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Disciplines
Business | Insurance

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This study investigates the impact of culture on non-life insurance consumption. Various economic, institutional, and cultural variables regarding 82 countries across a 10-year period are considered when building up the best and most parsimonious regression model. Employing blocking and bootstrapping techniques, we find that nations with a low degree of *Power Distance*, a high level of *Individualism*, and a high degree of *Uncertainty Avoidance* tend to have a high level of non-life insurance consumption. The empirical results suggest that consumers may respond to insurance solicitations according to their cultural belief, not only economic rationality.

Introduction

The insurance industry is founded on the idea of risk diversification and loss minimization. Even though insurance products provide protective care for a policyholder's life and/or wealth, they are secondary goods in which the exact value of any benefit is unknowable and advanced payment is required. Prior studies by Beenstock et al. (1988), Browne et al. (2000), and Esho et al. (2004) suggest that GDP is one significant factor determining non-life insurance consumption. Interestingly, Figure A shows that US non-life premiums per capita are around two times those of Sweden despite the fact that the GDP per capita for both countries is comparable. Thus, what are the other driving forces or incentives for American consumers to buy far more of a product whose present value is not yet known? What about consumers in other countries? Would it be possible that culture differentiates consumers in different countries by their purchase of insurance products?

There are several empirical studies investigating the significant factors influencing life insurance consumption. According to Figure B, Chui and Kwok (2008, 2009) found the inclusion of cultural factors increases the predictive ability of the regression model on life insurance consumption by 13% – highly significant. However, there are only a few studies which explore the area of property-casualty insurance and none of them investigates the impact of culture. Key findings from these studies include a log-linear relation between insurance penetration (total non-life premium volume divided by GDP) and GDP by Beenstock et al. (1988). Browne et al. (2000) finds foreign firms' market share and the form of legal system (civil or common law) are statistically significant. Esho et al. (2004) extends the work of Browne et al. (2000) by using a larger set of countries and considering other potential independent variables such as the origin of the legal system: English, French, German, and Scandinavian which are all found to be insignificant.

Jean Lemaire, the Harry J. Loman Professor of Insurance and Actuarial Science at the Wharton School, and Jonathan McBeth, a Joseph Wharton Scholar (2010) found a significant impact of cultural variables on non-life insurance consumption. However, other cultural variables such as religion are not considered and the robustness of the result has not been confirmed yet.

This study follows up on Lemaire's and McBeth's prior findings. Blocking and bootstrapping techniques will be applied to 82 countries across a 10-year period (1999-2008) to increase the validity of the model. Non-life Insurance Penetration (total non-life premium volume divided by GDP) will be considered as another

dependent variable as it may capture cultural variations better than Non-life Insurance Density (number of US Dollars spent annually on life insurance per capita). Economic, Institutional, and Cultural factors will be taken into account.

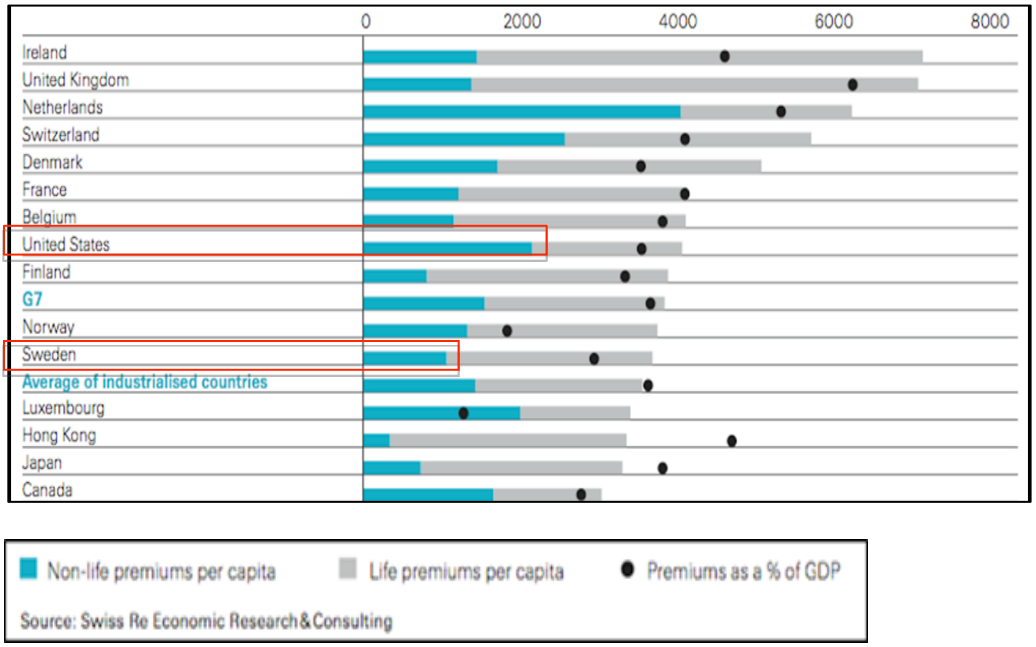

Figure A: A comparison of average life and non-life premiums per capita across countries

	PDI	*UAI*	*Prin*$_{Econ}$	*Prin*$_{Demo}$	*Pro*	*Rel*	Adj R^2
Panel A Pooled *GLS* regressions (1966–2004, 38 countries)							
1			1.360*** (24.14)	−0.391*** (−6.35)	1.644*** (11.07)	−0.002* (−1.66)	0.74
2	1.015*** (7.89)	−0.647*** (−5.44)	0.953*** (19.22)	−0.403*** (−8.21)	0.780*** (5.31)	−0.000 (−0.03)	0.87
Panel B Regressions of time-series means (1985–2004, 32 countries and each country has at least 10 observations)							
1			1.931*** (5.67)	0.100 (0.25)	1.622** (2.19)	−0.000 (−0.00)	0.78
2	1.514* (2.05)	−0.407 (−0.54)	1.425*** (3.81)	−0.193 (−0.56)	1.406 (1.58)	0.002 (0.41)	0.87
Panel C Fama–MacBeth regressions (1980–2004, at least twenty-two countries in each year)							
1			1.501*** (15.62)	−0.418*** (−3.08)	1.582*** (22.48)	0.001 (0.77)	0.75
2	1.287*** (11.58)	−0.609*** (−4.50)	1.078*** (9.76)	−0.662*** (−2.93)	0.897*** (4.51)	0.002 (1.69)	0.83
Panel D Random effect models (1966–2004, 38 countries and standard error adjusted for cross-sectional heteroskedasticity and with-in panel correlation)							
1			0.855*** (3.72)	−0.799*** (−3.63)	1.474** (2.34)	−0.002 (−0.42)	0.73
2	1.602*** (2.84)	−0.727* (−1.74)	0.843*** (3.69)	−0.788*** (−3.59)	0.627 (0.93)	−0.002 (−0.62)	0.86

Figure B: Chui and Kwok regression model on life insurance consumption

Variables

This study investigates the impact of culture on property-casualty insurance purchases. We consider two dependent variables: *Non-life Insurance Density* and *Non-life Insurance Penetration* with a greater focus on *Non-life Insurance Penetration.* A number of explanatory variables are from annual data for 82 countries which account for a population of 5.67 billion representing 82.7% of the world's total. Variables such as

Legal System and *Hofstede's Cultural Variables* do not evolve across this 10-year period and are thus presented as a single time-invariant number. Table 1 summarizes the variables definitions and provides all sources. The hypothesized relationships between non-life insurance consumption and our explanatory variables are in Table 2. Tables 3 and 4 provide descriptive statistics and correlation for all variables respectively.

