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Demand for non-life insurance: A cross-country analysis

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Abstract

A number of existing studies on insurance demand report an apparently pathological result that insurance is a luxury good. Using cross-country insurance data and national wealth data, we resolve this spurious puzzle. While we found that the income elasticity of insurance demand is larger than unity, the wealth elasticity of insurance demand is smaller than unity at least for upper-middle and high wealth countries.

JEL Classifications: D80, G22
Keywords: Demand for insurance; Semiparametric regression; Wealth elasticity

1 Theoretical Background

There is no doubt that insurance plays an important role in the modern world. However, our understanding of the insurance demand is limited contrary to our common sense. In particular, due to the lack of household-level data of insurance, there are very few existing empirical works on insurance demand.[1] As a result, most existing studies only use macro data. A number of such works report an apparently pathological result that insurance is a luxury good, i.e. the income elasticity of insurance demand is greater than unity, e.g. Beenstock et al. (1988), Outreville (1990), and Enz (2000).

However, the standard model of insurance demand specifies the demand function as a function of the premium (price) and the 'initial wealth' rather

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[1]There are some exceptions, though. Galabova and Lester (2001) uses Eurostat NewCronos household budget survey and the World Bank Living Standards Measurement Survey, while Dixon, Clancy, Seabury and Overton (2006) collects and uses household data for the US National Flood Insurance Program.

than income. It is well known that the optimal proportionate coverage is decreasing (constant) in the initial wealth if DRRA (CRRA)[2] when the initial wealth and the loss exposure are proportionate with each other and the loading factor is strictly positive, because the optimal insurance coverage choice problem can be reformulated as a static portfolio choice problem (see, for example, Schlesinger [2000]). Since it is most likely that the preferences of the people exhibit DRRA or CRRA, the wealth elasticity of insurance demand should not be greater than unity as long as the loss exposure (insurable) is proportionate with the wealth level.

This paper aims at filling this gap in the existing literature using cross-country insurance data and national wealth data. Note that it may well be the case that the disparity in wealth across countries is far larger than that in income, since wealth is really an accumulation of surplus from income. Also, the growth rate of wealth may well be much higher than that of income over time. Hence, the result that insurance is a luxury good may be proved to be spurious once we use the initial wealth instead of income.

2 Empirical Strategy

The insurance demand is crucially affected by the loss exposure, and thus, we need to control for it when we test the theory empirically. In particular, the loss exposure is affected by the structure of uncertainty, which in turn is determined by the structure of the economy. However, it is impossible to know the true structure of the economy. Accordingly, we need to make some assertion about it. The simplest one is such that the loss exposure of an economy is proportionate with its aggregate wealth, an assumption we impose in our analysis.[3]

Nevertheless, there are several factors we may need to control for. First, most insurance products are based on the logic of the strong law of large numbers, and thus, the population size may matter. Namely, when the population is larger, the premiums become fairer, and thus, the aggregate insurance demand becomes larger. Secondly, not only the level and size of the wealth but also the wealth distribution within a country may have an impact on the aggregate insurance demand; the aggregate insurance demand should be smaller when the wealth inequality is larger. To control for this, we use income Gini coefficients from Deininger and Squire (1996), because income and wealth have a strong positive correlation in general, although we should use wealth Gini coefficients if such data are available. Hence, the theory predicts that the aggregate insurance demand is smaller when the income Gini coefficient is higher. Finally, the insurance demand may be affected by transactions costs, e.g. the lack of access to formal insurance markets and the lack of contract enforceability. To control for the former

[2] DRRA and CRRA are decreasing and constant relative risk aversion, respectively.

