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ABSTRACT

This paper examines the importance of legal rights and enforcement in influencing property-casualty insurance consumption. We extend the existing literature by examining the role of legal factors in determining insurance density across countries. Also, measures of risk aversion, loss probability and price, which overcome limitations of proxies used in the existing literature on insurance demand are analysed. Using a panel data set we apply a Generalized Methods of Moments dynamic system estimator, which relaxes the assumption of strict exogeneity of the regressors and produces unbiased and efficient estimates. The results show a strong positive relationship between the protection of property rights and insurance consumption, which is robust to various model specifications and estimation techniques. Moreover, the results show the purchase of property-casualty insurance is significantly and positively related to loss probability and income, as well as providing weaker evidence of a negative relationship with price.

1. Introduction

The relevance of legal rules and their enforcement in explaining the development of financial markets and economic growth has recently become the focus of much empirical research. Laporta, Lopez-de-Silanes, Shleifer and Vishny, (1997, 1998, 2000) examine the importance of national legal origin on creditor and shareholder rights, along with the implications of creditor, shareholder rights and legal enforcement on external finance. Levine (1998, 1999), Beck, Levine, and Loayza (2000) and Levine, Loayza and Beck (2000) extend this research to examine the importance of legal systems for economic growth and financial development. An important conclusion is that countries with poor legal rules and law enforcement have narrower debt and equity markets (see La Porta et al (1997)), and that a well-defined and enforced legal system facilitates greater financial intermediation, and thereby economic growth (see Levine et al (2000)).

Since insurance involves the legal transfer of risk, the value of the contract is dependent upon legal rules and enforcement, the efficiency of conflict resolution through the judiciary, and the stability and integrity of the law making process. Moreover, given that insurers have a positive probability of insolvency, insurance liabilities may be viewed as analogous to risky corporate debt (see Cummins and Danzen (1997)).[1] Therefore, as in the case of debt and equity markets, it is likely that the development of insurance markets and thereby additional financial intermediation is also critically dependent upon the quality of the underlying legal system. Despite the theoretical importance of the impact of the law and its enforcement on demand for insurance, existing empirical research has not examined the extent to which property rights and law enforcement affect insurance consumption. This study fills a gap in the literature by

providing an analysis of the role of law in explaining the depth and growth of the insurance industry across countries.

In addition, by utilising a larger panel data set comprising of 44 developed and developing countries this study extends the work of Browne, Chung, and Frees (2000), Outreville (1990, 1996), and Beenstock, Dickinson, and Khajuria (1988). Beenstock et al. (1988) were the first to utilise a panel data set to analyse various elasticities of demand for insurance across countries. Outreville (1990, 1996) used a cross sectional sample of emerging markets to examine the social and economic determinants of property-liability insurance and life insurance, while Browne et al. (2000) employed a panel data set to distinguish between common-law and statutory-law systems as a means of determining insurance consumption across OECD countries. However, legal system dummy variables were utilised to proxy the probability of loss rather than explicitly modelling the impact of the law on insurance demand.

The current insurance literature has estimated the determinants of insurance demand using either small, single year cross-sectional samples [see Outreville (1990, 1996), Browne and Kim (1993), and Beenstock et al. (1988)], or relied upon panel data techniques that do not account for the potential endogeneity of the contemporaneous regressors [see Browne et al., 2000]. This is a potentially important issue, in view of the current literature that indicates economic growth can also be assisted by financial development, inclusive of the insurance industry[2]. Moreover, the existing literature has ignored the process of dynamic adjustment to long-run equilibrium, which is central to understanding the long-run effects of changes in legal rights and income growth on the development of insurance markets.

Therefore, to account for the above limitations, this paper contributes to the current literature in three ways. Firstly, we incorporate legal factors as possible determinants of property-casualty insurance (PCI) consumption. Secondly, the empirical analysis includes time series data

for 44 countries between the years 1984 to 1998. As well as overcoming the small sample limitations of prior studies, the length of the time-series also allows the estimation of a dynamic panel data model that can examine short and long-run influences on property-casualty insurance. Thirdly we include proxies for price, risk aversion and loss probability, which have not previously been utilized in studies of insurance demand. Moreover, by including both economically developed and underdeveloped countries, we extend the literature beyond the studies of Outreville (1900, 1996) who examined only developing countries, and Browne et al. (2000) who focus on OECD countries.

In the following section we outline the model, and in Section 3 describe the cross-sectional and panel data estimation techniques. This is followed by a discussion of the results in Section 4, and a conclusion in Section 5.

2. The Determinants of Property-Casualty Insurance

(i) Measuring Insurance

In this paper we model the determinants of property-casualty insurance as a function of legal rights and enforcement, economic development, risk aversion, the price of insurance and the probability of incurring losses. The dependent variable is defined as real per capita property-casualty insurance, PCI, and is measured in constant 1995 US dollars. An unavoidable cost of including developing countries in the sample, is that the dependent variable aggregates across various lines of insurance. This can lead to the problem whereby some lines of insurance are more pronounced than others in different countries. Nevertheless, PCI is dominated by motor vehicle and property insurance, which accounts for the majority of the PCI market in the OECD countries for which disaggregated data is available and clearly where motor vehicle insurance is

mandatory then there is *a priori* evidence that the legal system supports the contractual transfer of risk via insurance.

