The value of Diversification—An empirical study based on 220 companies

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Abstract: In this study the value of diversification has been assessed by constructing the excess value of firms using the multiplier method. Through regression, it was found that there was 15.7% to 34.9% average loss from diversification during 2011-2015. The smaller the firm size, the more value would lose from diversification. It was found that cross-subsidization contributed to the firm's value loss from diversification; meanwhile, coinsurance effect would not influence positively on firm value by removing the financial constraints as expected.

Keywords: Diversification, Firm value, Cross-subsidization, Coinsurance

1. Introduction

During the 1950s and 1960s, diversification was considered as the most competitive corporate strategy, and then there was an upsurge of diversification among corporations. However, this flood abated at the beginning of the 1980s, especially after the miserable disasters of enterprises from 1997 to 2002, when 75% enterprises encountered the plight of diversified management failure [3]. Then the trend reversed to specification [4]. Does diversification reduce firm value? It is a vital question since one-third of the enterprises in Compustat database are operating with multiple business segments, and these companies appear to suffer significant discounts compared to firms with single division [1]. According to the study by Graham et al, the value of discounts of diversified firms are estimated to be over $800 billion in 1995, and these massive losses of the firm value suggest that more value could be created by changing the segments of diversified businesses into focused companies [6]. Therefore, this study will explore whether diversification destroys firm value.

2. Hypotheses

2.1 Related Diversification Effect

Related diversification refers to conducting diversification programs in the industry that is the same as its current business. Because of the economics of scope as similar skills and resources are used in the related industry, related diversification has a more positive impact on firm value than unrelated diversification does [10]. The benefit of good reputation in current industry affects positively on the firm value during related diversification programs. Hypothesis 1 has been developed where relatedness plays a positive impact on value change from diversification as it increases the firms' values or reduces the value lost from diversification. If not, an alternative hypothesis 1 would be where relatedness would not affect the firm value positively by enhancing firm values or eliminating value loss.

2.2 Cross-subsidization Effect

Firm diversification can be related with the cross-subsidization effect. In segment terms, cross-subsidization can be found in firms with multiple segments [11]. Cross-subsidization is regarded as activities where segments with poor performance would drain corporate resources from divisions with good performance. Cross-subsidization effect reduces the value of diversified firm because of waste of resources for the unprofitable lines of business. I have developed hypothesis 2 where firm diversification reduces the firm value due to cross-subsidization effect. However, the efficiency of the internal market could also be good. An alternative hypothesis 2 would be that firm diversification would not reduce or even increase firm value by the cross-subsidization effect.

2.3 Coinsurance Effect

The cash flows generated by the diversified firms' segments are imperfectly correlated, which result in a coinsurance effect that can increase the financing ability of a diversified firm [8]. The coinsurance effect decreases the power of financial constraints and the managers of firms with large borrowing abilities and excess free cash flows are easier to make investment decisions [7]. I develop hypothesis 3 that firm diversification increases the firm value through coinsurance effect. But this effect would also bring some potential negative effect through the selections of investment, so I develop an alternative hypothesis 3 that firm diversification would not increase or even reduce the firm value through coinsurance effect.

2.4 Combining the Hypotheses

The cross-subsidization effect and coinsurance effect resulting from diversification create costs and benefits for firm value respectively. The value of diversification as its effect of the firm value hinges on the degree of its benefits and harms. If the potential damages of diversification outweigh its benefits, then the impact of diversification on firm value as a whole is negative. However, if the benefits of diversification are more than the costs, an alternative result would be achieved where the impact of diversification on firm value is positive in general.

3. Data and Methodology

3.1 Data

The sample in this study consists of firms reporting data at both firm-level and segment-level in the Compustat database. The study obtained firm-level data from Compustat/Annual database and adopted Compustat/Segment database for the segment figures. According to FASB No. 14, firms are required to publish information about the segment whose sales, assets or profits account for more than 10% of the figures for the firm as a whole after 1997. So the data in segment-level before and after 1997 cannot be compared directly [2]. Therefore, the study sets the sample period from 2011 to 2015 to ensure comparison. Following studies of Berger and Ofek [1], this study excludes the firm with segments in the financial industry (such industries with SIC codes ranged from 6000 to 6999) and the firm whose total sales less than $20 million to avoid vacancies of key figures for valuation methods. Total capital, sales, assets, market value, book value and debt in firm level are required, while sales, assets, capital expenditures and SIC codes for each segment are used at segment level. For this research, diversification relies on SIC codes generally refers to firms having more than one segment with different SIC code. Founded on these filtering criteria, the sample of 110 diversified firms and 100 single firms are selected randomly.

