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Assessing the Demand Factors for Residential Earthquake Insurance in Turkey: Empirical Evidence

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Abstract:

The purpose of this study is to understand what the drivers of attitude towards purchasing insurance products are and which factors –both psychological, economical and consumer characteristics- affect consumers’ purchase decisions. The structural equation modeling (SEM) seems to be the most suitable approach to look for the relationship between these variables because it accounts measurement errors of variables and give opportunity to identify both direct and indirect effects.

The compulsory earthquake insurance (CEI) was introduced in 2000 as a result of the devastating impacts of 1999 Marmara Earthquake in Turkey. In the literature, previous studies examined only descriptive differences between consumers who buy or not earthquake insurance. In this study, we compare the importance of different factors by modeling consumer’s buying decision next to focusing on purchase intention of non-owners of an earthquake insurance consumer in SEM framework. In the study, 800 households in six different regions of Ankara with different socio-economic characteristics are surveyed with simple random sampling.

This study is a first study to apply structural equation modeling to the Turkish Catastrophe Insurance Pool claims data. Findings of the analysis will help insurance sector to design better policies to overcome unwillingness to buy earthquake insurance, to indicate how to approach to convince consumers to purchase insurance products.

Keywords: **consumer behavior, consumer decision making process, insurance demand, structural equation modeling (SEM).**

Introduction

Insurance is one of the financial instruments to deal with the possible economical losses of natural disasters. It is a very efficient financial mechanism in developed countries such as US and Japan. The earthquakes are low frequency and high severity events. Therefore, the most appropriate solution to deal with their consequences can be suggested as insurance/reinsurance applications. The 1906 San Francisco earthquake initiated the important implications of earthquake insurance. In emerging markets like Turkey, despite the efforts of governmental insurance programs, earthquake damages that occurred remain largely as uninsured losses. It is therefore important to understand when and in which cases people purchase or more willing to purchase earthquake insurance.

As [1] states, insurance behavior and decision-making do not conform to standard economic models of choice and decision-making and therefore the economic theory is not sufficient alone to explain insurance purchase behavior. Previous studies discussed many anomalies both at supply and demand side.

Decision to buy residential earthquake insurance contains a psychological dimension as well next to many interdependent environment variables, such as disposal income, government subsidized and region. The decision to purchase earthquake insurance is a special case in the general study of individual response to uncertainty in the environment. Homeowner has to evaluate a future outcome that is risky in nature. The risk attitude of the homeowner, in combination with his or her evaluation of the future, plays a role in reaching a decision.

1. Turkish Catastrophe Insurance Pool

The Turkish Catastrophe Insurance Pool (TCIP/DASK in Turkish) is the first example of Public Private Partnership (PPP) in an emerging market. The penetration rate of the TCIP measured 25.9 % as of March 2011 and this pool became one of the largest insurance pools in the World. The TCIP/DASK provides compulsory earthquake insurance (CEI). However, the compulsory part works during deed or mortgage operations. Otherwise, there is no penalty if a house owner does not hold compulsory earthquake insurance. Although Turkish consumers can buy the CEI without over paying, there are still many consumers who do not buy or intent to buy it as long as it is really mandatory. Turkish consumers indicate a low interest and demand on not only earthquake, but also other insurance products compared to developed countries.

The main aim of the TCIP is to transfer the national risk to world-wide risk sharing pools under the management of the international reinsurance companies. Basically, it (1) shares the burden; (2) pools the risk; (3) spreads the insurance culture; (4) controls the construction of earthquake resistant structures; (5) provides warranty system for buildings, and (6) helps to reduce the economic burden on the government's budget in case of a disaster strike. Besides, the idea of introducing the importance of earthquake insurance, the TCIP also plays a significant role in the control of the use of the necessary building codes during the construction, since it is required by the reinsurers. The use and the control of the current Building Code 1998 is one of the main problems in terms of disaster risk management in Turkey. One other aim of the TCIP is to provide minimum amount standard insurance for residents living in these earthquake risk zones.

