AN ANALYSIS OF THE DEGREE OF DIVERSIFICATION AND FIRM PERFORMANCE

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ABSTRACT

A firm's diversification decision is likely to be a response of two interacting effects, one is the agent problem and the other is the economies of scale. Whether diversification causes a discount or a premium depends on the interaction of the two effects. This paper re-evaluates the effect of diversification on firm performance by examining firms with different degrees of diversification. We found the evidence that the diversification premium gets smaller if a firm engages in more than three industries.

JEL: G30, G34, L22, L25

KEYWORDS: Tobin's Q, Firm performance, Diversification

INTRODUCTION

A key strategy issue facing corporate management relates to the degree of diversification that their firm should achieve. Thus, the relationship between diversification and firm performance has inspired a large literature in many fields, including Industrial Organization, Corporate Finance and Strategic Management. However, after several decades of research, the literature has not reached a decisive conclusion whether diversification causes a premium or a discount.

Lang and Stulz (1994) showed that Tobin's q and firm diversification are negatively related. Firms that choose to diversify are poor performers relative to specialized firms. Berger and Ofek (1995) also found that diversified firms trade at a discount relative to specialized firms. Conversely, recent research shows that the diversification discount disappears when we control for the self selection problem. Campa and Kedia (2002) found that firm characteristics, which make firms diversify, might also cause them to be discounted. Villalonga (2004) estimated the value effect of diversification by matching diversifying and single-segment firms on their propensity score and found that diversification does not destroy firm value. In the same direction, Graham, Lemmon and Wolf (2002) pointed out that segments acquired by diversifying firms already traded at a discount before the acquisition, thus refuting the post acquisition negative relationship between diversification and firm performance.

Despite being a central topic in the corporate finance literature, we have not reached a consensus on the effect of diversification on firm performance. Thus, the issue whether diversification improves or worsens firm performance is still worthy of further research.

A diversification discount or premium is a balance of the costs and the benefits of diversification. If the costs of diversification outweigh the benefits, there may exist a diversification discount or vice versa. The gains generally can rise from: (1) managerial economies of scale; (2) efficient resource allocation in internal capital market; (3) firms' current resource may be exploited in other industries. On the other hand, the costs may arise from: (1) inefficient resource allocation in internal capital market; (2) opportunities for managers to use firm resource for their own benefits; (3) difficulty of motivating divisional managers.

The main purpose of this paper is to re-evaluate the effect of diversification on firm performance by examining firms with different degrees of diversification. Intuitively, diversification may intensify agency problem between corporate insiders and small shareholders. On the other hand, diversification may boost firm value due to the economies of scale. Whether diversification causes a discount or a premium depends on the interaction of the two effects. By focusing on the degrees of diversification, we may offer new insight into this diversification debate.

The remainder of the paper is organized as follows. The next section reviews the literature on firm performance. We then introduce the methodology and the measurement of firm performance. Next, we describe the data and provide some summary statistics. Finally, we provide the empirical results and conclude the paper.

LITERATURE REVIEW

The diversification discount has been the subject of an active debate in corporate finance during the past few years. There is a substantial literature that compares diversified firms to specialized firms, but empirical evidence is to date is far from conclusive.

Lang and Stulz (1994) showed a negative relationship between firm performance and diversification by using different diversification measures. They found that highly diversified firms have significantly lower average and median q ratios than specialized firms so firms that choose to diversify are poor performer relative to specialized firms.

Along this line, Berger and Ofek (1995) used segment-level data to study the effects of diversification on firm value by estimating the value of a diversified firm's segments as if they were operated as separate firms. They also found that diversification reduces firm value by 13% to 15% over the 1986-91 sample periods for firms of all sizes.

Other research, including Servaes (1996) and Lin and Servaes (1996) confirm the existence of this diversification discount and this discount seems to be robust to different time periods and different countries. On the other hand, several recent studies show that the discount disappears when sample selection bias is controlled for.

Campa and Kedia (2002) argued that diversifying and nondiversifying firms differ systematically in many firm characteristics. They use a panel data and instrumental variables to control for the endogeneity of the diversification decision and found that the diversification discount disappears and even turns into a premium when selection bias is corrected for.

Villalonga (2004) employed a new comprehensive database to examine whether diversified firms in the United Stateds trade at a discount relative to specialized firms. The new data is used to construct business units that are more consistently and objectively constructed than segments; the use of the new data reveals that diversified firms actually trade at a large and statistically significant premium relative to specialized firms in the same industry.

