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Keywords
non-life insurance, cultural variables, econometric analysis

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Business | Business Administration, Management, and Operations | Business Analytics | Insurance | Management Sciences and Quantitative Methods | Marketing | Statistics and Probability

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Abstract

Regression techniques are applied to an unbalanced panel data that includes 82 countries observed over a ten-year period, to explore the factors that affect non-life insurance demand across nations. While previous literature has discovered several significant economic, demographic, and institutional variables, little attention has been devoted to cultural dimensions. We find that non-life insurance consumption is adversely impacted in countries where a large fraction of the population has Islamic beliefs. Also highly significant are three of the cultural scores developed by Hofstede in a celebrated study: Power Distance, Individualism, and Uncertainty Avoidance. A conjecture that culture impacts non-life insurance more in affluent countries receives ample statistical support, with an adjusted R-square coefficient increasing by 20%. These results have implications for multinational insurers seeking to enter a new market. *Ceteris Paribus*, these insurers should target countries, and population segments within these countries, that exhibit low Power Distance, and high Individualism and Uncertainty Avoidance scores.

1. Introduction

Numerous publications in insurance journals explore the determinants of insurance consumption, and attempt to find variables that significantly impact life and non-life insurance purchases. All studies implicitly assume that policyholders are making rational decisions, maximizing benefits to dependents after death and protecting their assets, and focus on economic determinants such as income, legal system, and education using international panel data. However, it may be unreasonable to expect such a high degree of competence and rationality on the part of insureds confronted with the purchase of very complex and abstracts products. It may very well be that national culture has a strong impact on insurance purchase decisions. Humans do not share the same decision-making process when facing economic decisions. Consumers may respond to insurance solicitations according to their cultural beliefs, not only on economic rationality.

The main purpose of this paper is two-fold. First, we explore national culture as potential determinant of non-life insurance consumption. Hofstede (1983, 2001) provides four cultural dimensions

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that can describe cross-cultural differences across different countries: Individualism, Power Distance, Masculinity / Feminity, and Uncertainty Avoidance. We test the effect of these four cultural measures on non-life insurance demand using a large international panel data that includes 82 countries over a ten-year period. We also introduce affiliation to one of the world's largest religions as cultural variables. Second, we investigate the importance of economic and cultural factors on non-life insurance demand at different stages of economic development. From Figure 1A, a positive relationship between GDP and non-life insurance penetration emerges, as reported in all previous literature. However, the relationship deteriorates in richer countries; it even totally breaks down among economies with GDP greater than $20,000, as shown in Figure 1B. Beenstock *et al* (1988) observe a similar phenomenon, but do not investigate it further, relegating it to further reserach. We subdivide our sample into developing and developed nations and investigate whether national culture can explain a substantial part of the residual insurance demand variations among developed countries.

The paper is organized as follows. The literature review is section 2 is followed by our lists of variables in section 3. Section 4 presents our data and methodology. Results are discussed in section 5. Section 6 provides our summary and conclusions.

2. Literature Review

A large body of insurance research applies econometric models to select the most appropriate factors that explain variations in the demand for life insurance across countries, with, as most frequently cited papers, Beck and Webb (2003), Browne and Kim (1993), and Outreville (1996). The dependent variables for the vast majority of models are the life insurance density (number of US Dollars spent annually on life insurance per capita) and the life insurance penetration (total life premium volume divided by GDP), published annually in Swiss Re's publication *Sigma.* Explanatory variables that have been shown to significantly impact life insurance demand are GDP per capita, inflation (real, anticipated, or feared), development of the banking sector, institutional indicators (such as investors protection, contract enforcement, and political stability), and whether Islam is the dominant religion or not. Variables that appear to have a borderline impact include education, old and/or young dependency ratio (ratio of the population above the age of 65, or below 15, to the number of persons age 15 to 64), urbanization, size of the social security system, life expectancy, and market structure.

In a couple of important papers, Chui and Kwok (2008, 2009) demonstrate that the inclusion of cultural factors in the set of explanatory variables greatly improves the predictive ability of regression analyses. Using an unbalanced panel data of 41 countries observed from 1976 to 2001, they include in their models four cultural variables introduced by Hofstede (1983, 2001) in a series of celebrated studies: Individualism, Power Distance, Masculinity, and Uncertainty Avoidance. They find the first three variables to be highly significant. The results prove to be robust, even after controlling for economic, institutional, and demographic factors such as GDP per capita, inflation, bank sector and stock market development, creditors rights, contract enforcement quality, dependency ratio, and religion. For instance, the inclusion of just one cultural variable, Individualism, increases the adjusted R^2 from 0.70 to 0.83 – a highly significant improvement.

Compared with the voluminous literature on life insurance country variations, very little empirical research has been devoted to the determinants of the demand for property-casualty insurance. In a cross-sectional analysis of consumption patterns limited to automobile insurance in 359 townships of the state of Massachusetts in 1979, Sherden (1984) finds that the demand for motor insurance is generally inelastic with respect to price and income, and that the demand for comprehensive and collision coverage increases substantially with increased population density. In a first international study using *Swiss Re* data, Beenstock *et al* (1988) investigate the relationship between property-liability premiums per capita and GDP per capita for 45 countries in 1981. A log-linear model proves a strongly significant positive relationship, with an income elasticity exceeding unity: non-life insurance is a superior good, disproportionately represented in economic growth. The relationship between income and premiums, however, seems to deteriorate as countries get richer. Outreville (1990) uses a cross-sectional logarithmic model of non-life insurance penetration for 55 developing countries that confirm the Beenstock *et al* (1988) main result of an income elasticity greater than unity. The level of financial development is the only other factor found to significantly impact non-life insurance.

