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Insurance and ownership structure in India's corporate sector

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Abstract In this study we examine the effect of ownership structure on the decision of Indian firms to purchase property insurance. We find that firms with a high degree of managerial ownership and leverage, plus firms with high growth options, high asset tangibility, and public listing status are more likely to insure their assets than other entities. We also observe that different factors determine the amount of property insurance purchased, in particular, the higher the degree of managerial ownership and indebtedness the less indemnity coverage acquired. Additionally, the younger the firm the greater the amount of insurance purchased. We contend that our results shed light into the strategic risk management behavior of Indian firms and that such insights could be of relevance to various parties, including international and domestic business investors.

Keywords Insurance · Ownership structure · India · Asia Pacific

Risk management (including insurance) is one of the most important strategic issues facing companies operating in rapidly growing but uncertain emerging economies such as India and other economies of the Asia Pacific region (e.g., see Claessens & Fan, 2002; Majumber & Sen, 2009; Schleifer & Vishny, 1997;

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Swiss Re, 2004).[1] The importance of risk management mechanisms, such as insurance, to corporate strategy is underpinned by the fact that emerging economies (like India) are intrinsically risky and uncertain business environments with inadequate institutional infrastructures and poorly developed economic and political support systems (Gaur & Kumar, 2009: 177). Companies operating in emerging economies are also susceptible to acute unforeseen losses resulting from environmental perils (e.g., fire and flooding), accidents, fraud, and a host of other business risks (Freeman & Kunreuther, 2002; Sarker & Sarker, 2000; Sinha, 2004).[2] Exposure to such risks therefore underpins the need for Indian firms to have sound systems of risk management in order to ensure that operating, finance, and investment plans are not disrupted by a lack of liquidity following unexpectedly acute mishaps to corporate assets (e.g., see Froot, Scharfstein, & Stein, 1993; Zou & Adams, 2006, 2008a).

Risk management (insurance) is also important for firms operating in much of the Asia Pacific region because external markets for corporate control and local systems of property rights and investor protection are much less developed than they are in Western countries such as the UK and US (Anant, Gangopadhyay, & Goswami, 1992; Bhagwati, 1993; Chhibber & Majumdar, 1999; Claessens & Fan, 2002; Majumber & Sen, 2009). For example, in India creditor protection legislation is undeveloped, costly, and inefficient, while market exit/bankruptcy procedures for firms are complex and onerous (Anant et al., 1992; Bhagwati, 1993; Majumber & Sen, 2009).[3] In addition, risk mitigation/management through international diversification is only a recent business phenomenon in India and then such a strategic option is confined to only a few very large corporations with transnational operations such as the Tata Group (Gaur & Kumar, 2009). As a commonly used strategic risk management technique, property insurance is particularly important for firms in emerging economies because unanticipated (uninsured) losses can reallocate resources from planned long-term investment opportunities to the task of asset repletion and reconstruction, which can come at a high cost for shareholders, government agencies, and others (Sinha, 2004).

Pearce and Zahra (1992), Thomsen and Pedersen (2000), and Zheka (2005), among others, report that the identity of owner-investors of firms is important for understanding corporate strategy and risk-taking and that various types of owners are likely to have different business priorities and objectives and varying abilities to effectively reduce insurable risks through diversification. Zou and Adams (2008b) add that, as a corporate governance mechanism, ownership structure can shape corporate strategies and influence how management are monitored and compensated in order to reduce agency incentive conflicts in firms. Therefore, ownership structure

[1] The view that the purchase of insurance is a key strategic issue for companies is well established in the literature (e.g., see Aunon-Nerin & Ehling, 2008; MacMinn & Garven, 2000; Mayers & Smith, 1982; Zou & Adams, 2006, 2008a). For example, MacMinn and Garven (2000) report that in the US corporate sector annual property insurance premiums consistently exceed the value of dividends by a factor of 30–40% per annum. See also "Theoretical review and hypothesis development."

[2] For example, Sinha (2004) reports that between 1985 and 2003 economic losses in India arising from natural catastrophes averaged around US$ 1.2 billion per annum or 0.4% of gross domestic product (GDP). Flooding and storm damage accounted for approximately 75% of the annual value of insurance claims.

[3] For instance, India's Industrial Disputes Act of 1947 imposes a statutory duty on large industrial corporations to obtain government approval for making workers redundant (Majumber & Sen, 2009).

can have important implications for the risk profile of companies. Furthermore, Peng, Tan, and Tong (2004) contend that the myriad of corporate ownership and control structures that exist in many emerging economies of the Asia Pacific region (e.g., the prevalence of state- and family-owned enterprises) can influence strategic decision-making, such as risk transfer, in ways that are different from companies operating in more developed economies such as the UK and US. These factors combine to make the examination of insurance and ownership-control structures in emerging economies, such as India, a potentially important subject for international business research (Fang, 2010).

In the present study, we focus on analyzing separately the participation and volume of insurance decisions in India's corporate sector (utilizing a two-stage probit-Cragg estimation procedure) because such an approach could yield interesting insights into the factors that influence the *ex-ante* and *ex-post* aspects of the corporate insurance decision (Zou & Adams, 2006, 2008a; Zou, Adams, & Buckle, 2003). Insurance is also a potentially better corporate hedging measure than the use of derivatives in that as an indemnity contract it cannot be used for speculative purposes (Aunon-Nerin & Ehling, 2008). Moreover, in contrast to previous corporate insurance studies from the Asia Pacific region (e.g., China) that focus on publicly listed companies (PLCs) (e.g., Zou & Adams, 2006, 2008a; Zou et al., 2003) most firms (approximately 90%) examined in the present study are small and medium-sized firms (SMEs) where roughly one-third do not insure their assets. We argue that this feature is potentially advantageous in that a more balanced cross-sectional mix of insurance users and insurance non-users reduces the risk of self-selection bias and provides a potentially cleaner test of the corporate insurance participation decision than has been carried out previously in other Asia Pacific emerging economies (such as China). This attribute further counteracts the inherent (and unavoidable) lack of time-series (panel) data used in the present study, which could arguably allow us to derive more robust estimates and thus more solid and generalizable conclusions.

