Strategic Management Journal, Vol. 10, 271–284 (1989)

THE IMPACT OF DIVERSIFICATION STRATEGY ON RISK–RETURN PERFORMANCE

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This study examines the impact of diversification strategy on risk and return in diversified firms. Following an assessment of previous research on strategic risk, relationships between risk, return, and diversification strategy are hypothesized. Regression analysis shows that differences in risk–return performance among diversified firms are more closely associated with structural factors associated with markets and businesses than with the particular diversification strategy chosen. Returns also influence the choice of diversification strategies which, in turn, do not get rewarded with higher profits. A curvilinear risk–return relationship is also observed which is consistent with previous theoretical suggestions. Implications for the strategic management of risk are then drawn.

INTRODUCTION

In recent empirical research on corporate strategic risk two main research themes are evident. The first explores the association between risk and return, and also examines the relationship to management's risk attitude (Bowman, 1980, 1982, 1984; Fiegenbaum and Thomas, 1986, 1988). The second studies the linkage between strategy and risk–return performance (Bettis, 1981, 1982; Bettis and Hall, 1982; Bettis and Mahajan, 1985; D'Aveni, 1985).

This study attempts to investigate empirically the impact of diversification on risk–return performance. The importance of incorporating risk into performance measures has been asserted by a number of strategy researchers (e.g. Bettis and Hall, 1982; Baird and Thomas, 1985). Further, since diversification is a well-defined strategy, its impact on risk and return can be empirically examined. Building on previous studies which conceptualize risk as variation of return,[1] this study explores the underlying structure of corporate risk, and uses this structure to analyze and test the different risk-reduction effects of diversification strategy. This study may therefore augment the findings of Bettis and Mahajan (1985) on risk–return tradeoffs among diversified firms and add further insight into the relationship between strategy and risk and return.

This paper is organized as follows. First, hypotheses about the relationships between risk, return, and diversification strategy are developed. Regression models are employed to test these hypotheses and the findings of these models are then presented and discussed. The distinctive contributions of this research are as follows:

[1] Apart from correspondence with previous studies, two additional considerations lead us to investigate accounting risk instead of systematic risk (beta). First, managers are responsible to diverse groups of stakeholders (Freeman, 1984), rather than only to shareholders. Second, beta and accounting risk are correlated, both theoretically and empirically (Foster, 1978).

0143–2095/89/030271–14$07.00

Received 8 December 1987
Revised 30 June 1988

1. The study uses data from Compustat I, Compustat II, and the Census of Manufacturing in order to develop more appropriate risk and return measures. These measures have not previously been used in strategy research in this area.
2. The research investigates the hypothesis of a curvilinear risk–return relationship suggested by such behavioral theorists as Kahneman and Tversky (1979) and Laughhunn, Payne and Crum (1980), and also by strategy researchers including Bowman (1980, 1982) and Fiegenbaum and Thomas (1986, 1988).
3. The study investigates whether profitability influences diversification or whether diversity and diversification leads to improved profitability. Measures of both product and geographic diversity are included in the analysis.

The paper develops two main themes: first, that diversification does not affect profitability or risk; second, that return influences the choice of diversification strategies which, in turn, do not lead to higher profitability.

THEORETICAL BACKGROUND AND LITERATURE REVIEW

A review of the literature indicates that there are a number of important studies in the literature of economics, finance and strategy which examine the risk–return relationship. Positive risk–return relationships have generally been found in cross-sectional studies at the industry and firm levels (Conrad and Plotkin, 1968; Fisher and Hall, 1969; Cootner and Holland, 1970; Hurdle, 1974). Negative risk–return relationships arise when other measures are incorporated in the analysis (for example, Armour and Teece, 1978; Bowman, 1980, 1982, 1984; Treacy, 1980). These measures vary from the nature of the industry, diversification strategy, firm size, the time period examined, and risk–return measures. The negative risk–return association is also explained by the risk-seeking attitudes of more troubled firms (Bowman, 1982). Existing research on diversification strategies shows that related diversification leads to negative risk–return association, whereas unrelated diversification shows evidence of positive risk–return association (Bettis and Hall, 1982; Bettis and Mahajan, 1985).

Recent developments in the behavioral analysis of risky decisions (Fishburn, 1977; Fishburn and Kochenberger, 1979; Kahneman and Tversky, 1979; Laughhunn *et al.*, 1980) have stressed the role of reference or target levels in the analysis of risky choices. Current findings suggest that risk attitudes are closely associated with the notion of a target return. As predicted by prospect theory (Kahneman and Tversky, 1979), for returns below target a majority of individuals appear to be risk-seeking; for returns above target a majority of individuals appear to be risk averse. Singh (1986) uses this research framework to study the association between organization risk-taking and performance. The direct relationship triggered by performance below acceptable levels is negative, but the indirect relationships, which are mediated by organizational slack and decentralization, are positive. Fiegenbaum and Thomas (1986, 1988) also confirm that the U-shaped risk–return relationship holds both within and across industries over a 20-year period, thus supporting the theoretical propositions provided by prospect theory.