Browne *et al* (2000) study 22 OECD countries from 1987 through 1993 and focus on the premium density of two lines of insurance: motor vehicle (usually purchased by households) and general liability (normally bought by businesses). Panel data analysis demonstrates that income (GDP per capita), wealth, foreign firms market share, and the form of legal system (civil law or common law) are significant factors to explain the purchase of the two types of insurance. Per capita income has a much greater impact on motor insurance than on general liability. Esho *et al* (2004) expand the work of Browne *et al* (2000) by using a larger set of countries, and by introducing the origin of the legal system and a measure of property rights in their model. Dummy variables, characterizing the English, French, German, and Scandinavian legal system origin, are found to have an insignificant effect. Results show a robust relationship between the protection of property rights and insurance consumption, as well as a significant effect of loss probability and income. Esho *et al* (2004) also include one of Hofstede's dimensions, Uncertainty Avoidance, as a proxy for risk aversion. They find a marginally positive relationship and conclude that culture does not seem to play an important role in non-life insurance demand.

Park *et al* (2002) examine the impact of culture on insurance pervasiveness, defined as the combined penetration of life and non-life insurance. Four of Hofstede's cultural dimensions are included in the panel regression analysis in addition to GNP, socio-political stability, and economic freedom. In contrast with the life insurance demand studies of Chui and Kwok (2008, 2009), results show that only Masculinity is positively correlated with insurance pervasiveness. This conflicting result may be due to the aggregation of life and non-life insurance, which may produce a bias against finding meaningful relationships if the cultural impact on insurance demand is different for life and non-life insurance. Also, Park *et al* (2002) only have three other control variables in their regression model; they did not include life- or non life-specific control factors. The low number of controls may cause an omitted variable problem and result in biased coefficient estimates.

3. Variables

Our study, devoted to the impact of cultural variables on non-life insurance purchases, uses an extensive number of explanatory variables. Most variables, for instance market concentration and GDP per capita, are provided on an annual basis from 1999 to 2008 for 82 countries, with a population of 5.67 billion representing 82.7% of the world's total. Other variables, like the legal system and cultural measures, do not evolve over time and are presented as a single time-invariant number. Table 1 summarizes variable definitions and provides all sources.

3.1. Dependent Variables

1. The Non-Life Insurance Penetration (PEN). In its annual study of world insurance markets, the Swiss Reinsurance Company ranks over 85 countries according to Non-Life Insurance Penetration: non-life insurance premiums, as a percentage of GDP.

2. The Non-Life Insurance Density, at Purchasing Power Parity (DEN). Density, defined as premium per capita in US dollars, is also published annually by Swiss Re. To better reflect cost of living differences, we applied a Purchasing Power Parity (PPP) correction to the density. Premiums per capita can be converted to US Dollars either using market currency exchange rates, or at PPP. The use of market rates can lead to misleading conclusions when comparing per-capita living conditions across countries. Economists prefer to correct the data by a PPP factor that attempts to reflect the differences in prices and services between a country and the United States. The PPP correction can be significant, with maximum values exceeding five for countries like Angola or Ukraine.

Nearly every single international comparative study uses insurance density and penetration as dependent variables. We correct density to better reflect purchasing power. These variables have the advantage of being easily available, annually, for a large number of countries. Swiss Re puts in a lot of effort in reconciling the different valuation techniques used around the world, and standardizes the data by providing figures that are gross of reinsurance and commissions. A disadvantage of density and penetration is that they add up premiums across various lines of insurance. In some countries motor insurance is the dominant non-life policy, while other nations emphasize more liability insurance. Aggregate premiums result in a loss of information, reducing the likelihood that significant explanatory variables will be discovered.

Density and penetration measure slightly different effects. Penetration measures life insurance consumption relative to the size of the economy, while density compares life insurance purchases across countries without adjusting for income. High GDP countries will spend more on insurance in absolute terms, as they have more assets to protect. We therefore expect a very high correlation between insurance density and GDP – indeed one of the reasons for the paucity of research in determinants of non-life insurance may have been a belief that purchases are driven by wealth and little else. Penetration measures relative insurance consumption, as the overall wealth effect has been removed through division by GDP per capita. It measures how wealth is allocated to insurance in relative terms: two countries with similar GDP per capita may exhibit different insurance consumption patterns, an effect captured by penetration and not by density. For this reason we consider penetration to be our primary variable, and use density only for robustness checks.

Explanatory Variables

Economic and Institutional Variables

3. The Gross Domestic Product per capita, at Purchasing Power Parity (GDP). All previous studies, whether devoted to life or non-life insurance, conclude that income, measured as GDP per capita, 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. 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, for a variety of reasons. Sherden (1984) expects urban dwellers to perceive a higher risk of car accidents and thefts. Browne *et al* (2000) observe that urban concentration increases the rate of interaction among individuals, with more activities undertaken in close proximity to neighbors, and consequently use urbanization as a proxy for loss probability. According to Esho *et al* (2004), there is a greater concentration of assets in urban areas, leading to increased opportunities for crime and for evading detection. Hwang and Gao (2003) observe that many countries are facing a transition from an agricultural to an industrialized society. The city then becomes the center of economic development, with great impact on traditional values and perception of risk. Families become smaller, economic security in the form of informal agreements within a family or village no longer exists, so additional sources of financial security are needed. Life and non-life insurance are efficient tools to provide this security. Also, the concentration of potential customers in a small geographic area such as a city simplifies the marketing and distribution of insurance. We expect the degree of urbanization of a country to be positively related to its consumption of non-life insurance.