Graham, Lemmon and Wolf (2002) contended that the division of diversified firms systematically differs from the stand-alone firms. Failure to account for this difference would lead to incorrect inferences regarding the value of a diversified firm. They analyze several hundred firms that expand via acquisition or increase their number of business segments. They show that units that are combined into firms through merger or acquisition are priced at significant discounts prior to merger. Due to the discounted unit added to existing firms the combined firms are traded at a discount.

METHODOLOGY

To investigate the dominating effect of the benefits and the costs, we will model the relationship between firm performance and diversification as

$$Y_{it} = \alpha + X_{it}\beta + \delta_1 I_{\{seg=1\}} + \delta_2 I_{\{seg=2\}} + \delta_3 I_{\{seg=3\}} + c_i + e_{it}, \quad (1)$$

where Y_{it} is firm performance, which is measured by Tobin's q. $I_{\{.\}}$ is an index function. Seg denotes the number of divisions a firm owns. c_i denotes unobserved heterogeneity, and X_{it} are some control variables.

To estimate the parameters δ_1 , δ_2 and δ_3, we may evaluate the dominating effect on firm performance. Therefore, we might cast some new insights into the firm's diversification issue. Intuitively, when a firm starts to diversify, the benefits should be greater than the costs. Up to certain degree, larger firms would be much more difficult to monitor, which increases the costs. When the costs outweigh the benefits, a diversification premium would become a diversification discount. By dividing firms into four groups, we may detect the critical point that the costs start to outweigh the benefits.

In this paper, we use Tobin's q as a measure of firm performance. Tobin's q is calculated as the sum of the market value of common equity plus the book value of preferred shares plus the book value of total debt divided by the book value of total asset. As is pointed by Lang and Stulz (1994), q is designed to measure the present value of future cash flows divided by the replacement costs of tangible asset. One advantage of using Tobin's q is that there is no theoretical reason to adjust for risk or leverage to compare firms.

THE DATA

The sample consists of all firms with annual data reported on the COMPUSTAT Industry Segment database and Industry Annual from 1996 to 2002. All financial firms (6000-6999) are excluded since financial firms are difficult to value with the methodology being used due to their special characteristics. We also exclude firms whose sales are below $20 million to prevent distortions caused by small firms. Table 1 shows some summary statistics, where we divide all the firms into four groups: (1) Firms operating in two industries; (2) Firms operating in three industries; (3) Firms operating in more than three industries. As we can observe from this table, large firms are more likely to engage in multiple industries, which is an important characteristic of diversified firms. Roughly speaking, more firms are engaging in multiple industries. In this table, we report the observations instead of the number of firms in different groups since diversified firms may become specialized firms for this period or vice versa.

Table 1: Summary Statistics

Seg	Obs	Ave_asset	Ave_sales	Med_asset	Med_sales	Std_asset	Std_sales
1	11126	3404	1510	332	233	27818	5477
2	5492	6543	3358	671	548	34157	11935
3	4669	9332	5468	1493	1047	42961	15991
4	4345	32358	15256	4246	2944	105211	33622

This table shows the average, median and standard deviations of assets and sales for firms with different degrees of diversification. The data were collected from COMPUTAT. The sample comprises 12,006 firm-years from 3070 firms during 1996-2002. Seg denotes Segment SIC Code #1 (Source: SEGSICB data set), which is the number of industries a firm is operating on. Obs are the number of observations. Ave_asset, Ave_sales are the average of total asset and sales. Med_asset and Med_sales are the medians of assets and sales. Std_asset, Std_sales are the standard deviations of assets and sales.

RESULTS

In table 2, we provide estimates of OLS regressions. In specification 1, we use segment dummies as specified in equation (2), log of assets, book leverage ratio, EBIT/sales, R&D/Sales and invest/Sales as our independent variables. In specification 2, we include squared log of assets as an additional regressor. In specification 3, we include year dummies as additional regressors.

As one can see from table 2, the coefficients on δ_1, δ_2 and δ_3 are all significant and negative. In other words, the diversification discount remains significant, regardless of the number of segments a firm is operating on. As noted above, a diversification discount or premium is a balance of the costs and the benefits of diversification. These results are consistent with Lang and Stulz (1994)'s finding of a negative relation between firm performance and diversification. It should be also noted that R-squared is relatively small for all specifications.