Dependent Variables

1. Non-Life Insurance Density Adjusted for Purchasing Power Parity (DEN) is defined as premiums per capita in US dollars adjusted for Purchasing Power Parity. Purchasing Power Parity is an adjustment for different living conditions, price, and services so that non-life insurance density is more comparable across countries. The Swiss Reinsurance Company publishes an annual study of the world insurance market in which *Non-life Insurance Density* for 85 countries is found.

2. Non-Life Insurance Penetration (PEN) is defined as premiums, as a percentage of GDP. Dividing by GDP allows more variation in other variables besides GDP and reflects consumers' allocation of wealth: purchasing non-life insurance products or other goods. Therefore, *Non-life Insurance Density* and *Non-life Insurance Penetration* measure insurance consumption from different perspectives. These data can also be found in Swiss Re's annual study of the world insurance market.

One disadvantage of using *Non-life Insurance Density* and *Non-life Insurance Penetration* is that they sum up the premiums across various lines of non-life insurance products. Therefore, specific purchasing patterns for individual product are less likely to be observed and some independent variables will possibly become less significant. Different lines of non-life insurance products are observed to dominate in different countries. Motor vehicle and/or third party automobile liability insurance consumption is dominant in most countries, especially developing countries. Health insurance has a large market share in nations that have privatized the health care system.

Explanatory Variables

Economic and Institutional Variables

3. Gross Domestic Product Per Capita, at Purchasing Power Parity (GDP) is a measurement of income. All former studies concluded that income is the most important factor affecting purchasing decisions.

Obviously, increased income allows for higher consumption in general, makes insurance more affordable, and creates a greater demand for non-life insurance to safeguard acquired property. Therefore, we expect income to have a strong, positive impact on non-life insurance demand.

4. Urbanization: Percentage of Population Living in Urban Areas (URBAN). Several authors suggest that *Urbanization* could be an important determinant for non-life insurance demand. Urban dwellers may perceive a higher risk of car accidents and thefts. The increasing rate of interaction among individuals in urban areas may increase loss probability and opportunities for crime and evading detection. Due to *Urbanization*, families become smaller and family protection disappears, so additional sources of financial security are needed. We expected the degree of *Urbanization* to have a positive impact. However, after introducing *Individualism* (one of Hofstede's cultural variables), we may see a weaker effect of *Urbanization* as these two variables overlap.

5. Market Concentration: Sum of Squared Market Shares of Ten Largest Non-life Insurance Companies (HERF). This measures the degree of market competition. A high index means low insurer concentration, less competition and, maybe, less demand for non-life insurance products because competition should force down the price. We believe high demand should lead to high competition but the opposite may occur.

6. Education: Percentage of Population Enrolled in Third-level Education (EDUC). The level of education in a country is generally used as a proxy for risk aversion. We expected that education would increase the awareness of risk and threats to financial stability. We also expected that education would increase people's understanding of the benefits of insurance.

7. Legal System in Force (COMMON, ISLAMIC). Legal systems can be subdivided into two families: Civil Law and Common Law. The common law system is more open to economic development than the civil law system as it tends to have higher law enforcement quality and stronger legal protection for creditors and investors.

The legal systems of Muslim countries are distinct from the common law and civil law systems by incorporating principles of the Shariah. According to the Shariah, a purchase of insurance products shows a distrust in Allah (God). Thus, we expected a negative relationship because conventional insurance is not

compatible with the Shariah. Even though insurers in Muslim countries have developed specific products (Takaful insurance) that comply with the Shariah, we still expect a negative relationship.

8. Political Risk Index. Countries with low political and investment risk are more likely to have developed insurance markets, as the financial environment is more conducive to foreign investment, and financial contracts such as insurance policies are easier to enforce. Countries receive scores on twelve risk components – that could each be considered as a potential explanatory variable.

- government stability (government unity, legislative strength, popular support)
- socioeconomic conditions (unemployment, consumer confidence, poverty)
- investment profile (contract viability, expropriation risk, profit repatriation, payment delays)
- internal conflict (civil war threat, political violence, civil disorder)
- external conflict (war, cross-border conflict, foreign pressures)
- corruption
- military interference in politics
- religious tensions
- law and order (strength and impartiality of judicial system, popular observance of the law)
- ethnic tensions
- democratic accountability
- bureaucratic quality.

Political Risk Index is defined in such a way that a high score implies a low degree of political risk. So we expect a high score to have a positive impact on the demand for non-life insurance. These twelve variables are highly correlated, thus we apply the Principal Component Analysis technique to find one variable representing them in one dimension, called *The First Principal Component*.

Cultural variables

9. Religion: Percentage of Individuals Who are Christian, Buddhist, or Muslim. Zelizer (1979) notes that, historically, organized religion is in conflict with the concept of insurance. Some observant religious people believe that reliance on insurance to protect one's life or property results from a distrust in God's protective care. Browne and Kim (1993) find Islamic beliefs to significantly decrease life insurance purchases. We

expect countries with a high percentage of those who identified with established religion to have a lower degree of insurance consumption. This is especially true in Muslim countries.