5. Education: percentage of population enrolled in third-level education (EDUC). Several authors [Browne and Kim (1993), Browne *et al* (2000), Esho (2004)] use the level of education in a country as a proxy for risk aversion. Our perspective is that education increases the awareness of risk and enables a better assessment of threats to financial stability. Educated people are more able to understand the benefits of insurance. Along with most authors [Browne and Kim (1993), Browne *et al* (1993), Esho *et al* (2004), Outreville (1990, 1996), Truett and Truett (1990)] we expect a country's level of education to be positively correlated with demand for non-life insurance.

6. Market concentration: sum of squared market shares of ten largest non-life insurance companies (HERF). Competition forces down the price of insurance, and makes it more affordable. Outreville's (1996) main conclusion is that a monopolistic market has a negative effect on life insurance growth. Browne *et al* (2000) use the market share held by foreign insurers as a proxy for insurance price. The availability of market shares for large companies allows us to define a better proxy variable for competition, in the form of a modified Herfindahl index: sum of squared markets shares of the ten largest insurers. Given that a high index means low insurer concentration and less competition, we expect a negative relationship between our measure of concentration and the demand for non-life insurance.

7. The legal system in force (COMMON). While every country has its own specific legal rules, scholars broadly subdivide all legal systems of the world in two families. Civil Law systems originated with Roman Law and the Napoleonic Code, and were spread around the world by France through conquest, colonization, cultural dominance, and imitation. Common Law systems are based on British law, and are in force in countries that were colonized or heavily influenced by England.

Some legal research [La Porta (1998), Min (2006), Posner (2004)] claims that Common Law is more conducive to economic development than Civil Law. Common Law countries generally have higher law enforcement quality and stronger legal protection of creditors and investors. Common Law's reliance on judicial opinion may contribute to commercial growth, as precedents provide reasonable guidance on issues and more certainty of outcome in case of a dispute. By contrast, in Civil Law countries, consistency is not guaranteed as judges must rule anew on each issue. As a result Common Law countries adapt more rapidly to changing conditions and new opportunities.

The legal system in force in a country may impact the development of insurance, as it specifies the liabilities of those responsible of damage, and defines the business environment of insurers (Browne *et al*, 2000). For instance, the United States leads the world in per capita consumption of liability insurance. The American legal system may be a contributing factor, by encouraging Americans to over-consume property-liability insurance (Syverud *et al*, 1994). Browne *et al* (2008) find the legal system to be a significant factor in the development of non-life insurance. Esho *et al* (2004) also investigate the impact of the legal system, but find it non-significant after controlling for income and property rights. Recently, Park *et al* (2010) showed that the use of a Common Law legal system is the most important determinant of toughness of bonus-malus systems in automobile insurance. We expect the development of non-life insurance to be positively related to Common Law, a time-invariant dummy variable.

8. The Political Risk Index (PRISK). Countries with little 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. The Political Risk Services Group publishes an International Country Risk Guide, rating most nations around the world according to political, financial, and economic risk. The Political Risk Index (that could also be called the Risk Index for International Business) is the outcome of a statistical model that analyzes the potential risks of international business operations. 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.

The twelve measures of the Political Risk Index are highly correlated, with numerous correlation coefficients in excess of 0.6. Introducing all of these potential explanatory variables in the same regression model would lead to severe multicollinearity problems and reduce the power of the regression. We therefore applied a Principal Components Analysis to summarize the twelve scores, and used the primary factor in all our regressions. This primary factor has a very large eigenvalue of 5.49 and explains 46% of the total variance of all PRS scores.

Cultural variables

9. Religion: percentage of individuals with Buddhist, Christian, or Islamic beliefs (BUDD, CHRT, MUSLIM). Zelizer (1979) notes that, historically, religion has opposed life insurance. Some religious people believe that reliance on insurance to protect one's life or property results from distrust in God's protective care. Until the 19th century, several European nations condemned and banned life insurance on religious grounds. Religious antagonism to insurance is still quite prevalent in many Islamic countries. In addition, the religious inclination of a population may affect its risk aversion (Beck and Webb, 2003). Browne and Kim (1993) find Islamic beliefs to significantly decrease life insurance purchases. We expect a high percentage of religious people in a country to negatively affect insurance purchases, especially in Islamic countries.

10. Hofstede cultural variables. In a celebrated study, Hofstede (1983) analyzed the answers of 116,000 cultural survey questionnaires collected within subsidiaries of a large multinational business organization, in 64 countries. Four cultural dimensions of national culture emerged from the study, which collectively explain 49% of the variance in the survey data:

- *Power Distance* (PDI) is the degree of inequality among people which the population of a country considers as normal. Scores of all countries on all cultural dimensions can be found under http://www.geert-hofstede.com/hofstede_dimensions.php. Countries scoring high on Power Distance include China, Mexico, India, and the Arab World. Israel, New Zealand, Ireland, Scandinavian countries receive low scores. The Power Distance index attempts to capture differences in how nations deal with inequality in wealth, power, and privileges. High Power Distance countries accept these inequalities more easily, and agree to a high degree of centralization of authority and autocratic leadership. According to Chui and Kwok (2008), in high Power Distance nations, individuals surrender power and authority readily, but expect in return their superiors to be mindful of their welfare and take actions to reduce their risk, thereby reducing the need for insurance. We expect the impact of Power Distance on insurance consumption to be slightly negative.

