

The Impact of International and Industrial Diversification Strategies on Firms' Overinvestment of Free Cash Flow

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Abstract

We examine the quarterly data of Compustat's all active and research firms from the first quarter of 1999 to the fourth quarter of 2005. Using a dataset that includes more than 79,000 firm quarters, we look at the impact of diversification on the firms' tendency to over-invest their free cash flow. Our fixed-effects regressions show positive and significant effect of the interaction between industrial diversification and free cash flow on the degree of over-investment. That is, firms tend to over-invest their free cash flow as they become more industrially diversified.

I. Introduction

The question of whether international diversification and industrial diversification strategies create or destroy value has been extensively researched in the financial economics literature. The outcome of the research in the area is conflicting; with no clear consensus on whether the two diversification strategies create or destroy value. Even in the absence of consensus on the value-creation/value-destruction frontier, some characteristics of diversified firms have been attributed to value created and others to value destroyed by diversification. Among the characteristics of diversified firms that underlie the value destruction impact of diversification are: agency cost (Denis et al., 1997), information asymmetry (Scharfstein and Stein, 2000), over-investment (Berger and Ofek, 1995; Blanchard et al., 1999), and inefficient capital markets (Lamont, 1997; Lamont and Polk, 2002). On the other hand, studies that find value creation from diversification have associated the value created with the following characteristics of diversified firms: market completion (Errunza and Senbet, 1981, 1984), internalizing the market for intangible assets (Morck and Yeung, 1991), and increased debt capacity (Lewellen's, 1971).

There is also a documented evidence that firms have the tendency to over-invest their free cash flow (Richardson, 2006) and over-investment problem has been associated with agency problems in firms (Jensen, 1986). In this paper, we tie the two strands of literature, diversification as well as over-investment of free cash flow, and directly assess the impact of diversification strategy on the over-investment of free cash flow. We pose the question of whether the two diversification strategies exasperate or mitigate the over-investment problem. Using a novel approach of measuring over-investment as well as free cash flow, as developed by Richardson (2006), we assess the impact of the two diversification strategies on the over-investment of free cash flow.

We add to the literature evidence that industrial diversification actually exasperates the over-investment of free cash flow. In addition, our findings are consistent with an already documented evidence that industrial diversification destroys value. Coupled with an existing literature that agency costs contribute to value destruction by industrial diversification, our findings lead us to believe that over-investment of free cash flow by industrially diversified firms is another manifestation of agency problems in industrially diversified firms.

II. Literature Review and Hypotheses

In frictionless capital markets, firms could raise capital from external sources at the same cost as that of internal sources to finance their positive NPV projects. However, friction in the capital markets may make the cost of raising capital internally cheaper than the cost of raising it externally. Hence firms may be inclined to finance their projects using internal sources of funds and at the same time over-invest their free cash flow in negative NPV projects (Jensen, 1988). Richardson (2006) has found that firms have the tendency to over-invest their cash flow. Richardson (2006) defines free cash flow as cash flow beyond what is needed to finance positive NPV projects, and defined over-investment as negative NPV investment. We examine the relationship between over-investment and free cash flow in light of international and industrial diversification. We examine whether internationally and industrially diversified firms are more or less inclined to over-invest as their free cash flow increases. That is, do the two types of diversification strategies affect the relationship between over-investment and free cash flow of firms?

There are two reasons why the two diversification strategies may lead firms to mitigate over-investment of their cash flow. First, positive relationship between excess value and firms' level of internationalization has been documented for US firms (Errunza and Senbet, 1981, 1984; Morck and Yeung, 1991, 2001; Bodnar et al., 1999). Morck and Yeung (1991) find evidence that U.S. acquiring firms with information-based intangible assets experience a significantly positive stock price reaction upon announcing a foreign acquisition. That is, a firm's Tobin's Q increases as result of the firm internalizing the value of foreign markets for the firm's intangible assets. Therefore, greater investment opportunities created in different geographic areas of the world may make firms less inclined to over-invest in negative NPV projects. The growth opportunities internationally diversified firms could enjoy in several geographic markets and the number of viable positive NPV projects that come with geographic expansion could lead international diversification to mitigate the relationship between free cash flow and over-investment. Second, diversification may increase operating efficiency, and when internal capital markets within the firm operate efficiently, firms could have the opportunity to utilize their internal resources in subsidiaries that could efficiently utilize it. Lundstrum (2003) finds evidence that diversified firms' access to internal capital market is positively related to firm value when firms face low levels of information problems. Therefore, diversification may reduce the impact of free cash flow on firm's tendency to over-invest.