10.Hofstede Cultural Variables. In a celebrated study, Hofstede (1983) analyzed the answers in 116,000 cultural survey questionnaires collected within subsidiaries of IBM in 64 countries. Four national cultural dimensions emerged from the study, that collectively explain 49% of the variance in the data:

- *Power Distance* (PDI) is the degree of inequality among people which the population of a country can accept that inequality. High Power Distance countries accept inequalities in wealth, power, and privileges more easily, and tolerate a high degree of centralized authority and autocratic leadership. Chui and Kwok (2008) suggest that the population of a high power distance country expects their political leaders to take sufficient actions to reduce their risk. However, this also occurs in a low power distance country, thus the effect of *Power Distance* seems to be ambiguous.
- *Individualism* (IDV) measures the degree to which people in a country prefer to act as individuals rather than as members of groups. We expected the more individualistic people in a certain nation are, the more insurance products they tend to buy to protect their wealth as they depend less on family or rely less on other individuals. We expected the insurance consumption of a country to be positively related to its level of *Individualism*.
- *Masculinity* (MAS) evaluates whether biological gender differences impact roles in social activities. It represents the different roles of males and females that each society pictures for itself. In masculine societies, performing, achieving, and earning a living are given paramount importance. In feminine societies, helping others and the environment, having a warm relationship, and minding the quality of life are key values. In life insurance, Chui and Kwok (2008) find that feminine societies purchase more insurance, as these societies are very sensitive to the needs of their families and want to protect them against the financial consequences of an untimely death. The effect of Masculinity/Feminity on non-life insurance purchases may be ambiguous. Masculine societies may buy more insurance to be more in control of the future – a factor that may outweigh the higher level of care in feminine societies.

- *Uncertainty Avoidance* (UAI) scores tolerance for uncertainty. *Uncertainty Avoidance Index* assesses the extent to which people feel threatened by uncertainty and ambiguity, and try to

avoid these situations. It measures the degree of preference for structured situations, with clear rules as to how one should behave. *Uncertainty Avoidance* is correlated to risk aversion but it is not risk aversion. People who are risk averse are willing to take more risk if they are compensated to do so with a goal of maximizing utility function while people with a high degree of *Uncertainty Avoidance* strongly prefer a well-defined predictable outcome. Thus, the impact of *Uncertainty Avoidance* on non-life insurance purchases may be ambiguous.

Scores of all countries on all cultural dimensions can be found at http://www.geert-hofstede.com/hofstede_dimensions.php. Several papers use databases that are overrepresented by OECD countries. In order to avoid that potential issue, we have assigned cultural values to several countries from regions poorly represented in the dataset, based on their neighbors. For instance, we have given Bahrain, Jordan, Oman, and Qatar the same cultural scores as other countries from the Arab World. We have assigned Latvia and Lithuania Hofstede's scores for Estonia. No such similar approximation was made for Western Europe and South America, already well represented. Due to rarely missing observations of insurance density and penetration, this resulted in unbalanced panel data including the 82 countries in regressions using Hofstede's four initial variables.

Theoretical Framework and Methodology

The Principal Component Technique

The 12 measures in *Political Risk Index* are highly correlated, with numerous correlation coefficients in excess of 0.6. Thus, to avoid the severe Multicollinearity problem, we apply the Principal Component Analysis technique to summarize these 12 variables and use the first factor in the analyses. This first factor has a very large eigenvalue of 5.49 and explains 46% of the total variance of all *Political Risk Index* scores.

The Log-log Transformation

Figures C shows a fan-shaped relationship between *Non-life Insurance Density* and *GDP*, and *Non-life Insurance Density* and *Market Concentration* which under the log-log transformation become more homoskedasticity as shown in Figure D. The same results occur for *Non-life Insurance Penetration*. Even though, in the presence of heteroskedasticity, the estimators are unbiased, the standard errors will be underestimated, thus the T-statistics will be inaccurate resulting in a possible wrong conclusion regarding the significance of explanatory variables. Therefore, the log-log transformation is employed.

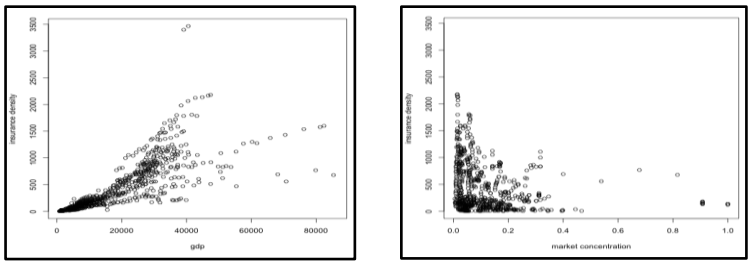

Figure C: A fan-shaped relationship. *Left*: Non-life Insurance Density and GDP. *Right:* Non-life Insurance Density and Market Concentration.

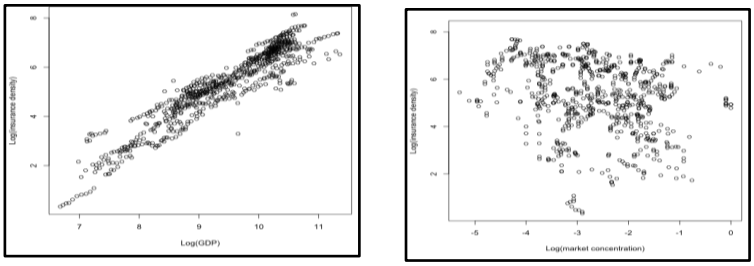

Figure D: The results of the Log-log transformation. *Left*: Non-life Insurance Density and GDP. *Right:* Non-life Insurance Density and Market Concentration.

The Full Model

The full model is described by the following equation:

$$Ins_{it} = \alpha + \beta_1 X_{it,Econ} + \beta_2 Y_{i,\ Inst} + \beta_3 Z_{i,\ Cult} + \gamma D_{Year} + \varepsilon_{it}$$

In which Ins_{it} is non-life insurance consumption (natural logarithm of density or penetration) for country *i* in year *t*. $X_{it,Econ}$ is an array of economic variables (*GDP, Urbanization, Market Concentration, and Education*) that vary with country and time. $Y_{i,\ Inst}$ is an array of institutional variables (*Legal system* and *The First Principal Component* summarizing *Political Risk Index*) that vary across countries. $Z_{i,\ Cult}$ is an array of cultural variables (*Hofstede Cultural Variables* and *Religion*) that are country-dependent but time invariant. β_1, β_2, and β_3 are vectors of coefficients corresponding to these variables. D_{Year} is an array of annual dummy variables used to estimate the effect of time on insurance purchases, with γ as the corresponding regression coefficient. ε_{it} is the error term for country *i* in year *t*.

Bootstrapping

Relying on the Ordinary Least Square technique to obtain the regression models indicates that we make assumptions about the structure of the populations (i.e. homoskedasticity). If assumptions about the population are wrong, we may potentially derive an inaccurate conclusion. However, Fox (2002) suggests that the nonparametric bootstrap allows us to estimate the sampling distribution of a statistic empirically without making assumption about the form of the population. The idea of the nonparametric bootstrap is as

follows: We proceed to draw a sample of size n from our observations, sampling with replacement so that we will not end up reproducing the original sample. Thus, we are treating each sample as an estimate of the population in which each element is selected for the bootstrap sample with the probability 1/n where n is the number of our samples, mimicking the original selection of the sample from the population. Next, we compute the statistic T for each of the bootstrap samples. Then the distribution of T around the original estimate of T is analogous to the sampling distribution of the estimator T around the population parameter T. Therefore we use the bootstrap estimate of the sampling standard error to compute t-statistic and partial F-statistic. Even though the log-log transformation resulted in more homoskedasticity data, but to what extent is hardly measurable. Thus, to control for the sampling error (failing to enumerate all bootstrap samples) and obtain a sufficiently accurate significance level, we make the number of bootstrap replications large enough, say 1,500 (the borderline choice Fox recommend is 999).

