Law and the Determinants of Property-Casualty Insurance

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Working Paper WP2001-02

June 2001

Australian Prudential Regulation Authority

The authors wish to thank AXCO insurance services and Swiss Reinsurance for providing data, and Ian Sharpe, David Michayluk and Alvin Liaw for helpful comments. The views and opinions expressed in this paper are those of the authors and do not necessarily reflect those of APRA.

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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 both legal and political factors have on 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 the GMM 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 nonlife insurance is significantly and positively related to risk aversion, loss probability and income, and negatively related to price.

JEL Classification Numbers: G22, K11, K40.

Keywords: Insurance, Property Rights, Law.

1. Introduction

The importance 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 and political 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 extensive 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, and provided an initial analysis of the link between insurance and financial development. 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 also only estimated the determinants of demand using either small, single year cross-sectional samples (see Outreville (1990, 1996), Browne and Kim (1993), and Beenstock et al (1988)), or relied on panel data techniques that do not account for the potential endogeneity of the contemporaneous regressors (see Browne et al (2000)). This is particularly important, 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 on insurance demand, of changes in factors such as legal and political rights, and income.

Therefore, to account for the above concerns this paper contributes to the current literature in three ways. Firstly, we incorporate legal and political factors as possible determinants of property-casualty (PC) insurance consumption. Secondly, the empirical analysis includes time series data for the 44 countries between the years 1984 to 1998. This allows us to estimate a dynamic panel data model using the GMM system estimator, as well as overcoming the small sample limitations of prior studies. Thirdly we include alternative proxies for price, risk aversion and loss probability than currently used 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 describe the primary determinants for PC insurance consumption as being income, financial depth, risk aversion, price of insurance, legal systems, property rights, judicial effectiveness and political rights. In Section 3 we 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 section a number of factors that potentially influence PC insurance consumption are considered, incorporating economic, social, legal and political aspects. We define the dependent variable, the level of real property-casualty insurance, PCI, as real per capita premiums defined 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. Nevertheless, PCI is dominated by motor vehicle and property insurance, which

accounts for the majority of the PC market in the OECD countries for which disaggregated data is available.

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, 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 PC insurance 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 create 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.

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 also the only legal / political variable examined that is not time-invariant, which allows for its use in a panel regression[5]. We expect PROPERTY to be positively related to insurance consumption as it should measure the ability of the legal system to promote insurance as an efficient means of transferring risk.

Finally, the legal enforcement of property rights is also dependent on the efficiency of the judicial system. Following Laporta et al (1998), we use Business International Corporation's measure of judicial efficiency (JUDICIAL), which provides an investors' assessment of the "efficiency and integrity of the legal environment as it affects business". An efficient judicial system enhances the enforcement of property rights and is therefore expected to be positively related to insurance demand.

(*iii) Political Stability*

The stability of government and the level of checks and balances in the political decision making process affects confidence in the political system and law making. With a high level of checks and balances, individual protections, such as property rights, are more likely to be maintained and policy changes are likely to be less arbitrary. In effect, the strength of legal rules and enforcement can only be as good as the political institutions and processes that enforce those laws[6]. Also, recent work by Ritzen, Easterly, and Woolcock (2000) stress the link that social cohesion and good politics can have on economic growth. This would compliment the extent to which legal rights are maintained within a country.

To account for the effect of political factors on insurance consumption we include a measure of political checks and balances (CHECKS). CHECKS measures "the number of veto players in a political system, adjusting for whether these veto players are independent of each

other, as determined by the level of electoral competitiveness in a system, their respective party affiliations, and the electoral rules" (see Beck, Clarke, Groff, Keefer and Walsh (2000))[7]. The CHECKS index increases with the level of checks and balances in the political system and is expected to be positively related to insurance demand.

(iv) Economic Growth and Financial Development

The relative importance of the PC insurance market within a country will also be dependent upon economic and financial factors. 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, insurance consumption could be supply-driven by financial development. This raises the issue of endogeneity when estimating these determinants. 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 and financial growth with insurance, we use real gross domestic product per capita, REALGDP, to measure national income. As a measure of the depth of financial intermediaries we use the ratio of private credit provided by deposit money banks and other financial institutions to gross domestic product, BANK. This ratio focuses on the primary functions of intermediaries which is to mobilize savings and channel it to investors. Levine (1999), Levine, Loayza, and Beck (2000) and Beck, Levine, and Loayza (1999) are studies, among others, that have utilised a similar ratio rather than use the more traditional, yet

less accurate measure of M2 over GDP. We expect the coefficient on REALGDP and BANK to be positively related to the level of insurance density within a country.[8]

(v) Risk Aversion

A primary determinant 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.