On the other hand, diversified firms tend to have higher information asymmetry problems, higher agency cost as well as inefficient cross-subsidization of less profitable business units. Firm diversification may be as a result of managerial self-interest; therefore, diversified firms may have the tendency to over-invest firm's free cash flow (Jensen and Merklings, 1976; Jensen, 1986). Diversification could also result in more complex business structure and higher information asymmetry that increases the cost of capital of the firm (Doukas and Pantzalis, 2003). Lamont (1997) and Shin and Stulz (1998) find evidence of cross-subsidization of poorly performing divisions of conglomerates by other divisions. Thus, when diversification is agency motivated, it may result in over-investment of free cash flow. We put forth the following two hypotheses.

Hypothesis One: International diversification has no effect on the relationship between free cash flow and over-investment. A positive α_4 in equation (1) is consistent with agency motivated international diversification strategy, while a negative α_4 is consistent with the presence of efficient capital market within the internationally diversified firms.

Hypothesis Two: Industrial diversification has no effect on the relationship between free cash flow and over-investment. A positive α_5 in equation (1) is consistent with agency motivated explanation of industrial diversification strategy, while a negative α_5 is consistent with the presence of efficient capital market within the industrially diversified firms.

III. Data and Methodology

A. Data

The sample is compiled from Compustat quarterly data from Q1Y1999 to Q4Y2005. We started our sample with all active and research firms in the Compustat database. Firms with SIC codes from 6000-6999 and 4000-4999 are excluded from our sample. American Depository Receipts (ADRs) are also excluded from the sample. We use Compustat Industrial segment files (C.I.S) to find segment-related information for industrially diversified firms, and Compustat Geographic Segment files (C.G.S) to find segment information for internationally diversified firms.

SFAS No. 14 requires firms with more than 10% of their consolidated sales to report income or assets from operations outside of the U.S., to report data on unaffiliated sales, income and identifiable assets for non-domestic operations. SFAS No. 14 requires firms to report data for any activity segment making up more than 10 percent of the firm's consolidated revenues, operating income, or identifiable assets. Following Kim and Mathur (2005) we limit our sample period to the period after the adoption of Statement of Financial Accounting Standard (SFAS) No. 131, the rule that supersedes SFAS No. 14. This will avoid the effect of the SFAS 131 in our findings (Kim and Mathur, 2005). Firms with total sales of \$20 million or less are eliminated from the sample. The sample screening criteria is similar to that of Denis et al (2002). We winsorize the sample on the bottom 1% for Cash Holdings, Cash flow from operations, Depreciation and Amortization, operating income after depreciation and amortization, first-order lag of Firm Value as computed in Table I, first-order lag of stock return, and on the top 1% , for Cash Holdings, Cash flow from operations, Depreciation and Amortization, operating income after depreciation and amortization, first-order lag of Firm Value, first-order lag of stock return, research and development expense, capital expenditure, acquisition, sale of property, plant and equipment, and debt ratio. After deleting observations with missing data, our sample size for the entire sample period includes 79,755 firm quarters.

A firm is classified as internationally diversified if it reports foreign sales in the Compustat Geographic Segment file, and is classified as industrially diversified if it reports more than one segment in the Compustat Industrial Segment file. Following Kim et al. (2005) firms are classified into four groups, single-segment domestic firms (SD), single-segment geographically diversified firms (SG), multi-segment domestic firms (MD), and multi-segment geographically-diversified firms (MG).

B. Measures of International Diversification and Industrial Diversification

To measure the impact of international diversification, we use the percentage of foreign sales of a company from Compustat Geographic Segment files (C.G.S). To measure the degree of industrial diversification we use (1 - Herfendeil Index) coded as HR_INDEX. HR_INDEX is measured between 0 and 1 and is directly related with the degree of industrial diversification. We compute sales based Herfendeil Index as the sum of squared segment sales divided by the square of total firm sales. Segment related information is obtained from Compustat Industrial segment files (C.I.S).