THEORETICAL DEVELOPMENT AND HYPOTHESES

The risk impact of diversification

It is clear that any diversification move will affect a firm's risk–return profile (Bettis and Hall, 1982). This will occur through potential changes in risk-influencing components including: (1) changes in industry-specific risk, (2) changes in the size of the firm, (3) changes in the number of businesses within the firm, and (4) changes in the degree of relatedness among the set of businesses. Some specific examples of component changes follow. First, a firm can diversify into less risky product markets (e.g. less variation in industry demand or profits) or can withdraw from high-risk businesses to reduce firm risk. Second, successful diversification moves will lead to an increase in firm assets. Through efficient transfer of resources, large reservoirs of resources can be designed to absorb external risk. Researchers (e.g. Hurdle, 1974; Shepherd, 1975; Winn, 1977) have already documented that larger firms tend to have less risky profiles. Third, it can be argued that the more a firm diversifies (i.e. the larger the number of businesses a firm has) the more it can spread industry-specific risk. Finally, risk will tend to be reduced if the new businesses are little, or negatively, correlated with existing businesses.[2]

By extending the above analysis and focusing it in cross-sectional rather than dynamic terms, it can be argued that the risk associated with diversification strategy is dependent upon the risk associated with the industries in which the firm competes, the number of those industries, the size of the firm, and the generic diversification strategy chosen. The relationship between risk reduction and generic diversification strategy can be analyzed using Rumelt's (1974) diversification strategy categorization scheme. Rumelt used the degree of relatedness among businesses in a diversified firm to classify highly diversified firms into a number of categories, including related constrained (RC), related-linked (RL), and unrelated businesses (UR). In terms of the correlation of risk between two businesses, high relatedness would mean high correlation in business risk, or in industry risk, since these businesses share some common factors and sources of uncertainty, and consequently face similar risk. On the other hand, high unrelatedness would indicate a diverse set of sources of uncertainty, and therefore, indicate potential for significant risk reduction. From this argument the following risk relationships can be hypothesized:

$$\mathrm{RISK}_{\mathrm{RC}} > \mathrm{RISK}_{\mathrm{RL}} > \mathrm{RISK}_{\mathrm{UR}}$$

Therefore, the previous discussion about risk modeling and strategy leads to the following hypotheses:

Hypothesis 1: A diversified firm's risk is positively associated with the risk of its product markets.
Hypothesis 2: A diversified firm's risk is negatively associated with the size of the firm.
Hypothesis 3: A diversified firm's risk is negatively associated with the number of businesses it operates in.
Hypothesis 4: The risk associated with generic diversification strategy is in the following order:

$$\mathrm{RISK}_{\mathrm{RC}} > \mathrm{RISK}_{\mathrm{RL}} > \mathrm{RISK}_{\mathrm{UR}}.$$

[2] Although it seems difficult to find negative correlated businesses in practice.

Diversification strategy and firm's return

The four components of diversification strategy reflected in the above hypotheses also impact on the firm's return. Empirical studies relating diversification strategy and economic performance (typically measured in terms of accounting returns) are already well documented (Rumelt, 1974, 1982; Christensen and Montgomery, 1981; Bettis, 1981). Rumelt (1982) and Bettis and Hall (1982) noted the existence of industry effects on the profitability of the individual firm. Rumelt also stressed the economic efficiency advantage of the related-constrained strategy over the related-linked strategy, and over unrelated strategies. Further, since diversification is a growth strategy (Chandler, 1962), the size effect should also be considered (Hurdle, 1974; Shepherd, 1975). When firm size is controlled, then high diversity should result in a low average market share of each business and failure to realize economies of scale; therefore, high diversity (large number of businesses) will be associated with lower profitability. To summarize, the hypotheses on the relationship between components of diversification strategy and return are as follows:

Hypothesis 5: A diversified firm's return is positively associated with the return of its product markets.
Hypothesis 6: A diversified firm's return is positively associated with the size of the firm.
Hypothesis 7: A diversified firm's return is negatively associated with the number of businesses it operates in.
Hypothesis 8: The return associated with generic diversification strategy is in the order

$$RETURN_{RC} > RETURN_{RL} > RETURN_{UR}.$$

The curvilinear relationship between risk and return

The earlier discussion of recent developments in the behavioral analysis of risky decisions suggests the following hypothesis:

Hypothesis 9: A U-shaped curvilinear relationship exists between risk and return.

