A MODEL OF DEMAND FOR INSURANCE IN THE PRESENT OF BACKGROUND RISK: EMPIRICAL EVIDENCE FROM TAIWAN

Feng Teng Lin, Shu-Te University, No.59, Hengshan Rd., Yanchao Dist., Kaohsiung City 82445, Taiwan, 886-7-6158000 ext. 3215, imblacksugar@gmail.com
Hsin Ying Wur, Open University of Kaohsiung, No. 436, Daye North Rd., Siaogang Dist., Kaohsiung City, Taiwan, 886-7-8012008, cindywu0422@gmail.com

ABSTRACT

This study investigates how this background risk affects households' property insurance expenditure by using data of Survey of Family Income and Expenditure (SFIE) in Taiwan. After controlling other factors including household income and wealth, the characteristics of the head of the household and other demographic variables, the main findings show that property insurance expenditure is positively affected by uninsurable background risk and the effect of background risk on the property insurance expenditure increases as the level of households wealth raises. This results suggest that consumer with more background risk is more risk averse and leads a higher demand of insurance which is consistent with consumer preferences being characterized by "standard risk aversion" condition proposed by Eeckhoudt and Kimball (1992) [1] and Kimball (1993) [2].

Keywords: Background risk; Demand for insurance.

1. INTRODUCTION

People often make decisions under uncertain conditions, against the background of other unmarketable risks in the real world. Over the past several decades, many theoretical papers have contributed knowledge regarding sufficient or necessary conditions that cause individuals' to take less risk after introducing an increased background risk. Pratt and Zeckhauser (1987) [3] introduced properness or proper risk aversion; Kimball (1993) [2] revealed conditions called standard risk aversion (decreasing absolute risk aversion and prudence); and Gollier and Pratt (1996) [4] provided a complex necessary and sufficient condition called risk vulnerability. These conditions guarantee that adding an unfair background risk to wealth makes risk-averse individuals behave in a more risk-averse way. Eeckhoudt, Gollier, and Schlesinger (1996) [5] determined the effect on risk-taking preferences of first-degree stochastic dominant or second-degree stochastic dominant deteriorations in background risk. Following their results, we can find the positive effect of background risk on the insurance demand which also depends on the risk-taking attitude of the individuals.

The current study aims to provide empirical evidence that the addition of a zero-mean, uninsurable risk increases the demand for insurance. Guiso and Jappelli (1998) [6] found that households facing greater income risk (self-report index) bought more casualty insurance. Koeniger (2004) [7] provided empirical evidence that households with higher income risk (dummy variables of occupation risk including unskilled manual and skilled non-manual) spent more on automobile insurance in the United Kingdom. Although the literature provides many insightful findings with both theory and empirical evidence about background risk, to our knowledge few empirical studies have focused on this issue in the context of property insurance.

The remainder of the paper is organized as follows. Section 2 proposes an empirical model to

estimate a household's insurance purchase with income risk. A description of the empirical evidence is given in section 3. Section 4 outlines this study's conclusions.

2. EMPIRICAL MODEL

The current study uses OLS regression by constructing an objective index of background risk (variation of household realized income) to address this research question: Does an increase in background risk cause households to purchase more or less insurance? Robst, Deitz, and McGoldrick (1999) [8] used the coefficient of variation (CV) of income for the prior five years as a proxy of income risk, and indicated uncertainty plays an important role in the decision to purchase versus rent, with uncertainty decreasing the probability of owning. Gakidis (1998) [9] and Vissing-Jorgensen (2002) [10] assumed an income process and used the variance of income realizations as proxy for income risk. Specifically, this study classifies income recipients (by household heads) based on their occupation or industry. For a given occupation, the author treats the mean real income in 1992-2005 (our formation period) to be the attributed factor income for the occupation. We then take the deviation (measured by the coefficient of variation or standard deviation) of actual household incomes from the attributed income. Thus, there are two proxies for the background risk: 1) the coefficient of variation (CV) by given occupation; and 2) standard deviation (SD) of real income for a given occupation type. Specifically, the two alternative proxies are respectively called Income risk–CV by occupation; and Income risk–SD by occupation. The corresponding models are named as Model 1 and 2. OLS regressions are used to estimate the relationship between background risk and the amounts that households spend on property insurance, the equations are:

$$\begin{aligned}\ln INSExpen = &\sum \alpha_i x_i + \beta_0 \ln Householdwealth + \beta_1 \ln Income \\ &+ \beta_2 Backgroundrisk + \beta_3 backgroundrisk \times Householwealth + \varepsilon\end{aligned} \tag{1}$$

where x_i are the controlling variables such as the characteristics of the head of the household and other demographic variables.

