The Geneva Papers on Risk and Insurance, 7 (No 24, July 1982), 237-247

Business Insurance and Large, Widely-Held Corporations

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1. Introduction

In his recent lecture to the Geneva Association, Professor Borch [1981] included a discussion of business insurance in theory and practice. In the case of widely-held, limited liability companies, however, this discussion seems to have raised more questions than it answered. It is the purpose of this note to use Professor Borch's analysis as a starting point in a search for an answer to the rather puzzling question of why widely-held, limited liability companies purchase business insurance at all.

The fact that such large companies are major purchasers of property and liability insurance is well documented. In a recent survey of the *Fortune* Largest 500 Industrial Corporations in the US, Main [1981] found that 55 percent of the 189 responding corporations claimed to insure over 75 percent of their perceived insurable risks. Using first the Capital Asset Pricing Model framework developed by Professor Borch, we will examine the motives of these corporations in making such extensive use of the insurance market. When this fails to provide a satisfactory answer, we turn to a discussion of possible market failures that might induce this behaviour. Some likely candidates, such as the concern of the firm's employees over job security, are found lacking in explanatory power. But other explanations, such as a concern with liquidity, do combine to form a powerful argument for corporate purchases of insurance.

2. Business insurance — theory revisited

Consider a firm exposed to a certain risk, i, represented by the stochastic variable x_i. Then allowing this risk to be independent of all other risks faced by the firm and, for that matter, independent of all other risks in the economy then, in the absence of administrative costs, we have the premium which the firm will have to pay to have this risk covered by insurance as

(1) $$P_i = E\{x_i\} + R_i$$

Here $E\{x_i\}$ = the "net premium", i.e. expected claims payment

R_i = the reward for risk bearing

* University of Edinburgh. The author is grateful for research support provided by the Centre for Management Studies and by the Institute of Business and Economic Research, University of California, Berkeley. Thanks are also due to David Babbel, Julian Franks and Charles O'Reilly for helpful discussions. Remaining errors are my own.

As a convenient measure of the reward for risk bearing Professor Borch implicitly introduces the Capital Asset Pricing Model (CAPM) of Sharpe [1964], Lintner [1965], and Mossin [1966]. This one period model is applicable only under certain restrictive conditions, the major one being, as Professor Borch points out, that either all preferences must be represented by quadratic utility functions, or all stochastic variables must be normally distributed. But although this model offers, at best, an approximation to reality, it provides a useful vehicle for the argument of this paper, due to the way in which the model succinctly categorises risks. The CAPM divides all risk into "specific" risk or "systematic" risk. Specific risk is independent of all other risks and, thus, by pooling a large number of such risks either by holding a diversified portfolio of securities, or by purchasing insurance the Law of Large Numbers allows uncertainty to be replaced by certainty. By contrast, systematic risk displays a correlation with other risks in the economy. A popular formulation of this model gives the price of a security, or risky prospect as [1]

$$P_i = \frac{1}{1+R}\left(E\{x_i\} - \frac{E\{x\} - P(1+R)}{\text{var}\{x\}} \cdot \text{cov}\{x_i x\}\right) \tag{2}$$

where,

$x = x_1 + x_2 + \ldots\ldots\ldots x_n$

$P = P_1 + P_2 + \ldots\ldots\ldots P_n$

$R =$ the risk free interest rate

If we write

$$\beta = \frac{E\{x\} - P(1+R)}{\text{var}\{x\}}$$

and if we introduce a loading factor as a fixed proportion, λ, of net premiums, and if we ignore time hence setting the risk free rate of interest at zero, we have

$$P_i = (1+\lambda)\, E\{x_i\} + \beta \text{cov}\{x_i x\} \tag{3}$$

The formula is obviously equivalent to Professor Borch's equation (13) when x_i is independent of all x_j, $j \neq i$. What is not apparent from this formulation, however, is that in a world containing infinitely many independent risky prospects, then the second term on the right hand side of equation (3), i.e. the "reward for risk bearing", is effectively zero. To see this consider fuller form in the limit,

$$\lim_{n \to \infty} \left[\frac{E\{x\} - P}{\text{var}\{x\}} \text{var}\{x_i\}\right] \to 0.$$

Of course, this is the very stuff of which insurance is made. There is no risk premium required to hold a very large number of independent risks. The Law of Large Number sees to that. What is more, any equity holder with a diversified portfolio has already availed himself of this form of "insurance". In insuring such