Also, a limitation of using premiums to measure insurance output is that premiums can be seen to measure revenue (see Yuengert (1993)). Cummins, Tennyson, and Weiss (1999) suggest the use of the value added approach to defining output. In this approach outputs are measured in terms of services provided and include risk transfer, measured by losses paid, and financial intermediation, measured by addition to reserves. Unfortunately, the necessity for detailed data precludes us from using the value added approach, and we therefore follow the existing insurance demand literature by using gross premiums.

(ii) Legal Origin, Property Rights and Judicial Efficiency

La Porta et al. (1998) show the origin of a country's legal system is related to the level of legal protection and enforcement provided to external creditors and shareholders. Their results indicate common law countries provide the greatest protection of shareholder and creditor rights, while French civil law countries provide the least protection. Furthermore, La Porta et al. (1997) find that French and Scandinavian legal origin countries have significantly smaller debt markets (measured by debt/GNP) relative to countries with English and German legal origins.[3]

The effect of legal systems on financial development and economic growth has also been examined by Levine (1998, 1999) and Levine et al. (2000). These studies use legal system variables as instruments to extract the exogenously determined component of financial intermediation, and conclude that financial intermediation leads to economic growth. Moreover, they show that a well-defined and enforced legal system facilitates greater financial intermediation, which leads to economic growth. After controlling for income, Levine (1998) and Levine et al. (2000) find that banking and financial intermediary development is significantly

greater in countries with German legal origins, with no significant differences between the other legal groups.

The importance of the legal system to the insurance industry stems from the positive probability of insurance company insolvency. Since insurance policies may be viewed as analogous to risky corporate debt (see Cummins and Danzon (1997)), legal systems that protect creditor rights and therefore promote external debt markets, should similarly facilitate insurance demand. In order to capture the effect of legal systems on insurance demand, we follow Levine et al (2000) and La Porta et al (1997) and include three legal system dummies, ENGLISH, FRENCH and GERMAN, with the Scandinavian (SCAND) legal system dummy variable excluded.

In addition to the solvency of the insurance supplier, the value of PCI is directly affected by the enforcement of property rights.[4] Property rights provide individuals and firms with the right to own and sell assets, and protection against damage or devaluation of such assets by third parties. Knack and Keefer (1995, 2000) have shown that the insecurity of property rights reduces economic growth, as firms may adopt less than optimal fixed capital assets because of expropriation risk, avoid investments in assets that are capital intensive or operate at an inefficient scale. In terms of insurance, the enforcement of property rights creates an economic incentive to acquire and insure property, since government and legal enforcement of property rights help to protect individuals from loss or damage to the asset.

However, it is also worth noting that there is also the possibility that if property rights are well enforced then it may also act as a deterrent to those intending to cause damage and actually reduce the demand for first-party insurance. While perhaps at the same time promoting the up take of third party liability insurance particularly in economies with strict liability laws.[5].

Therefore, although we suspect the influence of property rights to be more likely positively related to insurance consumption, we leave it as ambiguous, ex ante, in table 1.

As a measure of property rights we use the 50 point property rights index, PROPERTY, developed by Knack and Keefer (1995). The index is determined by measuring the general level of corruption, rule of law, state bureaucratic quality, the risk of contract repudiation and the risk of expropriation, either through outright confiscation or enforced nationalization of property. The larger the index, the more property rights are maintained and thereby the greater the potential return from insurance. This index is, unlike the legal origin dummy variables, time-varying, which allows for its use in a panel regression[6].

(iii) Economic Development

The relative importance of the PCI market within a country will also be dependent upon economic development. With greater rates of economic growth, consumption of insurance products should increase as a result of increased income, and an increased stock of assets requiring insurance. Furthermore, the development of insurance is likely to facilitate greater economic growth, implying that economic growth may be endogenous. Consistent with these arguments, Outreville (1990, 1996) finds the level of financial development and economic development are positively related to the level of insurance across emerging markets. Also, Ward and Zurbruegg (2000) show for some OECD countries that economic growth and insurance market development exhibit a bi-directional relationship.

To incorporate the link between economic growth and insurance, we use real gross domestic product per capita, REALGDP, to measure national income, and expect it to be positively related to PCI.

(iv) Risk Aversion

A primary motive for purchasing insurance is to minimise the damage from an adverse event. Unfortunately, measuring attitudes to risk is difficult and in the past most insurance studies have used education to proxy risk aversion. According to Outreville (1996), education promotes an understanding of risk and hence increased demand for insurance. However Szpiro and Outreville (1988) have argued that the more people are educated, the less risk averse they become. One reason for this is that improving cognition enables a better assessment of risk. Alternatively, increasing education levels are associated with an increase in transferable human capital, facilitating greater risk taking by individuals with lower risk aversion. Following Outreville (1990) we include EDUCATION, defined as the proportion of the population completing secondary education, as a proxy for risk aversion. Although we expect the impact of EDUCATION on insurance demand to be positive, we acknowledge Szpiro and Outreville's (1988) suggestion that a negative relationship may be observed.