We use the uncertainty avoidance index (UAI) discussed in Hofstede (1995) to proxy risk aversion. Based on survey data, the UAI index is constructed using employees 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 index is utilised as a dummy variable with cross-sectional variation ranging 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 sees 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. While the UAI has not been used in the empirical insurance literature it has received a great deal of usage for various financial studies. As an example, Niswander (1995) recently

utilised it to explain cultural differences in national accounting systems. We expect the coefficient on the UAI variable to be positively related to insurance consumption.

However, in order to compare our results with earlier studies we will also include a measure of education. Following Outreville (1990) we use the proportion of the population completing secondary education, EDUCATION, as a proxy for risk aversion. Although we expect the impact of EDUCATION on insurance demand to be positive, it may not be the case given Szpiro and Outreville's (1988) discussion.

(vi) 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. 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. Ceteris paribus, the more likely individuals lose value on their property to insurable risks, the more willing they will be to purchase insurance. As it is expected that claims due to 'acts of god' will be randomly displaced, 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 for 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 are interested in citizens' complaints. 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.

Unfortunately, not all the countries reported crime rates on a frequent, annual basis to the UN World Crime Surveys. Therefore 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, and data sources and variable descriptions are provided in Appendix 1.

3. Data And Estimation

(i) Data

Table 2 provides the 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[9]. The countries in the sample are listed in Appendix 2. The selection criteria for choosing these countries was

simply based upon ensuring annual premium rates were reported for at least a decade in each country from Swiss Re.[10].

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 PC insurance markets than English and French based countries. The mean PC insurance 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 more developed financial systems, lower priced insurance, higher education levels, higher rates of urbanization and theft, and greater protection of property and political rights.[11] 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 and financial depth, highest priced insurance, lowest level of education and lowest protection of property and political rights.

Correlation scores are also reported in Table 2. The signs of the correlation coefficients between the explanatory and dependent variables are generally consistent with the predictions summarized in Table 1. PCI is highly positively correlated with REALGDP (.854), BANK (.722), EDUCATION (.684), THEFT (.665), PROPERTY (.745) and JUDICIAL (.606), and negatively correlated with PRICE (-.297).

(ii) Estimation

Three different approaches are used to examine the determinants for PC insurance. To cater for the time-invariant nature of some of the variables, ordinary least squares (OLS) cross sectional estimation is applied where data for each country is averaged over the complete time series, leaving one observation per country. Secondly, fixed effects estimation applied to panel data based on non-overlapping three year averages; and thirdly GMM dynamic system estimation applied to panel data based on three year averages and annual data are examined. Data averaging is commonly applied in the growth literature to stabilize and account for time varying factors in variables (see Easterly Loayza, and Montiel (1997), and Levine, Loayza, and Beck (2000) for examples).

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[12]. However, relative to the panel data estimation techniques, the averaged cross-sectional estimation ignores time and country specific effects, provides less efficient estimates due to the loss of degrees of freedom, and ignores the process of dynamic adjustment to long-run levels. While the standard fixed effects estimation approach overcomes the above limitations, fixed effects estimates are biased and inconsistent when the model includes a lagged dependent variable (see for example Verbeck (2000)).

A further econometric problem which arises in the estimation of insurance consumption and economic growth equations is the endogeneity of the explanatory variables. To account for the likelihood that economic growth and financial development may be endogenous vis-à-vis PCI growth, we use two-stage-least-squares (TSLS) when estimating the model using averaged cross-sectional data. However, our preferred method of dealing with endogenous variables is to apply

the GMM 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:

$$y_{i,t} = y_{i,t-1} + b\, x_{i,t} + m_i + t_t + e_{i,t} \qquad (1)$$

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, t is a time specific effect, e 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:

$$y_{i,t} - y_{i,t-1} = a_1(y_{i,t-1} - y_{i,t-2}) + b_2(x_{i,t} - x_{i,t-1}) + (e_{i,t} - e_{i,t-1}) \qquad (2)$$

with the following moment conditions:

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

The 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)).