Table 2: Pooled OLS Estimation Results

Independent Variables	**Specification 1**	**Specification 2**	**Specification 3**
δ_1	-0.345(0.069)**	-0.343(0.069)**	-0.420(0.082)**
δ_2	-0.500(0.077)**	-0.506(0.077)**	-0.579(0.091)**
δ_3	-0.748(0.094)**	-0.796(0.093)**	-0.836(0.107)**
log of assets	-0.024(0.191)	-0.164(0.064)**	-0.022(0.020)
book leverage ratio	-1.022(2.716)	-1.803(2.961)	-0.967(2.711)
EBIT/Sales	0.899(0.259)**	0.911(0.263)**	0.817(0.244)**
R&D/Sales	1.552(0.340)**	1.569(0.343)**	1.495(0.329)**
invest/Sales	0.146(0.171)	0.165(0.171)	0.108(0.168)
log of assets squared	No	0.010(0 .004)	No
Constant	2.262(0.086)**	2.690(0.219)**	2.195(0.097)**
Year dummies	No	No	Yes
R-squared	0.027	0.028	0.030

This table shows the simple OLS regression estimates of the equation: $Y_{it} = \alpha + X_{it}\beta + \delta_1 I_{\{seg=1\}} + \delta_2 I_{\{seg=2\}} + \delta_3 I_{\{seg=3\}} + e_{it}$.
*The dependent variable is Tobin's q. For the first equation, we does not include squared log of assets. For the second specification, we include one extra regressor: squared log of assets. For the last specification, year dummies are included to control for year effect. Robust standard errors in parentheses , * * significant at 5%; * significant at 10%*

Table 3 shows the fixed effect estimation result, which vary substantially from Table 2. As we can observe from this table, for specification 1, the estimators of δ_1, δ_2 and δ_3 are positive and only the estimator of δ_3 is insignificant. For specification 2, we can observe the same sign and the same significance levels of the coefficients. In contrast, for specification 3, the estimators of δ_1, δ_2 are positive but insignificant. This new results provide new empirical evidence on diversification premium. However, the estimator of δ_3 is negative and significant.

In comparison with the results in Table 2, the R squared values in fixed effect models are much larger than the ones in simple OLS regression. This provides new evidence that fixed effect models can

explain variability in a data set much better than OLS models. In some sense, this result provides evidence of a positive relationship between firm performance and diversification.

For the fixed effect model, we control for firm fixed effect. We also run a random effect model and obtain similar results as in table 2. In addition, we ran Hausman specification test. The null hypothesis of the Hausman test is that the random effect model is consistent. The alternative hypothesis is that both random effect and fixed effect models are consistent. Based on the Hausman test, all null hypotheses are rejected at 5% significance levels. The testing results also show the estimators of the OLS models as in described in table 2 are inconsistent. Therefore, our empirical evidence shows a positive relationship between firm performance and diversification.

Table 3: Fixed Effect Estimation Results

Independent Variables	**Specification 1**	**Specification 2**	**Specification 3**
δ_1	0.192(0.109)*	0.191(0.109)**	0.084(0.112)
δ_2	0.230(0.128)*	0.229(0.128)**	0.093(0.131)
δ_3	0.196(0.161)	0.194(0.161)	-0.836(0.107)**
log of assets	-0.697(0.057)**	-0.722(0.193)**	-0.010(0.166)
book leverage ratio	-0.393(2.334)	0.361(2.344)	0.243(2.348)
EBIT/Sales	0.837 (0.167)**	0.838(0.167)**	0.800(0.169)**
R&D/Sales	0.040(0.199)	-0.039(0.199)	-0.035(0.200)
invest/Sales	0.593(0.223)**	0.594(0.223)**	0.587 (0.227)**
log of assets squared	No	0.002(0 .015)	No
Constant	6.308(0.356)**	6.376(0.603)**	6.520(0.382)**
Year dummies	No	No	Yes
R-squared	0.365	0.365	0.368

*See the note for table 2. In this table, we control for firm fixed effect and run the same regressions to. Robust standard error in parentheses , * * significant at 5%; * significant at 10%.*

CONCLUSION

In this paper, we studied firms with different diversifying degrees and found that diversified firms operate on a premium. Firms choose the extent of their operations and decide whether to operate in a single industry or diversifying into multiple industries. A firm's diversification decision is likely to be a response of two interacting effects, one is the agent problem and the other is the economies of scale. By using an annual dataset comprised of 12,006 firm-years from 3070 firms during 1996-2002, we employed a panel data model and found a positive relationship between firm performance and diversification. Further research is needed to use other datasets to check the robustness of our results.

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