3. EMPIRICAL RESULT

Table 1 summarizes the statistics of our background risk variables: the standard deviation and the coefficient of variation of the household real income deviated from its imputed incomes (mean real incomes by occupation from 1992 to 2005). We use two income risk variables: 1) Income risk–SD by occupation; and 2) Income risk–CV by occupation, respectively used in Model 1 and 2. Statistics of Income risk by occupation show that the occupations with higher background risk include the following: 1) legislators, administrators, business executives, and managers, and 2) professionals. Those with lower background risk include: 1) service workers and shop and market sales workers; 2) plant and machine operators, and assemblers; and 3) laborers.

This study uses OLS regression methods to analyze the property insurance expenditure which household would purchase only when they have cars, motorcycles and houses. Table 2 reports the results of OLS estimations using the sample with positive insurance expenditure of property insurance. The results show how insurance amounts vary with income risk and other household characteristics and calculate the income elasticity of property insurance.

Table 1. Background risk: standard deviation (SD) and coefficient of variation (CV) of income

Occupation	SD	CV
Legislators, Administrators, Business Executives and Managers	51.191	0.0549
Professionals	33.763	0.0471
Technicians and Associate Professionals	18.677	0.0346
Clerks	12.899	0.0331
Service Workers and Shop and Market Sales Workers	9.327	0.0232
Craft and Related Trades Workers	16.062	0.0401
Plant and Machine Operators and Assemblers	9.899	0.0274
Laborers	8.293	0.0290

Note: The mean and standard deviation of real income is expressed in thousands of year 1993 NT dollars.
Source: Survey of Family Income and Expenditure (SFIE) and Employee Turnover Statistics of Taiwan.

The estimation result shows that the coefficients of income risk-CV and income risk-SD are both positive that is consistent with Guiso and Jappeli's (1998) [6] estimated result of casualty insurance purchasing.

The coefficients of a household head's age and the square of age (included to capture a potential nonlinear relationship) are significantly positive and negative, respectively, showing age was concave with the probability of property insurance expenditure. Households that have more persons or children and household heads that are male, married or with higher education level tend to purchase more property insurance. Related to the wealth variables, higher household resources and income induce a higher amount of property insurance expenditure. Income risk raises the property insurance expenditure of households, while income risk interacting with other household resources has a negative effect. This means that the expenditure of insurance is higher in households with more income risk. It also suggests that for relatively poor households, an increase in income risk increases the expenditure of insurance more than it does for relatively wealthy households. The results are in line with previous studies such as Koeniger's (2004) [7], which showed that unskilled manual workers (with higher income risk) spent significantly less on motor-vehicle insurance, whereas skilled non-manual workers (with lower income risk) spent significantly more on motor-vehicle insurance than the rest of the population. The estimation results of controlling variables are broadly consistent with Showers and Shotick (1994) [11], Guiso and Jappeli (1998) [6], and Koeniger (2004) [7]. The primary results of both models suggest that households facing higher income risk have more insurance expenditures.

The coefficients of the variable "Ln (Income)" show the income elasticity of property insurance. The income elasticity of property insurance is positive but smaller than one. This result means a household's income change has a positive effect on the consumer's demand for property insurance. This result is consistent with some empirical studies such as Beenstock, Dickinson, and Khajuria (1988) [12], Outreville (1990) [13], Truett and Truett (1990) [14], Cleeton and Zellner (1993) [15], Browne and Kim (1993) [16], Showers and Shotick (1994) [11], Eisenhauer (1997) [17], and Enz (2000) [18] all of which found that people tend to increase insurance expenditures with respect to an increase in their income. This supports the notion that insurance is a normal good.