[3] It appears that we need to control for natural disasters, since they affect the loss exposure, and that, some regions are more prone to natural disasters than others. However, insurance for natural disasters is almost non-existent in disaster-prone regions, and thus, these are probably irrelevant in our context.

aspect, we employ King and Levine's (1993) financial depth measure, i.e. liquid liabilities shares of GDP, because a higher share most likely implies lower transactions costs in formal insurance markets. Regarding the latter aspect, we utilize the contract enforceability variable from Knack and Keefer (1995). With a poor contract enforceability, formal insurance transactions become more expensive relative to informal mutual insurance, and thus, the aggregate insurance demand becomes lower.

Based on the above observations, we use the following partially linear regression model, that extends the linear regression model to include a non-parametric component, to test the wealth elasticity of the insurance demand:[4]

$$\frac{D_i}{W_i} = f\left(W_i\right) + \mathbf{X}_i\mathbf{b} + \epsilon_i, \tag{1}$$

where D_i is country i's aggregate insurance demand (premium), W_i is country i's aggregate wealth, $\mathbf{b}$ is a vector of parameters, $\mathbf{X}_i$ is a vector of variables of country i for which the regression model is controlled, and ϵ_i is the error term. The left hand side of the equation is the proportion of the aggregate premium against the initial wealth. Hence, when $f'(W_i) < (>)\ 0$, the proportion is decreasing (increasing) in the initial wealth at W_i, and consequently, the wealth elasticity of the insurance demand is less (more) than unity at W_i.[5]

As for the data, we use the cross-country non-life insurance premium data from Swiss Re's sigma world insurance data. Also, for the population data, we use Penn World Table Version 6.1 (Heston, Summers and Aten [2002]), while for the wealth data, we use Kunte et al. (1998). More specifically, to represent the initial wealth, we use produced assets, which consist of buildings and structures, machinery and equipment, and urban land. Because produced assets data are available only for 1994, our analysis focuses on 1994. The data on the income Gini coefficients, liquid liability as share of GDP, and contract enforceability are averages over the period 1980-95 and are extracted from Levin and Demirguc-Kunt (2001).

In order to estimate the semiparametric regression model of linear partial equation (1), we use Lokshin's (2006) algorithm, which is based on the method of differencing. Table 1 summarizes the estimation results of the parametric part of equation (1). The contract enforceability variable has positive and statistically significant coefficients, suggesting that a better contract enforcement leads to a higher aggregate insurance demand. Specifications (I) and (II) in Table 1 replicate the results of the greater-than-unity income elasticity of insurance demand by replacing W_i with real GDP per capita. Figure 1 shows the estimated nonparametric part of specification (II) that is apparently an increasing function, suggesting that the income elasticity of insurance demand is larger than unity. Figure 2 reports the results of estimated nonparametric part of specification (III) in Table 1 by using the wealth variable. This figure indicates that the wealth elasticity of insurance demand

[4]See Section 5 of Ichimura and Todd (2006) for reference of semi-parametric estimations.

[5]It is straightforward to show that $f'\left(W_i\right) = \partial(\frac{D_i}{W_i})/\partial W_i = (\eta - 1)\frac{D_i}{W_i^2}$ where η is the wealth elasticity of the insurance demand.

is smaller than unity at least for upper-middle and high wealth countries. As for the low wealth countries, the wealth elasticity appears to be greater than unity; this may suggest that there are some unknown aspects that prevent people from purchasing formal insurance in developing countries.

3 Concluding Remarks

We have found that the apparently pathological result that insurance is a luxury good is spurious, once we use wealth data instead of income data. This appears to support the predictions of the theory. However, interpretation of our results requires some care.

As Mossin (1968) argues, the definition of the initial wealth requires some care. In a static problem, the initial wealth should be the marketable assets, since the decisions to be made are all immediate. However, in a dynamical situation, there is a sequence of decisions, and thus, the budget set involves the future stochastic income stream, too. It follows that the initial wealth should reflect the present value of the future income stream. In the latter case, the total wealth data from Kunte et al. (1998) is more appropriate since it includes human resources, which are mainly reflecting the future income stream. However, this requires a test of a more complicated model, which is beyond the scope of the current paper.