As an alternative risk aversion proxy, we also use the uncertainty avoidance index (UAI) discussed in Hofstede (1995). Based on survey data, the UAI index is constructed using employee attitudes towards the extent to which company rules are strictly followed, the expected duration of employment with current employers and the level of workplace stress. The UAI ranges from 8 for the lowest uncertainty avoidance country to 112 for the highest uncertainty avoidance country in our sample. The UAI was directly promoted as a determinant of the demand for insurance by Hofstede (1995) who saw insurance as a product of national values. According to Hofstede (1995) it is the cultural unwillingness of a society to deal with uncertainty that in part drives a desire to avoid the unknown and seek out insurance. These ideas were formally tested by Park, Borde and Choi (2002) who found no statistical relationship between UAI and insurance penetration. However, these findings can be considered weak when one notes that the data set only consisted of 37 countries for the single time period of 1997. We therefore intend to provide

a more robust test of the relationship between risk aversion and insurance demand, and expect the coefficient on the UAI variable to be positively related to insurance consumption.

(v) The Price of Insurance and Probability of Loss

The demand for any product or service is affected by price. We use the inverse of the loss ratio, defined as premiums divided by claims, to measure the PRICE of insurance and expect it to be negatively related to insurance consumption[7]. Cummins and Danzon (1997) use a similar measure of price in their study of price determination. However, previous studies of insurance demand have either omitted the price variable or used the proportion of foreign insurers in the market as a proxy. We believe that the number of insurers in the market may just capture the degree of openness within the insurance market and not necessarily the efficiency and costs associated with insurance business.

To assess the value of insurance, the price of insurance must be jointly considered with the probability of incurring a loss. Demand for insurance should be positively related to the likelihood of incurring losses due to adverse events. As it is expected that claims due to 'acts of god' will be randomly distributed, only losses that are related to socio-economic factors will be proxied.

Two measures are used for this purpose. The first uses data from the United Nations World Crime Surveys. We include the per capita rate of recorded property theft (THEFT) as a proxy for loss probability. Recorded crime does not necessarily indicate the level of crime within a state, but the willingness of individuals to report these events. Such willingness will only exist if: (i) victims believe there is a possibility of restitution; and (ii) that the police force can be trusted and has the resources and motivation to investigate reported crime. Therefore, a country where crime is reported will more likely reflect an insurance industry with higher claim rates and

consumers more willing to purchase insurance. Furthermore, crime must obviously be reported before an insurance claim can actually be made.

Unfortunately, not all the countries reported crime rates on a frequent, annual basis to the UN World Crime Surveys. Therefore as an alternative to THEFT, the degree of urbanization (URBAN) is also used to proxy loss probability. In urban areas there is a greater concentration of assets. According to Glaeser and Sacerdote (1999), these factors lead to increased opportunities for crime as well as increased scope for evading detection. In terms of other losses, greater concentrations of productive capital and vehicle movements lead to concentrations of risk with more activities undertaken in close proximity to each other. We expect both THEFT and URBAN to be positively related to PCI.

A summary of the hypotheses is provided in Table 1. Data sources and variable descriptions are also provided in Appendix 1.

3. Data And Estimation

(i) Data

Table 2 provides unlogged mean, median, standard deviation and number of observations for each variable for the full sample and legal origin sub-samples (Scandinavian, English, French and German) for the unbalanced panel data set using annual data from 1984 to 1998[8]. The countries in the sample are listed in Appendix 2. All countries that Swiss Re had data for at least one decade were incorporated into the sample[9]. A potential selection bias does exist as a number of smaller insurance markets that do not provide annual reported premiums are excluded. However, the countries utilised do represent the most significant nonlife insurance markets by density and geographical region.

In both the full sample and legal origin sub-samples, the data shows no obvious signs of skewness, with mean and median values for all variables, excluding the dependent variable,

being of similar magnitude. Across the legal origins some interesting patterns emerge. Countries with German and Scandinavian based legal systems have much larger per capita PCI markets than English and French based countries. The mean PCI market in countries with German legal systems ($682.6 per capita) is more than double that of English based systems ($302.6) and four times that of French based legal systems ($170.9). Relative to English and French based countries, German and Scandinavian based countries also tend to be richer (higher GDP per capita), have lower priced insurance, higher education levels, higher rates of urbanization and theft, and greater protection of property rights.[10] The one exception to this pattern is the level of risk aversion proxied by the UAI index, which shows German based countries are most risk averse (mean UAI = 76.25) and Scandinavian based countries the least risk averse (mean UAI = 40.25). Finally, it is worth noting that French based countries have the least developed economies, highest priced insurance, lowest level of education and lowest protection of property and political rights.