Table 1A: Descriptive Statistics in Firm Level

	Single firms					Diversified firms					Difference	
	Median	Mean	Max	Min	STD	Median	Mean	Max	Min	STD	Median	Mean
Firm Level												
Number of Segments	1.000	1.000	1.000	1.000	0.000	2.000	2.712	8.000	1.000	1.123	1.000	1.712
Total Capital	760.151	7743.243	165889.820	9.125	20607.979	3100.683	16703.010	416474.149	8.371	42380.258	2340.532	8959.766
Leverage	0.121	0.184	0.785	0.000	0.202	0.233	0.258	0.975	0.000	0.198	0.113	0.073
Cash	0.101	0.068	1.185	-0.853	0.161	0.082	0.075	0.369	-0.617	0.098	-0.019	0.006
Dividend	0.000	0.020	0.769	0.000	0.055	0.012	0.020	0.338	0.000	0.039	0.012	0
M/B	1.835	2.304	18.158	0.473	1.671	1.358	1.550	7.160	0.421	0.799	-0.477	-0.755
Firm Size	2.578	2.647	4.855	0.617	0.949	3.365	3.340	5.438	0.385	0.865	0.787	0.692
N	500					549						

Table 1A shows the characters of diversified firms and single firms and compares differences between them. Since the distribution is skewed, the median is used as a better indicator in the study instead of means. With the median of the number of segments, diversified firms obtain two segments and around two times that of single firms. Based on the indicator of firm size, which is the logarithm of asset, it is no surprise that the size of diversified firm is 1.3 times larger than the size of firms having just one segment. The total capital of multi-segments firms is 2341 higher than that of focused firms as well. In terms of some major ratios, the leverage of diversified firms is 11.3% higher than that of single firms. For cash flow return on asset, the ratio is used to assess how well the assets are used to generate cash income from the businesses of the firms. It shows that the ratio of diversified firms is 2% lower than that of focused firms. However, this result does not affect the ratio of dividends return on asset

directly, as diversified firms tend to distribute more dividends with cash flow created by their varied businesses. Market-to-book ratio obtained through calculating in the way that adding up the book value of assets and the market value of equity first, then deducting book value of common equity, and finally divided by the book value of assets, which is a significant indicator to measure how well the managers of the firm generate value to their shareholders. Single firms perform better in this perspective and their ratio is approximately 1.4 times that of diversified firms.

Table 1B: Descriptive Statistics in Segment Level

	Single firms					Diversified firms					Difference	
	Median	Mean	Max	Min	STD	Median	Mean	Max	Min	STD	Median	Mean
Segment Level												
Sales	348.601	2319.847	42650.000	20.000	4986.515	189.192	1997.942	97925.000	20.000	7946.351	-159.409	-321.905
Asset	378.455	3678.826	71576.000	4.138	9967.027	265.340	2394.546	185406.000	2.427	10437.847	-113.115	-1284.28
Capital Expenditures	0.034	0.153	1.000	0.000	0.481	0.041	0.105	0.984	0.000	0.182	0.007	-0.048
Negative CF	0.000	0.172	1.000	0.000	0.378	0.000	0.240	1.000	0.000	0.427	0.000	0.068
N	500					2219						

When it comes to the data at segment-level, which are provides in table 1B, the segments' scales of diversified firms tend to be smaller than that of focused firms, since the asset is slightly lower. However, the stage of asset allocation by the diversified firms is partly responsible for this difference. For investment level, which is assessed by the ratio of capital expenditures to sales, the ratio of diversified firms is lower than that of single firms in mean value, which fits well with the theory of cross-subsidization where the efficiency of investment is lower in diversified firms and more likely to go with overinvestment. Besides, 24% segments of diversified firms with negative cash flow while 17% of single firms coincides with the cost of diversification where diversified firms are prone to keeping the segments with poor performance.

