
	(0.1088)		(0.1088)		(0.0009)	
Hoping for public assistance	-0.4489	***	-0.4520	***	-0.0003	
	(0.1109)		(0.1109)		(0.0010)	
Having sense of expensiveness in public insurance	-0.5075	***	-0.5073	***	-0.0014	
	(0.1079)		(0.1079)		(0.0022)	
Degree of land riskiness	-0.1184	**	-0.1180	**	0.0009	
	(0.0470)		(0.0470)		(0.0013)	
Wooden house	-0.0459		-0.0453		0.0007	
	(0.0973)		(0.0973)		(0.0013)	
Age of a household head	0.0146	***	0.0146	***	0.0000	
	(0.0044)		(0.0044)		(0.0000)	
Household income in logarithm	-0.1265		-0.1279		0.0009	
	(0.1743)		(0.1741)		(0.0019)	
Dummy of a high income household	0.3100	**	0.3123	**	-0.0028	
	(0.1442)		(0.1439)		(0.0041)	
Household financial assets in logarithm	0.1455		0.1464		0.0003	
	(0.1036)		(0.1035)		(0.0010)	
Improved understanding of public insurance due to the 2009 questionary	0.4689	***	0.4690	***	-0.0027	
	(0.1161)		(0.1161)		(0.0038)	
Constant	-3.8807	***	-3.9061	***	0.0268	
	(1.0129)		(1.0064)		(0.0380)	
□	-0.0051					
	(0.0070)					
Chi-square statisitics	2.12					
(p-value)	0.1458					
Number of sample	2003					
Chi-square statisitics	141.93					
(p-value)	0.0000					
Log-likelihood	-2438.67					

1. The standard errors are given in parentheses.
2. *, **, and *** indicate statistical significance at 10%, 5%, and 1% levels respectively.

Table A-3: Estimation results of a nested logit specification for the case where both public and private insurance conver only fire damges

	Participation in public at the 1st stage, and private at the 2nd stage	Participation in public at the 1st stage, but not private at the 2nd stage	Chage from non-participation to participation in public
	Parameter estimates	Parameter estimates	Parameter estimates
A dummy of a household with a housing loan	-1.2703	0.3583	-2.3479
	(1.7193)	(1.0137)	(1.8701)
Constucted under the old building code	3.4532	-1.2941	2.6539
	(2.4681)	(1.1870)	(2.7897)
Having earthquake experiences	3.3557	-0.3442	4.4068
	(2.2473)	(0.9266)	(3.0154)
Expecting earthquakes in the near future	-3.0043	0.7925	-5.9966 *
	(2.5040)	(0.9661)	(3.3993)
Covering losses by savings	-2.8545	1.2757	-1.0478
	(2.3172)	(1.0903)	(2.4941)
Hoping for public assistance	-2.4925	0.4109	-1.8085
	(2.0192)	(1.0310)	(2.2183)
Having sense of expensiveness in public insurance	-1.3522	-1.2644	-2.1947
	(1.7964)	(0.9566)	(2.7379)
Degree of land riskiness	0.4236	-0.4139	0.4277
	(0.6205)	(0.3652)	(0.7520)
Wooden house	-2.9667	0.0109	-4.1588
	(2.1814)	(0.9198)	(2.8696)
Age of a household head	0.0172	-0.0232	-0.0449
	(0.0599)	(0.0334)	(0.0894)
Household income in logarithm	-4.3299	1.6892	-4.6715
	(3.1071)	(1.0769)	(3.8848)
Dummy of a high income household	1.8938	0.5073	3.4866
	(2.4630)	(1.5198)	(3.0387)
Household financial assets in logarithm	-0.4694	0.2356	-0.8258
	(1.3893)	(0.9132)	(1.8118)
Improved understanding of public insurance due to the 2009 questionary	-3.4271	-1.8306	-9.6296 *
	(3.2803)	(1.1588)	(5.6078)
Constant	42.9077	-5.0138	64.3270
	(28.0819)	(6.8709)	(38.6250)
□	-17.9634		
	(11.3196)		
Chi-square statisitics	11.90		
(p-value)	0.0006		
Number of sample	1991		
Chi-square statisitics	136.29		
(p-value)	0.0000		
Log-likelihood	-2594.55		

1. The standard errors are given in parentheses.
2. *, **, and *** indicate statistical significance at 10%, 5%, and 1% levels respectively.

Table A-4: Estimation results of an althernative nested logit specification for the case where both public and private insurance conver only fire damges

	Participation in public at the 1st stage, and private at the 2nd stage		Participation in public at the 1st stage, but not private at the 2nd stage		Chage from non-participation to participation in public	
	Parameter estimates		Parameter estimates		Parameter estimates	
Purchase by housing loan	0.5624	***	0.5558	**	0.2854	
	(0.2171)		(0.2262)		(0.3249)	
Constucted under the old building standard	0.0358		0.1927		-0.1790	
	(0.2402)		(0.3177)		(0.3445)	
Having earthquake experiences	-0.1489		0.0538		-0.2860	
	(0.2099)		(0.2917)		(0.3673)	
Expecting earthquakes in the near future	1.4756		0.8175	***	0.1598	
	(0.9281)		(0.2292)		(0.8853)	
Covering losses by savings	-0.6451		-0.4560	*	0.2300	
	(0.4867)		(0.2330)		(0.7085)	
Hoping for public assistance	-0.6330		-0.3860		0.3388	
	(0.5674)		(0.2697)		(0.7978)	
Having sense of expensiveness in public insurance	-0.6332		-0.5502		0.3891	
	(0.4148)		(0.3615)		(0.9215)	
Degree of land riskiness	-0.1539	*	-0.1959	*	-0.0690	
	(0.0800)		(0.1103)		(0.1248)	
Wooden house	0.2029		-0.1597		0.3892	
	(0.1982)		(0.4373)		(0.3497)	
Age of a household head	0.0205		0.0162	**	0.0026	
	(0.0128)		(0.0081)		(0.0170)	
Household income in logarithm	0.6086		0.2223		0.0090	
	(0.4801)		(0.2721)		(0.4389)	
Dummy of a high income household	-0.2069		-0.0497		0.1072	
	(0.3719)		(0.3127)		(0.3907)	
Household financial assets in logarithm	0.2747		0.0912		0.0672	
	(0.2712)		(0.2017)		(0.2513)	
Improved understanding of public insurance due to the 2009 questionary	0.6696	***	0.7060	***	0.6228	***
	(0.2014)		(0.2164)		(0.2234)	
Constant	-8.4524		-4.0680	**	-3.3762	*
	(7.2152)		(1.9007)		(1.8564)	
□	1.7139					
	(2.3032)					
Chi-square statisitics	0.10					
(p-value)	0.7488					
Number of sample	1991					
Chi-square statisitics	136.11					
(p-value)	0.0000					
Log-likelihood	-2600.45					

1. The standard errors are given in parentheses.
2. *, **, and *** indicate statistical significance at 10%, 5%, and 1% levels respectively.