Correlations are also reported in Table 2. The signs of the correlation coefficients between the explanatory and dependent variable are generally consistent with the predictions summarized in Table 1. PCI is highly positively correlated with REALGDP (.854), EDUCATION (.684), THEFT (.665), and PROPERTY (.745), and negatively correlated with PRICE (-.297).

(ii) Estimation Procedures

One primary econometric issue that this paper addresses is potential endogeneity. That is, the dependent variable (PCI) may influence the explanatory variables. As an example, it is not unreasonable to expect that the size of the insurance market and its operations may have a direct influence upon the economy of a country. This makes the examination of PCI econometrically difficult, as there is the potential for the endogenous variables to be correlated with the

disturbance term. A common means to overcome this problem is to utilize instrumental variables. These are variables that are correlated with the endogenous variable, but uncorrelated with the disturbances.

For this reason, and as a preliminary measure to analyze the data, instrumental variables are applied within a two-stage-least-squares framework (TSLS). Specifically, to account for the time-invariant nature of some of the variables, cross sectional estimation is applied where data for each country is averaged over the complete sample period, leaving one observation per country. As well as allowing for the inclusion of time-invariant explanatory variables in the equation, the averaged cross sectional estimation approach also focuses attention on long-run relationships, while also attempting to reduce statistical noise due to short term fluctuations in the macroeconomy[11]. However, relative to panel data estimation techniques, averaged cross-sectional estimation ignores time and country specific effects, as well as providing less efficient estimates due to the loss of degrees of freedom from a reduction in the sample size.

Therefore, to provide a more comprehensive picture of the influence of the explanatory variables upon PCI, panel estimation is also conducted. This addresses the problem of endogeneity, and by incorporating a lagged term for the dependent variable it is possible to examine the dynamic adjustment of the PCI market to long-run levels. However, standard fixed effects estimates are biased and inconsistent when the model includes a lagged dependent variable (see for example Verbeck (2000)).

As a solution, this paper adopts a methodology that has been popular in recent economic growth studies, which share similar econometric problems. Specifically, not only is there a problem with accounting for possible endogeneity with some of the explanatory variables (such as with the interaction between financial market growth and economic growth) but that consideration must also be made for a lagged dependent variable if it is believed that changes to

the dependent variable in a previous period may affect the contemporaneous period. This would also generally be the case where in many macroeconomic variables one would expect a degree of persistence and inertia to exist [see Loayza, Schmidt-Hebbel and Serven (2000) and Levine, Loayza and Beck, 2000).

The econometric procedure we utilize is referred to as the Generalized Methods of Moments (GMM) dynamic system estimator, developed by Arellano and Bond (1991) and Arellano and Bover (1995). The GMM system estimator relaxes the assumption of strict exogeneity, (that the explanatory variables are uncorrelated with current, future and past values of the error term), assuming instead weak exogeneity (that current explanatory variables may be affected by past and current values of the dependent variable, but are not affected by future changes in the dependent variable).

The GMM system estimator applied to panel data with a lagged dependent variable involves the simultaneous estimation of the regression equation in differences and levels. For the differenced equation, lagged levels of the explanatory variables serve as instruments, and for the levels equation differences serve as instruments. To illustrate, consider the following dynamic model:

$$y_{i,t} = \alpha\, y_{i,t-1} + \beta\, x_{i,t} + \mu_i + \varepsilon_{i,t} \qquad (1)$$

where y is the dependent variable, $y_{i,t-1}$ is the lagged dependent variable, x is the set of explanatory variables, μ is a country specific effect, ε is the error term, and i and t denote country and time periods respectively.

Taking first differences of equation (1) eliminates the country effects, μ, but imposes a correlation between the differenced error term and the differenced lagged dependent variable, resulting in biased estimates when using OLS. Assuming that the error terms are serially uncorrelated and that the explanatory variables are weakly exogenous, values of y and x lagged

two periods or more are valid instruments for the equation in first differences (see Arellano and Bond (1991)). The difference equation is:

$$y_{i,t} - y_{i,t-1} = \alpha_1 (y_{i,t-1} - y_{i,t-2}) + \beta_2 (x_{i,t} - x_{i,t-1}) + (\varepsilon_{i,t} - \varepsilon_{i,t-1}) \quad (2)$$

with the following moment conditions:

$$E\left[k_{i,t-s} \cdot (\Delta \varepsilon_{i,t})\right] = 0 \quad (s \geq 2; t = 3, \cdots, T;\ k_{i,t} = (x_{i,t}, y_{i,t})) \quad (3)$$

The above GMM estimator based on moment conditions in (3) is known as the difference estimator. However, it has been shown by Blundell and Bond (1998) that the difference estimator could produce biased and imprecise estimates due to the problem of weak instruments, which occurs when the lagged dependent variable is persistent and when the variance of the permanent effects increase relative to the variance of the transitory shocks (see also Blundell and Bond (1999)).