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[1] See Fama and Miller [1972] equation 7-26 page 298. A further important assumption made in this theory is that any individual risky prospect is of relatively negligible magnitude compared to the universe of such risky prospects in the economy.

pure risks the firm does not increase the value of such a portfolio. The market values the removal of the source of risk, i, at $E\{x_i\}$ and, thus, the value of the firm should increase by this amount; but as the removal of the risk was achieved at a cost of $(1+\lambda)\,E\{x_i\}$ due to the presence of loading, the net effect of a decision to insure the risk would be to *lower* the value of the portfolio. It is clear that such action is against the interest of the diversified equity holder.

When the risk in question is not independent then equation (3) is seen to be identical to Professor Borch's equation (14). But, as we are discussing business insurance, and as this article is focussing on the insurance purchasing behaviour of large widely-held firms it is important to ask whether insurance purchases will benefit the equity holder. Again the answer is a resounding " no ". The Capital Asset Pricing Model tells us that the removal of a risk, i, which has a covariance with all other risks in the economy of cov $\{x_i x\}$, will be worth

$$E\{x_i\} + \beta\mathrm{cov}\{x_i x\}$$

in terms of increased value of the firm, and hence of the firm's equity. However if such an insurance transaction is only possible at a price as given by equation (3), then the presence of a loading factor will have led to a reduction in the value of the firm. This clearly reduces the firm's share price, and hence harms the equity holder.

Of course, none of the above should be taken to imply that the purchase of insurance by a small closely-held firm is a bad idea. In such circumstances direct diversification of specific risks may not be possible and here insurance plays an important role.

3. Business insurance — practice. A survey of the Fortune 500

In order to shed some light on what factors do influence large firms to purchase insurance, a questionnaire was sent to the Chief Executive Officer of each corporation in the Fortune 500 Largest Manufacturing Corporations in the US. The respondents were asked to rate the importance (on a scale of $1 \equiv$ low to $5 \equiv$ high) of each of eight possible factors that might motivate their purchases of insurance [2]. This section of the paper lists each of the motivations that was suggested and explains why each was thought to have some possible importance. The section concludes with an analysis of the results.

3.1. Protection of the company's liquidity

In the normal course of events, a firm suffering a major loss due to damage of its productive capacity will base its decision to repair the damage or not upon the expected rate of return from the investment versus the cost of funds required. This

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[2] The list used for the survey was that published in *Fortune* on May 5, 1980. 232 of the 500 surveyed corporations returned completed questionnaires. This response rate was reasonably even across the range of the Fortune 500 (the numbers of responding corporations from the largest 100 to the smallest 100 were 57, 40, 48, 49 and 38 respectively). Earlier surveys were conducted by Fortune [1973] and Hogue and Olson [1976].

decision will not depend on whether the funds are available within the organisation, or have to be raised in the capital markets, or will be provided by the settlement of the subsequent insurance claim. The source of funds is of no relevance as is all cases the opportunity cost will be the same, namely the rate of return that could be obtained by investing the funds in an alternative project.

The situation changes drastically, however, when the loss is of sufficient magnitude and consequence as to place the company in a highly illiquid position bringing it to the verge of bankruptcy. This is the condition that Gordon [1971] has termed " financial distress ". Two considerations will cause the capital markets to either refuse funds to the company or to charge unusually high rates for funds. The first is the possibility that the company may actually go bankrupt and thus incur the substantial transaction costs that bankruptcy entails. These costs have been documented for a selection of US railroad bankruptcies by Warner [1977]. They are certainly large although in proportion to the company's net worth may not be prohibitive. The second consideration involves the dichotomy of interests between the existing equity holders and the potential lenders of fresh capital. The former wish to see the company survive at all costs, while the latter may be more concerned with a safe return on their capital. Under such circumstances it may be impossible due to moral hazard to provide sufficient assurances to the capital market.

The pre-existence of insurance cover would, of course, remove all such problems. The market imperfections that arise when a firm approaches bankruptcy would not arise. This then would provide an incentive for firms to purchase insurance against catastrophic losses. In our survey it proved to be the strongest motivator scoring an average of 4.1 on a scale of 1-5.