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

$$E\left[k_{i,t+p} \cdot m_i\right] = E\left[k_{i,t+q} \cdot m_i\right] \quad \text{for all } p \text{ and } q. \tag{4}$$

results in the additional moment conditions:

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

From these additional moment conditions, the levels equation can be estimated with lagged first differences of the variables acting as instruments.[13] 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 residuals, $g_{i,t,}$ and on the validity of the instruments. Therefore, along with the regression results, diagnostic test results are also provided for this. Under the null hypothesis of no serial correlation, the test of first order serial correlation

of the differenced residuals should be significantly negative, and the second order test should be insignificant. The Sargan test of over-identifying restrictions is based on the null hypothesis that the instruments are valid (Arellano and Bond (1991)). Failure to reject the null hypothesis supports the model specification.[14]

4. Results

(i) Cross Sectional Estimation

The first results presented in Table 3 focus on the legal and political determinants of insurance consumption using simple OLS and TSLS regressions. For TSLS, fitted values of REALGDP are used to account for possible endogeneity. These fitted values are calculated by a simple 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[15].

Most importantly, these results illustrate the primary importance of property rights over other legal, judiciary, and political factors for influencing PC insurance density. Regression 1 shows that, by itself, legal origin is a significant determinant of insurance consumption. Consistent with the reported summary statistics, countries with French and English based legal systems report significantly lower levels of PC insurance than countries with German or Scandinavian based legal systems. Moreover, our finding that German based countries have more developed insurance markets is consistent with Levine et al (2000) and La Porta et al (1997) who find that German legal origin is associated with greater financial development and debt markets, respectively. However, in Reg. 2, when we control for cross-country variation in income levels all the legal dummies become insignificant. The previous finding that legal origin determines

insurance consumption is primarily a result of German and Scandinavians countries being wealthier.

To examine whether the enforcement of property rights affects insurance consumption, Reg. 3 includes PROPERTY, while still controlling for variations in income levels and legal origin. The coefficient on PROPERTY is positive and statistically significant at the 5% level, indicating the importance of legal enforcement and protection of property in stimulating demand for PC insurance. In Reg. 4, PROPERTY is replaced with the measure for political rights, CHECKS, and judicial efficiency, JUDICIAL. JUDICIAL has the correct sign and is also statistically significant, while CHECKS is insignificant. However, when we include PROPERTY (as in Regs. 5 to 7), both JUDICIAL and CHECKS drop out leaving only PROPERTY to be the significant legal factor. This outcome suggests that property rights dominate political rights and judicial efficiency in explaining cross-country variation in insurance consumption[16].

In Regs. 6 and 7 we include PROPERTY, CHECKS and JUDICIAL within the same equation, but alter our specification for income. In Reg. 6 we assume REALGDP is strictly exogenous, while Reg. 7 is a reduced form equation which excludes REALGDP. In both specifications PROPERTY is statistically significant, while both JUDICIAL and CHECKS are insignificant. These results confirm our earlier finding that property rights are an important determinant of insurance, which dominates the effects of legal origin, political checks and balances, and judicial efficiency.

Table 4 extends the cross-sectional analysis to include the economic and social determinants of PC insurance consumption. In addition to income, we include proxies for financial depth, risk aversion, loss probability, and the price of insurance. Regression 1 examines PC insurance exclusive of any legal or political factors. The coefficients in Reg. 1 all

have the correct sign and suggest that PC insurance is significantly and positively related to income, financial depth (BANK (fitted))[17], the level of risk aversion (proxied by UAI) and the probability of incurring a loss (proxied by THEFT). There is also a negative relationship between PC insurance and PRICE. However, the relationship is statistically insignificant.

While we believe that the THEFT variable is a superior proxy of loss probability to the rate of urbanization, the sample for Reg. 1 is limited to 32 countries due to unavailable THEFT data. Therefore, in Reg. 2 we re-estimate the equation using URBAN as our proxy for loss probability, increasing the sample to 42 countries. The coefficient on URBAN is positive and statistically significant at the 1% level, supporting the hypothesis that increasing urbanization is associated with greater loss probability and therefore greater demand for insurance.