Therefore, given that the correlation between the levels of the explanatory variables and the country effects is constant over time, such that:

$$E\left[k_{i,t+p} \cdot \mu_i\right] = E\left[k_{i,t+q} \cdot \mu_i\right] \quad \textit{for all } p \textit{ and } q. \quad (4)$$

results in the additional moment conditions:

$$E\left[k_{i,t-s} \cdot (\varepsilon_{i,t} + \mu_i)\right] = 0 \quad (s = 1; t = 3, \cdots, T;\ k_{i,t} = (x_{i,t}, y_{i,t})) \quad (5)$$

From these additional moment conditions, the levels equation can be estimated with lagged first differences of the variables acting as instruments.[12] Using the moment conditions given by (3) and (5) the difference and levels equations are jointly estimated with the appropriate instruments using GMM. This is known as the GMM system estimator and is shown by Blundell and Bond (1998) to provide substantial improvements in terms of bias and precision over the single equation difference estimator.

The consistency of the GMM system estimator depends on a number of assumptions. Specifically, the assumption of no serial correlation in the error terms, and the validity of the instruments. Therefore, along with the regression results, diagnostic test results are also provided. Under the null hypothesis of no serial correlation, the test of first order serial correlation of the differenced error terms should be significantly negative, and the second order test should be insignificant. The Sargan test of over-identifying restrictions is also presented. This tests for the overall validity of the instruments by examining the sample analog of the moment conditions. Based on the null hypothesis that the instruments are valid (see Arellano and Bond, 1991), failure to reject the null hypothesis supports the model specification.[13]

4. Results

(i) Cross Sectional Estimation

Table 3 presents OLS and TSLS cross-sectional regression estimates of the economic and legal determinants of PCI consumption. For TSLS, fitted values of REALGDP are used to account for possible endogeneity. These fitted values are calculated by a OLS regression where REALGDP is determined to be a function of the consumer price index, budget deficit, black market premium, gross investment to GDP, rule of law, democracy, and the explanatory variables in the respective insurance regressions[14].

In addition to income, we include proxies for risk aversion, loss probability, the price of insurance, property rights and the country's legal origin. As noted earlier we have two proxies for risk aversion (UAI and EDUCATION) and two proxies for loss probability (URBAN and THEFT). In regressions 1 and 2 we maximize the data sample by initially using URBAN to proxy loss probability and examine the sensitivity of the results to the alternative measures of risk aversion. The significant coefficients in regressions 1 and 2 all have the correct sign and suggest that PCI is significantly and positively related to income, the probability of incurring

losses and the protection of property rights. The two alternative measures of risk aversion, UAI and EDUCATION, are correctly signed and close to being significant at the 10% level.

These results support the hypothesis that increased economic development facilitates growth in insurance, either by increasing income which allows for greater insurance consumption, and/or by increasing the stock of wealth for which insurance is required. The results are also consistent with the hypothesis that greater urbanization is associated with greater loss probability and therefore greater demand for insurance. There is also strong support for the hypothesis that the enforcement of legal rights, as measured by PROPERTY RIGHTS, are important in explaining insurance growth. However, we find no evidence to support the hypothesis that a country's legal origin affects the development of insurance markets.

In regressions 3 and 4 we re-estimate the models, but use the THEFT variable to proxy loss probability instead of URBAN. A limitation of this approach is that the sample in regressions 3 and 4 are limited to 32 countries due to unavailable THEFT data. The effect of including THEFT in the model is to substantially weaken the results, with only REALGDP being statistically significant in regression 3. The weaker results may be due to the smaller sample size and/or the high correlation between THEFT and PROPERTY[15]. In regression 4 we exclude PROPERTY from the model and find that THEFT is positive and statistically significant at the 10% level, indicating that demand for insurance is higher in countries that have higher reported crime rates, which is to be expected.

To summarize the cross sectional results in Table 3, we find strong and consistent evidence that income, property rights, and loss probability directly and significantly affect consumption of PCI. However, there is no evidence that PRICE, measured by the loss ratio, risk aversion measured by UAI or EDUCATION, or legal origin affects the cross country development of property-casualty insurance markets. Given that the legal origin and UAI are

unambiguously insignificant then it is reasonable to comment that the consumption of property and casualty insurance is in the main unaffected by cultural and institutional factors. This finding is in accord with the work of Park et al. (2002), and would tend to suggest that the development of insurance in such culturally different economies as Italy, UK, and Japan is not dependent upon how individuals perceive the value of insurance or the commercial transfer of risk. Rather, through property rights it is how technically effective the judiciary are at enforcing contracts that is important. Hence, the development of insurance is technically located not culturally located.

(ii) Panel Data Estimation

Table 4 provides the results of panel data regression estimates. There are three regression results presented enabling a comparison of the results using different techniques and sample estimates. Specifically, the table includes results from a standard fixed-effects model to provide a benchmark for the GMM results and to help determine the consistency of the results from using these different statistical techniques.