That is, risk is negatively associated with return and positively associated with the square of the return variable if the effects of such variables as diversification strategy are controlled in the analysis. Note the contrast between Hypothesis 9 and the conventional expectation that a positive risk–return relationship exists due to diversification (i.e. low risk–low return unrelated diversifiers and high risk–high return related constrained diversifiers). The positive risk–return relationship is typically based upon the following assumptions: first, that all businesses in a firm's portfolio are independent of each other; second, that behavioral considerations do not influence manager's decisions and, third, that efficient factor markets exist. As argued before (see also Fiegenbaum and Thomas, 1988: 98), when these assumptions are relaxed, and industry and diversification effects are controlled, it is expected that a U-shaped risk–return relationship will be identified.

Causation in the diversification strategy and risk–return association

Our presumption thus far has been that the direction of causation flows from diversity and diversification to performance. Since there are two possible causative directions in the association between diversification and performance (Rumelt, 1974), an alternative hypothesis is that profitability influences diversification. Consequently we focus here on the prediction that current profitability promotes diversifying investment. This leads to the following hypothesis:

> *Hypothesis 10: Current profitability (or alternatively, changes in profitability) promotes diversifying investment (or alternatively, changes in levels of either product or geographical diversification).*

RESEARCH DESIGN AND SAMPLE SELECTION

Model specification

Hypotheses 1 and 9 were tested by formulating a seemingly unrelated regression (SUR) model[3] (Zellner, 1962) consisting of two regression equations. By assuming the relationships are linear except the relationship between risk and return, the two regression equations are specified as follows:

$$\mathrm{RISK}_i = a_0 + a_1\mathrm{WIRK}_i + a_2\mathrm{SIZE}_i + a_3\mathrm{RL}_i + a_4\mathrm{UR}_i + a_5\mathrm{RETURN}_i + a_6\mathrm{RETURN}_i^2 + e_i$$

$$\mathrm{RETURN}_i = b_0 + b_1\mathrm{WIRN}_i + b_2\mathrm{SIZE}_i + b_3\mathrm{NB}_i + b_4\mathrm{RL}_i + b_5\mathrm{UR}_i + b_6\mathrm{RISK}_i + e_i$$

where RISK_i = corporate risk of firm i, defined as variance of ROA over the 5-year period 1977–81;

RETURN_i = corporate return of firm i measured by mean ROA over the 5-year period 1977–81;

WIRK_i = weighted industry risk for firm i, industry risk is measured at the four-digit SIC code level;

SIZE_i = logarithm of mean assets of firm i over the 5-year period 1977–81;

NB_i = number of three-digit SIC code industries in firm i;[4]

RL_i = dummy variable, RL = 1 for related-linked firms, RL = 0 otherwise;

UR_i = dummy variable, UR = 1 for unrelated firms, UR = 0 otherwise;

WIRN_i = weighted industry return for firm i; industry return

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[3] Zellner (1962) and Theil (1971) indicate that a joint estimation of the set of equations using generalized least squares results in more efficient estimates than OLS equation by equation. Here it is improper to use simultaneous-equation regression, since the two dependent variables are statistics computed from the same set of data, i.e., both risk and return measures are computed from the same 5-yearly ROAs. Furthermore, most empirical studies on risk and return have provided theoretical explanations based on the assumptions that either risk or return is endogenous. There are also technical difficulties in the specification of a simultaneous regression model of risk and return. In single equation regression, it can be assumed that the error terms are identically and normally distributed. Using simultaneous regression, the nature of risk and return measures will lead to heteroscedasticity and non-normal distributions for the error terms.

[4] Almost the same results are obtained if the number of four-digit SIC industries are used.

also is measured at the four-digit level;

e_i = error terms.

In the risk equation the explanatory variables associated with diversification are weighted industry risk (WIRK), SIZE, and two dummy variables for generic diversification strategy, RL for related-linked, and UR for unrelated strategy.[5] The coefficient of weighted industry risk (WIRK) is predicted as positive, since it indicates both industry effects (Hypothesis 1) and diversity (number of businesses) effects (Hypothesis 3);[6] the coefficients of Size (SIZE) and both dummy variables (RL and UR),[7] representing generic diversification strategy effects, are predicted as negative (Hypotheses 2 and 4). The last two explanatory variables, RETURN and its square RETURN2, are designed to test for the U-shaped risk–return relationship (Hypothesis 9). This test assumes that, after the effects of diversification strategy are removed, the risk residuals will reflect managerial attitude toward risk. And in the risk equation, managerial attitude toward risk is assumed to respond to corporate return. The U-shaped risk–return relationship predicts that the coefficient of RETURN is negative, whereas the coefficient of RETURN2 is positive.

Similar variables associated with diversification strategy are included in the return equation. Among them, weighted industry return (WIRN), and size (SIZE) are predicted to have positive associations with corporate return (Hypotheses 5 and 6). The coefficient associated with the number of businesses (NB) is predicted as negative (Hypothesis 7). The two dummy variables of RL and UR are predicted as having negative coefficients (Hypothesis 8). The last explanatory variable in the return equation, RISK, is designed to test for the existence of risk premia in corporate returns. The coefficient of RISK is predicted to be positive. The error terms in both equations are assumed uncorrelated between different firms.