Blocking

The most powerful assumption we made in order to apply the bootstrap technique in constructing the regression model is independence. We assume that our 820 samples are independent from each other. Unfortunately, it is nearly impossible to check whether this assumption is true for our data. Alternatively, Lin and Foster (2011) have shown that if all observations are truly independent, the weaker block independence assumption can be made and the result will also be as credible as making the stronger full independent assumption with only a little power lost. Thus, in our case, we rely on a more credible block independence assumption treating each country as an independent observation. Therefore, we bootstrap 82 countries recovering the "block" data for each selected country, and then assembling data matrix by gluing blocks together. We call this data matrix "the bootstrap samples".

Model Interpretation

To avoid deriving an inaccurate conclusion, we focus only on the result from the blocking and bootstrapping techniques shown in Tables 5 and 6 for *Non-life Insurance Penetration* and *Non-life Insurance Density*. Under the log-log transformation, R^2 of the regression models is not very informative and is not comparable to R^2 of the regression models without the log-log transformation, thus we focus only on bootstrapping t-statistics in order to determine the significance of explanatory variables and the goodness of the model. The coefficients of *GDP* and *Market Concentration* may be interpreted in terms of elasticity as we transform these variables logarithmically and the coefficients of other explanatory variables may be interpreted in

terms of percentage change in insurance consumption per one unit change in each variable. However, these interpretations do not add much to the understanding of insurance consumption, thus we concentrate only on whether each explanatory variable has a significant relationship with insurance consumption. If it has a significant impact, the relationship is positive or negative. Last, we focus on partial F ratio of a set of significant cultural variables, as it determines the significance of culture.

Empirical Results

Table 5 shows the results of *Non-life Insurance Penetration* from the blocking and bootstrapping techniques. Significant economic and institutional variables include *Market Concentration, Islamic Law,* and *The First Principal Component (Political Risk Index).* As expected, *Market Concentration* and *Islamic Law* have a negative impact. This supports the idea that a higher index of *Market Concentration* (a lower degree of competition) increases non-life insurance consumption and the prior belief that the population in Islamic countries tend to buy fewer non-life insurance products, as a purchase of them convey the buyer's distrust in Allah. Even though Takaful products are compatible with the Shariah, the negative relationship still remains. The positive impact of *The First Principal Component* indicates that a higher level of insurance consumption is observed in a region that has low political and investment risk. It is not surprising that *GDP* is not significant. Penetration is premium divided by *GDP*, thus less variation around *GDP* is observed as expected.

Surprisingly, the bootstrap T-statistics suggest that *Urbanization, Education,* and *Legal System* are insignificant in determining non-life insurance consumption. Possibly either these three variables have no significant relationship with non-life insurance consumption or the goodness of these variables as a measurement of urbanization, education, and legal system in a nation is questionable. The use of national statistics may deteriorate the impact of urbanization, as national statistics seem to reconcile the level of urbanization in urban area and rural area in that nation. The quality of education is hardly measurable and comparable across countries. Tertiary education may not be a good proxy of one's understanding of sophisticated financial and insurance products as the knowledge of these products may not be taught in schools. The dummy variable characterizing countries with common law and civil law system does not measure the degree of law enforcement quality and the legal protection for creditors and investors in each nation. Therefore, the goodness of these proxies may lead to an insignificant impact of these variables on property-casualty consumption.

Clearly, *Religion* is not significant possibly because it does not reflect the degree to which people incorporate religious belief into their daily life or decision making. Adding *Hofstede's cultural variables* individually, we observe a negative significant impact of *Power Distance* and a positive significant impact of *Individualism*. *Masculinity* and *Uncertainty Avoidance* are found insignificant. Interestingly, *Power Distance* becomes less significant when the model consists of *Power Distance* and *Individualism*, however, when the model includes *Power Distance*, *Individualism,* and *Uncertainty Avoidance*, the magnitude of bootstrap T-statistics of *Power Distance* and *Uncertainty Avoidance* approach to 2 showing that *Power Distance* and *Uncertainty* become more significant when they are together. Even though Figures E(a) and E(c) confirm that when 4 cultural variables are added to model 4, the impact of *Power Distance* and *Uncertainty Avoidance* are ambiguous (bootstrap coefficients of both variables vary around 0), Figure E(d) shows that the cluster of bootstrap coefficients of both variables point toward one exact direction (positive for *Uncertainty Avoidance* and negative for *Power Distance*) confirming that both variables are significant when they are together.

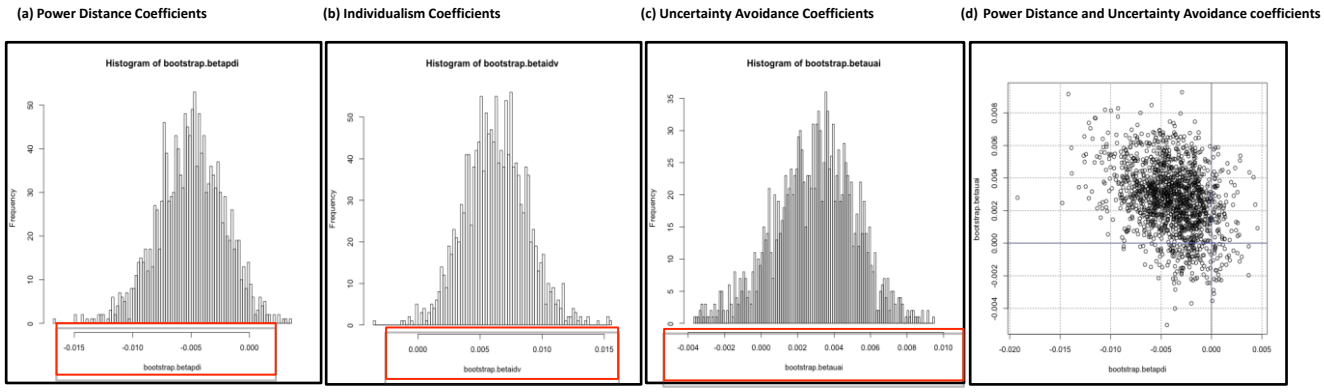

Figure E: Distributions of *Power Distance* bootstrap coefficients (a), *Individualism* bootstrap coefficients (b), and *Uncertainty Avoidance* bootstrap coefficients (c) when 4 *Hofstede's cultural variables* are added to Model 4. E(d) shows a 2-D plot of *Power Distance* and *Uncertainty Avoidance* bootstrap coefficients.