In Reg. 3, PROPERTY is added to the set of economic variables given in Reg. 2. Consistent with the earlier results, PROPERTY is positive and statistically significant at the 10% level. This suggests the enforcement of legal property rights remains an important determinant of PCI, even after controlling for social and economic factors.

The importance of legal origin (see Reg. 4) is insignificant when controlling for the full set of legal, political and economic variables. In Reg. 5 and 6, UAI is replaced with EDUCATION as the proxy for risk aversion. The EDUCATION variable is a weaker measure of risk aversion and is found to be statistically insignificant in Reg. 5. However, in Reg. 6, which is the reduced-form equation for Reg. 5 without REALGDP, it could be acting as a proxy for income as education and GDP levels tend to be correlated across countries. Nevertheless, in all specifications the measures for legal origin are found to be insignificant, making them redundant when property rights are incorporated.

To summarize the cross sectional results in Tables 4 and 5, we find strong and consistent evidence that income, property rights, loss probability and, to a lesser extent, risk aversion directly and significantly affect consumption for PC insurance. However, there is only weak evidence that PRICE, measured by the loss ratio, and financial depth affect insurance demand.

(ii) Panel Data Estimation

Table 5 provides the final set of results that account for both time and cross-country variation. As these estimation procedures require time-variation in the explanatory variables, URBAN and UAI are not included. Moreover, BANK is excluded for two reasons. Apart from only showing weak evidence that it is a determinant of insurance consumption, part of any measure of financial depth will include insurance company assets and credit. This may lead to bias results[18].

All the regressions in table 5 include the lagged dependent as an explanatory variable, thereby allowing for the process of dynamic adjustment to long-run equilibrium. In regressions 1 to 4 the data is averaged over non-overlapping three year periods, giving a total of five time periods, while Reg. 5 provides a comparison using annual data.

In Reg. 1 we estimate the model using fixed effects, which serves as a base for comparison with the GMM system estimation results[19]. The fixed effects model suggests that REALGDP, PROPERTY and EDUCATION directly affect insurance demand, although PRICE(-1)[20] 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 PC insurance 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 equation.

The GMM system estimator overcomes the limitations of the fixed effects results. These results are reported in Regs. 2 to 5. 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 and significant in all models, excluding Reg. 2[21]. This supports the assumption of no serial correlation in the residuals and hence the consistency of the GMM estimator.

Regression 2 differs from the other system estimator results in that it is the only regression that includes both time and country specific dummy variables. As with the fixed effects model, the results suggest that REALGDP and PROPERTY directly affect consumption of PC insurance, indicating that income and property rights are the two prominent determinants for PC insurance. 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. The size of the PRICE(-1) coefficient (-0.103) also suggests very little price sensitivity. This may be in part due to the fact that a proportion of PC insurance will be compulsory and therefore insensitive to price movements.

We test the sensitivity of our results by altering the specification in Reg. 3 to replace the country specific dummies with legal dummy variables. This has a major impact on the results, with all explanatory variables becoming statistically significant at the 1% level. The lagged dependent variable is now also significant and has a coefficient of 0.72, suggesting a very slow

adjustment to long run levels. However, we must treat these results with care. Calderón, Chong and Loayza (2000) argue that omitting the country dummies focuses the regression on cross-country variation in the data. They also find, in their study on current account deficits, an increase in persistence from the omission of country specific dummies from the model. In effect, the results in Reg. 3 have forced the unobserved country variation into the remaining explanatory variables. Nevertheless, for an examination of cross-country variation it is important to note that all the explanatory variables have the correct sign.

In Reg. 4 we examine whether the adjustment speed is affected by the inclusion of time specific effects. Omitting the time dummies (and therefore not de-trending the data) has a minimal impact on the results, although the coefficient of the lagged dependent variable is now high as 0.62. Finally, in Reg. 5 we examine the sensitivity of our results to using annual data rather than non-overlapping three-year averages. This has the added benefit of leading to 418 observations within the sample. Once again the results suggest that REALGDP and PROPERTY are the most important determinants of PC insurance density within countries.