The damage and losses of the hazards such as earthquakes, fires following earthquakes, explosions due to earthquakes and landslides following earthquakes are in the coverage of the Turkish Catastrophe Insurance Pool [2]. The Turkish Catastrophe Insurance Pool does not provide coverage for the following items: rubble moving expenses, loss of business profit, bankruptcy, stop of rent revenue, alternative residence and business premise expenses, injuries and deaths, any losses occurring after earthquake, which are not mentioned in the coverage. The TCIP has a very efficient and strong data management and IT structure. This enables the TCIP to be able to handle large and successive claims safely, easily and quickly in case of a disaster occurrence. The data arriving to the pool are stored and organized in Istanbul. The system has a back up in Ankara.

As of March 2011, the number of policies is 3.365.840 in Turkey. The corresponding penetration rate is 25.9 %. Total premium collected sums up to 215 million USD. The maximum coverage that the compulsory earthquake insurance provides is almost 100.000 USD in 2011. The losses exceeding this coverage can be insured with additonal private insurance. The deductible amount is 2 %. Up to March 2011, there have been 11084 claims arrived to the Pool due to 307 earthquakes. The total paid amount for these claims is approximately 13.7 million USD. In 2011, the TCIP has 4 billion USD payment capacity [2]

2. Structural Equation Models

The structural equation model (SEM) is used to be able to show which factors are important on consumer's buying decision and on purchase intention of non-owners of an earthquake insurance consumer. During SEM analysis, LISREL (Linear Structural Relations) has wide use in both social and economic research. LISREL analysis have been developed by Jöreskog and Sörbom ([3],[4]) to accommodate models that include latent variables, measurement errors in both dependent and independent variables, reciprocal causation, simultaneity, and interdependence. This approach consists of two elements:

1-) a measurement component, which describes how latent variables or hypothetical constructs are theoretically related to observed variables. It specifies the measurement properties, namely reliabilities and validities of the observed variables [5].

2-) a structural relations model, which specifies the causal relationships among the latent variables. It describes the causal effects by assigning the explained and unexplained variance ([5], [6]).

The LISREL method estimates the unknown coefficients of the set of linear structural equations. The model assumes that there is a causal structure among a set of latent variables, and the observed variables are the indicators of the latent variables.

The following three equations define the full LISREL model [6]:

(1) The structural equation model:

$$\eta = B\eta + \Gamma\xi + \zeta \qquad (1)$$

where

η is an $(m\times1)$ vector of the endogenous latent variables

ξ is an $(n\times1)$ vector of the exogenous latent variables

ζ is an $(m\times1)$ vector of random variables

B matrix is an $(m\times m)$ coefficient matrix for the latent endogenous variables

Γ matrix is an $(m\times n)$ coefficient matrix for the latent exogenous variables.

(2) The measurement model of exogenous variables:

$$x = \Lambda_x\xi + \delta \qquad (2)$$

(3) The measurement model of endogenous variables:

$$y = \Lambda_y \eta + \varepsilon \qquad (3)$$

where

x and δ are column q-vectors related to the observed exogenous variables and errors, respectively Λ_x is a (q x n) structural coefficient matrix for the effects of the latent exogenous variables on the observed variables

y and ε are column p-vectors related to the observed endogenous variables and errors,respectively

Λ_y is a (p x m) structural coefficient matrix for the effects of the latent endogenous variables on the observed ones.

In the literature, maximum likelihood method is used to estimate the structural equation system generally, however other alternative estimation methods or robust maximum likelihood estimation for nonnormal data are also available nowadays, such as unweighted least squares (ULS), weighted least squares (WLS), generalized least squares (GLS), and so on (see [7], [8]).

3. The Proposed Model

In this study, it is aimed to answer what the drivers of attitude toward purchasing insurance products are, how attitude towards insurance policy affects the purchase intention, behavior to purchase insurance, and which factors –both psychological, economical and consumer characteristics- affect consumers' purchase decisions. The structural equation modeling (SEM) seems to be the most suitable approach to look for the relationship between the variables mentioned above, because it accounts measurement errors of variables and also give opportunity to identify both direct and indirect effects. Figure 1 gives the structural part of the proposed SEM.