As the panel estimations allow for time-variation, URBAN and UAI cannot be included. Moreover, as is common with much of the economic growth literature, we also take the step of creating averaged non-overlapping three-year time intervals from the annual data. There are several benefits of doing this. From a statistical viewpoint, averaging helps deal with outliers and temporal influences in the results. However, from an economic perspective the benefits of averaging over longer time-intervals helps minimize the influence of the business cycle on some or even all of the variables. Moreover, the effects of inertia from the impact that previous economic conditions may bear upon cotemporaneous circumstances are also reduced. Nevertheless, in order to provide a measure as to the influence of averaging upon the dataset, annual results are also presented for the GMM model.

Reg. 1 reports the results from using the fixed effects model. The fixed effects model suggests that REALGDP, PROPERTY and EDUCATION directly affect insurance demand, although PRICE(-1)[16] is insignificant. The coefficient on the lagged dependent variable has a value of 0.258 and is significant at the 5% level. As this value is fairly low it implies that the process of adjustment to long-run levels is rapid (over a three year period), with the long-run effect of a change in the other determinants of PCI being roughly 1.4 times the short-run impact. However, the fixed effects estimator does not account for endogeneity, and is biased and inconsistent when a lagged dependent variable is included in the model.

The GMM results are reported in regressions 2 and 3. The specification tests of the system estimator reported in the lower panel of Table 5 support the GMM system estimation. In all cases the Sargan test cannot reject the hypothesis that the instruments are uncorrelated with the error term, supporting the validity of the instruments. Moreover, there is no evidence of second order serial correlation, while the first order serial correlation test is negative, though not quite significant for Reg. 2[17]. Overall, the results support the assumption of no serial correlation in the error terms and thereby the consistency of the GMM estimator.

The GMM estimates in regressions 2 and 3 include both time and country specific dummy variables. As with the fixed effects model, the results suggest that REALGDP and PROPERTY directly affect consumption of PCI, indicating that income and property rights are the two prominent determinants for PCI. However, in contrast to the earlier results, there is now a significant negative price effect and the lagged dependent variable is insignificant, indicating instant adjustment to long-run levels, over a three year period

Finally, in Reg. 3 we examine the sensitivity of our results to using annual data rather than non-overlapping three-year averages. This allows us to increase the sample to 418 observations. Once again the results suggest that REALGDP and PROPERTY are the most

important determinants of PCI density across countries. It is also interesting to note that the lagged dependent variable is statistically significant in regression 3 and has a coefficient of comparable magnitude to that of regressions 1 and 2, given that in this regression annual data is used rather than three year averages.

5. Conclusion

The major methodological contribution of this paper is the application of the GMM system estimator to a large panel dataset encompassing both developed and developing countries. By accounting for the problem of endogeneity and the possibility of dynamic adjustment, a more thorough examination of the determinants for global PCI is provided to that of the existing literature. While the results of the GMM system estimator are similar to those obtained from using OLS or fixed effects estimation techniques, some important differences are observed. The most notable difference being that it is only in the GMM results that the price of insurance is found to significantly negatively related to insurance consumption.

This study also provides the first empirical test of the influence of legal origin and the protection of property rights on property-casualty insurance. The importance of the legal environment for insurance arises from the positive probability of insurer insolvency, and secondly from the enforcement of property rights. Both factors aid the development of insurance markets through a lowering of transaction costs associated with contractually transferring risk.

We find strong support for a direct relationship between property rights and the level of insurance density across countries. Moreover, the results suggest that after controlling for variation in income and property rights, a country's legal origin does not affect insurance demand.

For policymakers, it is important to note that while Levine et al. (2000) suggest that banking sector development is conditional on a number of characteristics from the legal

environment including legal origin and creditor rights, this study indicates that the linkage between insurance and the legal environment appears to be more focused on the single issue of enforcing property rights. As a consequence, the legal environment promotes the demand for insurance by facilitating efficient transactions between insurance companies and policyholders.

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Table 1

HYPOTHESES	PROXIES	EXPECTED RELATIONSHIP WITH DEMAND FOR P-C INSURANCE
Legal Rights and Enforcement		
• Legal Origin	ENGLISH	?
	FRENCH	?
	GERMAN	?
	SCAND	?
• Property Rights	PROPERTY	?
Economic Development	REALGDP	+ ve
Risk Aversion	UAI	+ ve
	EDUCATION	+ ve
Price of Insurance	PRICE	- ve
Loss Probability	URBAN	+ ve
	THEFT	+ ve