To sum up, our study contributes to the literature by examining whether ownership structure influences the strategic risk (insurance) management decision of firms operating in an important emerging economy—India. Insights contributed by our research could help contracting constituents (e.g., investors and lenders) to make better informed decisions as well as be of potential interest to regulators and company licensing authorities that have an interest in the effective governance of firms.

The results of our study suggest that firms with more insider ownership, greater leverage, more growth options, more tangible assets, and publicly listed firms are more likely to purchase property insurance. Our findings also imply that firms with less insider ownership, lower leverage, and more recently established companies are more likely to have higher levels of property insurance. Overall, the results suggest that corporate ownership structure, especially the degree of inside managerial ownership, affects the incidence and the extent of property insurance use in India.

The remainder of our paper is organized as follows. The section "Insurance and the Indian corporate sector" briefly introduces the development of commercial insurance in India and the importance of ownership structure in assessing business

risks. "Theoretical review and hypotheses development" explains the link between corporate ownership structure and the purchase of property insurance, and motivates our hypotheses. "Sample and variables" describes our research design, including the data used, definition of the variables, and the modeling procedure employed. The empirical results are reported in the section "Results," while "Conclusion" concludes our paper.

Insurance and the Indian corporate sector

Since India initiated its market economy reform program in the early 1990s the supply of insurance in the Indian economy has increased markedly so that managers are currently better able to satisfy their companies' insurance needs than has hitherto been the case (Sen & Vaidya, 1997; Subhash & Bhat, 2007; Swiss Re, 2004, 2007).[4] The increase in the supply of insurance has occurred in tandem with the increased availability of credit and the removal (in 1991) of state-induced barriers of entry (e.g., licensing restrictions) to the Indian banking market. The relaxation of bank licensing policies, for example, has seen the growth of foreign-owned banks in India (Majumber & Sen, 2009). Subhash and Bhat (2007: 66) report that the expansion in insurance provision in India particularly took off in 1999–2000 when, in line with the government's liberalization-privatization-globalization (LPG) economic policy, 24 new (mostly foreign-owned) insurers began operations in India, many of which have formed joint ventures with domestic insurance companies. Today, more than 30 major insurance companies operate in India offering a wide range of commercial insurance products.[5]

Chakrabarti, Megginson, and Yadav (2008) report that ownership structure could be a significant influence on the risk management and internal control decisions of Indian firms. For example, firms that have highly concentrated shareholdings (e.g., family-controlled firms) are likely to transfer business risk to third party insurance companies as a cost effective alternative to risk retention within an undiversified ownership structure. This view is also shared by Zou and Adams (2008b) in their analysis of corporate ownership and equity risks in China. Prior research (e.g., May, 1995; Saunders, Strock, & Travlos, 1990; Smith & Stulz, 1985) also contends that a high degree of inside managerial ownership relative to that of outside shareholders can influence the effectiveness of risk management practices in firms. Whether the type of corporate ownership structure affects the incidence and propensity of Indian firms to insure their assets is therefore likely to be an empirical question of some importance to insurance suppliers, investors, financial analysts, and others with an interest in India's corporate sector. This is particularly likely to be the case for foreign

[4] For example, Swiss Re (2007) report that in 2006 there were 11 private and six public property-liability insurance companies operating in India generating annual premiums of approximately US$ 19 billion.

[5] Due to relatively undeveloped legal (tort) systems, liability insurance in emerging Asia Pacific economies (such as India) is small compared with property insurance lines of business. For example, liability insurance comprises less than 5% of total annual non-life insurance premiums in India, with property lines constituting about 20% of non-life annual market premiums (Sinha, 2004).

insurers that have been granted licenses to operate in India following the deregulation program initiated by the Insurance Regulatory and Development Act (1999). Furthermore, focusing on an institutional (India) perspective can help to isolate factors (particularly those relating to ownership structure) that may help to differentiate the risk management (insurance) decisions of emerging economy firms from firms operating in more developed economies (e.g., see Gaur & Kumar, 2009: 173).

Theoretical review and hypotheses development

As noted earlier, corporate ownership structure is essentially a governance mechanism which influences the way managerial performance is monitored and controlled in order to ensure compliance with owners' wealth maximization objectives (Pearce & Zahra, 1992; Thomsen & Pedersen, 2000; Zou & Adams, 2008b). Finance theory holds that strategic risk management techniques, such as insurance, help managers and owners to maximize the traded value of the firm by reducing the volatility of earnings and mitigating financial distress and bankruptcy risk (Smith & Stulz, 1985). More specifically, property insurance involves the transfer of insurable asset risks (e.g., arising from fire, flooding, wind storms, and so on) to a third party insurance carrier in return for the payment of actuarially fair rates of premium (Mayers & Smith, 1982).[6] As noted previously in footnote 1, MacMinn and Garven (2000) and Mayers and Smith (1982), among others, argue that insurance is an integral part of corporate financial policy and thus an important strategic issue for board-level managers. Indeed, several prior academic studies (e.g., Froot et al., 1993; Hoyt & Khang, 2000; Mayers & Smith, 1982; Zou & Adams, 2006, 2008a; Zou et al., 2003) suggest that property insurance can be an effective strategic post-loss investment financing mechanism that can help reduce information asymmetries and financial distress/bankruptcy and other (e.g., agency) costs for firms. In this regard, managers may be motivated to purchase property insurance in order to protect and promote their job security. The analysis of Froot and colleagues (1993) further implies that by protecting firms' free cash flows in the event of unexpectedly severe loss events property insurance enables managers to realize potentially positive net present value (NPV) projects in the firm's investment opportunity set thereby adding value for shareholders (i.e., the so-called "crowding out problem"). In addition, as insured assets have to be reinstated following loss events in accordance with the indemnity schedules of insurance policies (which are also subject to compliance monitoring by insurance companies) the agency theory-based risk that managers may misuse the proceeds from claims and invest in negative NPV projects is reduced (Hau, 2006). These attributes of property insurance enables the managers of firms to protect their job security, reduce their cost of capital, maximize value for their shareholders, and promote the interests of other business stakeholders (e.g., customers) (Shimpi, 2002).