- *Individualism* (IDV) measures the degree to which people in a country prefer to act as individuals rather than as members of groups. Examples of countries with high Individualism are the US, the

UK, Australia, and the Netherlands. China, South Korea, Thailand, Pakistan, and Central American countries are at the other end of the scale (*Collectivism).* In individualistic countries ties between individuals are loose: people are not expected to care much about persons beyond their immediate family. Collectivist societies are integrated into strong groups, beginning with the extended family, and unquestioned protection and loyalty among members of the group is expected. People with an individual mindset tend to rely more on insurance for protection and less on network financial security. We expect 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. High-masculinity countries include Japan, Switzerland, Austria, and Venezuela. Sweden, South Korea, Uruguay, Portugal, have high-feminity values. Some societies allow men and women nearly equal access to all occupations and roles. Others keep a sharp distinction between what men and women should do. In that case, men are given the more dominant and assertive roles in society, and women the more caring and service-oriented roles. In masculine societies, performing, achieving, making money, are given paramount importance. In feminine societies, helping others and the environment, having warm relationships, 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 their future – a factor that may outweigh the higher level of care of feminine societies.

- *Uncertainty Avoidance* (UAI) scores tolerance for uncertainty. Japan, Russia, Belgium, Greece, and Spain are uncertainty-avoiding countries. Singapore, Sweden, Hong Kong, and the UK, are among the uncertainty-seeking nations. The 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. Societies try to cope with uncertainty by introducing laws, rules, regulations, religion in a broad sense, and technology. Uncertainty-avoiding societies promote employment stability, select managers on the basis of seniority, are suspicious towards foreigners as managers, and rely excessively on external consultants. People from societies with a high Uncertainty Avoidance index use more mineral water, consume less frozen foods, buy their cars new, avoid large do-it-yourself projects at home, and prefer skill and strategic contests over games of chance. They invest less in stocks. Note that, while Hofstede's concept of Uncertainty Avoidance is correlated with insurance researchers' measure of risk aversion, it is far from being identical. Risk avoiders are willing to pay a premium to reduce risk in their lives, uncertainty avoiders have other goals: they exhibit a strong preference for a well-structured, predictable society with clear rules and expectations. Still, we expect that uncertainty-avoidance countries tend to have a more developed insurance market.

The hypothesized relationships between non-life insurance consumption and our explanatory variables are summarized in Table 2.

4. Data and Methodology

Swiss Re' studies annually include over 85 countries, based on a minimum premium threshold. Hofstede's 1983 study provides scores for his four cultural variables for 66 countries and three regions (the Arab World, East Africa, West Africa), for a total of 80 countries. Several previous articles use databases that are overloaded with 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, Omar, and Qatar the same cultural scores as other countries from the Arab World. We have assigned Latvia and Lithuania the scores of Estonia.[3] Values for all other explanatory variables were found in international databases. Due to rare missing observations of insurance density and penetration, this resulted in an unbalanced panel data including 82 countries observed during the ten-year period [1999 – 2008].

Panel data analysis uses at the same time the cross-sectional and time series aspects of the data, an approach which increases dramatically the number of observations, and consequently the degree of freedom of tests and the significance of results, while reducing collinearity. The pooling of times series and cross-sectional data allows us to make inferences about a particular country based on observations from other countries, resulting in more accurate predictions.

Table 3 provides descriptive statistics for all variables. Table 4 provides correlations. Due to the high positive skewness and non-normality of insurance density and penetration, GDP per capita, and the modified Herfindahl index, these variables have been transformed logarithmically.

Our basic model is described by the following equation:

$$Ins_{it} = \alpha + \beta_1 X_{it,Econ} + \beta_2 Y_{i,\,Inst} + \beta_3 PRIN + \beta_4 Z_{i,\,Cult} + \gamma D_{Year} + \varepsilon_{it}$$

where Ins_{it} is the 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 a vector of institutional variables (Legal system) that vary across countries, but remain constant over time. $PRIN$ is the first principal component summarizing the PRS scores. $Z_{i,\,Cult}$ is an array of cultural variables (Hofstede measures, religion) that are country-dependent but time invariant. β_1, β_2, β_3, and β_4 are vectors of coefficients corresponding to

[3] We ran all analyses without these approximations to check whether they bias our results, especially in the low GDP subgroup analysis. Results are very robust.

these variables. D_{Year} is an array of annual dummy variables used to estimate the effect of time on insurance purchases, with γ the corresponding regression coefficient. ε_{it} is the error term for country *i* in year *t*.

5. Results

Main regression results are presented in Table 5. We use Huber-White's estimators[4] in our tests to allow for possible heterogeneity in the error structure. Independence is still assumed but observations may have different variance. Year dummies proved to be consistently insignificant and are included but not reported in all tables. In column (1), only economic and institutional variables were used. An adjusted R-square coefficient of 0.534 results from the very strong influence of GDP, Common Law, market concentration, and political risk. Signs of regression coefficients all conform to our predictions: a higher income per capita, a low degree of political risk, a market that is not highly concentrated, and the use of a Common Law legal system, all lead to highly significant increases in non-life insurance demand. Contrary to our expectations, higher urbanization levels and third-level education did not significantly impact insurance consumption; these variables are highly correlated with income, and log GDP proves to be the best summary variable for this effect. Column (2) includes our first cultural variable, percentage of Muslims, and demonstrates the powerful negative effect of Islamic beliefs in insurance. The adjusted R-square increases by 4.9% following the addition of this single variable. The percentage of the population with Christian or Buddhist beliefs did not prove to have a significant impact, so we excluded these two religious variables from our base regression model and provide full regression result as a robustness check.

Column (3) includes in the model specification the four Hofstede variables. All are significant at the 1% level, with regression coefficients signs according to predictions. Power Distance has a negative impact on non-life insurance sales, Individualism and Uncertainty Avoidance a positive influence. Our hypothesized relationship concerning Masculinity / Feminity was ambiguous: our results show a significant domination of the masculine side. In life insurance, Chui and Kwok (2008) found dominance of the feminine side. It may be that feminine societies are more sensitive to the risk of early deaths for family members and purchase more life insurance, while masculine societies are more oriented towards goods they want to protect, and buy non-life products. All together, the four Hofstede variables increase the adjusted R-square coefficient by 6%. The partial F-test for the null hypothesis that, combined, the Hofstede variables have no impact, leads to a huge F-statistic exceeding 25 and rejection at all significance levels.