Table 2
Summary Statistics

	PCI	REALGDP	PRICE	EDUCATION	UAI	URBAN	THEFT	PROPERTY
Full Sample								
Mean	301.1	8234	1.753	75.57	61.05	64.62	1884	37.17
Median	141.2	7325	1.566	76.90	56.00	66.72	1401	37.70
Std. Dev.	342.2	5436	0.699	29.66	20.86	21.09	1859	10.37
Correlation*	-	0.854	-0.297	0.684	0.064	0.412	0.665	0.745
Observations	640	650	493	569	659	659	270	616
Scandinavian								
Mean	561.0	14300	1.313	109.1	40.25	75.58	4164	48.85
Median	590.2	14136	1.268	109.1	39.50	78.45	3969	49.00
Std. Dev.	183.7	1520	0.308	12.55	14.88	9.350	1730	0.955
Observations	60	60	38	52	60	60	47	56
English								
Mean	302.6	8282	1.732	71.13	47.87	59.76	1716	38.53
Median	147.9	8542	1.506	80.00	49.00	57.03	1046	40.33
Std. Dev.	45.8	6098	0.737	32.32	16.45	26.89	1749	9.431
Observations	224	224	179	189	225	225	94	210
French								
Mean	170.9	6215	1.876	68.13	71.58	65.69	1042	32.48
Median	50.77	4283	1.667	62.55	76.00	66.80	531.9	32.82
Std. Dev.	239.8	4260	0.739	26.55	16.84	18.68	1332	9.674
Observations	296	306	231	274	314	314	100	294
German								
Mean	682.6	12357	1.581	96.49	76.25	66.29	1645	45.03
Median	691.6	13158	1.597	96.50	77.50	64.36	1638	47.23
Std. Dev.	440.8	3559	0.249	5.635	13.31	7.935	675.4	6.222
Observations	60	60	45	54	60	60	29	56

- Correlation with the dependent variable PCI
- Note: The summary statistics are raw figures and are not logged.

Table 3
The Determinants of Property-Casualty Insurance:
Cross Sectional Results [a, b.]

Independent Variables	Reg. 1	Reg. 2	Reg. 3	Reg. 4
CONSTANT	-11.419 ***	-11.870 ***	-9.999 ***	-11.52 ***
	[.000]	[.000]	[.006]	[.000]
REALGDP	1.002 **	0.832 *	1.371 **	1.772 ***
(fitted)	[.017]	[.062]	[.046]	[.000]
UAI	0.008		0.007	0.006
	[.159]		[.283]	[.282]
EDUCATION		0.621		
		[.107]		
PRICE	-0.013	0.059	-0.159	-0.327
	[.952]	[.791]	[0.590]	[.142]
URBAN	0.866 *	0.799 *		
	[.061]	[.088]		
THEFT			1.52 e-4	1.8 e-4 *
			[.166]	[.079]
PROPERTY	0.083 ***	0.077 **	0.051	
	[.008]	[.017]	[.408]	
ENGLISH	0.070	0.219	0.189	0.577
	[.839]	[.533]	[.605]	[.570]
FRENCH	0.063	0.327	0.285	0.195
	[.879]	[.392]	[.532]	[0.634]
GERMAN	0.302	0.588	0.665	0.800
	[.503]	[.166]	[0.221]	[0.106]
Summary Stats.				
Observations	44	44	32	32
F-Stat. / Chi-Sq.	463.7 ***	448.3 ***	303.0 **	346.4 **
Specification Test	10.55	8.39	4.69	5.46
Adjusted R^2	0.916	0.913	0.916	0.908

[a.] White adjusted 'p'- values in brackets.
[b.] ***, ** and * indicate significance at 1%, 5% and 10% levels respectively.
[c] Specification tests are Sargan tests for the validity of the choice of the instrumental variables. It is asymptotically distributed as $\chi^2(m)$ with m over- identifying instruments.

Table 4
The Determinants of Demand for Property-Casualty Insurance:
Panel Data Results [a]

	Fixed Effect	GMM System Estimates	
Independent Variables	Reg. 1 [b]	Reg. 2 [b]	Reg. 3 [c]
CONSTANT	0.490 ***	3.790 ***	-2.748
	[.011]	[.000]	[.106]
PCI (-1)	0.258 **	0.194	0.701 ***
	[.027]	[.160]	[.000]
REALGDP	0.863 **	0.645 ***	0.405 *
	[.017]	[.000]	[.076]
EDUCATION	0.661**	0.309	-0.101
	[.049]	[.394]	[.289]
PRICE (-1)	0.037	-0.103 *	0.004
	[.517]	[.058]	[.197]
PROPERTY	0.012 *	0.022 ***	0.006 *
	[.090]	[.000]	[.092]
TIME (1990-1992)	0.959 *	0.783 ***	
	[.077]	[.000]	
TIME (1993-1995)	1.137 *	0.222	
	[.075]	[.128]	
TIME (1996-1998)	0.490	-0.959***	
	[.199]	[.000]	
Summary Statistics			
Number of Countries	44	43	44
Observations	137	136	418
F-Statistic [p-value]	0.000 ***	-	-
Adjusted R^2	0.987	-	-
Wald joint test [p-value]	-	0.000 ***	0.000***
Sargan test	-	15.56	3.962
AR (1) test [N(0,1)]	-	-1.406	-3.383 ***
AR (2) test [N(0,1)]	-	-0.936	-1.033

All regressions incorporate time and country dummies.
[a.] ***, ** and * indicate significance at the 1%, 5% and 10% levels respectively.
[b] There is a loss of one country from the sample (Brazil) as a result of the lagging procedure involved in the estimation of Reg. 2.
[c.] Yearly time dummies are included in Reg. 3 which uses annual data, but are not reported.