A number of alternative regression models were formulated to explore the causative direction of influence in the associations between diversification strategy and risk–return performance (Hypothesis 10). Since Rumelt's diversification strategy categories are less adequate for analyzing the effects of changes in diversification on risk–return measures, we chose the Herfindahl index as a continuous measure of product diversity (noting its close correlation with the Rumelt measures (Montgomery, 1982)). In addition, we adopted a continuous measure of geographic diversity; namely the ratio of international sales to the total corporate sales, in the regression analysis.

The range of regression models[8] were formulated in the following terms:

(a) Change in product diversification
= f (return, size, initial level of product diversification)

(b) Change in geographical diversification
= f (return, size, initial level of geographical diversification)

(c) Change in return
f = (change in market return, change in product diversification, change in geographical diversification, change in assets)

(d) Change in risk
= f (change in market risk, change in product diversification, change in geographic diversification, change in assets).

The measures, data, and sample

There are three data sources from which most of the data are drawn for the 5-year time period 1977–81. Standard and Poor's Compustat I data base provides company data such as ROA, net sales, and total assets on an annual basis. The Compustat II Business Segment data tape provides company segment sales data on an annual basis together with each segment's four-digit SIC code. These data, in addition to industry data, are essential to the computation of weighted industry return (WIRN) and weighted industry risk (WIRK).[9] Industry data are mainly drawn

[5] Please refer to the Appendix for the operational definition of these variables.

[6] However, the design of this variable cannot separate these two effects to test Hypotheses 1 and 3 separately.

[7] In fact the degree of relatedness, or correlation, among business segments is not homogeneous in firms with the same diversification strategy. Therefore, dummy variables only provide rough estimates of diversification strategy effects.

[8] Full details of the regression equations which gave significant results are presented in Table 5.

[9] This 'weighted industry data' approach to the study of diversified firms has been used by researchers (see, for example, Christensen and Montgomery, 1981). Full details of the computation of these weighted measures are given in the Appendix.

from the third data source, the Census of Manufacturing and the Survey of Manufacturing. The earliest date in the Compustat II data base is 1978, and for this year the frequency of missing data is much higher than in later years. For these reasons, this study selects 1979 as the base year for computing the 'weights'—the ratios of individual segment sales to total company net sales.

The sample is a subset sample of Rumelt's (1974) sample, consisting of firms in the categories of related and unrelated diversification strategies. Rumelt's original sample was a random sample drawn from *Fortune* 500 firms. This subset sample has been used and enlarged by Bettis and Hall (1982) and Bettis and Mahajan (1985) with each firm's diversification strategy checked and updated. In this study, however, only 71 firms have data available in Compustat I. Among them, seven firms do not report segment data in Compustat II. This results in a final sample of 64 firms which enter the regression analysis. The names of these companies and their diversification strategy are listed in Table 1.

Table 1. The sample of diversified firms

Related-constrained strategy (25 firms)		
Cluett Peabody	Corning Glass Works	Rohm & Haas
Stevens (JP)	Fairmont Foods	Lockheed
NCR	Pillsbury	Bristol-Myers
Coca-Cola	Eastman Kodak	Merck
Sterling Drugs	Abbott Laboratories	Mead
General Foods	General Mills	Gillette
Ingersoll-Rand	Pfizer	Procter & Gamble
Stauffer Chemical	Ashland Oil	Clark Equipment
Collins & Aikman		
Related-linked strategy (21 firms)		
DuPont	Libby-Owens-Ford	McGraw Edison
Monsanto	Borden	Borg-Warner
General Instrument	Sundstrand	Westinghouse
3M	Becton Dickinson	Dow Chemical
Dresser	Koppers	Pennwalt
Texas Instruments	Times Mirror	Time, Inc.
Warner-Lambert	Eaton Yale and Towne	Handy & Harman
Unrelated strategy (18 firms)		
Raytheon	Scott & Fetzer	Lear Siegler
Gulf & Western	United Technologies	Dayco
Tenneco	W. R. Grace	AMF
Rockwell	SCM	Whittaker
Brunswick	ITT	United Industries
Litton	TRW	Textron

Table 2. Performance comparison among groups of diversified firms

Strategy measures	Mean ROA	Risk
Group means:		
Related-constrained	0.07739	0.0003852
Related-linked	0.07315	0.0003670
Unrelated	0.06204	0.0002768
Results of analysis of variance:		
F value (N=64)	2.07	0.16
Prob. > F	0.1345	0.8533

Table 3. Yearly performance comparison among groups of diversified firms

Groups N =	RC 25	RL 21	UR 18	ANOVA test 64
Year		Mean ROA		F values
1977	0.0790	0.0768	0.0584	4.97**
1978	0.0820	0.0809	0.0570	5.02**
1979	0.0856	0.0754	0.0642	2.68*
1980	0.0730	0.0678	0.0642	0.45
1981	0.0673	0.0630	0.0664	0.09

* Significant at 0.10 level; ** significant at 0.05 level.
Notes:
1. ANOVA test for significant differences among the three groups of firms.
2. Scheffe test for significant difference between any two groups of firms finds that RC > UR and RL > UR for the years 1977 and 1978. No significant differences are found for the rest of years (significant at 0.05 level).