Figure F suggests that *Masculinity* is not significant as the bootstrap coefficients of *Masculinity* vary around zero and 2-D plots of *Power Distance* and three other *Hofstede's cultural variables* show that *Masculinity* behaves like noise. Therefore, only *Power Distance*, *Individualism*, and *Uncertainty Avoidance* have a strong impact on *Non-life Insurance Penetration*.

(e) Masculinity Coefficients (f) Masculinity and Individualism Coefficients (g) Masculinity and Power Distance Coefficients (h) Masculinity and Uncertainty Avoidance Coefficients

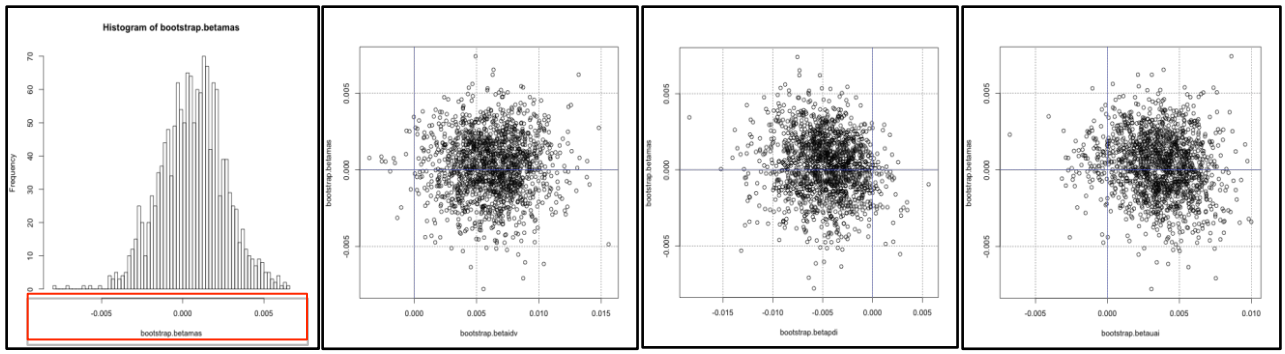

Figure F: A distribution of *Masculinity* (e) bootstrap coefficients varies around zero. 2-D plots of *Masculinity* bootstrap coefficients with *Individualism* (f), *Power* Distance (g), or *Uncertainty Avoidance* (h) bootstrap coefficients show cluster around zero for *Masculinity* bootstrap coefficients with no exact direction.

The negative relationship between *Power Distance* and non-life insurance consumption is possibly consistent to Chui's and Kwok's suggestion that the population of a high *Power Distance* country expects their political leaders to take sufficient actions to reduce their risk and losses, thus fewer insurance products are purchased. Hofstede defines that people with a high degree of *Uncertainty Avoidance* strongly prefer a well-defined predictable outcome so the positive relationship between *Uncertainty Avoidance* and non-life insurance consumption may suggest that people with a high level of *Uncertainty Avoidance* perceive insurance products as a mean to achieve a more predictable situation. Even though *Uncertainty Avoidance* is not risk aversion and people with a high degree of *Uncertainty Avoidance* do not buy insurance products to primarily maximize their utility function, they behave in a consistent way with risk averse people.

Individualism seems to have the strongest positive influence. This may hint that the more individualistic people in a certain nation are, the more insurance products they tend to buy to protect their wealth as they depend less on family or rely less on other individuals. It is not surprising that *Masculinity* is insignificant as we initially find the definition of *Masculinity* ambiguous. *Masculinity* represents the different roles of males and females that each society pictures for itself. In masculine societies, performing, achieving, and earning a living are given paramount importance. In feminine societies, helping others and the environment, having a warm relationship, and minding the quality of life are key values. One explanation could be that the borderline between the roles of males and females has vanished during this 10-year period, thus the measure of *Masculinity* is possibly inaccurate leading to an insignificant impact. Or it could potentially suggest that *Masculinity* is truly not significant.

The Partial F-statistics confirm our summary that *Power Distance*, *Individualism*, and *Uncertainty Avoidance* have a strong impact on non-life insurance consumption: the bootstrap partial F-statistic is 55 and the bootstrap standard deviation of the partial F-statistic is 29, thus in terms of T-statistic, *Power Distance*, *Individualism*, and *Uncertainty Avoidance* are significant. The array of annual dummy variables is found to be not statistically significant indicating that insurance consumption does not statistically depend on time.

Table 6 shows the result of *Non-life Insurance Density* from the blocking and bootstrapping techniques, which are similar to the results of *Non-life Insurance Penetration*. As expected, *GDP* has a very strong positive relationship with *Non-life Insurance Density* because density does not divide out the impact of *GDP* while penetration does. *The First Principal Component* has less influence when cultural variables are added. *Power Distance* and *Uncertainty Avoidance* are found less significant possibly due to a very strong impact of *GDP*. *Individualism* is still statistically significant confirming the strong impact of *Individualism*.

Table 5: Log Nonlife Insurance Penetration (Blocking and Bootstrapping)