3.2 Methodology

To assess the value of diversification, this paper in accordance with the method used by Berger and Ofek [1] as measuring excess values. It is a cross-sectional study, which measures the distinction between a firm's actual value and the sum of assessed values of its segments that operate as separated firms. To compute the assessed value of each segment, median ratios should be found firstly. The ratio is the multiplier computed by picking median of total capital to accounting items (asset, sales or earnings) of the single firms in the same industry with the same two-digit SIC codes. Then multiply the ratios by the corresponding accounting items of the segments. Then I measured the excess value by the nature log of ratio of the actual value to assessed value of the firm, to learn about the value of diversification, value-enhancing or value-reducing. There is also a conditional excess value applied in the study. Compared with the formal one, the distinction is the assessed value. To assess conditional excess value, the assessed value of segment with positive EBIT is computed as its asset or sales multiplied by its corresponding industry median ratio. It is worth noting that this median ratio is just calculated with single firms having positive EBIT in the industry. Similarly, the assessed value of segment with negative EBIT is calculated as its asset or sales multiplied by its industry median ratio of single firms with negative EBIT. The method can be indicated by formulas as follows [1].

$$I(V) = AI_i * (Ind_i (V / AI)_{mf}) = 1$$

$$EXVAL = \ln(V / I(V))$$

I(V): Assessed value of the summation of the assessed values of the firm's segments when they operating as focused firms.

AIi: The accounting items (asset or sales) of segment i.

Indi (V / AI)mf: The median ratio (total capital to the accounting items (asset or sales)) for the single firms in the same industry as segment i does.

EXVAL: Excess value for the firms.

V: Total capital for the firms.

n: The total number of segments in the firm that including segment i.

Positive excess value means that diversification impact positively on firm value by enhancing the value of segments compared with single firms. Contrarily, the negative excess value indicates that diversification causes a loss in firm value.

After achieving the result of diversification effect on the firm value, I undertook regression analyses with the dependent variable excess value or conditional excess value and several essential indicators as variables, diversification indicator and negative cash flow indicator, to find out the correlation between the value change and the potential factors that lead to value variety. The diversification indicator variable measures the percentage disparity between single and diversified firms in their excess values, while negative cash flow indicator variable captures the effect on single and diversified firms with the appearance of negative cash flow in their segments.

4. Result

4.1 The Overall Effect of Diversification

4.1.1 Excess Value Measures

Table 2: Excess Value of Firms

Excess value	Median	Mean	Quartiles		STD	Observations
			1st	3rd		
Using asset multiples						
Single firms	0.001	0.027	-0.334	0.363	0.534	500
Diversified firms	-0.090	-0.079	-0.477	0.257	0.580	480
Using sales multiples						
Single firms	-0.001	-0.183	-0.614	0.343	0.855	494
Diversified firms	-0.199	-0.441	-1.176	0.256	1.044	543

Table 2 shows the excess value of diversified firms and single firms by using asset multiplier and sales multiplier. The excess values of single firms reported are used to assess the accuracy of excess value measurement, while that of diversified firms are regarded as the major indicator of the overall effect of diversification. By adopting asset multiplier, the median excess values for single firms are close to zero but slightly larger than zero in the overall performance over entire sample period and specific annual performance as well. This error is probably caused by the deletion of the extreme excess values resulting from outliers of items of some samples. For multiples of sales, the distribution is negatively skewed and the median excess value is slightly lower than zero. On the whole, the distance errors are in a reasonable range, so I can conclude that there is no obvious distinction between excess values for single firms and zero, and the excess value measures are relatively well-behaved. When it comes to diversified firms, the negative results report the significant differences in mean and median excess values between them and single firms, besides, the differences are obvious by using any multiple, which indicates that there is a value-reducing effect of diversification.