5. Conclusion

The major methodological contribution of this paper is from 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 PC insurance is provided to that of the existing literature. Evidence was provided that both persistence in insurance purchases from one period to the next and PRICE can influence insurance consumption.

This study also provides the first empirical test of the influence of legal origin, judicial efficiency 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 the transaction costs of contractually transferring risk.

We find strong support for a direct relationship between property rights and the level of insurance density within 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	+ ve
• Judicial Efficiency	JUDICIAL	+ ve
Political Rights		
• Checks and Balances Income	CHECKS	+ ve
	REALGDP	+ ve
Financial Development	BANK	+ ve
Risk Aversion	UAI	+ ve
	EDUCATION	+ ve
Price of Insurance	PRICE	- ve
Loss Probability	URBAN	+ ve
	THEFT	+ ve

Table 2

Summary Statistics

	PCI	REALGDP	BANK	PRICE	EDUCATION	UAI	URBAN	THEFT	PROPERTY	CHECKS	JUDICIAL
Full Sample											
Mean	301.1	8234	0.661	1.753	75.57	61.05	64.62	1884	37.17	3.597	7.711
Median	141.2	7325	0.560	1.566	76.90	56.00	66.72	1401	37.70	3.000	8.000
Std. Dev.	342.2	5436	0.460	0.699	29.66	20.86	21.09	1859	10.37	2.012	2.223
Correlation*	-	0.854	0.722	-0.297	0.684	0.064	0.412	0.665	0.745	0.165	0.606
Observations	641	651	571	494	569	660	660	270	616	484	570
Scandinavian											
Mean	561.0	14300	0.786	1.313	109.1	40.25	75.58	4164	48.85	4.705	10.00
Median	590.2	14136	0.826	1.268	109.1	39.50	78.45	3969	49.00	4.500	10.00
Std. Dev.	183.7	1520	0.301	0.308	12.55	14.88	9.350	1730	0.955	1.651	0.000
Observations	60	60	56	38	60	60	60	47	56	44	60
English											
Mean	302.6	8282	0.696	1.732	71.13	47.87	59.76	1716	38.53	3.806	8.150
Median	147.9	8542	0.700	1.506	80.00	49.00	57.03	1046	40.33	3.000	9.000
Std. Dev.	45.8	6098	0.685	0.737	32.32	16.45	26.89	1749	9.431	2.144	2.134
Observations	224	224	209	179	189	225	225	94	210	165	225
French											
Mean	170.9	6215	0.439	1.876	68.13	71.58	65.69	1042	32.48	3.130	6.350
Median	50.77	4283	0.348	1.667	62.55	76.00	66.80	531.9	32.82	3.000	6.250
Std. Dev.	239.8	4260	0.321	0.739	26.55	16.84	18.68	1332	9.674	1.796	1.852
Observations	296	306	250	231	274	314	314	100	294	231	225
German											
Mean	682.6	12357	1.405	1.581	96.49	76.25	66.29	1.645	45.03	4.159	8.875
Median	691.6	13158	1.431	1.597	96.50	77.50	64.36	1638	47.23	4.000	9.750
Std. Dev.	440.8	3559	0.517	0.249	5.635	13.31	7.935	675.4	6.222	2.241	1.686
Observations	60	60	56	45	54	92	60	29	56	44	60

* Correlation with the dependent variable PCI

Table 3
Legal and Political Determinants of Demand for Property-Casualty Insurance [a, b.]