3.2. Improvement of the corporation's stability of earnings

This proved to be the second most highly ranked of the eight suggested motivators of insurance purchase (scoring 4.0 on average). The advantages of insurance in controlling the timing of expenses are obvious. Again, however, it is difficult to understand why anything but catastrophic losses are worth insuring against. For a large corporation the Law of Large Number should result in a reasonably stable and predictable expense history for small and moderate losses.

3.3. Improvement of the security of the company's assets and hence a lowering of the cost of capital

As explained in section 2 above, the value of a company's equity to a diversified portfolio holder is not enhanced by the purchase of insurance. Given that bond holders are equally able to hold diversified portfolios then this observation should hold for all sources of capital. In a perfectly competitive capital market the cost of capital will not then be lowered by the corporation's decision to purchase insurance.

As we shall see under our discussion of bond covenants, however, in the real world the often divergent interests of the equity holder and bond holder may introduce what Jensen and Meckling [1976] have referred to as the " agency costs " of the bond

holders policing the corporation's behaviour. The introduction of an insurance company as an interested third party may significantly reduce such costs and, hence, effectively lower the cost of capital. Indeed this motivation achieved an average score of 3.4 on a scale of 1-5 in our survey ; this ranked it as the third strongest of the eight.

3.4. Provision of evidence of sound financial management to the business community in general

The argument of section 2 was that the purchase of insurance *per se* would not raise the value of a corporation. This does not mean, of course, that the risks faced by a corporation do not affect its valuation by the business community, and consequently the cost of capital it faces. In particular the Capital Asset Pricing Model highlights how the valuation of the corporation is affected by the degree to which its fortunes are tied to those of the market in general. It is essential then for the company to be able to transmit clear signals to the business community about the risks it faces. Leyland and Pyle [1977] have suggested that an important role played by financial intermediaries is in certifying the quality of such information. This is done by their holding a stake in the corporation in question.

Much the same argument can be made about insurance companies. Their involvement provides some clear information about the risks faced by a firm, and due to their underwriting of these risks there is no incentive for them to dissemble. This motivation gained an average score of 3.0 in our survey, and ranked fourth highest.

3.5. A tax minimising method of marketing provision for loss

There is no tax advantage to insurance as long as tax laws allow the market value of uninsured losses to be written off against taxes. In the case of very large losses, of course, current period earnings may not be sufficient to derive the full tax advantage. Most countries, however, permit a carry-back and carry-forward of large losses into other accounting period.[3] Thus although the present value of the compensating tax advantage may be reduced, it is certainly not lost.

A serious potential loss of tax advantage in self insurance arises in the presence of inflation. Tax Laws generally allow the book value of the loss to be written-off but not the market value. On the other hand, insurance claims for the market value of a loss are not generally regarded as taxable income as long as the proceeds go to restoring the loss. This provides a distinct advantage to insurance purchasing. A detailed discussion and numerical example can be found in Main [1981]. It was somewhat surprising, therefore, to find survey respondents ranking this motivation as only fifth highest with an average score of 2.4.

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[3] In the U.S. there is a three year carry-back and a fifteen year carry-forward provision.

3.6. Insurance available at rates that are a bargain when compared to the company's expected claims.

The possibility that the insured knows more about his expected claims that does the insurer has been examined in great depth by Rothschild and Stiglitz [1976]. Although it may lead to markets not functioning, where markets do operate in a stable fashion over time it must be expected that rates do reflect the expected claims. This motivator was ranked third lowest by our respondents, with a score of 2.3. Some respondents even wrote in to point out that they often turned to insurance when entering new areas, as they realised that insurance companies had more experience, and in fact know more than they about the underlying risks.

3.7. Insurance required by bond covenants

In earlier sub-sections we have discussed the often diverging interests of the bond holder and the equity holder. These differences often come into the open in the form of covenants attached to bond indentures requiring the corporation to purchase insurance. The prevalence of such provisions in indenture agreements was first documented by Smith and Warner [1979] who recognised that the corporate form already effectively hedged insurable risks and interpreted the activity as one of bonding to reduce the agency costs between bondholders and equity holders.

The problem stems from the fact that an increase in risk taken by the firm represents an increase in downside risk to the bondholder, who is not in a position to benefit from the good fortunes of the company. If a corporation cancelled all of its existing insurance, the value of the company (which now pays out no insurance premiums) will not be affected. The bond holder's claim to the Company's earnings would appear less certain and therefore the value of outstanding bonds would fall. The value of outstanding equity would consequently rise. It is obviously in the interest of the bond holder to restrict the activities of the corporation. Bond indentures requiring insurance purchase are an example of such behaviour.