[6] Companies can also self-insure via captive insurance subsidiaries. However, most insurance captives are owned by large European and US multinational corporations and are located in offshore centers such as Bermuda, the Cayman Islands, and Guernsey in the Channel Islands (Adams & Hillier, 2000).

Finance theory argues that modern firms can incur agency costs (e.g., in the form of higher borrowing expenditures) arising from debtholder-shareholder incentive conflicts, and that due to acute information asymmetries and weak creditor protection laws, such agency costs can be particularly acute in emerging Asia Pacific economies like India (Majumber & Sen, 2009). However, the presence of appropriate levels of property insurance cover allows debtholders' payoffs to become relatively independent of project selection and so limits the ability of borrowing firms to shift business risk onto debtholders (MacMinn, 1987). As a result, the corporate purchase of property insurance can, as predicted by agency theory, help mitigate potential agency incentive conflicts such as borrowers' assets substitution incentives and thereby lowers lenders' risk exposures. Additionally, a firm's claim to insurance proceeds following an insured loss obviates the need for it to raise (costly) new equity and debt, and/or utilize accumulated cash resources to replenish impaired and/or depleted assets. This further helps to reduce the well-known agency theory-based underinvestment incentive problem whereby after a severe unanticipated asset loss event (e.g., due to catastrophe) shareholders may exercise their default put option under limited liability rules and voluntarily liquidate the firm at the expense of debtholders' economic interests (MacMinn, 1987).[7]

The ability of insurance to mitigate such agency incentive conflicts in firms is expected to be particularly important in many Asia Pacific emerging economies (such as India) where publicly quoted and non-quoted companies tend to rely heavily on debt financing, particularly from banks. This is because domestic stock markets in the Asia Pacific region are not deep and liquid markets by international standards. In addition, in the context of India, the issue of public equity is strictly controlled by the Securities and Exchange Board of India (SEBI) set up in 1992 (Chakrabarthi et al., 2008).[8] As noted earlier, banks in many major emerging economies are now increasingly requiring companies to insure collaterized assets as a condition of the granting of loans. Consistent with this situation, Zou and Adams (2008a) find that the purchase of property insurance by Chinese PLCs enables managers to expand debt capacity, lower interest costs, and finance growth and development. A related benefit is that expanded debt capacity resulting from increasing the level of property insurance coverage on assets-in-place may afford borrowing firms a larger interest tax shield benefit thereby being potentially value-increasing for shareholders. Ownership structure could be an important consideration on the decision of lenders to require borrowers to both take out insurance and the level of insurance purchased. For example, small family-owned firms with concentrated risk are likely to be required by their banks to insure/take out relatively more insurance than large multinational companies or State-owned firms that are better able to diversify the risk of losses.

[7] The argument presented here indicates that property insurance helps to mitigate agency incentive conflicts between debtholders and shareholders. One plausible situation where this might not happen is where the debtholder seeks to increase its revenues by forcing the borrower to take out more property insurance cover than is required and/or charge an actuarially unfair premium. However, in a competitive financial services market (which India is increasingly becoming) such exploitive behavior by lenders would not persist for long.

[8] For example, Chakrabarthi and colleagues (2008: 59) report that in the first half of 2006 the value of debt issued by Indian companies reached an all time high of US$ 13.7 billion, up 28% from a year earlier.

In the following sections we consider how property insurance decisions interact with particular aspects of the ownership-control structure of Indian firms.[9] We put forward four hypotheses to guide empirical testing.

Ownership structure and corporate insurance

Shareholder ownership Zheka (2005: 452) reports that in developing economies, such as India, company ownership structure can significantly affect financial performance by influencing managerial incentives, systems of monitoring and control, and the strategic decision-making process. As noted earlier, shareholders that hold a high proportion of their wealth in a firm (e.g., as is often the case with family firms) are likely to have less diversified portfolios than investors with widely-held shareholdings (Zou & Adams, 2008a). As a result, the managers of firms with concentrated share ownership are more likely to transfer risk to third parties using insurance than their counterparts in firms with more disparate shareholdings (Doherty, 2000). Chhibber and Majumdar (1999), Khanna and Palepu (2000), and Sarker and Sarker (2000) examine the roles of different types of shareholders in monitoring governance and risk control practices in Indian firms. They find that certain large shareholders (e.g., owners of family-controlled firms) actively engage in monitoring the effectiveness of systems of corporate governance and risk mitigation, particularly within affiliated groups. This implies that taking out property insurance will be important to shareholders with a majority controlling interest in Indian firms as both the *ex-ante* decision to insure assets and ensuring adequate indemnity coverage *ex-post* helps to safeguard productive assets against mishap, ensures the generation of future cash flows, and so maximizes value for shareholders. Therefore:

Hypothesis 1 Other things being equal, there is likely to be a positive relation between firms, concentrated shareholdings and the incidence and level of property insurance purchased.