Independent Variables	Reg 1	Reg 2	Reg 3	Reg 4	Reg 5	Reg 6 [c]	Reg 7
CONSTANT	6.316 ***	-10.664 ***	-9.637 ***	-10.425 ***	-9.498 ***	-12.345 ***	-4.225 ***
	[.000]	[.000]	[.000]	[.000]	[.004]	[.000]	[.000]
ENGLISH	-2.009 ***	-0.273	0.104	-0.086	0.193	0.198	0.182
	[.003]	[.509]	[.770]	[.835]	[.594]	[.556]	[.713]
FRENCH	-2.258 ***	-0.385	0.497	0.323	0.678	0.425	1.147 **
	[.000]	[.350]	[.220]	[.745]	[.158]	[.271]	[.039]
GERMAN	-0.025	0.305	0.546	0.539	0.635	0.522	0.844
	[.952]	[.509]	[.206]	[.266]	[.159]	[.199]	[.156]
REALGDP (fitted)[c]		1.775 ***	1.205 ***	1.482 ***	1.072 *	1.651 ***	
		[.000]	[.002]	[.000]	[.085]	[.000]	
PROPERTY			0.091 **		0.098 *	0.049 *	0.189 ***
			[.011]		[.080]	[.094]	[.000]
JUDICIAL				0.259 **	0.095	0.066	0.149
				[.031]	[.253]	[.367]	[.161]
CHECKS				-0.006	-0.039	-0.040	-0.038
				[.926]	[.511]	[.472]	[.642]
Summary Statistics							
Observations	44	44	44	38	38	38	38
F-Statistic / Chi Sq.	3.06 **	158.5 ***	393.2 ***	232.3 ***	376.9 ***	66.91 ***	33.04 ***
Specification Test		6.25	7.746	6.097	9.242		
Adjusted R^2	0.187	0.901	0.908	0.893	0.914	0.940	0.865

[a.] White adjusted 'p'- values in brackets.
[b.] ***, ** and * indicate significance at (1%), (5%) and (10%) levels respectively.
[c.] Actual REALGDP is used in regression 6.
[d.] 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:
Cross Sectional Results [a, b.]

Independent Variables	Reg 1	Reg 2	Reg 3	Reg 4	Reg 5	Reg 6
CONSTANT	-11.218 ***	-12.989 ***	-12.681***	-11.419 ***	-11.870 ***	-10.04 ***
	[.000]	[.000]	[.000]	[.000]	[.000]	[.000]
REALGDP	1.333 ***	1.240 **	1.064 **	1.002 **	0.832 *	
(fitted)	[.000]	[.016]	[.050]	[.017]	[.063]	
BANK	0.866 **	0.493	0.315			
(fitted)	[.029]	[0.265]	[.344]			
UAI	0.012 **	0.007 *	0.009 *	0.008		
	[.024]	[.098]	[.061]	[.159]		
EDUCATION					0.621	0.831 *
					[.107]	[.060]
PRICE (-1)	-0.243	-0.297	0.035	-0.013 *	0.059	0.081
	[.267]	[.214]	[.169]	[.060]	[.791]	[.757]
THEFT	2.0 e-4 **					
	[.051]					
URBAN		1.211 *	0.932 *	0.866 *	0.799 **	1.452 ***
		[.073]	[.089]	[.062]	[.087]	[.000]
PROPERTY			0.061 *	0.083 ***	0.077 **	0.125 ***
			[.084]	[.008]	[.017]	[.000]
ENGLISH				0.070	0.219	0.232
				[.205]	[.533]	[.578]
FRENCH				0.063	0.327	0.435
				[.153]	[.392]	[.334]
GERMAN				0.302	0.588	0.717
				[.676]	[.166]	[.151]
Summary Stats.						
Observations	32	42	42	44	44	44
F-Stat. / Chi-Sq.	341.2 ***	335.7***	506.2 ***	463.7 ***	448.3 ***	44.86 ***
Specification Test	2.432	7.304	10.42	10.55	8.39	
Adjusted R^2	0.925	0.917	0.934	0.916	0.913	0.897

[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 5
The Determinants of Demand for Property-Casualty Insurance:
Panel Data Results [a]