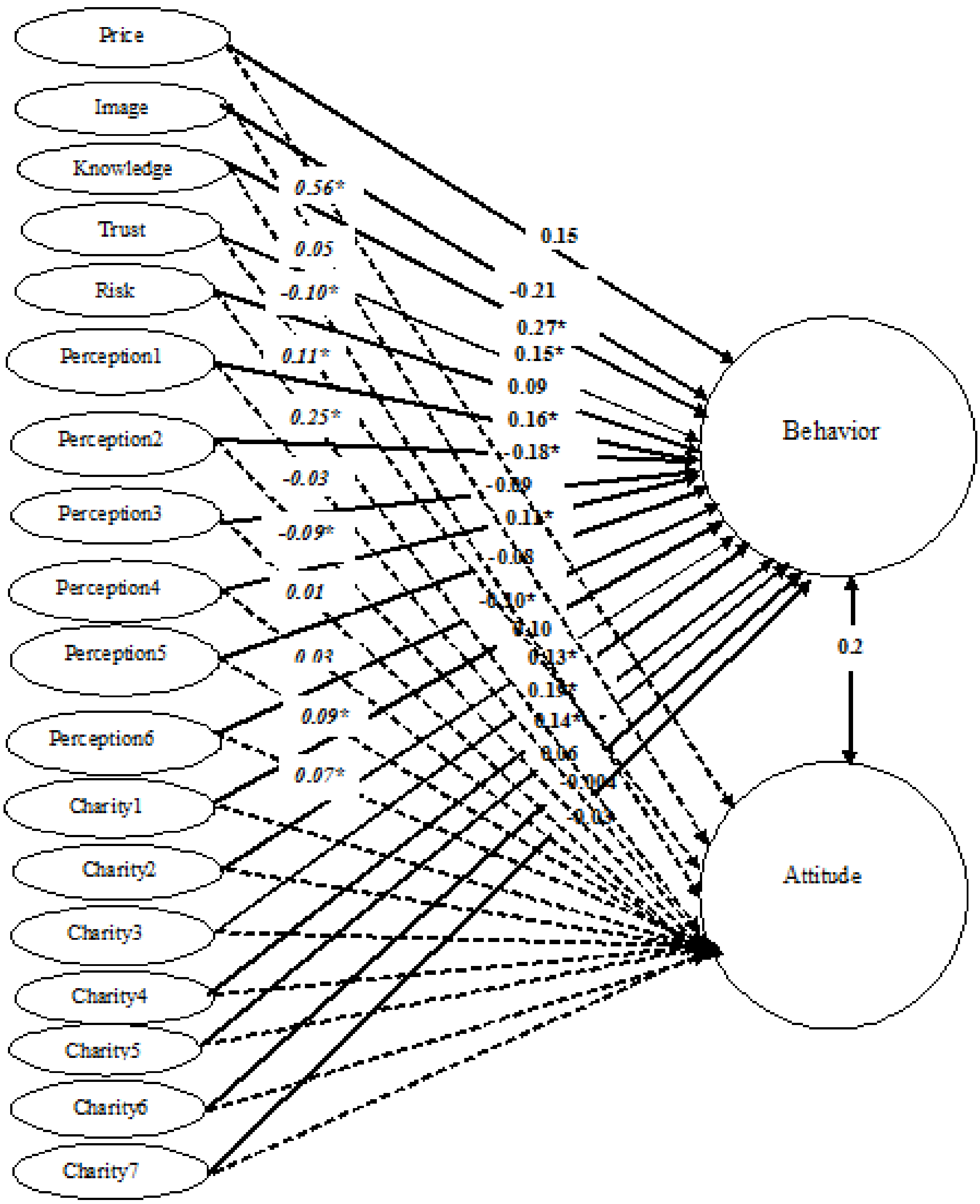

Figure 1. Structural part of the proposed SEM (*=significant at α=0.05).
Chi-Square = 1360.80 df = 539 p-value = 0.00000 RMSEA = 0.048

4. Data Analysis and Results

In this study, the sample size has been decided by using the methodology in [13]. The households for the determined sample size is provided by the Turkish Statistical Institute based on simple random sampling. 800 households in six different regions of Ankara are surveyed. These regions have different socio-economic characteristics. In the preparation of questionnaire, many marketing scale references were used such as [15].
Existing previous studies examined only descriptive differences between consumers who buy or do not buy earthquake insurance. Here, we compare the importance of different factors by modeling consumer buying decision next to focusing on purchase intention of non-owners of earthquake insurance in SEM framework. By understanding the way information is processed by homeowners and the limitations on thought processes, better policies may be designed to overcome unwillingness to buy earthquake insurance, and other relevant insurance products.

