



The impact of real income on insurance premiums: Evidence from panel data

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ABSTRACT

This study applies a recently-developed panel smooth transition regression (PSTR) model and takes into account the potential endogeneity biases in order to establish country-specific and time-specific elasticities of insurance premiums with respect to real income for 36 selected countries from the period 1979–2007. The PSTR model endogenously determines the non-linear insurance-income nexus and allows for a continuum of an intermediate regime among extremes. We find overwhelming evidence in support of a non-linear income threshold. The life and non-life insurance premiums are inelastic and elastic with respect to real income, suggesting that they are a necessary good and luxury good respectively. Furthermore, as time goes on, the income elasticities of insurance premiums present a similar upward trend, implying that the impact of economic development on insurance premiums is more important in recent periods.

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1. Introduction

A dramatic increase in recent economic development has led to an increase in people's purchasing power and living standards, thus resulting in growing demand for economic security. Since 1950, the global insurance industry has seen an annual growth rate of over 10%. For the period 1985–2007, the world's total written real insurance premiums have increased by approximately 5.5 times from US\$0.63 trillion to US\$4.13 trillion, and the life and non-life insurance premiums have increased by approximately 7.5 times and 3.9 times respectively. The importance of the insurance-income relationship is growing due to the larger share of the insurance sector within the financial sector, and this greater importance is reflected in the business volume of insurers. It is important to note that insurance activities can also deter economic performance as they relax the incentive for the insured to engage in prudent behavior and loss mitigation (Haiss & Sümegi, 2008).¹ Bianconi (2003) indicates that in the presence of private information, insurance mechanisms would be harmful to expected growth. Furthermore, the insurance industry in general appears to show a stronger profit picture while the entire financial service industry has suffered from profitability problems, except for those economies with a severe and prolonged depression (Malkiel, 1991). Thus, the linkage between insurance activities and economic performance has been a popular issue of debate, yet lacks a consensus.

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¹ Gueyie and Lai (2003) note that when banks display higher risk exposures than the risk category based on the flat rate, risk transfer to the insurer will occur, and thus banks could gain a subsidy from the insurer. These banks may increase their asset risk and/or decrease capital ratios to maximize the subsidy from the insurer, which is known as moral hazard.

Since insurance premium rates are usually based on projected investment income and expected losses, which are subject to business cycles, it may be reasonable to expect a significant interrelationship between the activities of insurance markets and macroeconomics. Most existing studies use a conventional linear model to examine the relationship that assumes a different degree of economic development that has the same effects on insurance markets' activities. This is a very restrictive assumption. However, as economic performance rapidly changes, if we do not consider that countries with different economic development and characteristics may have different effects on the insurance market, then it may lead to biased results. This means that we should apply a non-linear model to re-investigate the relationship between insurance premiums and relevant macroeconomic variables. From a policy point of view, this current research is novel in that it is the first study to model the non-linear relationship between insurance activities and real income per capita of 36 selected countries for the period 1979–2007 in the panel context. We use disaggregate data on real premium, including life and non-life insurance premiums,² which is an important feature that is different from previous aggregate data studies.

This study contributes to the existing literature as follows. First, we apply the panel smooth transition regression (PSTR) model recently developed by [González, Teräsvirta, and van-Dijk \(2005\)](#) to investigate the non-linear relationship between insurance premiums and real GDP per capita for 36 selected countries from the period 1979–2007. We prefer a smooth transition scenario due to market participants in the insurance market being unlikely to move to a new regime all at the same time, especially if they hold different beliefs ([Haug & Siklos, 2006](#)). In the PSTR model, we consider that the income elasticity of insurance premium changes with country and time, and it allows for a smooth and continuous switch between two regimes. It is noteworthy that the PSTR model is different from most existing literature on insurance-income models, and it could endogenously determine the non-linear model.

Second, the panel data approach has a number of advantages over the analysis of individual time series or cross-sectional data. It gives more information with less collinearity among the variables, more degrees of freedom and more efficiency, and it can control for individual heterogeneity. It also allows us to exploit both cross-country and time-series variations in insurance premiums. Focusing on a panel of countries rather than on a single country permits us to learn about an individual's performance by observing the behavior of others. Based on PSTR specifications, we derive elasticities of insurance premiums that vary not only between countries, but also with time.

Third and finally, many existing studies for the causality between insurance and real income have found unidirectional causality from insurance demand to real income and/or from real income to insurance demand. Thus, the problem of potential endogeneity exists in the insurance-income nexus. However, few studies to date have noticed this problem. To consider the potential endogeneity, we apply the PSTR model with instrumental variables developed by [Fouquau, Hurlin, and Rabaud \(2008\)](#).

In the existing literature, i.e. [Enz \(2000\)](#) and [Zheng, Liu, and Dickinson \(2008\)](#), the optimal non-linear types for the insurance-income relationship are not empirically investigated, thus the results may be biased. To improve this, the PSTR model in this study allows for different types of market behavior depending on the nature of the transition function. In particular, the logistic function allows for differing behavior depending on whether real income is large or small ([McMillan, 2003](#)). Besides, in our PSTR model the regression functions are not identical across all observations in a sample, but fall into classes. The key idea is that when threshold is passed, then the economy can move smoothly to another regime, with the insurance-income relationship being different between the old and the new regimes. More importantly, the threshold value is estimated rather than being imposed a priori. It also allows for a smooth transition from low-income to high-income levels, and the impact of real income per capita can be assessed more easily since the variable is directly considered as an explanatory variable in the insurance premium model.

Aside from this, the existing literature does not consider the possible impact of endogeneity biases. Thus, we enrich the existing literature by examining the impacts of real income on insurance premiums with instrumental variable approaches and take into account (by endogenous determination) the types of our PSTR models for insurance premiums. The transition variable is the key to the identification of a non-linear relationship as it is one of the economic variables that are believed to trigger the smooth transition from one regime to another ([Haug & Siklos, 2006](#)).

The remainder of this study is organized as follows: [Section 2](#) discusses the reasons for non-linear and potential endogeneity in the relationship between insurance-income. [Section 3](#) introduces the PSTR model with instrumental variables. [Section 4](#) illustrates the variables' definitions and data sources and provides the empirical results. Robustness checks are provided in [Section 5](#). A conclusion is presented in [Section 6](#).

2. Why do non-linear and endogeneity matter?

The previous studies mainly utilize time-series or cross-sectional datasets to investigate the relevant issues of insurance premiums.³ As global issues are paid attention to and global datasets are established, researchers have begun to utilize panel data to analyze the issues on insurance consumption (i.e. [Beck & Webb, 2003](#); [Chen et al., in press](#); [Enz, 2000](#); [Lee, 2011](#)). The panel data approach provides more powerful tests and estimates, and it also allows us to increase the information available coming from the cross-sections. By controlling for country heterogeneity using the panel data approach, this study provides not only a clear picture

² Life insurance is a form of insurance coverage that pays out premiums to the insured or their specified beneficiaries upon a certain incident. Non-life insurance essentially consists of insurance policies that protect the insured against losses and damages other than those covered by life insurance such as property, motor, marine, transport, pecuniary loss, and aviation.

³ [Wahab \(2011\)](#) notes that there are some limitations in a time-series estimation since it requires an adequate number of observations to maintain the enough degrees of freedom, and that a cross-section estimation will exhaust degrees of freedom with a limited number of cross-section units since it uses data-averaged over time to abstracts from business cycle effects. However, a panel-data estimation can improve these problems of the time-series and cross-section estimations.

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