	Fixed Effects	GMM System Estimator			
Independent Variables	Reg 1 [b]	Reg 2 [b]	Reg 3	Reg 4	Reg 5 [c]
CONSTANT	0.4903***	3.790 ***	-3.169 ***	-3.810 ***	-4.555 ***
	[0.011]	[.000]	[.000]	[.000]	[.005]
NLCAP (-1)	0.2581**	0.194	0.720 ***	0.622 ***	0.663 ***
	[0.027]	[.160]	[.000]	[.000]	[.000]
REALGDP	0.8628**	0.645 ***	0.275 ***	0.463 ***	0.581 ***
	[0.017]	[.000]	[.000]	[.000]	[.006]
EDUCATION	0.661**	0.309	0.383 ***	0.402 ***	0.143
	[0.049]	[.394]	[.000]	[.000]	[.267]
PRICE (-1)	0.0368	-0.103 *	-0.090 ***	-0.134 ***	0.015
	[0.517]	[.058]	[.000]	[.000]	[.741]
PROPERTY	0.0122*	0.022 ***	0.016 ***	0.004 ***	0.010 *
	[0.090]	[.000]	[.000]	[.000]	[.092]
TIME (1990-1992)	0.9593*	0.783 ***	-0.044 ***		
	[0.077]	[.000]	[.008]		
TIME (1993-1995)	1.1369*	0.222	-0.096 ***		
	[0.075]	[.128]	[.000]		
TIME (1996-1998)	0.4903	-0.959***	-0.229 ***		
	[0.199]	[.000]	[.000]		
ENGLISH			0.228 ***		
			[.000]		
FRENCH			0.234 ***		
			[.000]		
GERMAN			0.280 ***		
			[.000]		
Summary Statistics					
Number of Countries	44	43	43	43	44
Observations	137	136	136	136	418
F-Statistic [p-value]	0.000 ***				
Adjusted R^2	0.987				
Wald joint test [p-value]		0.000 ***	0.000 ***	0.000 ***	0.000 ***
Sargan test		15.56	30.31	39.97	38.45
AR (1) test [N(0,1)]		-1.406	-1.983 **	-2.001 **	-1.875 *
AR (2) test [N(0,1)]		-0.936	-0.973	-1.154	0.158

[a.] ***, ** and * indicate significance at (1%), (5%) and (10%) levels respectively.
[b.] Individual company effects are included in the regression but not reported.
[c.] Yearly time dummies are included in Reg. 5 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
BANK	The log of the ratio of private credit provided by deposit money banks and other financial institutions to GDP.	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)
CHECKS	Checks and balances measured by the number of veto players in the political system and adjusted for the policy orientation of parties.	World Bank Database on Political Institutions (DPI)
JUDICIAL	Efficiency and integrity of the judicial system as it affects business. Scale from 0 to 10 with lower scores indicating lower efficiency.	Business International Corporation

Appendix 2

Countries in the Sample

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

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

Endnotes

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

[6] Modigliani and Perotti (2000) stress this point. Specifically, that legal enforcement rather than legal rules are most important for financial decision making. Using a market based measure of shareholder protection, they find evidence that poor enforcement of legal rules leads to a greater reliance on bank lending and less reliance on traded securities. The equity price measure of legal enforcement is consistent with measures of the efficiency of the judicial system, law & order and government corruption, but sometimes inconsistent with the shareholder rights index provided in La Porta et al (1998). The study is however limited by a small cross sectional sample of seven observations.

[7] The measure we use takes into account the policy orientation of parties.

[8] The treatment of economic growth and financial development as exogenous variables could be inappropriate, since development of insurance markets is likely to lead to economic growth and financial development. The various estimation techniques we use to alleviate the problem of endogeneity are discussed in Section 3.

[9] 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.

[10] With the exception of Germany, the countries utilised also represent the largest nonlife insurance markets by density and geographical region. Germany was excluded due to the structural and statistical effects reunification had on the data.

[11] It is interesting to note that the more developed countries have the highest reported theft rates. This is most likely due to the incentive to report crime in developed countries being greater due to a better protection of property rights.

[12] 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).

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

[14] We use the Dynamic Panel Data (DPD) for Ox program written by Doornik, Bond and Arellano (1999) to implement the GMM system estimator.

[15] The source for the macroeconomic data is the World Bank. Re-specifying the equations differently does not qualitatively change the results tabulated in table 3.

[16] Cross-section correlations between these variables are not excessively high (0.67 and 0.10 for JUDICIAL and CHECKS with PROPERTY, respectively) suggesting the result is not necessarily due to multicollinearity.

[17] To account for endogeneity, BANK (fitted), is used as the proxy for financial depth. Following a similar framework to Levine et al (2000), the reduced form model of financial depth includes the black market premium, rule of law, democracy, CPI, GDP per capita in 1984, ENGLISH, FRENCH, GERMAN and the additional explanatory variables in the respective insurance model.

[18] Also, in preliminary regressions where panel equations included BANK, the coefficient values were not significant.

[19] The GMM three-year averages regressions lost one country (Brazil) due to missing data and the lagging procedure involved in its estimation.

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

[21] 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)).