Table 2 . The effect of background risk on the property insurance expenditure

	Model 1		Model 2	
Indep. Variables	Coef.	p-valve	Coef.	p-valve
Intercept	4.793350***	<.0001	4.960400***	<.0001
Age	0.001310	0.8088	0.001810	0.7378
Age^2	-0.000048	0.4272	-0.000059	0.3282
Male	0.060520***	0.0029	0.066730***	0.0009
Married	0.162890***	<.0001	0.160750***	<.0001
Education	0.019790***	<.0001	0.017120***	<.0001
Family size	0.099820***	<.0001	0.097310***	<.0001
No. of children	0.099870***	<.0001	0.098180***	<.0001
Ln (Household wealth)	0.071640***	<.0001	0.074950***	<.0001
Ln (Income)	0.332950***	<.0001	0.317530***	<.0001
Resident in the North[b]	-0.209430***	<.0001	-0.205120***	<.0001
Resident in the South	-0.296550***	<.0001	-0.293880***	<.0001
Resident in the East	-0.113170***	0.0059	-0.110710***	0.0069
Resident in Cities[c]	-0.074550	0.2702	-0.073650	0.275
Resident in Towns	0.071160	0.3064	0.072930	0.2937
No. of cars or motorcycles	0.389020***	<.0001	0.391180***	<.0001
Income risk–CV (by occupation)	4.276550***	<.0001		
Household resources * Income risk–CV	0.005380***	<.0001		
Income risk–SD (by occupation)			0.004960***	<.0001
Household resources * Income risk–SD			0.000006***	0.0004
Adj R-square		0.4444		0.4464

Note: a: The symbol *** significance at 99%, ** significance at 95%, * significance at 90%.
b, c: The basic (omitted) resident variables are Resident in the Center and Resident in Countries.

4. CONCLUSION

In real life, people almost always make choices with various background risks. Decision behavior with background risks is both interesting and important. Over the past few decades, a considerable number of studies have been conducted on this topic, and many illuminating results have been derived. Most of these results, both theoretical and empirical, investigate risk-averse agents and household portfolio decisions including risky assets, housing, saving, and casualty and automobile insurance. Empirical literature previously used income risk as a proxy of background risk. This adoption is beneficial in view of both practicability and significance. The purpose of this study was to discover

whether households buy more insurance after empirically introducing an independent background risk.

Using the Survey of Taiwan Family Income and Expenditure, this article constructed three indexes to be proxies of background risk, including the standard deviation (SD) and coefficient of variation (CV) of real income in occupation to measure income risk. To further check the question whether increasing background risk causes households to purchase more or less insurance, the dataset of year 2006 Survey of Taiwan Family Income and Expenditure was used to empirically explore the effect on household insurance expenditure of income risk. This study's results found that households with more income risk purchase more insurance, after controlling other factors, including household resources and income; the age, sex, marriage status, and education of the household head; family size; and residential area by using OLS regression models. The findings suggest that a household's preference is characterized by decreasing absolute prudence and decreasing absolute risk aversion, otherwise known as the "standard risk aversion" condition proposed by Eeckhoudt and Kimball (1992) [1] and Kimball (1993) [2].

APPENDIX

Definition of variables

Age: the age of the head of the household.
Married: a dummy with value 1 if the head of the household is married, and 0 otherwise.
Male: a dummy with value 1 if the head of the household is male, and 0 otherwise.
No. of children: number of children under 18 years old.
Family size: number of people of the household.
Education: education years of the head of the household, the original data give ranked classification of education level (elementary, junior high, senior high, community college, university, graduate).
Income: yearly income of a household, including employee compensation, business owner earnings, property income, rent, and current transfer incomes.
Household wealth: rent of real estate and property revenue of a household.
Resident in Cities: a dummy with value 1 if the household lives in a "city."
Resident in Countries: a dummy with value 1 if the household lives in a "country."
Resident in Towns: a dummy with value 1 if the household lives in a "town."

The SFIE classifies residential regions into "cities", "countries" and "towns" by the proportion of occupation industries of the residents: To be a "city," a region must have less than 25% employment proportion in Agriculture, Forestry, Fishing, Animal and Mining and Quarrying industries, *and* more than 40% in Service industries. To be a "country," the employment proportion must be more than 45% in Agriculture, Forestry, Fishing, Animal and Mining and Quarrying industries. Others are classified as "towns."

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