4.1.2 Overall Value Effect

Table 3A: Overall Effect of Diversification

Excess Value		
	Using asset multiples	Using sales multiples
Intercept	-0.193***	-0.660***
	(0.00)	(0.00)
Diversification Indicator	-0.157***	-0.349***
	(0.00)	(0.00)
Firm Size	0.083***	0.154***
	(0.00)	(0.00)
Operating Margin	-0.006***	-0.009***
	(0.00)	(0.00)
Capital Expenditures	-0.032	0.431***
	(0.49)	(0.00)
Observations	980	1042
Adjusted R-Squared	0.03	0.11

***,** and * denote significance at the 0.01, 0.05, and 0.10 level, respectively.

Besides, the correlation between value-reducing and diversification is reported in Table 3A. It is measured by the coefficient from regressions of excess value on an indicator variable that is assigned one for diversified firms and control variables. The indicator variable for diversification reflects the percentage disparity in excess value between diversified and single firms. The control variables are factors making influences on excess value but do not attribute to diversification. These factors including scale, earning power and growth opportunities, are represented by the natural log of assets,

operating margin and capital expenditures to sales respectively. The findings are identical with the two multipliers. By applying the asset multiplier, 15.7% value loss from diversification, while 34.9% lost value with the sale multiplier. Besides, taking the mean leverage of about 23.3% for diversified firms into account and assuming debt value would not be impacted, the value of equity holders loss is from 20.5% to 45.5%. The result fits well with the hypothesis 2 for the cross-subsidization effect that predicts a negative correlation between firm diversification and firm values.

4.1.3 Effect of Relatedness and Number of Segments

Table 3B: The Impact of Relatedness and Number of Segments

Excess Value		
	Using asset multiples	Using sales multiples
Intercept	-0.358***	-0.790***
	(0.01)	(0.00)
Number of Segments	-0.012	-0.056
	(0.69)	(0.24)
Related Segments	-0.111*	-0.041
	(0.06)	(0.67)
Firm Size	0.106***	0.126**
	(0.00)	(0.02)
Operating Margin	-0.031	0.387*
	(0.82)	(0.09)
Capital Expenditures	-0.012	0.480***
	(0.80)	(0.00)
Observations	480	542
Adjusted R-Squared	0.02	0.07

***,** and * denote significance at the 0.01, 0.05, and 0.10 level, respectively.

In Table 3B, the relations among value changes, relatedness, and number of segments are tested to investigate whether the diversification conducts in related areas or not would lead to different value results and assess how could the number of segments impacts on the achievements of diversification. Table 3B reports the regression of excess value on the number of segments, a related segment indicator and control variables that are same as that in Table 3A. The indicator of related segments is gained by calculating as the total number of segments of a firm minus its number of unrelated segments. The segments are classified as unrelated segments if they have different two-digit SIC codes. Assuming other conditions are equal, the result indicates that diversified firms tend to lose more value when the number of their segments increase and they become more diversified since the coefficient of the number of segments in regression is negative. While the negative coefficient estimated on related segments demonstrates that relatedness could not diminish value loss from diversification and could even lead to further reduction. However, the result of these coefficients are not significant enough, so the relations among value changes from diversification, relativity of segments, and the quantity are inconclusive in this study. Therefore, original hypothesis 1 cannot be confirmed and should be rejected.

4.1.4 Effect of Size

Table 4: The Impact of Size

Excess Value								
	Using asset multiples				Using sales multiples			
Total assets	<50	50~150	150~500	>500	<50	50~150	150~500	>500
Intercept	-0.090	-0.254***	0.122**	0.086**	-0.797***	-0.300**	-0.187*	-0.145**
	(0.23)	(0.00)	(0.05)	(0.02)	(0.00)	（0.02）	(0.07)	(0.02)
Diversification Indicator	-0.471***	0.044	-0.083	-0.162***	-0.759***	-0.499***	-0.184	-0.337***
	(0.00)	(0.77)	(0.42)	(0.00)	(0.00)	（0.01）	(0.30)	(0.00)
Operating Margin	0.051	-0.270***	-0.009***	0.160**	-0.310	-0.488***	-0.010*	0.370***
	(0.78)	(0.01)	(0.01)	(0.02)	(0.20)	(0.00)	(0.06)	(0.00)
Capital Expenditures	0.302	0.156	-0.183	-0.028	5.580**	0.650	0.344	0.403***
	(0.88)	(0.81)	(0.16)	(0.55)	(0.03)	（0.50）	(0.12)	(0.00)
Observations	124	90	161	662	124	90	161	662
Adjusted R-Squared	0.08	0.07	0.11	0.14	0.10	0.08	0.12	0.13