Managerial ownership There are two main competing theoretical arguments concerning the influence of managerial ownership on corporate risk management, namely, the managerial incentive alignment and the managerial risk aversion hypotheses. The former argument, advanced by Saunders and colleagues (1990), contends that shareholders' positions can be viewed as a call option whose value will increase with the growing risk exposure of the underlying assets of the firm. Such risk exposure includes both financial (e.g., market price) risks as well as the risk of asset loss due to pure (e.g., catastrophic) risk events (Han & MacMinn, 2006). This argument predicts that as insider ownership increases, managers' interests become more closely aligned with shareholders' interests, and as a result, managers have incentives to increase the level of business

[9] We initially tested for the effect of state ownership on the corporate decision to purchase property insurance but only about 1% of our sample of (mainly large) firms had state-held equity. This is consistent with the view of Chakrabarthi and colleagues (2008) that in India, state ownership is highly concentrated in large (mainly publicly listed) companies and in particular industrial sectors (e.g., utilities). This feature contrasts with China where state shareholdings are relatively more prevalent across firms of varying size, ownership structure, and industry (Xu & Wang, 1999).

risk and either not insure their assets in the first place or provide insufficient indemnity coverage *ex-post* in order to reduce the costs of risk transfer. This enables manager-owners to retain cash resources so that they can invest in prospective positive NPV projects. In the context of property insurance, Hoyt and Khang (2000) find evidence consistent with this argument in the US corporate sector. Thus:

Hypothesis 2a Other things being equal, there is likely to be an inverse relation between firms with high levels of inside ownership and the incidence and level of property insurance purchased.

On the other hand, the managerial risk aversion hypothesis, advanced by Smith and Stulz (1985), holds that managers are often unable to effectively diversify risks specific to their financial claims on the corporation (both economic wealth-based and firm-specific human capital-related). Therefore, as the proportion of managers' holdings of shares increases, they become increasingly risk averse and so are more likely to pursue hedging and other risk reduction strategies such as the purchase of property insurance. Indeed, purchasing insurance can, as Froot and colleagues (1993) hypothesize, minimize liquidity risks arising from unexpectedly severe loss events and enable the owners of firms to realize positive NPV projects in their investment opportunity set. In addition, because the payoff of holding ordinary shares is expected to be a linear function of a firm's traded value, managers may be hesitant to engage in risk-taking behavior even if doing so would potentially increase the market value of the firm's equity. This is because optimizing managers' long-run compensation and rates of perquisite consumption depends on the survival of the company in its product-markets (DeMarzo & Duffie, 1995). May (1995) cites evidence supporting the managerial risk aversion hypothesis within the context of share ownership among Chief Executives Officers (CEOs) in diversified US corporations, while Zou and Adams (2006) provide evidence supporting the managerial risk aversion hypothesis among Chinese PLCs. Sarker and Sarker (2000) further report that due to the prevalence of family-owned firms in the domestic economy managerial ownership tends to be much more common in India than in many other large emerging economies of the Asia Pacific region (such as China) suggesting that in the Indian corporate sector insurance could be employed to mitigate risks to insiders' (undiversified) residual claims. Consequently, an alternative hypothesis is:

Hypothesis 2a Other things being equal, there is likely to be a positive relation between firms with high levels of inside ownership and the incidence and level of property insurance purchased.

Foreign ownership The impact of foreign investors on the property insurance decisions of local managers could be important in developing India's corporate sector. In fact, Zou and Adams (2006) predict that foreign investors will expect local managers to insure assets-in-place and ensure that sufficient property indemnity coverage is purchased in order to control for the potentially large business risk exposures to asset losses that could arise from investing in highly asymmetric Asia Pacific emerging economies. Foreign investors are also likely to

have developed knowledge and expertise in the fields of strategic risk management and insurance which they can impart to the managers of emerging economy-based companies in which they have made an investment. In contrast, the managers of Indian firms with little or no overseas-held shareholdings are likely come under less pressure from their shareholders to take out property insurance. As a result, we predict that:

Hypothesis 3 Other things being equal, there is likely to be a positive relation between firms with high levels of foreign ownership and the incidence and level of property insurance purchased.

Sample and variables

This section describes our data and defines the proxies used in the study.

Data

Our data were obtained from a comprehensive survey of 2,274 Indian companies of varying size and ownership structure carried out by the World Bank in 2005 (World Bank, 2005). The firms were drawn from 73 cities across India covering 24 major industrial sectors (e.g., manufacturing, engineering, pharmaceuticals, and so on) but excluding financial services. The survey data include financial information on sales, profits, assets and liabilities, expenses, plus information on ownership structure and property insurance purchases for the years 2003–2004 and represents roughly 1% of the total size of India's corporate sector according to estimates by the International Monetary Fund (IMF) (Topalova, 2004). However, to perform our regression analyses we had to delete cases with relevant missing data and this procedure left us with a reduced sample of 921 firms of which 593 (approximately 65%) insured their assets-in-place.

Estimation procedures

We first employ a binomial probit model (including marginal effects) to examine the effects of ownership structure and other firm-specific characteristics on the decision to purchase insurance and then a second-stage tobit-type (Cragg) regression to model the amount of insurance spending. As in Zou and Adams (2006, 2008a) and Zou and colleagues (2003) the binary dependent variable in the first-stage (probit) regression is a dummy that takes the value of 1 if a firm insures its assets and 0 otherwise; and the dependent variable in the second-stage (Cragg) regression is the insurance-to-insurable assets ratio, defined as property insurance spending divided by the prior year-end value of fixed assets and inventory. The probit model can be expressed as:

$$\text{Insurance dummy} = f(\text{Ownership Structure variables}, \text{Other firm characteristics}, \text{Industry dummies}, \text{City dummies}) + \varepsilon$$

Where $\varepsilon \sim N(0,1)$ is a disturbance term. In addition to the standard probit model, we also estimate, and report, the results of the probit model as marginal effects evaluated at the means of the explanatory variables. Here the marginal effects in the explanatory variables arise as the probability of the binary dependent variable changes from 0 to 1. Our probit models are also estimated using maximum likelihood estimation with heteroskedasticity robust standard errors to control for cross-sectional variations and extreme values in our data set (Greene, 1999).