Predictor Variable	Regression Model with Economics and Institutional Variables				Regression Model with Economics, Institutional, and Cultural Variables								
	1	2	3	4	5	6	7	8	9	10	11	12	13
Economic Variable													
Log(GDP per capita)	0.109	0.170	0.166										
	(0.896)	(1.543)	(1.522)										
Log(Market Concentration)	-0.117	-0.129	-0.138	-0.158	-0.160	-0.160	-0.162	-0.153	-0.151	-0.166	-0.144	-0.154	-0.164
	(-2.495)	(-2.794)	(-3.042)	(-3.190)	(-3.818)	(-3.950)	(-4.120)	(-3.850)	(-3.846)	(-3.949)	(-3.454)	(-3.552)	(-4.320)
Urbanization	0.003												
	(0.758)												
Education	0.001												
	(0.117)												
Institutional Variable													
Common Law	0.126	0.093											
	(0.937)	(0.736)											
Islamic Law	-0.456	-0.496	-0.513	-0.494	-0.480	-0.461	-0.464	-0.489	-0.509	-0.452	-0.527	-0.497	-0.478
	(-2.156)	(-2.599)	(-2.681)	(-2.775)	(-5.246)	(-2.455)	(-2.470)	(-2.551)	(-2.838)	(-2.410)	(-2.856)	(-2.721)	(-2.659)
The First Principal Component	0.101	0.088	0.089	0.145	0.093	0.092	0.090	0.091	0.102	0.113	0.101	0.146	0.149
	(2.515)	(2.298)	(2.352)	(4.425)	(3.222)	(3.476)	(3.448)	(3.374)	(3.678)	(4.466)	(3.531)	(7.156)	(7.056)
Cultural Variable													
Bhuddhism Ratio					0.000								
					(0.000)								
Christianity Ratio					0.000								
					(0.186)								
Muslim Ratio					0.001								
					(0.132)								
Power Distance					-0.006	-0.006	-0.005	-0.004		-0.006			
					(-1.978)	(-1.907)	(-1.769)	(-1.525)		(-2.404)			
Individualism					0.005	0.005	0.006	0.005	0.007		0.007		
					(1.790)	(2.031)	(2.256)	(2.109)	(3.034)		(2.624)		
Masculinity					0.002	0.002						0.002	
					(0.969)	(1.013)						(1.171)	
Uncertainty Avoidance					0.004	0.004	0.004		0.004				0.003
					(1.641)	(1.853)	(1.886)		(1.731)				(1.141)
R squared	0.584	0.577	0.574	0.553	0.619	0.619	0.616	0.596	0.601	0.582	0.584	0.556	0.562
Adjusted R squared	0.580	0.574	0.572	0.551	0.614	0.615	0.613	0.593	0.598	0.579	0.582	0.554	0.56
F-statistic	147	208	257	314	123	176	203	224	229	264	267	239	244.4
Partial F-statistic					19	33	41	40	45	52	57	6	16
Bootstrap Partial F-statistic Mean					29	43	55	52	57	64	72	10	28
Bootstrap Partial F-statistic SD					14	23	29	27	34	54	53	12	34

Note: This table provides the results of Non-life Insurance Penetration under the blocking and bootstrapping techniques. The coefficients are from the Ordinary Least Square regression while T-statistics provided in the parentheses are from the blocking and bootstrapping techniques. Partial F-statistics and Bootstrap partial F-statistics test hypothesis about a group of variables found in Model 5-13 but not found in Model 4.

Table 6: Log Nonlife Insurance Density (Blocking and Bootstrapping)

Predictor Variable	Regression Model with Economic and Institutional Variables			Regression Model with Economics, Institutional, and Cultural Variables									
	1	2	3	4	5	6	7	8	9	10	11	12	13
Economic Variable													
Log(GDP per capita)	1.083	1.158	1.155	1.112	1.105	1.109	1.119	1.139	1.145	1.209	1.230	1.223	1.240
	(9.368)	(11.167)	(11.142)	(10.819)	(10.862)	(10.965)	(11.028)	(11.291)	(11.256)	(16.537)	(17.565)	(16.219)	(17.049)
Log(Market Concentration)	-0.122	-0.137	-0.143	-0.145	-0.147	-0.148	-0.139	-0.137	-0.130	-0.131	-0.118	-0.123	-0.114
	(-2.676)	(-3.026)	(-3.167)	(-3.208)	(-3.330)	(-3.600)	(-3.305)	(-3.179)	(-2.882)	(-3.217)	(-2.817)	(-2.915)	(-2.578)
Urbanization	0.004												
	(0.975)												
Education	0.002												
	(0.174)												
Institutional Variable													
Common Law	0.107	0.068											
	(0.822)	(0.551)											
Islamic Law	-0.439	-0.485	-0.497	-0.319	-0.476	-0.478	-0.513	-0.503	-0.530	-0.539	-0.586	-0.553	-0.592
	(-2.253)	(-2.584)	(-2.634)	(-0.845)	(-2.464)	(-2.482)	(-2.727)	(-2.720)	(-2.859)	(-2.874)	(-3.180)	(-3.040)	(-3.267)
The First Principal Component	0.118	0.104	0.104	0.060	0.069	0.066	0.072	0.058	0.063				
	(3.053)	(2.753)	(2.822)	(1.476)	(1.793)	(1.716)	(1.836)	(1.516)	(1.618)				
Cultural Variable													
Bhuddhism Ratio				0.001									
				(0.216)									
Christianity Ratio				0.001									
				(0.300)									
Muslim Ratio				-0.002									
				(-0.375)									
Power Distance				-0.004	-0.004	-0.004		-0.003		-0.004		-0.004	
				(-1.287)	(-1.510)	(-1.482)		(-1.277)		(-1.694)		(-1.522)	
Individualism				0.006	0.006	0.006	0.008	0.006	0.007	0.008	0.010	0.007	0.009
				(2.333)	(2.262)	(2.548)	(3.183)	(2.210)	(2.746)	(3.169)	(4.010)	(2.841)	(3.725)
Masculinity				0.001	0.001								
				(0.566)	(0.707)								
Uncertainty Avoidance				0.003	0.003	0.003	0.003			0.003	0.002		
				(1.270)	(1.620)	(1.575)	(1.439)			(1.375)	(1.162)		
R2	0.925	0.922	0.921	0.932	0.931	0.931	0.929	0.929	0.928	0.928	0.926	0.926	0.925
Adjusted R2	0.924	0.921	0.921	0.931	0.930	0.930	0.929	0.928	0.927	0.928	0.926	0.926	0.925
F-statistic	1285	1786	2226	934	1280	1458	1664	1645	1944	1633	1903	1914	2341
Partial F-statistic				16	27	35	43	39	65	55	70	72	126
bootstrap Partial F-statistic Mean				26	37	46	54	48	52	67	81	81	136
bootstrap Partial F-statistic SD				13	21	27	34	31	25	32	40	42	72

Note: This table provides the results of Non-life Insurance Density under the blocking and bootstrapping techniques. The coefficients are from the Ordinary Least Square regression while T-statistics provided in the parentheses are from the blocking and bootstrapping techniques. Partial F-statistics and Bootstrap partial F-statistics test hypothesis about a group of variables found in Model 5-13 but not found in Model 3.

Conclusion

This study extends the existing literature on non-life insurance consumption by investigating a much larger and more representative selection of countries and by employing more rigorous statistical techniques than what had been used in the past. An empirical analysis using blocking and bootstrapping techniques confirms the impact of culture on non-life insurance consumption: nations with a low degree of *Power Distance*, a high level of *Individualism*, and a high degree of *Uncertainty Avoidance* tend to have a high level of non-life insurance consumption.

Although this study covers a much larger and more representative selection of countries, our sample tends to bias toward developed European countries, thus including countries from Africa and Central Asia may give a more solid result. Also, even though this study employs rigorous statistical techniques such as the blocking and bootstrapping to avoid making assumptions about the structure of the populations, some limitations arise from the use of national statistics and the use of total premium. The average national values may not well represent the typical household and the population of a country may not be homogeneous, thus the result does not represent individuals within a nation. *Non-life Insurance Density* and *Non-life Insurance Penetration* are based on the sum of the premiums across various lines of non-life insurance products but the rationality and decision making process to buy non-life insurance products may vary across the lines of products and across individuals. To avoid the ecological fallacy, we do not apply the results to each line of non-life insurance products and individuals within the nation.