***, ** and * denote significance at the 0.01, 0.05, and 0.10 level, respectively.

Table 4 shows the coefficient estimates on the diversification indicator of the regression that is similar to the one in Table 3A but excluding size control. To find out the relationship between value loss and firm size, diversified firms are divided into four groups depending on their sizes. The results

indicate that value loss would occur regardless of the size, and the greatest loss is found in smallest firms with the significant minimum coefficient.

4.2 Sources of Value Change from Diversification

4.2.1 Cross-subsidization

One major reason for diversification discount is the negative effect of cross-subsidization existing in the segments of diversified firms. As constraints against cross-subsidization can result in value gain in diversified firms [7], Meyer argues that cross-subsidization would lead to failing segments of firms causing greater losses in diversified firms than they operated as focused firms [9]. To verify this theory, I used negative cash flow computed as earnings before interest and tax (EBIT) plus depreciation (EBITD) as the indicator of poor performing. Furthermore, I examined whether a firm contains one or more segments with negative cash flow would create more value losses than a single firm having negative cash flow. If so, the result also supports the argument that unprofitable lines of business in diversified firms would drain value from other segments.

Multiplier method is also adopted, but the multiplier used to impute value of segment with positive EBIT is different from the segment with negative EBIT. If the EBIT of the segments is positive, then the multiplier for these segments should be the median ratio of the focused firms having positive EBIT in the same industry, while if the EBIT of the segments is negative, the multiplier for them converts to the median industry ratio of focused firms with negative EBIT. Then these multipliers are applied to construct conditional excess value for the firms.

As the cross-subsidization test is to assess whether diversified firms with segments having negative cash flows would have a lower value than diversified firms keep away from these badly performed segments, the measures of excess value should be conditional on whether EBIT is negative. If do not distinguish from the former measures of excess value, the actual values can be expected to be less than assessed value for firms with negative cash flows, since stock market prices are the present value of the firm's cash flows. Contrarily, conditioning excess value based on EBIT enables this figure to embody the effect of negative cash flow on the firm level.

Table 5: The Effect of Cross-subsidies

Conditional Excess Value				
	Using conditional asset multiples		Using conditional sales multiples	
	Single	Diversified	Single	Diversified
Intercept	-0.026	-0.005	-0.582***	-0.445**
	(0.73)	(0.97)	(0.00)	(0.02)
Negative CF Indicator	-0.441***	-0.377***	-0.543***	-0.629***
	(0.00)	(0.00)	(0.00)	(0.00)
Firm Size	0.065**	0.062	0.219***	0.159***
	(0.02)	(0.16)	(0.00)	(0.00)
Capital Expenditures	0.076	0.005	0.513***	0.479***
	(0.12)	(0.95)	(0.00)	(0.00)
Observations	500	482	500	540
Adjusted R-Squared	0.12	0.05	0.25	0.12

***, ** and * denote significance at the 0.01, 0.05, and 0.10 level, respectively.

Table 5 shows regressions of conditional excess value on control variables and an indicator variable that is assigned one if the firm has one or more segments with negative cash flow. The coefficients estimate on the negative cash flow indicator is negative and significant for both focused firms and diversified firms, which are identical with the theoretical and empirical conclusions in this article that negative cash flow would result in value losses. The coefficients estimate on the negative cash flow indicator for single firms adopting conditional asset multiplier and conditional sales multiplier are -44.4% and -54.3% respectively. While the coefficients estimate on the negative cash flow indicator for diversified firms are -37.7% when applying conditional asset multiplier and -62.9% when applying conditional sales multiplier. Using statistical analysis, it was found that 64% diversified firms have one or more segments with negative cash flow in an average year, while 17.2% focused firms have such segments per year. It represents the probabilities of firms' experiences of cross-subsidization in a year and it is identical with the view that single firms are less susceptible to exist with negative cash flow. By multiplying these probabilities by the average value loss assessed by the coefficient of negative cash flow indicator, the average value lost from cross-subsidization could be found out, as -7.6% to -9.3% for single firms and -24. 1% to -40. 1% for diversified firms.