Appendix 1

Data Definitions

VARIABLE	DESCRIPTION	SOURCE
PCI	The log of the ratio of property-casualty premiums to the population level deflated by the terms of trade index and defined in constant 1995 US dollars.	Swiss Reinsurance
REALGDP	The log of gross domestic product (GDP) per capita deflated by the terms of trade index and defined in constant 1995 US dollars.	World Bank
PRICE	Defined as premiums divided by claims.	AXCO and various national insurance bodies.
EDUCATION	The log of the proportion of the population enrolled in secondary education within respective age groups.	World Bank
UAI	Uncertainty Avoidance Index	Hofstede (1995)
URBAN	The log of the proportion of the population living in urban areas.	World Bank
THEFT	Defined as the number of property thefts per 100000 persons.	UN World Crime Surveys
ENGLISH (FRENCH, GERMAN, SCAND)	Equal to one if the country's legal system has respectively either an English (French, German or Scandinavian) legal system and zero otherwise.	La Porta et al (1998)
PROPERTY	50 point property rights index combining corruption, rule of law, bureaucratic quality, contract repudiation and expropriation risk. The higher the index the greater the protection of property rights.	Knack and Keefer (1995)

Appendix 2

Countries in the Sample

Algeria[ac]	France	Mexico[a]	South Africa
Argentina[a]	India	Morocco	South Korea[a]
Australia	Indonesia	Netherlands	Spain
Austria	Iran	New Zealand	Sweden
Belgium	Ireland	Nigeria[a]	Switzerland
Brazil[ac]	Israel	Norway	Thailand
Canada	Italy	Pakistan[a]	Tunisia[ab]
Colombia	Japan	Panama	Turkey
Denmark	Kenya[a]	Philippines	United Kingdom[a]
Egypt	Kuwait[ab]	Portugal	United States
Finland	Malaysia	Singapore	Venezuela

[a] Indicates exclusion from regressions containing the variable THEFT.
[b] Indicates exclusion from regressions containing the variable BANK.
[c] PCI for the years 1984-88 and 1984-90 are not included for Argentina and Brazil respectively.

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Endnotes

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[1] By extending standard option models for the pricing of risky corporate debt, Cummins and Danzen (1997) develop and empirically test a model of price determination in insurance markets, which assumes insurers are subject to insolvency risk. They find the price of insurance is positively related to the financial quality of the insurer, reflecting the lower insolvency risk of the insurer.

[2] See Levine and Zervos (1998) for how financial markets contribute to economic development. Ward and Zurbruegg (2000) and Catalan, Impavido, and Musalem (2000) focus on evidence from the insurance market.

[3] In addition to the legal dummies their model includes GDP growth, log GNP and rule of law. When creditor rights is included in the regression, the French Legal origin dummy is insignificant.

[4] A third legal influence on insurance demand is highlighted by Browne et al (2000), who argue that liability insurance is greater in countries where dispute resolution is more likely to involve litigation and the associated granting of financial damages.

[5] We thank an anonymous referee for this suggestion.

[6] Average standard deviation across countries on an annual basis is 3.32 points.

[7] The loss ratio may also have a negative relationship with premiums if insurers increase their excess levels in response to problems with adverse selection of customers. This can lead to a reduction of the number of claims relative to premium income.

[8] Although the number of observations varies by variable on an annual basis, we report the data for all available annual observations, rather than for a constant sample. This is because data averaging allows for missing observations in the annual data series.

[9] Germany was excluded from the sample due to the structural and statistical effects reunification had on the data.

[10] It is interesting to note that the more developed countries have the highest reported theft rates. This is most likely from the incentive to report crime in developed countries being greater due to a better protection of property rights, and the likelihood that crime needs to be reported in order for insurance claims to be made.

[11] Averaged cross-sectional estimation is common in the economic growth literature (see for example Beck et al. (2000) and Levine et al. (2000)). In the insurance literature single year cross sectional estimation has been applied by, among others Outreville (1990, 1996) and Browne and Kim (1993).

[12] Additional lagged differences are considered redundant (see Arellano and Bover (1995)).

[13] We use the Dynamic Panel Data (DPD) for Ox program written by Doornik, Bond and Arellano (1999) to implement the GMM system estimator. The full set of recommended instruments (see Blundell and Bond, 1998) were applied for the GMM estimation results.

[14] The results of the structural equations are available from the authors. The source for the macroeconomic data is the World Bank.

[15] The correlation between THEFT and PROPERTY is 0.68. Although not excessively large it is the highest correlation recorded for any of the variables in the sample of 32 countries.

[16] We use the one period lag of the price variable under the assumption that prices are dependent upon historical

losses.

[17] Lack of both first and second order serial correlation in the differenced residual is consistent with the level residual following a random walk (see Arellano and Bond (1991)).