The level of education of these households seems to be the primary factor of insurance awareness, as we observed the frequencies with 12.6% of participants are primary school graduate, 12.7% of them are secondary school graduate, 34.4% of them are high school graduate, 10.6% of them are college graduate, 25.4 % of them are university graduate, 3.5% of them have master degree. When we examine the knowledge about compulsory earthquake insurance by asking whether consumers know the open from of “DASK”. It is observed that participants gave accurate, inaccurate and irrelevant responses with 4.8%, 12% and 83.1%, respectively. It can be concluded that policyholders have insufficient knowledge about their insurance contents. DASK owners belong to lower income, middle income and high income with 6.5%, 18.3%, 11%, respectively.

In accordance with the data collected, 53.8% of participants are women and 46.2% of them are men. When the range of participants’ age is considered, 40% of participants are from 18 to 35 years old, 45% of the participants are in 36 to 55 years age group and 15% of participants belong to the age group of 56 to 86 years old.

Based on existing studies in the literature, we proposed the relationships drawn in the model in Figure 1. We expect that the decision to buy an earthquake insurance is mediated by attitude towards insurance. Consumer’s price perception about insurance policies, image of insurance companies, knowledge, trust to insurance companies, risk attitude and consumer perception about insurance (it is labelled as perception1-perception6) influence consumers’ attitude towards insurance. Additionally, consumer’s actual behavior about purchasing an earthquake insurance are influenced by the variables, which hypothesized as an affect on attitude towards insurance and some additional variables which we label them as charity hazard (charity 1-7). Charity hazard represents consumers rely on which institutions in case of an experience of an earthquake damage. Charity hazard and perception about insurance were measured with only on item. Therefore, their loadings are fixed to 1, perception variables’ error variances to 1.98 (which corresponds 85% reliability, see [16]) and charity variables’ to 0.

After applying CFA (Confirmatory Factor Analysis), we fit a model only to which factors do influence attitude towards insurance without actual behavior. Then, attitude was entered to the model as a mediating variable between the factors and the behavior. After the examination of the model carefully, it was seen that there is no significant effect of attitude on behavior. Because of this, we combined the attitude and behavior in the model. According to model fit statistics, the model seems to be reasonably well (χ^2 (539) = 1360.88, p <.05, RMSEA =

0.048, GFI = 0.891, AGFI = 0.843, CFI = 0.895, NNFI = 0.855). We obtained standardized loadings (Lambda), variance extracted (VE) values and construct reliability (CR) values. VE values of last three items of Risk are less than 0.50, their standardized loadings are less than 0.5 and CR values are less than 0.70. For this reason, we omitted those items and recalculated measurement model. Since the model is too big, when we run the LISREL syntax with the polychoric matrix (used when there are ordinal variables in the data), we had some troubles. After inspecting the full structural model again, all conditions are satisfied.

To summarise our proposed SEM, price perception seems to be the most effective factor on attitude towards insurance companies. Risk perception, trust and knowledge are the next three factors to have influence on attitude (for all factors p-value<0.05, so is significant). Knowledge, charity3 (help from relatives) and perception2 (defined as extra spending for secure future) are observed to be the three most significant factors on the decision of purchase of an earthquake insurance (for all factors p-value<0.05, so is significant). The factor loadings can be seen in Figure 1.

5. Conclusion

In this paper, the aim was to determine factors affecting the attitude towards insurance companies and consumer behavior on the purchase of earthquake insurance. For this purpose, a questionnaire was conducted in Ankara, which is a metropolitan city keeping varieties of consumers needed for our survey. After data collection and preprocessing, the proposed structural equation model was tested to see the accuracy of different factors as given in the literature. The response variables are attitude and behavior in the proposed model. After standardization of collected data, we obtained convergence. Generally, increasing sample size after new data collection or reducing constructs measured with one item might prevent this problem. In the final model, attitude was mainly affected by price perception, knowledge, trust and risk perception. Among these factors, knowledge has a negative effect on attitude towards insurance companies. One reason for that might be the past experiences that the consumers have. Moreover, knowledge, charity from relatives/TV and organizations/families and trust are the main factors to influence customer behavior on the purchase decision of earthquake insurance. For future research, we will improve the model fit by combining contructs of perceptions of insurance items and charity hazard. Besides, it will be tested that the model fit with polychoric matrix. Moreover, the same model will be tested with partial least sqaures (PLS).

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