In the second-stage estimation, we follow previous studies on corporate risk management (e.g., Cummins, Phillips, & Smith, 2001) and use Cragg's (1971) generalized log-normal tobit model, which assumes that the density of the metric-measured dependent variable (INS) is truncated at zero.[10] Cummins and colleagues (2001) report that a conventional tobit model may not be appropriate as it measures the participation decision along with the volume decision simultaneously and thus forces variables to have the same signs with respect to the insurance participation decision and the volume of insurance purchased once the decision to transfer insurable asset risk into the commercial insurance market has been made. In other words, the conventional tobit model assumes that the same vectors of variables and their coefficients determine both the probability that firms will insure their assets and the extent of property insurance coverage purchased thereafter. However, it is possible that the determinants of the decision to insure are different from those factors that influence the extent of insurance (e.g., insurance limits could be influenced by managerial risk appetites, firms' asset structures, and cost considerations) (Haushalter, 2000). The Cragg model, as used in the present study, thus allows variables to have different parameter values in the insurance participation and volume decisions. It also addresses the sample selection issue in the second-stage model on insurance volume decisions by treating the insurance participation and volume decisions as independent.[11] In the Cragg model, the dependent variable is the natural log of the insurance-to-insurable assets ratio that was defined earlier. The other variables are the same as for the probit model.

Proxies and variable measurements

Proxies for ownership structure As discussed previously, the type of ownership structure could impact on the insurance decision of Indian firms. For example, managerial risk aversion may play a role in corporate risk management decisions (particularly in a nascent emerging economy like India where managers' private wealth tends to be poorly diversified outside of the firm). In the present study, we measure

[10] The log normal transformation is used as an additional control for the possible effect of heteroskedasticity (e.g., see Cummins et al., 2001: 75).

[11] As recommended by Lin and Schmidt (1984), we also evaluate our choice of the Cragg model by computing a likelihood ratio statistic to test the null hypothesis that the coefficient of the vectors of the Cragg model and the conventional tobit estimation are equivalent. The likelihood ratio statistic of –1372 (Probability 1.000) overwhelmingly rejects the null hypothesis at the 0.01 level (two-tail) suggesting that in this case our choice of the Cragg model is appropriate.

concentrated shareholder ownership as the proportion of total ordinary shares issued that are held by the largest shareholder and define managerial ownership as the proportion of the insiders' holdings of ordinary shares to total share issued. Additionally, the proportion of ordinary shares held by foreign investors to total shares in issue is employed to test the effect of foreign ownership on the insurance decision of firms operating in India's corporate sector. We also control for whether firms are publicly quoted or unquoted companies as insurance decisions are likely to vary according to corporate listing status. For example, PLCs may be relatively more insured than other firms because insurance provides surety for investors by helping to stabilize earnings following severe unanticipated losses to assets. In this way, property insurance can help support share prices and protect franchise value. On the other hand, the opposite may be true as PLCs are often more diversified than other firms as a result of their generally larger size and wider scope of business operations.

Control variables for corporate property insurance To separate out the effects of ownership structure on the corporate decision to purchase property insurance, we control for other firm-specific factors affecting a firm's property insurance decisions. Following prior studies (e.g., Hoyt & Khang, 2000; Mayers & Smith, 1982; Zou & Adams, 2006; Zou et al., 2003), we include firm size (measured as the natural log of book value of assets), and in our multivariate analysis, the quadratic of leverage (defined as the lagged squared value of total debt / total assets). Theory predicts that small and highly levered firms will tend to have a relatively higher demand for property insurance than other firms. This is because small and highly indebted firms are susceptible to economic shocks and the risks of financial distress and bankruptcy.[12] As in Allayannis and Weston (2001), we measure firms' growth options as the lagged value of annual capital expenditure / annual sales, and predict that firms with more growth options are likely to insure (and insure more) than other firms as hedging minimizes underinvestment when cash flows are low, which is likely to be the case after a severe loss event (e.g., see also Froot et al., 1993). A firm's (lagged) asset tangibility ratio—defined as tangible insurable assets / total assets—is introduced to control for the effects on insurance decisions due to differences in asset structure across firms in our sample. We further interact leverage with the asset tangibility ratio to capture the possibility that the purchase of property insurance may concomitantly depend upon the degree of leverage and amounts of tangible assets-in-place. Additionally, four main industry categories

[12] Several prior studies (e.g., Graham & Rogers, 2002; Purnanandam, 2008; Zou & Adams, 2008a) argue that many determinant factors of risk management (insurance) decisions (e.g., leverage) are not strictly exogenous. Accordingly, in our modeling procedure the metric explanatory variables (e.g., firm size) are lagged to control for possible endogeneity with the corporate decision to purchase property insurance. Additionally, the quadratic term leverage^2 is included in our regression model because Purnanandam (2008) finds that indebtedness has a non-linear effect on extent of corporate hedging. Consequently, while we expect more levered firms to insure their assets (and thus reduce their future costs of debt and increase debt capacity) than lowly levered firms (Zou & Adams, 2008a), we nevertheless predict the coefficient estimate for LEV^2 to be negatively signed in the Cragg model as at very high levels of leverage the level of insurance is likely to decline as investors' risk-shifting and default put option incentives begin to predominate (Purnanandam, 2008: 715–716). Leverage was excluded from the regression analysis as this variable was highly (negatively) correlated with leverage^2 (-0.96, $p \leq 0.01$, two tail) thus potentially increasing the risk of multicollinearity and biased coefficient estimates.