Column (4) summarizes the full model that includes all significant cultural variables: Muslim percentage and the Hofstede cultural variables. All cultural variables are highly significant, with the exception of Masculinity / Feminity, only significant at the 10% level despite the large number of observations. Among the economic variables, income (log GDP) is still positive but has lost all

[4] We used STATA's "robust" option to obtain this robust variance estimation.

significance, being highly correlated with urbanization, education, and political risk. The inclusion of the five cultural variables raises the adjusted R-square coefficient from 0.534 to 0.635, a considerable 10.1% increase that amply demonstrates that culture does matter in non-life insurance markets in a key way.

Given the high correlation between several economic / institutional variables, a more parsimonious model is presented in column (5): urbanization, education, and the political risk score are deleted. GDP then becomes highly significant. The adjusted R-square barely suffers from the deletion of three variables. The regression coefficient for the Masculinity / Feminity dimension does not differ significantly from zero, indicating that the impact of this factor, if any, is very small.

In table 6, all countries have been subdivided into low- and high-income, with a GDP of $20,000 as cut-off point. Results do not change markedly if the cut-off point is changed. The rationale behind this division is that, while culture permeates all aspects of life in all layers of societies, its influence on insurance can only be felt after basic needs, such as food, clothing, and shelter, are satisfied. Insurance is not a primary good – it is not needed when there are no assets to protect. Only once a given wealth level has been attained can insurance compete with other secondary goods such as brand name clothing and flat-screen TVs, and cultural preferences will surface. Consequently, we expect to find a stronger cultural influence and a weaker income effect in richer countries.

Results fully confirm this conjecture. For low-income countries [columns (1) to (4)] only Muslim percentage and Power Distance are significant among cultural variables. Individualism, Uncertainty Avoidance, and Masculinity are not even significant at the 10% level. The inclusion of all five cultural variables only raises the adjusted R-square coefficient from 0.548 to 0.575, a meager 2.7% increase. A totally different picture emerges for the high-income countries [columns (5) to (8)]. With the exception of Masculinity, all cultural variables are significant. Muslim percentage raises the adjusted R-square coefficient from 0.456 to 0.512 (a 5.6% increase), the Hofstede variables raise it to 0.638 (an 18.2% jump). Combined the five cultural variables bring the adjusted R-square coefficient to 0.661, a spectacular 20.5%, demonstrating the tremendous impact of culture on insurance purchases for those whose income allows them to make choices among non-essential goods.

A variety of robustness tests are summarized in table 7. Several alternative panel regression estimation techniques were used to examine the sensitivity of our results to the selected estimation method. We also checked if cultural variables impact the other common measure of insurance demand, density. In column (1), the Fama-MacBeth regression model was applied to check for possible within year cross-sectional correlations of error terms. This technique runs the same regression model on an annual basis; each regression coefficient is the average of the ten annual coefficients. In column (2), the Cluster option in STATA was used to take into account a possible within-country clustered error structure. Indeed, an upward bias in t-statistics may occur if residuals of some countries in GLS regression are correlated. The Cluster option allows for this possibility. Column (3) provides robust regression results, using the “rreg” (robust regression) command in STATA, which uses an iteratively re-weighted least-squares estimation approach to accommodate outliers or non-normality problems (Hamilton, 2003). Different weights are assigned to observations based on specific criteria; some outliers may be excluded from the sample. Column (4) presents the results of a random effect panel regression, to account for the

fact that country-specific effects may still be present despite the use of annual dummy variables. A random effect model reduces the possible autocorrelation problem that these effects may create. Column (4) presents the regression model that uses log (density) instead of log (penetration) as dependent variables. Finally, column (6) is the full regression model that includes all variables – with the exception of the year dummies.

The robustness checks confirm the conclusions obtained in previous models: cultural variables add considerable explanatory power to all regressions. While adherence to Christian or Buddhist beliefs has no demonstrated impact on insurance demand, a large percentage of believers in the Muslim faith strongly interferes with the development of non-life insurance. Among the cultural variables designed by Hofstede, Power Distance and Uncertainty Avoidance are consistently significant at the 1% level in all model specifications. Individualism has the predicted positive effect, but with a level of significance that varies – up to the point of non-significance in some models. Finally, the effect of Masculinity / Feminity remains ambiguous, and is in any case very small.

6. Conclusion and Discussion

A large body of literature attempts to explain the determinants of life and non-life insurance purchase across nations. Researchers have mostly focused on economic, demographic, and institutional variables, and shown that high income per capita, low inflation, political stability, a developed banking sector, and good protection of investors and creditors, are conducive to higher demand for insurance. In life insurance, Chui and Kwok (2008, 2009) included four cultural variables defined by Hofstede (1983, 2001) among their set of explanatory variables. Their analysis demonstrates that three cultural dimensions (Individualism, Power Distance, and Masculinity) greatly improve the predictive ability of models, after controlling for several factors such as GDP per capita, inflation, bank sector and stock market development, creditors rights, contract enforcement quality, dependency ratio, and religion.