Overall, the cross-subsidization acting as a reason for value loss in diversification is validated. Diversified firms having segments with negative cash flow have remarkably lower conditional excess value than those in a different situation. Moreover, unprofitable lines of business of diversified firms create more value losses on an average than they operated as single firms. Therefore, original hypothesis 2 should be accepted.

4.2.2 Coinsurance Effect

The cash flows of a diversified firms' segments are imperfectly correlated, which improves the debt capacity of diversified firm and is regarded as coinsurance effect [8]. This coinsurance effect eliminates the degree of financial constraints of firms and hence makes the firms to be apter to connect with the external capital market [7]. However, the coinsurance effect would also motivate the unconstrained firms' managers to invest in some value-reducing programs with large borrowing abilities and surplus cash flows [7], which would lead to value loss.

There are two factors affecting financial constraints of the firms: size and payout ratio. Larger firms have superiority in accessing capital market than smaller firms and hence suffer fewer financial constraints [12]. The payout ratios of financially constrained firms are lower than those unconstrained, since the latter with higher payout ratios can achieve sufficient financial resources through their internal markets [5]. The study assessed the firm size by logarithm of total assets and measured the payout ratio by the ratio of dividends to total assets. I then ranked all firms according to these two criteria in each year of the sample period and divided them into two groups. The firms whose size was above the mean size in that year and payout ratio exceeded the mean value of annual payout Ire regarded as financially unconstrained group, while firms with figures below benchmark are assigned to the financially constrained group. In the sample, there are 64.02% of unconstrained groups that are diversified firms and the rest 35.98% are single firms. While in the constrained group, only 31.69% are diversified firms and 68.31% are single firms, which is consistent with diversified firms that are more prone to face less stringent financial constraints.

Table 6: The Effect of Coinsurance

Excess Value				
	Using asset multiples		Using sales multiples	
	unconstrained	constrained	unconstrained	constrained
Intercept	0.289***	-0.046	-0.053	-0.301***
	(0.00)	(0.23)	(0.67)	(0.00)
Diversification Indicator	-0.231***	-0.157**	-0.602***	-0.446***
	(0.01)	(0.02)	(0.00)	(0.00)
Operating Margin	-0.007	-0.007***	0.384**	-0.009**
	(0.95)	(0.01)	(0.04)	(0.03)
Capital Expenditures	-0.448***	-0.074	0.990***	0.447***
	(0.00)	(0.45)	(0.00)	(0.00)
Observations	155	353	162	369
Adjusted R-Squared	0.10	0.04	0.15	0.20

***, ** and * denote significance at the 0.01, 0.05, and 0.10 level, respectively.

Table 6 reports the regression of excess value on diversification indicator variables that equals one if the firm is diversified and equals zero if the firm is single, and control variables (EBIT to sales and capital expenditures to sales) in both unconstrained group and constrained group, which are used to find out the correlation between financial constraints and value change. The result shows that value loss occurs in both financially unconstrained firms and constrained firms with the negative and significant coefficients of diversification indicator. The percentage loss occurring in unconstrained firms is even larger than that in constrained firms, which is adverse to the original hypothesis 3 where coinsurance effect is favorable to firm values. That is to say, although diversified firms are more likely to be affected by coinsurance effect and hence to be financially unconstrained, the firm value losses are still inevitable. Therefore, the original hypothesis should be rejected and alternative ones that the coinsurance effect brought by diversification would not impact positively on firm value by removing financial constraints to some degree through coinsurance effect.

5. Conclusion

This study finds out that a significant loss of firm value in corporate diversification, but fails to provide the evidence for the hypothesis that undertaking diversification in related industries can impact positively on value changes, such as reducing value loss from diversification. In addition, the study provides the correlation between value changes and potential sources, and hence confirm the

hypotheses that firm diversification reduces firm value through effects of cross-subsidization. The coinsurance effect would not impact positively on firm value by removing financial constraints as expected.

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