(manufacturing and electronics, pharmaceuticals and bio-technology, information technology (IT) and communications, and other) represented by three dummy variables were included in our model to control for the risk-profile difference in different business lines. Moreover, we pooled our 73 cities into two groups representing India's major financial centers (Delhi, Mumbai, Calcutta, Bangalore, and Jaipur) and other cities using a dummy variable to control for possible omitted variable effects, such as spatial differences in levels of risk management knowledge and expertise that could exist in India. This procedure could help deliver a more robust test of our hypotheses than might otherwise be the case (Zou et al., 2003). Finally, we control for the age of the firm (i.e., the number of years since formation) as older firms are likely to have more assets-in-place that are potentially at risk of unexpected losses than newer market entrants. The managers of long-established firms are also expected to have greater risk management (insurance) knowledge than younger firms, other things being equal. Table 1 provides a detailed description of how we define our variables.

Results

Summary statistics

The summary descriptive statistics for our sample are given in Table 2.

Table 2 shows that about 65% of firms in our sample insured their assets and spent approximately 13% of the book value of their tangible assets on property

Table 1 Variable definitions.

Variable	Definition
Insurance dummy	Equals 1 if a firm insures its assets and 0 otherwise
Insurance Intensity	The natural log of annual spending on insurance / the book value of tangible assets at the beginning of the year
Shareholdings	The proportion of ordinary shares held by the largest shareholder to total shares issued
Managerial ownership	Insiders' holdings of ordinary shares to total share issued
Foreign-owned firms	The proportion of ordinary shares held by foreign investors to total shares issued
Listing status	Equals 1 if a firm is a publicly listed company or unlisted joint stock company and 0 for otherwise
Firm size	The natural log of book value of total assets.
Leverage (Leverage^2)	The lagged squared value of the total debt / total assets
Growth options	The lagged value of annual capital expenditure / annual sales
Asset tangibility	(Average inventory + net book value of fixed assets) / total assets
Asset tangibility × Leverage	Interaction term between (mean-centered) leverage and (mean-centered) asset tangibility (centered to reduce collinearity)
Industry dummies)	Equals 1 if a firm operates in manufacturing and electronics (i = 1), pharmaceuticals and bio-technology (i = 2), IT and communications(i = 3), 0 otherwise
Cities	Equals 1 if a firm is located in a major financial center and 0 otherwise
Firm age	The number of years since formation

Table 2 Summary statistics of main variables (excluding industry and city dummies).

	Mean	Median	sd	Min	Max	N
Insurance dummy	0.646	1	0.479	0	1	1899
Insurance intensity	0.125	0.002	2.531	0	100	1899
Log of insurance intensity	−5.516	−5.533	1.995	−17.169	4.605	1226
Shareholdings	0.691	0.600	0.305	0.000	1.000	1878
Managerial ownership	0.471	0.080	0.489	0.000	1.000	1899
Foreign ownership	0.009	0.000	0.079	0.000	1.000	1879
Listing status	0.076	0.000	0.265	0.000	1.000	1899
(log) Firm size	9.029	8.700	1.985	−1.309	19.734	1900
Leverage	0.654	0.678	14.407	0.000	1.000	1731
Leverage^2	0.516	0.459	0.364	0.000	1.000	1731
Growth options	0.892	0.800	2.533	0.000	9.335	1626
Asset tangibility	0.771	1.000	2.343	0.000	9.117	1532
Assett tangibility × Leverage	0.916	3.602	6.910	0.000	2.362	1190
Firm age	16.751	15.000	11.504	0.000	90.000	1881

insurance. Surprisingly, this is roughly a tenfold increase in percentage terms compared with the levels of insurance spending of Chinese PLCs reported by Zou and Adams (2006) and Zou and colleagues (2003), and approximately three times that reported in the US corporate sector by Hoyt and Khang (2000). In addition, only about 8% of firms in our sample are joint-stock companies which accounts for the lower average size of firms in our data set compared with the sample of Chinese PLCs used by Zou and Adams (2006) and Zou and colleagues (2003). On average, about 47% of ordinary shares are held by managers of our Indian firms which is a much higher percentage than the less than 1% figure of insider shareholdings for Chinese PLCs that have been reported in previous research (e.g., Zou & Adams, 2006, 2008b). This difference is largely explained by the fact that our data set comprises a much larger proportion of small and medium-sized family and single owner firms (roughly 90% of our sample) than prior Chinese corporate insurance studies. Average leverage levels for our sample of Indian firms (13%) is also lower than the 45–50% mean leverage ratios that have been reported in other emerging economy insurance studies (e.g., Zou & Adams, 2008a, 2008b). This observation again reflects the generally small and medium-sized composition of firms in the present study—many of which are likely to have limited access to bank-issued debt capital and/or bond markets.

Before conducting our multivariate tests, we checked the correlation coefficients between the variables for insurance, corporate ownership structure, and other firm-specific characteristics as reported in Table 3.

As can be seen from the table, multicollinearity is not a serious problem. Most of the correlation coefficients (after excluding the correlation between leverage and leverage^2) are below 0.3, which makes us comfortable to include these variables in

Table 3 Pearson correlation coefficients (excluding industry and city dummies).

	Variables	1	2	3	4	5	6	7	8	9	10	11	12
1	Log Ins. intensity	1											
2	Shareholdings	0.032	1										
3	Managerial ownership	−0.080	0.225	1									
4	Foreign ownership	0.065	−0.057	−0.085	1								
5	Listing status	−0.064	−0.191	−0.335	0.141	1							
6	(log) Firm size	−0.051	−0.019	0.010	0.004	0.069	1						
7	Leverage	−0.183	0.039	−0.004	−0.446	0.006	0.016	1					
8	Leverage^2	0.201	−0.021	−0.016	0.457	−0.012	−0.020	−0.960	1				
9	Growth options	−0.008	0.044	0.031	−0.006	−0.014	0.122	−0.003	−0.002	1			
10	Asset tangibility	0.047	0.048	−0.037	0.003	−0.023	−0.050	−0.021	0.018	−0.004	1		
11	Asset tang x Leverage	−0.186	−0.012	0.035	−0.361	0.024	0.046	0.767	−0.797	0.004	−0.618	1	
12	Firm age	−0.103	−0.114	−0.065	0.007	0.170	−0.022	−0.010	0.000	−0.016	0.027	−0.016	1

Correlation coefficients at or over 0.164, 0.195, and 0.254 are statistically significant at the 10%, 5%, and 1% levels, respectively (two-tailed).

the models simultaneously. We also calculated the variance inflation factor of each independent variable and found no evidence of multicollinearity.[13]

Multivariate results

The empirical results of our probit models without and with marginal effects are given in Table 4 (columns 2 and 3 respectively), and the results of the Cragg model are presented in Table 4 (column 4).