In spite of Smith and Warner's [1979] findings, and the later development of this theory by Mayers and Smith [1981], our survey respondents ranked this the second lowest motivator of insurance purchase, with on average score of 2.3.

3.8. Improves industrial relations by making employment more secure

The fact that workers in a firm usually derive the vast majority of their income from wages and hence find it impossible to be truly diversified, has been noted by Professor Borch [1981]. While this is unambiguously true, it is less clear that they become any more diversified when the corporation purchases insurance against property/liability losses. As was discussed in section 3.1, a loss will be repaired — and a job secured, if the expected rate of return of the required investment exceeds the opportunity cost of the funds required. The source of the funds is of no consequence. Thus jobs are no more secure in an insured corporation than in an uninsured corporation. Responses from our Fortune 500 survey ranked this the lowest motivator of insurance purchase,

with a score of 1.9. The question was actually phrased in terms of industrial relations, but it was felt that this was a reasonably succinct way of posing the question.

4. Search for underlying factors motivating insurance purchase

Each of the above motivations has been introduced and discussed singly.[4] It does seem possible, however, that there may be some more basic factors than those represented in the eight suggested motivations contained in our questionnaire. As a first step, the correlation matrix was constructed of the responses to the eight possible motivations.[5] This is presented in Table 1.

Table 1 : Pearson correlation matrix of motivations for purchasing insurance

	1	2	3	4	5	6	7	8
1. Liquidity	1.00	.26*	.34*	.14*	.08	.08	.12**	.17*
2. Stability of earnings		1.00	.23*	.25*	.03	.04	.19*	.05
3. Cost of Capital			1.00	.28*	.06	.08	.13*	.17*
4. Signal of Soundness				1.00	.17*	.11**	.17	.21*
5. Minimises Taxes					1.00	.06	.10	.13*
6. Bargain Rates						1.00	.09	−.01
7. Bond Covenants							1.00	.06
8. Human Capital								1.00
Mean Rating	4.07	4.02	3.36	2.95	2.37	2.35	2.25	1.87
Standard Deviation	0.98	1.05	1.26	1.19	1.06	1.21	1.20	0.93

* Significantly different from zero at $\alpha = .05$.

** Significantly different from zero at $\alpha = 0.10$.

The Pearson correlation coefficient between response i and response j is given by r_{ij}, where :

$$r_{ij} = \frac{\sum_{n=1}^{232} (x_{in} - \bar{x}_i)(x_{jn} - \bar{x}_j)}{\left(\left(\sum_{n=1}^{232} (x_{in} - \bar{x}_i)^2\right)\left(\sum_{n=1}^{232} (x_{jn} - \bar{x}_j)^2\right)\right)^{1/2}}$$

and x_{in} is the response of the n^{th} corporation in the i^{th} question.

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[4] The average responses for "minimises taxes", "available at bargain rates" and "required by bond covenants" were not different at a statistical significance level of $\alpha = 0.05$. It was also true that "liquidity" and "stability of earnings" had average responses that were also not different at a statistical significance level of $\alpha = 0.05$. All other results were found to be significantly different.

[5] Pearson correlation coefficients are presented. Kendall correlation coefficients are preferred by some when the data is of this "strength-of-response" nature, but the results were similar in both cases.

There is a surprising lack of correlation among the responses. Thus, although, some motivation may have earned near equal scores on average, there seems to be a substantial variation in the way in which respondents scored the various motivations. Lest these simple bivariate correlations masked a deeper relationship among the variables, the data were subjected to factor analysis. The factor loadings obtained when the data were divided into four factors,[6] are shown in Table 2.

The first factor loads vary strongly on liquidity and the cost of capital. This may be regarded as a concern with the survival of the firm. The second factor is dominated by stability of earnings but also has some representation from providing a signal of financial soundness to the business community, requirements by bond covenants, and human capital considerations. Perhaps this factor can be interpreted as representing the firm's relations with its labour force and with its sources of capital. A sort of public relations factor. The third factor rather mirrors the second in some aspects. It too weights human capital and signals to the business community. It differs from the second factor mainly in the lack of importance attached to stability of earnings and bond covenants, and may apply to companies that are not dependent on the capital market for growth. The fourth factor emphasizes the availability of