Moreover, the current paper is only using macro data, and thus, we cannot conclude anything about individual insurance demand. This requires an empirical study using micro data. In other words, the usual caveats for empirical studies using macro data apply here.

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Table 1

Estimation Results of the Semiparametric Regression Model

Model	(I)	(II)	(III)	(IV)
Variable for non parametric part	GDP per capita	GDP per capita	Produced assets	Produced assets
Variables for parametric part				
Population size	-9.04×10^{-12}	1.92×10^{-12}	-2.25×10^{-12}	4.21×10^{-12}
	(9.81×10^{-12})	(9.59×10^{-12})	(2.63×10^{-12})	(3.56×10^{-12})
Gini coefficient		0.00040		0.00016
		(0.00025)		(0.0000879)
Liquid liabilities as share of GDP		0.00122		0.000897
		(0.00561)		(0.00239)
Contract enforceability		0.0110		0.00457
		(0.0046)*		(0.00147)**
Number of observations	54	32	54	32
Adjusted R^2	0.0046	0.226	0.0015	0.301

Note: Standard errors are in parentheses. "**" and "*" indicate statistical significance at the 1% and 5% levels, respectively.

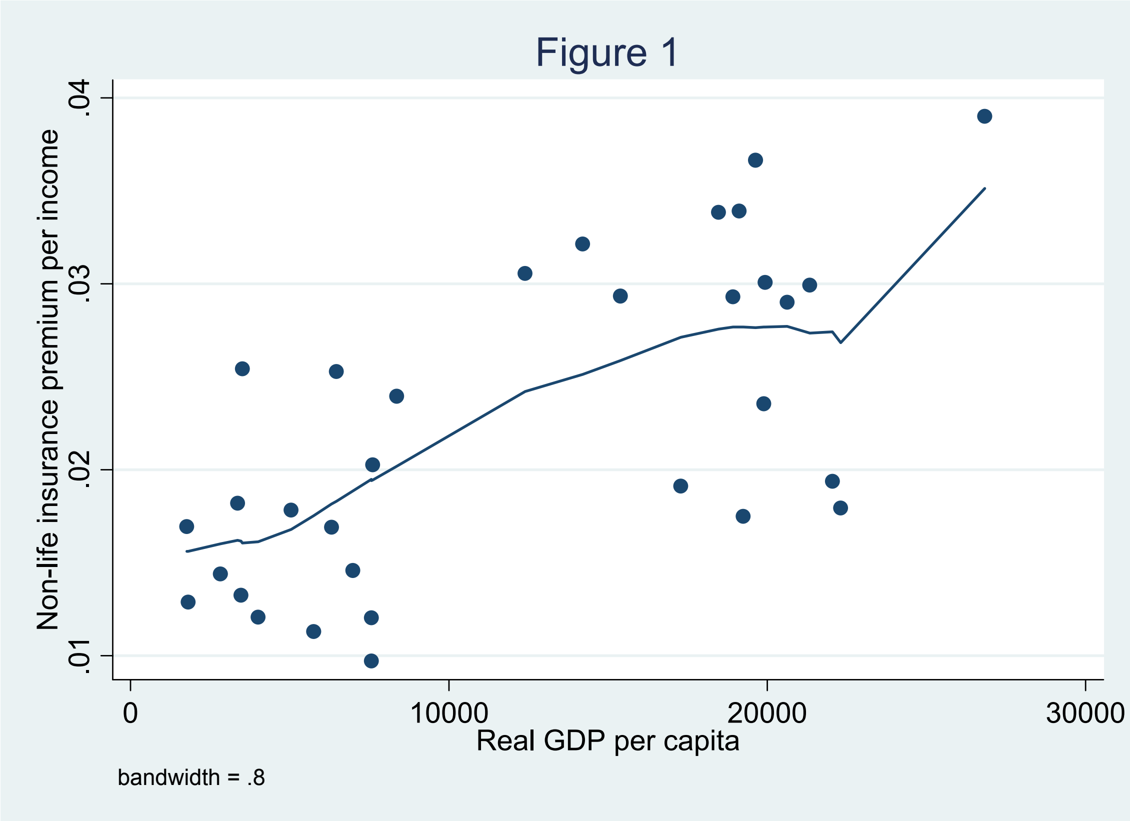
Figure 1
Non-life insurance premium per income
.01
.02
.03
.04
0
10000
20000
30000
Real GDP per capita
bandwidth = .8