As can be seen from Table 4, the coefficient estimates for foreign ownership (hypothesis 3), firm size and age are not statistically significant in our probit models although the signs of the coefficients are consistent with our predictions. Interestingly, the estimated coefficient for shareholdings is negative and significant at the 1% level (one-tail), which suggests that a firm with more concentrated shareholder ownership is less likely to purchase insurance *ex-ante*. This finding is inconsistent with the results of prior studies (e.g., Zou & Adams 2006) and our theoretical reasoning (Hypothesis 1), and suggests that firms with more concentrated shareholdings tend to retain asset risk rather than transfer the risk of loss to a third party insurer. DeMarzo and Duffie (1995) give a plausible explanation why firms with highly concentrated shareholdings might hedge (insure) less than firms with more diversified equity. They suggest that firms with closely held ownership structures are more effective in controlling aberrant behavior by managers and therefore less likely to hedge (insure) in order to mitigate agency incentive conflicts arising, for example, from risky business activities and/or careless managerial practices. Bertrand, Mehta, and Mullainathan's (2002) analysis of ownership structure in India's corporate sector suggests that in family-owned firms inside shareholders (family members) may often engage in high risk strategies and resource expropriation at the expense of outside shareholders (a process called "tunneling"). Therefore, another possible explanation as to why our results indicate a negative relation between the insurance decision and shareholder concentration in the Indian corporate sector is that family-owners may seek to reduce insurance costs and share retained risks with outside owners. Majumber and Sen (2009) also note that in India lax corporate laws have tended to encourage tunneling by owners and managers at the expense of minority outside investors, and that family-owned firms often lack the necessary expertise in key business areas such as risk management.[14] Our probit analysis (with marginal effects) indicates that in the Indian corporate sector increased concentration of shareholder ownership reduces the likelihood that firms will purchase property insurance by approximately 19%.

The positive coefficient estimates in our probit analyses for managerial ownership suggests that there is, as hypothesized in Hypothesis 2b, a positive relation between firms with high levels of insider ownership and the incidence of property insurance ($p \leq 0.01$, two-tail), which is consistent with the empirical studies of May (1995) and Zou and Adams (2006). Our probit analysis with marginal effects further show that firms that increase the degree of managerial equity by about 42% are more likely to

[13] Variance inflation factors are computed as 1 / (1-R^2) where R^2 is derived from the regression of individual explanatory variables on all other explanatory variables (Kennedy, 2003: 213).

[14] The lack of data on family shareholdings precluded a detailed analysis of family-effects on the property insurance decision in the Indian corporate sector.

Table 4 Ownership structure and property insurance.

Variables	Expected sign	Probit (Standard)	Probit (Marginal effects)	Cragg
Shareholdings	(+)	−0.655***	−0.188***	0.256
		(−3.93)	(−2.44)	(1.10)
Man. Ownership	(±)	1.451***	0.416***	−0.548***
		(13.47)	(6.77)	(−3.41)
For. Ownership	(+)	0.280	0.080	−1.088
		(0.30)	(0.30)	(−1.22)
Listing status	(+)	0.726***	0.155**	−0.136
		(2.99)	(3.61)	(−0.52)
(log) Firm size	(−)	−0.032	−0.009	−0.029
		(−1.06)	(−1.06)	(−0.73)
Leverage^2	(±)	0. 024**	0.007**	−0.981*
		(1.66)	(1.63)	(−1.67)
Growth	(+)	0.466**	0.134***	0.0001
		(1.91)	(2.49)	(−0.02)
Asset tangibility	(+)	0.76**	0.218**	−32.627
		(1.68)	(1.65)	(−1.03)
Asset tang. × Lev	(+)	0.004*	0.001**	−0.158
		(1.66)	(1.63)	(−1.03)
Firm age	(+)	0.005	0.002	−0.010*
		(1.06)	(1.05)	(−1.50)
Ind. dummy$_1$	(?)	Yes*	Yes**	Yes**
Ind. dummy$_2$	(?)	Yes*	Yes**	No
Ind. dummy$_3$	(?)	Yes*	Yes*	Yes**
City dummy	(?)	Yes*	Yes*	No
Log likelihood		−451	–	−1372
Pseudo R^2		0.2384	–	0.09
N		921	921	593

The table reports the results from the probit model (where the dependent binary variable is a dummy variable) and Cragg model (where the dependent variable is insurance intensity). Marginal effects for the probit model are also given. Reported in parentheses are z-values computed using heteroskedasticity robust standard errors clustered at the city level to allow for cross-sectional correlation. ***, **, * denote significance at the 1%, 5%, and 10% level, respectively (one-tailed). The intercept is included in all models but its coefficient is unreported for brevity. In addition, Leverage is excluded from the regression analysis as it is highly correlated with Leverage^2.

buy property insurance than other firms. These findings suggest that other things being equal, increasing equity ownership among managers encourages them to purchase property insurance in order to mitigate the risk of asset loss and possible bankruptcy, and thereby protecting their economic interests in the firm. The coefficient estimate for listing status is positively related to the decision to purchase property insurance at $p \leq 0.01$ (one-tail), while being a publicly quoted Indian company increases the likelihood of purchasing property insurance by roughly 16%.