RESULTS

Table 2 shows the mean values of the dependent variables for each category of diversified firms. It is found that there is no significant difference in RISK among the three groups of firms, although unrelated firms as a group show lower average risk than other firms. It can also be seen that there is no significant difference in RETURN (as mean of ROA) among the groups. However, when ROAs are compared by diversification categories for each year from 1977 to 1981, an interesting phenomenon emerges. As shown in Table 3, in the first two years, 1977 and 1978, the performance differences are significant between RC firms and UR firms, and between RL firms and UR firms. However, the performance gap disappears from 1979. In 1979 the American economy entered a recession. This suggests that economic recession has different impacts on the profitability of different categories of diversified firms.

The regression results relating to Hypotheses 1 through 9 are reported in Table 4.[10] The first part of the table reports the estimated coefficients of both the risk and return equations obtained by the ordinary least squares method. The second part reports the estimated coefficients obtained by the SUR method. As shown by the table, the estimated coefficients are very stable under both methods. In the risk equation the coefficients of WIRK and SIZE are statistically significant, while the rest of these variables have insignificant coefficients. The high significance of WIRK indicates that the risk reduction effect of diversification follows the hypothesis proposed by the financial theory of diversification and supports Hypotheses 1 and 3. The significance of the SIZE coefficient also leads to the acceptance of Hypothesis 2. The insignificant coefficients for generic diversification strategy dummy variables indicate that although changing the generic diversification strategy might change the risk profile of a firm, the effects are not so important when compared with size effects, diversity effects, and market effects (see also Grant, Jammine and Thomas, 1986).

Close examination of the risk residuals, that part of risk which is not explained by diversification strategy, shows them to be significantly correlated with a curvilinear function of corporate return. Since most of the risk associated with factors external to a firm is contained in the part of risk explained by diversification strategy, the risk residuals will tend to measure the risk associated with factors internal to a firm. In other words, by following the argument of Bowman (1980), the risk residuals might represent the

[10] A simple correlation analysis between the independent variables finds that variable NB has a moderate correlation with variable SIZE (Pearson correlation coefficient = 0.229, Prob = 0.069 under H_0: ρ = 0), and a high correlation with dummy variable UR (Pearson coefficient = 0.484, Prob = 0.0001 under H_0: ρ = 0). The authors did not drop variable NB from the return equation on a belief that such specification of the model is theoretically justified.

Table 4. Results of regression analysis

(a) *Ordinary least squares method*

$$\text{RISK} = \underset{}{0.0026} + \underset{(6.502)^{***}}{2.977\times10^{-7}}\ \text{WIRK} - \underset{(-2.233)^{**}}{1.167\times10^{-4}}\ \text{SIZE}$$

$$+ \underset{(1.518)}{2.134\times10^{-4}}\ \text{RL} + \underset{(0.057)}{8.536\times10^{-6}}\ \text{UR} - \underset{(-3.706)^{***}}{0.0369}\ \text{RETURN}$$

$$+ \underset{(3.159)^{***}}{0.1919}\ \text{RETURN}^2$$

$\bar{R}^2 = 0.4984$, N = 64
$F = 11.432$ (prob > F = 0.0001)

$$\text{RETURN} = -0.001 + \underset{(3.987)^{***}}{0.1519}\ \text{WIRN} + \underset{(2.154)^{***}}{0.0052}\ \text{SIZE}$$

$$- \underset{(-0.973)}{0.001}\ \text{NB} - \underset{(-0.611)}{0.00387}\ \text{RL} - \underset{(-0.879)}{0.0069}\ \text{UR} - \underset{(-1.747)^{*}}{7.6116}\ \text{RISK}$$

$\bar{R}^2 = 0.3141$, N = 64
$F = 5.808$ (prob > F = 0.0001)

(b) *Seemingly unrelated regression method*

$$\text{RISK} = 0.0026 + \underset{(6.313)^{***}}{2.884\times10^{-7}}\ \text{WIRK} - \underset{(-2.061)^{**}}{1.076\times10^{-4}}\ \text{SIZE}$$

$$+ \underset{(1.432)}{2.012\times10^{-4}}\ \text{RL} - \underset{(-0.115)}{1.717\times10^{-5}}\ \text{UR} - \underset{(-3.850)^{***}}{0.0383}\ \text{RETURN} + \underset{(3.165)^{***}}{0.1916}\ \text{RETURN}^2$$

$$\text{RETURN} = 0.0043 + \underset{(3.821)^{***}}{0.1452}\ \text{WIRN} + \underset{(2.006)^{**}}{0.00487}\ \text{SIZE}$$

$$- \underset{(-0.933)}{9.798\times10^{-4}}\ \text{NB} - \underset{(-0.615)}{0.0039}\ \text{RL} - \underset{(-0.960)}{0.0075}\ \text{UR} - \underset{(-2.229)^{**}}{9.696}\ \text{RISK}$$