Table 2 : Factor loadings. Varimax rotated factor matrix

	I	II	III	IV	h^2 (Communality)
1. Liquidity	.82	.18	.12	.09	.34
2. Stability of Earnings	.17	.64	.02	.00	.26
3. Cost of Capital	.30	.28	.28	.08	.34
4. Signal of Soundness	.00	.38	.50	.16	.28
5. Minimises Taxes	.02	.03	.27	.12	.17
6. Bargain Rates	.04	.03	.04	.42	.11
7. Bond Covenants	.06	.25	.13	.17	.19
8. Human Capital	.14	.24	.45	.08	.21
% of variance	59.0	19.4	13.0	8.5	

Factor analysis is based on decomposition of the correlation matrix in Table 1. For a full description of the technique, see Chapter 24 of Norman Nie's *Statistical Package for the Social Sciences*, 2nd Edn. McGraw Hill, 1975.

[6] Four factors were chosen as this division gave the closest agreement with a cluster analysis of the data. The choice is, of course, somewhat arbitrary.

rates (premiums) which compare favourably with the corporation's expected loss experience. As explained above, this factor cannot be expected to appear with any regularity or consistency.

Although factor analysis is a rather imprecise method of analysis, the results obtained do seem to point to at least two underlying motivations for purchasing insurance. One is the fear of catastrophic losses driving the company up against the costs of financial distress. At times of traumatic loss the capital markets may prove to be far from perfect, and at such times the presence of insurance cover may be sufficiently valuable to justify its otherwise relatively high cost. It would explain the purchase of cover against catastrophic losses, or general insurance purchases but with very large deductibles.

The second factor seems to relate more to the day to day relationships of the corporation with the capital markets and with its labour force. Concern with presenting a stable earnings record, obeying bond covenants, giving a signal of soundness to the business community all relates to a long term relationship. It appears that with many diverse interests in the performance of the corporation, that the insurance company enters as a third party to police the behaviour of the corporation. The insurance company or companies involved serve to reduce what Jensen and Meckling [1976] have referred to as the " agency costs ". Whether capital is loaned on an equity basis, or on a bonded debt basis, or whether labour is being committed to the firm, each party may feel more secure in its relationship with the firm in the knowledge that social custom dictates that there be a reasonably comprehensive amount of insurance cover. Thus, insurance fills the gap of imperfect information and non-zero transaction costs.

5. Conclusion

Insurance purchases by firms are usually explained in terms of risk aversion, much as in the case of households. It is perplexing to ask whose utility is being maximised in this story. In the case of a small firm that is owned by relatively few persons, then some form of aggregation of individual utility function, much as is done for households, can be imagined. When the firm is widely held then each equity holder can with relative ease reduce any specific risk involved in the investment by holding a diversified portfolio of investments. In this narrow context it is difficult to make a case for the firm behaving in any other way than to maximise its expected present value. In this sense it is essentially risk-neutral.

In the particular case of an insurance company, Borch [1966] has derived a utility function for the company based on the probability of ruin. In his later work, however, Borch [1981] introduces the Capital Asset Pricing Model [7] which, we have argued above, essentially shows that any insurance purchasing by widely-held firms is redundant. Although the Capital Asset Pricing Model is a useful vehicle, it is not

[7] Cummins [1976] and Sprecher and Pertl [1980] have also made use of the Capital Asset Pricing Model in discussing insurance purchases.

essential to the argument. By their very definition, insurance risks, or " pure risks " are exactly those which can be eliminated or reduced to near certainty by diversification. It is generally held that the securities markets provide a cheaper route to diversification (i.e. lower transaction costs) than does the purchase of insurance.

The prevalence of insurance among businesses must therefore be explained by a breakdown in the efficiency of the capital markets. Using data drawn from a survey of the Fortune 500 Largest US Industrial Corporations, this paper has argued that these failures can be categorised under two main headings. The first concerns catastrophic losses and the attendant costs of financial distress. The second pertains to the more mundane day to day operations of the company : various groups, often with highly divergent interests, are faced with the problem of controlling the behaviour of the firm when the information available is imperfect and the cost of detailed contracting is very high.

From both these considerations has emerged the social custom of corporations buying insurance. The insurance company stands in a unique position in terms of being able to monitor the activities of a company and due to its underwriting position being trusted by other parties involved.[8]

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[8] Arguing along independent lines, Mayers and Smith [1981] have reached a similar conclusion.

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