Among the control variables included in our probit models the estimated coefficients for leverage^2, growth options, asset tangibility, and the interaction between asset tangibility and leverage are positive, as expected, and statistically significant at $p \leq 0.10$ or better (one-tail). Therefore, consistent with Graham and Rogers (2002) and Zou and Adams (2008a), among others, Indian firms with high leverage are more likely than lowly levered firms to insure their assets in order to reduce their debt costs, reduce the risks of financial distress/bankruptcy, and/or increase their debt capacity. This observation is also consistent with the view that in emerging economies banks are increasingly requiring collaterized assets to be insured as a condition of loan issues. This attribute of property insurance could also help Indian firms to realize their future investment strategies. However, the marginal effect of corporate leverage on the incidence of property insurance purchases is less than 1%. Our results also support Froot and colleagues' (1993) prediction that firms with high growth options are likely to insure their assets than other firms. In addition, our probit model with marginal effects indicates that being a firm with high growth options increases the likelihood that it insures its assets by about 13%. As predicted, a firm with a high degree of tangible assets is also likely to insure property risk and that the marginal likelihood of it doing so compared with other firms is about 22%. The positively significant coefficient estimate for the interaction of asset tangibility and leverage ($p \leq 0.10$ level, one-tail) implies that firms' asset tangibility in relation to their indebtedness has a direct impact on firms' property insurance decisions. In addition, our probit estimations reveal that our industry and city dummies are positive and statistically significant (at $p \leq 0.10$ level, one-tail or better) which suggests that industry and location effects can influence the decision to buy property insurance in the Indian corporate sector.

Turning to the results of the Cragg model that are reported in Table 4, we observe that many explanatory variables have different effects in the "insurance volume" regression compared with the "insurance participation" regressions. This suggests that the determinants of the decision to insure are likely to be different from those factors that influence the extent of insurance vindicating our use of the Cragg model. In the Cragg model, the sign for the coefficient estimate for shareholdings is now positive, as predicted in Hypothesis 1, but it is not statistically significant. The insignificance of this result could, as noted earlier, indicate tunneling effects (i.e., retained asset risk sharing) by managers and family shareholders at the expense of outside investors. The sign of the coefficient estimate for managerial ownership is negative and significant (at $p \leq 0.01$ level, one-tail) which is opposite to that produced by our probit model but consistent with the prediction of Hypothesis 2a. This result implies that as insider (managerial) ownership increases, managers may selectively insure assets-in-place and limit the extent of indemnity coverage in order to reduce the costs of insurance and maximize returns on investment (e.g., see Saunders et al., 1990). The estimated coefficients for firm size, growth options, asset tangibility, and the interaction term for asset tangibility and leverage are not statistically significant in the Cragg regression. However, contrary to our probit analyzes, the coefficient estimate for the quadratic term (leverage^2) is now negative and statistically significant at $p \leq 0.10$ (one-tail). This observation could indicate that highly indebted firms may find it difficult to finance the costs of increasing the level of insurance coverage on assets-in-place and/or their owners/managers could be

contemplating excessively risky actions and exercising their default put option under limited liability rules should such a risk-taking strategy fail (Purnanandam, 2008). The age of a firm also has an unexpectedly negative impact on the volume of property insurance purchased at $p \leq 0.10$ (one-tail). This finding suggests that the market value of younger Indian firms could comprise mainly growth opportunities rather than assets-in-place, and that managers in these entities are motivated to increase their insurance coverage in order to protect future cash flows and investment plans from unexpected severe loss events (e.g., see Froot et al., 1993). Our results for industry effects indicate that firms operating in the manufacturing and electronics and IT sectors tend to have higher levels of property insurance than firms in other industries. However, the coefficient estimate for our city dummy variable is not significant in the "volume regression" suggesting that although city location may influence the corporate decision to insure assets, location is not a factor that influences the relative extent to which property is insured in India's corporate sector.

Conclusion

Using survey data from Indian firms (World Bank, 2005), this study tests empirically the effects of ownership structure on the corporate decision to first insure assets and if so, the choice of the amount of insurance coverage purchased. The link between insurance and corporate governance is also deemed to be timely and relevant given the recent growth of India's corporate sector and the increasing importance of risk management in emerging economies, particularly for foreign investors. In our probit analyses we find that firms with a high degree of managerial ownership, and firms with high growth options and asset tangibility are more likely to insure their assets than other entities. However, in the second-stage Cragg regression we find that different factors are likely to influence the amount of property insurance purchased compared with the initial decision to insure corporate assets. For example, managerial ownership and the length of time a firm has operated in a market appear to be inversely related to the level of property insurance coverage. This observation suggests that manager-owners may more selectively insure their assets-in-place in order to reduce the costs of insurance. Moreover, the managers of younger firms may be motivated to increase the level of indemnity coverage on physical assets because they have greater intrinsic risk of losing valuable investment opportunities in the event of catastrophic losses compared with other firms. We also find that the amount of property insurance purchased is decreasing in leverage indicating that the managers of highly indebted Indian firms may find the costs of increasing property insurance coverage too prohibitive and/or their owners may be contemplating high risk actions and voluntarily liquidating the firm in the event of strategic failure. These findings which suggest that relatively new firms with high growth opportunities appear to be particularly keen to purchase property insurance could be of wider interest to insurance suppliers operating in other emerging economies—for example, by enabling them to better target their sales and marketing strategies. The results of this study may, however, need to be tempered by recognition of some of the inherent limitations of the research such as the relatively large number of

SMEs in our Indian data set. Nevertheless, we believe that our findings contribute important insights into the strategic insurance (risk management) behavior of firms in India, which is an increasingly important emerging economy for international business investors, corporate managers, and policymakers, among others. This attribute should encourage other researchers to add to the international business literature by examining further the strategic function of risk management practices, such as insurance, in other emerging economies (Ahlstrom, 2010).

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