Our research focused on non-life insurance. Along with several economic and institutional controls, we included in our set of explanatory variables religion (percentage of the population adhering to Buddhism, Christianity, or Islam) and the Hofstede cultural variables (Individualism, Power Distance, Masculinity, and Uncertainty Avoidance). We applied several regression methods to an unbalanced international panel data comprising 82 countries observed from 1999 to 2008. The dependent variable was the logarithm of penetration, the fraction of GDP devoted to non-life insurance. Empirical findings for the most part conformed to our theoretical predictions. GDP per capita, urbanization, education, a measure of market concentration, and a principal component summarizing twelve political risk scores, all proved to be highly significant in affecting non-life insurance sales. While Christian and Buddhist values do not appear to have any impact, the development of insurance markets is profoundly negatively affected by Islamic beliefs. Among the Hofstede cultural variables, Power Distance, Individualism, and Uncertainty Avoidance prove to be highly significant. Whether a country exhibits masculine or feminine cultural values has at most a borderline impact on insurance.

Our results are amplified when our panel is subdivided into low- and high-income nations, with a GDP per capita $20,000 as cut-off income. While cultural values are probably similar among the poor and the rich in a given country, they can only affect insurance decisions once an income threshold has been reached. Basic needs in terms of housing, clothing, and food, need to be satisfied before insurance decisions are contemplated. Above the threshold, insurance has to compete against other non-essential goods such as a brand-name car, an I-Pad, or leisure travel. We thus conjectured that the impact of cultural variables would be primarily found in richer countries.

Empirical findings amply confirmed these predictions. For high-income countries, the adjusted R-square coefficient, that stood at 0.456 with all economic and institutional variables in the model, jumped to 0.661 when cultural variables were introduced, a spectacular increase of 20.1%. In other words, 38% of the unexplained variation in insurance demand across affluent countries is eliminated by culture. The corresponding percentage is much smaller for low-income countries: 6%.

Most variables are significant at the 1% level. These findings are all the more impressive as the unavoidable use of national statistics, that implicitly assume that mean national values are representative of a typical household and that the inhabitants of a country are homogeneous, reduces the chances of discovering meaningful relationships. Also, the use of insurance penetration that aggregates all lines of non-life insurance, those purchased by individuals (such as motor insurance) and those bought by corporations (liability policies), also reduces the significance of all variables.

For affluent countries, the regression coefficients for the most significant cultural variables, Power Distance and Individualism, average 0.8%. This means that annual insurance consumption, as measured by the logarithm of penetration, will increase by 8% for every ten-point change in the Hofstede score for these variables. Scores on Individualism range from 6 (Guatemala) to 90 (Australia). Scores on Power Distance range from 13 (Israel) to 104 (Malaysia).

Our results have several implications for multinational insurance companies seeking to enter a new market. While it is fairly obvious that these insurers should consider countries with low political risk, increasing income, and educated citizens, this research demonstrates that culture should also be incorporated in the decision process. Non-life insurance demands in emerging countries that score low on Power Distance, and high in Individualism and Uncertainty Avoidance have higher growth potential than other developing countries at equal levels of income, market concentration, and political risk, as their economies become more affluent. Within heterogeneous countries such as China, market segmentation strategies should direct foreign insurers to aim their promotional efforts at segments of the population that exhibit the best scores on the cultural variables.

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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	Dummy variables characterizing countries with a Common Law legal system	No	*The World Factbook,* CIA
Political Risk Index	PRISK	Political stability score based on a weighted average of 12 components	Yes	*International Country Risk Guide,* Political Risk Group
Religion	BUDD, CHRT, MUSLIM	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

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
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							
Penetration	770	2.01	1.87	1.12	0.18	8.7	1.04
Density	770	421.86	213.41	463.60	1.40	3,463.66	1.82
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
Political risk score (first principal component)	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
Muslim %	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

Table 4: Correlations

	log PEN	log DEN	log GDP	URBAN	EDUC	log HERF	COMMON	PRISK	BUDD	CHRT	MUSLIM	PDI	IDV	MAS	UAI
log PEN	1.00														
log DEN	0.85	1.00													
log GDP	0.62	0.94	1.00												
URBAN	0.46	0.67	0.70	1.00											
EDUC	0.44	0.53	0.50	0.46	1.00										
log HERF	-0.03	-0.25	-0.16	-0.26	-0.22	1.00									
COMMON	0.19	0.097	0.05	0.07	0.08	-0.26	1.00								
PRISK	0.63	0.82	0.80	0.46	0.47	-0.06	0.06	1.00							
BUDD	-0.04	-0.077	0.08	-0.04	0.03	-0.23	-0.01	0.05	1.00						
CHRT	0.38	0.32	0.20	0.16	0.23	-0.03	-0.01	0.31	-0.35	1.00					
MUSLIM	-0.49	-0.41	-0.25	-0.10	-0.32	0.12	-0.10	-0.39	-0.08	-0.67	1.00				
PDI	-0.52	-0.56	-0.47	-0.20	-0.38	-0.02	-0.17	-0.56	0.04	-0.22	0.35	1.00			
IDV	0.55	0.63	0.53	0.33	0.39	-0.09	0.17	0.62	-0.21	0.20	-0.21	-0.62	1.00		
MAS	0.01	-0.01	-0.03	0.11	-0.10	-0.11	0.15	-0.10	0.03	-0.06	-0.02	0.17	0.07	1.00	
UAI	0.00	-0.01	0.01	0.10	0.08	0.07	-0.34	-0.12	-0.04	0.25	-0.01	0.22	-0.24	-0.02	1.00