System $\bar{R}^2 = 0.4950$, $N = 64$

t-values are in parentheses.
*** Significant at 0.01 level; ** significant at 0.05 level; * significant at 0.10 level.

managerial risk behavior or attitude toward risk as a response to some particular level of corporate return. The finding of a curvilinear association between risk and return (thus confirming Hypothesis 9) suggests that at higher levels of return (compared to other firms and adjusted by market differences), managers will take more risky actions, for either they feel safe to do so or they can afford the risky actions. At lower levels of return, managers will also take more risky actions reflecting the gambling attitudes they may have, or the results of escalating commitment. The U-shaped relationship between risk residuals and returns is consistent with the propositions of Kahneman and Tversky's (1979) prospect theory.

The regression results for the return equation are also shown in Table 4. All the coefficients of explanatory variables associated with diversification strategy behave as anticipated. Variables WIRN and SIZE have positive and statistically significant coefficients, while variables NB, RL, and UR have negative and insignificant coefficients. These results confirm previous findings in that market profitability contributes a major portion of a diversified firm's return, and size will enhance profitability. Hence, Hypotheses 5 and 6 are accepted. The insignificant effect of NB indicates that market power is not a significant factor in explaining performance differences when market profitability also enters the explanation.

The coefficients of RL and UR are not significant, implying that Hypothesis 8 should be rejected.

The coefficient of RISK is significant but the sign is negative. This shows that the risk premium (in ROA) does not exist in diversified firms, at least in the period from 1977 to 1981. Although diversification strategy effects are controlled, we still cannot assume that firms are facing similar opportunities and uncertainties, and that those firms who are willing to take more risk will be rewarded with additional returns, i.e. risk premia. On the other hand, it appears that risk-taking (as captured by an *ex post* measure) is not associated with better performance, but rather, worse performance.

Overall the findings shown in Table 4 lead to the acceptance of Hypotheses 1, 2, 3, 5, 6 and 9. More specifically, lower risk is associated with operating in less risky businesses, with higher degree of product-market diversity, and with larger size or assets of a firm. Support is also found for the U-shaped risk–return relationship. Although Hypotheses 4, 7 and 8 are not supported, the signs of the regression coefficients suggest that lower risk may be more closely associated with unrelated strategies than with related strategies. On the relationship between strategy and return, differences in performance among diversified firms can be attributed to differences in market profitability and firm size.

Many alternative models were estimated to examine the direction of causation between diversification strategy and performance. Because of data limitations,[11] the results presented in Table 5 relating to Hypothesis 10 can only be regarded as preliminary and tentative.[12] Only regression models with significant coefficients of determination (adjusted R-squared) are reported in Table 5. These results suggest that low-profit firms tended to commit more to diversification activities, and the more a firm diversified, the less motivated it was to move further with its diversification strategy. Moreover, increasing the level of diversification did not lead to better growth in profitability. This suggests, following Rumelt (1982), that there may be a limit to the degree of diversity that can be effectively managed. The analyses provide a good starting point for further research in this area. With better samples it is anticipated that stronger results such as those of Grant *et al.* (1986) may be found.

DISCUSSIONS AND CONCLUSIONS

This study shows that the risk–return characteristics and the market power of markets which the business units of a diversified firm serve would appear to be the dominating influences on the firm's risk–return profile. Firm size is also associated with better risk–return profiles, while differences in these profiles cannot be attributed to differences in diversification strategies. Taken together the results enhance Bettis and Mahajan's (1985) study by showing that improved risk–return performance may be achieved through careful formulation of diversification moves—that is, choosing good industries and being strong in them. Diversification *per se* does not change risk–return profiles.

Although the generic diversification strategy effects on risk are found to be insignificant, the coefficients suggest that unrelated business strategies may have lower risk than related business strategies. The insignificant impact of generic diversification strategy on risk may be due to the inability of the dummy variables to capture the complex correlations among businesses in a firm. Nevertheless, the results are still able to shed some light on the relationship between diversification in general and risk in particular.

On the profitability impacts of diversification strategy, the findings of this study are generally consistent with those of Christensen and Montgomery (1981) and Rumelt (1982) in that market effects have the most impact on the profitability of diversified firms. Compared to Montgomery (1985), this study found that firm size, rather than a market share measure, can explain the return differences between diversified firms. However, since firm size may be regarded as a proxy measure for market share when the number of businesses (NB) is controlled, our findings are in line with those of Montgomery (1985). Our results also indicate that size may

[11] In both the Compustat Business Segment and Geographic tapes, the data are only available from 1978 to 1983 for most of the firms.