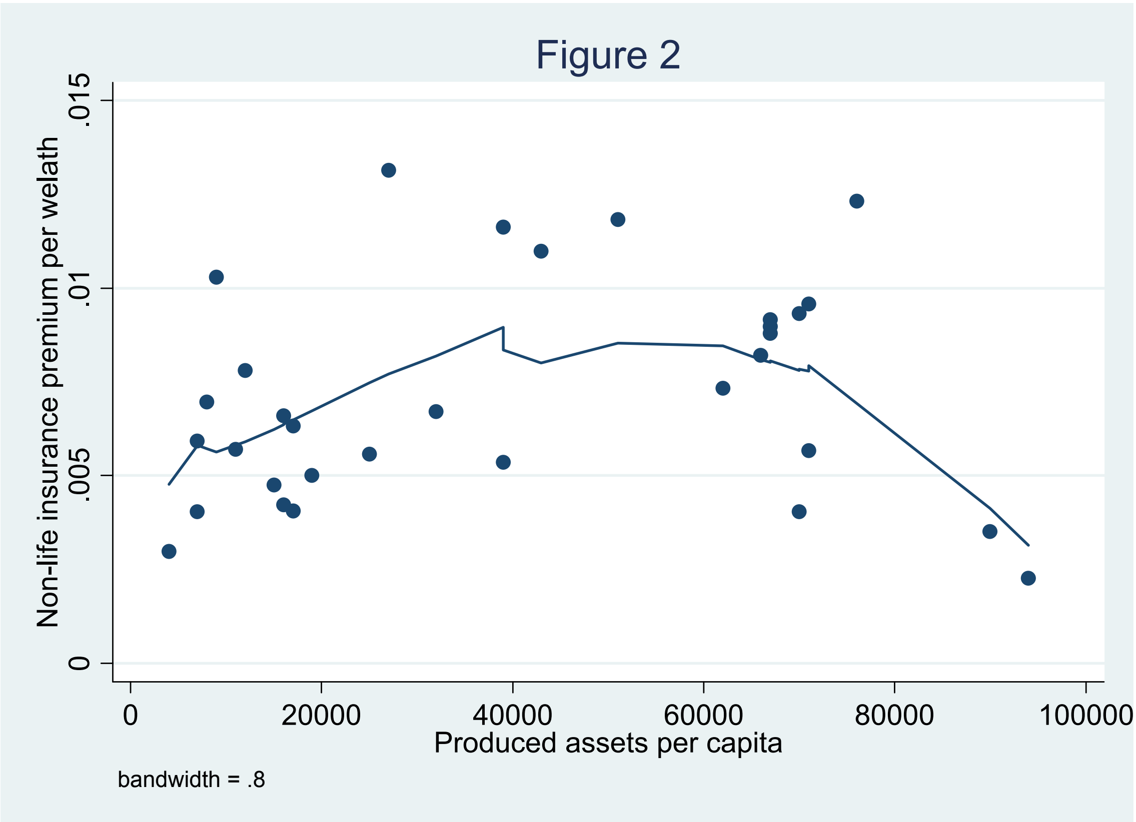
Figure 2
Non-life insurance premium per welath
0
.005
.01
.015
0
20000
40000
60000
80000
100000
Produced assets per capita
bandwidth = .8