Table 5: Main results

Variable	(1)	(2)	(3)	(4)	(5)
log GDP	0.1157***	0.1301***	0.0218	0.0536	0.2063***
	[2.9662]	[3.0991]	[0.6192]	[1.3294]	[8.1888]
URBAN	0.0020	0.0027**	0.0037***	0.0038***	
	[1.5478]	[2.1381]	[3.0357]	[3.1767]	
EDUC	0.0050	0.0001	-0.0031	-0.0070**	
	[1.4111]	[0.0262]	[-1.0140]	[-2.3424]	
log HERF	-0.1389***	-0.1244***	-0.1577***	-0.1405***	-0.1372***
	[-8.1377]	[-7.9621]	[-9.8184]	[-9.2916]	[-9.5951]
COMMON	0.1785***	0.1679***	0.2105***	0.1816***	0.1202***
	[3.9979]	[4.0495]	[5.0518]	[4.7608]	[3.4299]
PRISK	0.1212***	0.0917***	0.1130***	0.0743***	
	[9.3556]	[6.4124]	[8.9378]	[5.1494]	
MUSLIM		-0.0049***		-0.0046***	-0.0051***
		[-7.1905]		[-6.9966]	[-8.7280]
PDI			-0.0069***	-0.0054***	-0.0046***
			[-7.1340]	[-6.0449]	[-5.1715]
IDV			0.0023***	0.0042***	0.0062***
			[2.3541]	[4.6723]	[7.8253]
MAS			0.0020***	0.0013*	0.0003
			[2.6568]	[1.9047]	[0.5302]
UAI			0.0056***	0.0048***	0.0037***
			[7.5842]	[6.6737]	[5.4932]
Constant	-1.2439***	-1.2420***	-0.5872*	-0.7977***	-2.0502***
	[-3.4881]	[-3.3794]	[-1.7608]	[-2.2679]	[-8.3769]
Observations	743	743	743	743	766
R-square	0.544	0.592	0.604	0.645	0.621
Adjusted R-square	0.534	0.583	0.594	0.635	0.612

Note: *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively. Numbers in brackets show t-values. Year fixed effects are included but not reported here.

Table 6: Importance of cultural variables for low- and high-income countries

Variable	Countries with GDP < $20,000				Countries with GDP > $20,000			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
log GDP	0.3167***	0.2754***	0.2642***	0.2422***	-0.3726***	-0.1516***	-0.2967***	-0.1648**
	[6.4680]	[5.7127]	[4.7006]	[4.4162]	[-5.3900]	[-2.0560]	[-4.1125]	[-2.2900]
URBAN	0.0058***	0.0063***	0.0062***	0.0065***	-0.0033	-0.0023	0.0007	0.0011
	[4.0487]	[4.5148]	[3.7622]	[4.1287]	[-1.6399]	[-1.1709]	[0.3760]	[0.6255]
EDUC	-0.0023	-0.0078*	-0.0022	-0.0074	0.0265***	0.0224***	0.0043	0.0037
	[-0.5114]	[-1.7491]	[-0.4630]	[-1.5772]	[5.4414]	[5.0018]	[0.9485]	[0.8668]
log HERF	-0.1404***	-0.1403***	-0.1738***	-0.1688***	-0.1515***	-0.0940***	-0.1699***	-0.1248***
	[-6.1687]	[-6.3488]	[-6.9385]	[-6.9599]	[-7.9082]	[-4.9214]	[-8.8582]	[-5.6855]
COMMON	0.3963***	0.3522***	0.3730***	0.3189***	-0.0289	-0.0120	-0.0366	-0.0286
	[6.0875]	[6.0015]	[5.4304]	[5.1642]	[-0.5426]	[-0.2290]	[-1.1346]	[-0.8403]
PRISK	0.1082***	0.0990***	0.1208***	0.1032***	0.1543***	0.0884***	0.0612***	0.0275*
	[6.8896]	[5.8855]	[7.4432]	[5.5713]	[8.1063]	[3.9089]	[4.0804]	[1.6710]
MUSLIM		-0.0027***		-0.0026***		-0.0070***		-0.0048***
		[-4.1845]		[-3.8591]		[-5.5143]		[-3.3270]
PDI			-0.0056***	-0.0047***			-0.0083***	-0.0066***
			[-4.4327]	[-3.9603]			[-10.4262]	[-8.6022]
IDV			-0.0024*	-0.0007			0.0080***	0.0081***
			[-1.8092]	[-0.5042]			[7.2990]	[8.0935]
MAS			0.0019	0.0006			0.0010	0.0013*
			[1.2468]	[0.3958]			[1.2570]	[1.7431]
UAI			0.0004	-0.0000			0.0037***	0.0033***
			[0.3400]	[-0.0275]			[4.9740]	[4.6012]
Constant	-3.2211***	-2.7747***	-2.4926***	-2.2328***	3.8686***	1.8890***	2.8693***	1.6226***
	[-7.3697]	[-6.5999]	[-5.1058]	[-4.7861]	[5.4914]	[2.6143]	[3.7620]	[2.2549]
Observations	437	437	437	437	306	306	306	306
R-square	0.563	0.583	0.579	0.594	0.482	0.537	0.660	0.684
Adjusted R-square	0.548	0.567	0.559	0.575	0.456	0.512	0.638	0.661

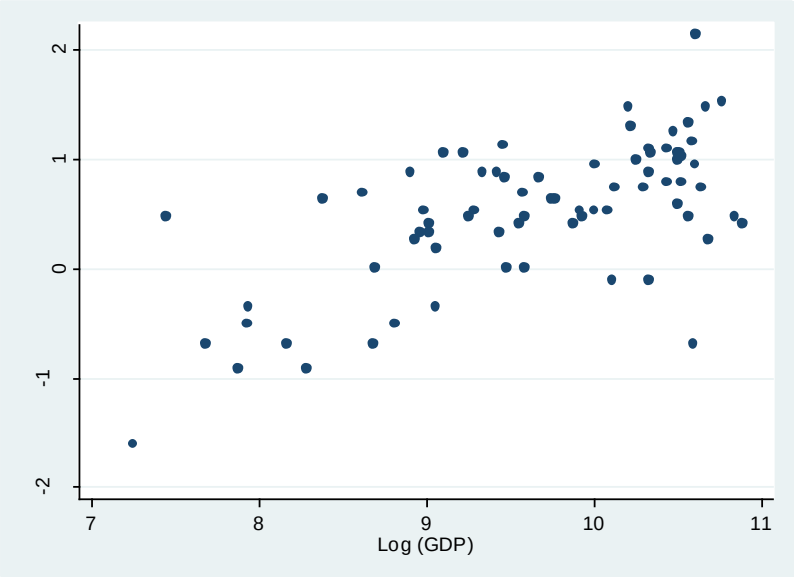
Note: *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively. Numbers in brackets show t-values. Year fixed effects are included but not reported here.