[12] Equation (d) was tested to examine whether diversification moves are rewarded by lower risk. Many model versions were tested and none was significant. Tentatively, it appears that diversification moves do not lead to either risk or return benefits.

Table 5. Analyses of the causal relationship between diversification and performance

XPDIV(78–83) = 1.9630 −0.2431 Mean ROA (77/81) + 0.2607 SIZE (77/81)
(−2.279) ** (0.858)

−0.3221 PDIV (78)
(−3.265) ***

N = 49 R^2 = 0.1771
(F = 4.516, Prob > F = 0.0074)

GMROA = 0.2033 −2.4413 XGDIV (78/80–81/83) −0.0183 XPDIV (78–83)
(−1.775) * (−0.786)
+ 0.5296 ASGR
(1.901) *

N = 49 R^2 = 0.0737
(F = 2.299, Prob > F = 0.0899)

Notes:
1. t-values are in parentheses.
2. * Significant at 0.10 level; ** significant at 0.05 level; *** significant at 0.01 level.
3. Variable definitions:
XPDIV(78–83): the change in product diversity from 1978 to 1983.
Product diversity PDIV (78) is estimated by the following Herfindahl formula:

$$\text{PDIV} = \frac{1}{\Sigma w^2}$$

where w is the fraction of total corporate sales contributed by a four-digit industry of the firm.

XGDIV(78/80–81/83): the change in geographic diversity from 1978/80 to 1981/83. Geographic diversity is estimated as the ratio of mean international sales over mean corporate sales, both over 3-year period.

Mean ROA(77–81): the mean ROA over 1977/81.

GMROA: the ratio of the mean ROA over 1980/84 to the mean ROA over 1977/81.

SIZE (77/81): the logarithm of the mean assets over 1977/81.

ASGR: the ratio of the mean assets over 1980/84 to the mean assets over 1977/81.

play a more important role in explaining the performance of highly diversified firms than is suggested by existing research evidence.

The results show no significant difference in risk–return measures between different groups of diversified firms. Even when market effects and firm size are controlled, the performance differences associated with different generic diversification strategies are inconclusive. In the dynamic analyses the causative relationships between strategy and risk–return are also insignificant, indicating that diversification moves do not lead to either risk or return benefits. However, these findings about strategy and risk–return relationships may only hold if the environment is stable. However, the choice of time period conditioned by data limitations in Compustat II data base raises additional important methodological issues. For example, this study could not explore how different environmental contingencies may affect the strategy and risk–return relationships. With an extended data base this research question could be tackled by appropriately designed longitudinal research which explicitly confronts the methodological dilemma presented (see Table 5) in using intemporal variance in profits as a measure of risk when using mean profitability as a measure of performance.[13]

This study also augments research in the area

[13] In longitudinal studies, the measure of risk as variance in returns may pose problems if the risk measure spans multiple stages of the business growth. Such risk measures will fail to differentiate different environmental contingencies. Market risk measures such as beta also have similar problems. An alternative approach would be to design a refined measure of risk based on fewer years data, or to use a forecast error approach as suggested by Silhan and Thomas (1986).

of corporate risk. The hypothesized U-shaped risk–return relationship (derived from prospect theory) is found to exist in this study. However, this study did not find any evidence supporting the risk premium forms of hypotheses. One interpretation of these findings is that both good- and bad-performing firms tend to take more risky actions than moderate-performing firms, and risky actions do not guarantee a higher expected return. This suggests that the risk-taking behavior of successful firms cannot be easily imitated by low-performing firms. Such an imitation barrier has been proposed and termed as 'uncertain imitability' by Lippman and Rumelt (1982). Or this suggests that since different firms have different 'efficient frontiers' (Markowitz, 1959) or opportunity sets of risk and return combinations, a cross-sectional analysis of firms, instead of intra-firm analysis, will result in a different relationship between risk and return. Since previous tests of risk premium hypotheses have found inconsistent results,[14] further studies using different methods than regression analysis to explore more closely the linkage between corporate risk and managerial risk attitude should be undertaken.

Questions still remain about the causative linkages between diversification strategy and risk–return performance. A number of research refinements should improve future research in this area. First, and most importantly, more effort needs to be directed towards model specification and, particularly, the measurement of change in diversification. Change scores, such as those used in the preliminary analysis of Table 5, are rather crude, biased measures. The most sensible solution is to use lagged dynamic models, such as first-order difference models, to capture the lagged, dynamic effects of profitability on diversification (or vice-versa). Second, given the first point, the research sample would have to be considerably altered (both in terms of the number of firms and years covered) from the Rumelt-based convenience sample used here in order to examine the influence of alternative lag structures.