Even though these limitations may weaken the significance of the findings, the empirical results are still reasonable and useful to some degree especially for the insurers looking for new foreign markets. Further study on individual non-life insurance products may result in more reliable findings.

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Appendix:

Table 1: Variable Definitions and Sources

Variable	Abbreviation	Description	Time-sensitive?	Source
Density	DEN	Non-life insurance premium per capita adjusted for Purchasing Power Parity	Yes	*Sigma,* Swiss Re. PPP factors from IMF
Penetration	PEN	Non-life insurance premiums divided by GDP	Yes	*Sigma,* Swiss Re
Income per capita	GDP	GDP corrected for Purchasing Power Parity	Yes	*World Economic Outlook database,* IMF
Urbanization	URBAN	Percentage of population living in urban areas	Yes	*World Development Indicators,* World Bank
Education	EDUC	Percentage of population enrolled in third level education	Yes	http://www.barrolee.com/
Market Concentration	HERF	Modified Herfindahl Index: sum of market shares of ten largest non-life insurance companies	Yes	*International Insurance Fact Book,* Insurance Information Institute
Legal System	COMMON, ISLAMIC	Dummy variables characterizing countries with Common Law resp. Islamic legal system	No	*The World Factbook,* CIA
Political Risk Index	PR	Political stability score based on a weighted average of 12 components	Yes	*International Country Risk Guide,* Political Risk Group
Religion	BUD, CHR, MUS	Percentage of individuals with Christian, Buddhist, and Islamic beliefs	No	*The World Factbook,* CIA
Power Distance	PDI	Cultural variable measuring inequality among people	No	http://www.geert-hofstede.com/hofstede_dimensions.php
Individualism	IDV	Cultural variable measuring individual vs. collective behavior	No	http://www.geert-hofstede.com/hofstede_dimensions.php
Masculinity	MAS	Cultural variable measuring masculine vs. feminine attitudes	No	http://www.geert-hofstede.com/hofstede_dimensions.php
Uncertainty Avoidance	UAI	Cultural variable measuring tolerance for uncertainty	No	http://www.geert-hofstede.com/hofstede_dimensions.php
Long-term Orientation	LTO	Cultural variable measuring long-term vs. short-term values	No	http://www.geert-hofstede.com/hofstede_dimensions.php

Time-sensitive variables are collected annually from 1999 to 2008. Time-insensitive variables are constant during the 10-year period

Table 2: Hypothesized relationships for all explanatory variables

Variable	Expected effect on insurance consumption
Income per capita	Positive
Urbanization	Positive
Education	Positive
Market Concentration	Negative
Common Law	Positive
Islamic Law	Negative
Political Risk	Positive
Buddhist Beliefs	Negative
Christian Beliefs	Negative
Islamic Beliefs	Negative
Power Distance	Negative
Individualism	Positive
Masculinity	Ambiguous
Uncertainty Avoidance	Positive

Table 3: Descriptive Statistics

Variable	Observations	Mean	Median	Standard Dev.	Minimum	Maximum	Skewness
Dependent variables							
Density	770	421.86	213.41	463.60	1.40	3,463.66	1.82
Penetration	770	2.01	1.87	1.12	0.18	8.7	1.04
Explanatory variables							
Income	820	17,681	12,656	14,490	796	86,008	1.29
Urbanization	820	67.38	68.50	19.38	10.56	100.00	-0.66
Education	790	10.06	8.91	6.40	0.48	30.6	0.66
Market concentration	808	0.12	0.075	0.13	0.00	1	3.59
Common Law	820	0.20	0.00	0.40	0.00	1.00	1.54
Islamic Law	820	0.15	0.00	0.35	0.00	1.00	2.00
Political risk score (first	820	0.00	0.12	2.34	-6.34	4.17	-0.34
Christianity	820	56.96	74.7	37.33	0	100	-0.47
Buddhism	820	4.4	0	17.09	0	94.6	4.39
Islamic	820	19.22	1.6	33.9	0	100	1.61
Power distance	820	60.06	63.50	21.26	11.00	104.00	-0.15
Individualism	820	44.21	39.00	22.69	6.00	91.00	0.22
Masculinity	820	50.29	52.00	17.98	5.00	110.00	0.05
Uncertainty avoidance	820	66.13	68.00	22.32	8.00	112.00	-0.26
Long-term orientation	290	44.90	33.00	27.29	0.00	118.00	0.88

Table 4: Correlations

	log DEN	log PEN	log GDP	URBAN	EDUC	HERF	COMMON	ISLAMIC	PR	BUD	CHR	MUS	PDI	IDV	MAS	UAI	LTO
log DEN	1.00																
log PEN	0.85	1.00															
log GDP	0.94	0.62	1.00														
URBAN	0.67	0.46	0.70	1.00													
EDUC	0.53	0.44	0.50	0.46	1.00												
HERF	-0.25	-0.033	-0.16	-0.26	-0.22	1.00											
COMMON	0.097	0.19	0.045	0.07	0.075	-0.26	1.00										
ISLAMIC	-0.39	-0.50	-0.22	-0.10	-0.28	0.19	-0.20	1.00									
PR	0.82	0.63	0.80	0.46	0.47	-0.063	0.064	-0.32	1.00								
BUD	-0.077	-0.043	0.079	-0.036	0.032	-0.23	-0.011	-0.11	0.054	1.00							
CHR	0.32	0.38	0.20	0.16	0.23	-0.029	-0.0087	-0.58	0.31	-0.35	1.00						
MUS	-0.41	-0.49	-0.25	-0.10	-0.32	0.12	-0.10	0.89	-0.39	-0.084	-0.67	1.00					
PDI	-0.56	-0.52	-0.47	-0.20	-0.38	-0.016	-0.17	0.30	-0.56	0.041	-0.22	0.35	1.00				
IDV	0.63	0.55	0.53	0.33	0.39	-0.089	0.17	-0.18	0.62	-0.21	0.20	-0.21	-0.62	1.00			
MAS	-0.01	0.0086	-0.028	0.11	-0.10	-0.11	0.15	0.036	-0.10	0.032	-0.062	-0.016	0.17	0.068	1.00		
UAI	-0.01	0.0017	0.011	0.097	0.082	0.073	-0.34	-0.0056	-0.12	-0.039	0.25	-0.012	0.22	-0.24	-0.018	1.00	
LTO	-0.037	-0.0772	-0.019	-0.045	-0.21	0.033	-0.27	-0.24	-0.054	0.42	-0.55	-0.31	0.30	-0.42	0.16	-0.069	1.00