Table 7: Robustness Tests

Variable	(1) Fama - MacBeth	(2) Cluster	(3) Robust	(4) Random Effect	(5) log Density	(6) Full model
log GDP	0.0522***	0.0536	0.0673*	0.4731***	1.0278***	0.0513
	[3.8226]	[0.4563]	[1.8748]	[8.0228]	[23.4750]	[1.2589]
URBAN	0.0037***	0.0038	0.0026**	-0.0095***	0.0047***	0.0039***
	[7.7224]	[1.1036]	[2.0948]	[-3.4852]	[3.0925]	[3.1628]
EDUC	-0.0070***	-0.0070	-0.0059**	-0.0067	-0.0064**	-0.0070**
	[-10.8002]	[-0.8158]	[-1.9640]	[-1.4791]	[-2.2020]	[-2.3116]
log HERF	-0.1404***	-0.1405***	-0.1529***	-0.0953***	-0.1402***	-0.1376***
	[-17.7439]	[-3.3076]	[-9.1308]	[-5.5173]	[-8.9362]	[-8.5663]
COMMON	0.1832***	0.1816	0.1516***	0.1324	0.1529***	0.1840***
	[10.7596]	[1.6405]	[3.5018]	[1.0403]	[3.9138]	[4.7148]
PRISK	0.0758***	0.0743*	0.0681***	-0.0182*	0.0868***	0.0730***
	[14.3902]	[1.8868]	[4.8937]	[-1.9518]	[6.1658]	[4.9608]
BUDD						0.0007
						[0.9287]
CHRT						0.0002
						[0.3832]
MUSLIM	-0.0046***	-0.0046**	-0.0043***	-0.0053***	-0.0050***	-0.0045***
	[-29.5030]	[-2.3311]	[-8.1960]	[-3.4660]	[-7.8277]	[-5.9637]
PDI	-0.0054***	-0.0054**	-0.0055***	-0.0022	-0.0044***	-0.0054***
	[-25.6736]	[-2.0527]	[-5.4042]	[-0.7049]	[-4.9851]	[-6.0208]
IDV	0.0041***	0.0042	0.0043***	0.0065**	0.0052***	0.0044***
	[12.8375]	[1.5902]	[4.2244]	[2.2632]	[5.5859]	[4.6321]
MAS	0.0013***	0.0013	0.0014	-0.0008	0.0012*	0.0013*
	[7.8352]	[0.6594]	[1.5237]	[-0.2846]	[1.8171]	[1.8445]
UAI	0.0048***	0.0048**	0.0047***	0.0035	0.0044***	0.0047***
	[27.7609]	[2.2503]	[6.1447]	[1.5245]	[6.3997]	[6.2376]
Constant	-0.7270***	-0.7977	-0.8808***	-3.8818***	-5.2928***	-0.8001**
	[-7.3596]	[-0.7745]	[-2.8170]	[-6.7815]	[-14.7376]	[-2.2369]
Observations	743	743	743	743	743	743
R-square	0.647	0.645	0.617		0.936	0.645
Adjusted R-square		0.635	0.606		0.934	0.634
Pseudo R-square				0.558		

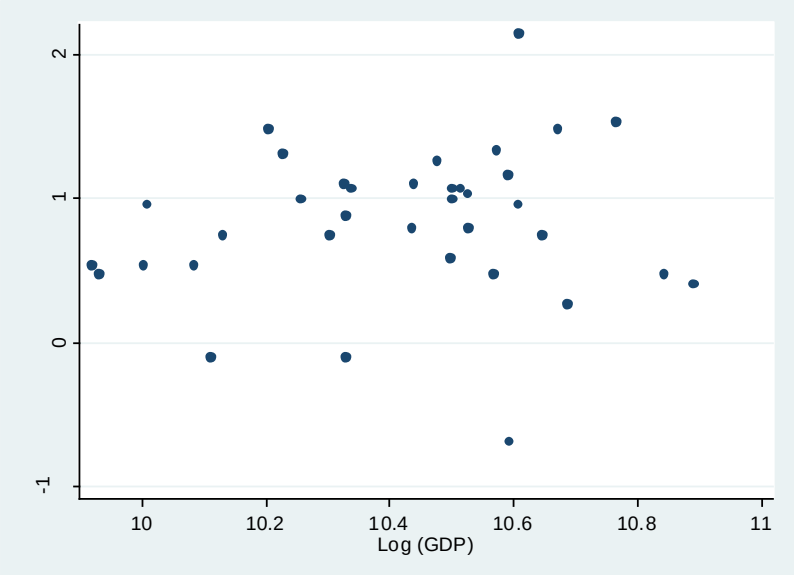
Note: *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively. Numbers in brackets show t-values. Year fixed effects are included but not reported here.

Figure 1A: Relationship between Log (GDP) and Log (Penetration), all countries



Note: Correlation between Log (GDP) and Log (penetration): 0.638

Figure 1B: Relationship between Log (GDP) and Log (Penetration), developed countries



Note: Correlation between Log (GDP) and Log (penetration): 0.081