In conclusion, we believe that further research in this area increasingly needs to be directed towards the dynamic and time-dependent nature of diversification strategy. In addition, particular attention must be focused upon examining whether significant diversification-risk/return results would be found if the research incorporated improved measures of generic diversification strategy which better captured the synergistic effects of diversification moves. To design such measures, the multi-dimensional measures of relatedness examined by Lemelin (1982) may provide a good starting point. In this search for good descriptions of synergy we may be able to provide strategic managers with guidance about the design of organizational structures to facilitate synergy gains. Finally, the curvilinear risk–return relationship which has been plausibly identified both here and in Fiegenbaum and Thomas (1988) needs to be further explored.

APPENDIX: VARIABLE DEFINITIONS AND MEASUREMENTS

Return and risk: the measure of corporate return is the mean value of return on assets (ROA) over the 5-year period 1977–81. The variance of ROA across the same period is chosen as the measure of corporate risk.

Industry profitability: for manufacturing industries, industry data are drawn from the Survey of Manufacturing, 1977–80 and the Census of Manufacturing, 1981. Since no return on investment or return on assets data are available at the four-digit SIC industry code level in the Census and the Survey data, surrogates are used. The industry profitability measure used in this study is the price-cost margin, computed from the formula:

$$\text{price-cost margin} = \frac{\text{gross margin of a four-digit industry}}{\text{total value of shipment of a four-digit industry}}$$

where gross margin = value added − total payroll − rental payments.

Since many firms have diversified into non-manufacturing industries (the data of which do not appear in the Census and the Survey data), proxy data are used for these industries. The approximated industry profitability, the price-cost margin for a particular four-digit non-

[14] Using similar models of return regressed by risk and other variables, Hurdle (1974), Bettis and Hall (1982) observed positive coefficients of risk, while Armour and Teece (1978) and this study found negative coefficients.

manufacturing industry, is computed from the ratio of the total gross margin of all firms under the same industry code in Compustat I to the total net sales of these firms. Thus, the average industry profitability across the 5-year period 1977–81 represents the mean industry profitability (MIP).

Weighted industry return of a firm: the mean industry profitability (MIP) for each industry in which a diversified firm operates will be multiplied by the fraction of the total net sales of the firm generated from that industry. The industry information of a diversified firm and its segment sales in that industry are obtained from the Compustat II data bank. In Compustat II, each firm reports up to 10 records of business segment data, each of which contains data such as net sales of the firm from that particular segment, and four-digit SIC codes of that segment. For each four-digit industry, the fraction of the total net sales of the firm generated from that industry would be the weight for the calculation of weighted industry return (WIRN). In the event of finding two SIC codes in a segment, the segment sales will be split equally between the two SIC codes.[15] Then the WIRN for a firm is computed from the formula:

$$\mathrm{WIRN} = \sum_i \mathrm{W}_i\, \mathrm{MIP}_i$$

where

W_i = weight for four-digit industry$_i$;
MIP_i = mean industry for profitability for four-digit industry i.

1979 is the base year for computing the weights.

Industry risk: this study used the relative variation of four-digit industry demand as a surrogate for industry risk (IRK). The calculation formula is as follows:

$$\mathrm{IRK} = \frac{\text{variance of demand for 1977–81 in a four-digit industry}}{\text{average demand for 1988–81 in the same four-digit industry}}$$

This measure is justified on the grounds that some researchers believe that diversification is motivated to reduce the risk associated with high fluctuations in market demand.[16] Data on industry demand are drawn from the Survey of Manufacturing, 1977–80, and the Census of Manufacturing, 1981, for manufacturing industries, and from Compustat I for non-manufacturing industries using a method similar to the computation of the industry profitability data.

Weighted industry risk: the weighted industry risk (WIRK) is computed using a method similar to that used in computing weighted industry return (WIRN) except that the square of the weight for each industry is used:

$$\mathrm{WIRK} = \sum_i \mathrm{W}_i^2 \mathrm{IK}_i$$

where IK_i is the industry risk for four-digit industry i.

As the number of businesses increases, the WIRK will decrease due to the square effect of W_i; therefore this variable proxies diversity effects (NB), and industry effects.

Assets: assets data are drawn from Compustat I for the years 1977–81.

Number of businesses: for each firm, the total number count of three-digit SIC industries is the number of businesses. The data are also drawn from Compustat II using 1979 as the base year.

Diversification strategy: the diversification strategy categories of the sample firms have been determined by Rumelt (1974) and updated by Bettis and Hall (1982). There are three categories in the sample: related-constrained, related-linked, and unrelated strategies. The names of the sample firms and their diversification strategies are listed in Table 1.

[15] This computing method is also used by Palepu (1985).

[16] This study did not use the variance of the industry profitability as the industry risk measure because the profitability measure is only a proxy for industry profitability. Using a proxy profitability measure as a basis for constructing a risk measure will tend to produce bigger bias. In addition, since fluctuations in market demand are highly correlated with fluctuations in market profitability, the industry risk measure should provide a meaningful risk construct.

ACKNOWLEDGEMENTS

We gratefully acknowledge the constructive and helpful comments of the referees and the Editor of this journal.

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