Table 7: Log Nonlife Insurance Penetration (Multiple Regression Models)

Predictor Variable	Regression Model with Economics and Institutional Variables				Regression Model with Economics, Institutional, and Cultural Variables								
	1	2	3	4	5	6	7	8	9	10	11	12	13
Economic Variable													
Log(GDP per capita)	0.109	0.170	0.166										
	(3.216)	(6.274)	(6.135)										
Log(Market Concentration)	-0.117	-0.129	-0.138	-0.158	-0.160	-0.160	-0.162	-0.153	-0.151	-0.165	-0.144	-0.154	-0.165
	(-6.859)	(-7.853)	(-8.586)	(-9.864)	(-10.100)	(-10.506)	(10.666)	(-9.869)	(-9.851)	(-10.633)	(-9.252)	(-9.559)	(-10.313)
Urbanization	0.003												
	(2.362)												
Education	0.001												
	(0.392)												
Institutional Variable													
Common Law	0.126	0.093											
	(3.067)	(2.318)											
Islamic Law	-0.456	-0.496	-0.513	-0.494	-0.480	-0.461	-0.464	-0.489	-0.509	-0.452	-0.527	-0.497	-0.478
	(-9.133)	(-10.534)	(-11.006)	(-10.365)	(-5.246)	(-10.192)	(-10.234)	(-10.578)	(-11.209)	(-9.733)	(-11.404)	(-10.453)	(-10.088)
The First Principal Component	0.101	0.088	0.089	0.145	0.093	0.092	0.090		0.102	0.113	0.101	0.146	0.149
	(8.411)	(7.700)	(7.761)	(20.636)	(9.751)	(10.408)	(10.165)		(11.685)	(14.000)	(11.410)	(20.825)	(21.205)
Cultural Variable													
Bhuddhism Ratio					0.000								
					(0.001)								
Christianity Ratio					0.000								
					(0.580)								
Muslim Ratio					0.001								
					(0.468)								
Power Distance					-0.006	-0.006	-0.005	-0.004		-0.006			
					(-5.878)	(-5.883)	(-5.466)	(-4.640)		(-7.178)			
Individualism					0.005	0.005	0.006	0.005	0.007		0.007		
					(4.650)	(5.238)	(5.961)	(5.184)	(8.520)		(7.555)		
Masculinity					0.002	0.002						0.002	
					(2.489)	(2.420)						(2.366)	
Uncertainty Avoidance					0.004	0.004	0.004		0.004				0.003
					(5.616)	(6.290)	(6.265)		(5.552)				(4.004)
R2	0.584	0.577	0.574	0.553	0.619	0.619	0.616	0.596	0.601	0.581	0.584	0.556	0.562
Adjusted R2	0.580	0.574	0.572	0.551	0.614	0.615	0.613	0.593	0.598	0.579	0.582	0.554	0.560
F-statistic	147	208	257	314	123	176	203	224	229	264	267	234	244
Partial F-statistic					19	33	41	40	45	52	57	6	16

Note: This table provides the results of Non-life Insurance Density under the Ordinary Least Square techniques. T-statistics are provided in the parentheses.

Table 8: Log Nonlife Insurance Density (Multiple Regression Models)

Predictor Variable	Regression Model with Economics and Institutional Variables			Regression Model with Economics, Institutional, and Cultural Variables									
	1	2	3	4	5	6	7	8	9	10	11	12	13
Economic Variable													
Log(GDP per capita)	1.083	1.158	1.155	1.112	1.105	1.109	1.119	1.138	1.145	1.209	1.230	1.223	1.240
	(32.315)	(43.104)	(43.020)	(42.288)	(42.413)	(42.731)	(42.867)	(44.322)	(44.337)	(63.328)	(65.532)	(64.416)	(66.285)
Log(Market Concentration)	-0.122	-0.137	-0.143	-0.145	-0.147	-0.148	-0.139	-0.137	-0.130	-0.131	-0.118	-0.123	-0.114
	(-7.215)	(-8.404)	(-9.025)	(-9.191)	(-9.618)	(-9.692)	(-9.087)	(-8.923)	(-8.490)	(-8.591)	(-7.781)	(-8.062)	(-7.436)
Urbanization	0.004												
	(3.128)												
Education	0.002												
	(0.594)												
Institutional Variable													
Common Law	0.107	0.068											
	(2.655)	(1.718)											
Islamic Law	-0.439	-0.485	-0.497	-0.319	-0.476	-0.478	-0.513	-0.503	-0.530	-0.539	-0.586	-0.554	-0.592
	(-8.909)	(-10.370)	(-10.762)	(-3.561)	(-10.687)	(-10.748)	(-11.618)	(-11.186)	(-11.896)	(-12.269)	(-13.497)	(-12.494)	(-13.563)
The First Principal Component	0.118	0.104	0.104	0.060	0.069	0.066	0.072	0.058	0.063				
	(9.927)	(9.175)	(9.227)	(4.725)	(5.728)	(5.529)	(5.974)	(4.789)	(5.263)				
Cultural Variable													
Bhuddhism Ratio				0.001									
				(0.948)									
Christianity Ratio				0.001									
				(0.877)									
Muslim Ratio				-0.002									
				(-1.394)									
Power Distance				-0.004	-0.004	-0.004		-0.003		-0.004		-0.004	
				(-4.022)	(-4.396)	(-4.111)		(-3.403)		(-4.680)		(-4.033)	
Individualism				0.006	0.006	0.006	0.008	0.006	0.007	0.008	0.010	0.007	0.009
				(6.184)	(6.200)	(6.775)	(8.859)	(6.137)	(8.085)	(8.770)	(11.806)	(8.085)	(11.207)
Masculinity				0.001	0.001								
				(1.425)	(1.697)								
Uncertainty Avoidance				0.003	0.003	0.003	0.003			0.003	0.002		
				(4.287)	(5.073)	(5.028)	(4.463)			(4.205)	3.474		
R2	0.925	0.922	0.921	0.932	0.931	0.931	0.929	0.929	0.928	0.928	0.926	0.926	0.925
Adjusted R2	0.924	0.921	0.921	0.931	0.930	0.930	0.929	0.928	0.927	0.928	0.926	0.926	0.925
F-statistic	1285	1786	2226	934	1280	1458	1664	1645	1944	1633	1903	1914	2341
Partial F-statistic				16	27	35	43	39	65	55	70	72	126

Note: This table provides the results of Non-life Insurance Density under the Ordinary Least Square techniques. T-statistics are provided in the parentheses.