C. Methodology

To test the two hypotheses we start by computing over-investment variables as in Richardson (2006). Richardson (2006) develops an accounting based definition of over-investment and free cash flow and finds positive relationship between free cash flow and the practice of over-investment. The author develops an over-investment variable that is residual from a model that estimates expected investment of a firm on positive NPV projects, and free cash flow variable as a difference between cash flow from existing assets and expected investment in new projects. Table I, prepared based on definition of variables and tables from Richardson (2006), depicts the development of the over-investment and free cash flow variables. After estimating the free cash flow and over-investment variables following Richardson(2006), we examine the impact of international diversification on the relationship between free-cash flow and over-investment. The hypothesis is tested using the following model.

$$\text{OverInvstment}_{it} = \alpha_0 + \alpha_1 \text{FCF}_{i,t} + \alpha_2 \text{Total Foreign Sales}_{i,t} + \alpha_3 \text{HR_INDEX}_{i,t} + \alpha_4 \text{Total Foreign Sales}_{i,t} * \text{FCF}_{i,t} + \alpha_5 \text{HR_INDEX}_{i,t} * \text{FCF}_{i,t} + \varepsilon_{i,t} \dots \dots \dots (1)$$

Where $\text{OverInvstment}_{it}$ is an over-investment measure defined as I_{NEW}^e in Table I , and $\text{FCF}_{i,t}$ is a free-cash-flow measure as defined Table I. The other variables are as defined in section III(B).

IV. Univariate Tests

A. Over-investment of Free Cash Flow

Figures 1 and Figure 2 show the average and median over-investment for the four diversification groups, for the sample period starting in Q3Y1999. Two lags are lost in estimating the free cash flow. The graphs show single-segment, internationally diversified firms had the highest rate of over-investment than the other groups for the most of the sample period. Multi-segment, internationally diversified firms had, on average, higher rate of over-investment than multi-segment, domestic firms for most of the sample period. Figure 2, shows the median over-investment for the sample period. The median over-investment for each of the four groups compare similarly to those of Figure 1. A cursory view of the graphs shows that single-segment, internationally diversified and single-segment, domestic firms had higher rate of over-investment for the sample period.

Table I
Over-investment and Free Cash Flow Variables

The following relationships elaborate the how Free Cash Flow and Over-investment are estimated as proposed by Richardson(2006). We use the measures of over-investment and free cash flow, developed by Richardson (2006) and illustrated below, to asses the impact of the two diversification strategies on the relationship between over-investment and free cash flow using Equation 1.

$$I_{TOTAL\ i,t} = CAPEX_{i,t} + ACQUISITIONS_{i,t} + RD_{i,t} - SalePPE_{i,t}$$

$$I_{MAINTENANCE\ i,t} = \text{Amortization and Depreciation}_{i,t}$$

$$I_{NEW\ i,t} = I_{TOTAL\ i,t} - I_{MAINTENANCE\ i,t} \quad I_{NEW\ i,t} = I_{NEW\ i,t}^e + I_{NEW\ i,t}^*$$

The following pooled regression is used to estimate the estimated amount of quarterly investment

$$I_{NEW\ i,t} = \beta_0 + \beta_1 V/P_{i,t-1} + \beta_2 Leverage_{i,t-1} + \beta_3 Cash_{i,t-1} + \beta_4 Age_{i,t-1} + \beta_5 Size_{i,t-1} + \beta_6 StockReturns_{i,t-1} + \beta_7 I_{NEW\ i,t-1} + \sum QuarterIndicator + \sum IndustryIndicator + \varepsilon_{i,t} \quad (A)$$

V/P is a measure of growth opportunities and is calculated as V_{AIP} divided by market value of equity.

V_{AIP} is calculated as follows: $V_{AIP\ i,t} = (1 - \alpha r) BV_{i,t} + \alpha(1+r)X_{i,t} - \alpha rd_{i,t}$ where, $\alpha = (\omega / (1+r - \omega))$

Where BV is the book value of common equity, X is operating income after depreciation, and d is quarterly dividend. ω is the abnormal earnings persistence parameter from Ohlson(1995) estimated following Dechow et al. (1999). $r = 12\%$, and $\omega = 0.51$.

I_{NEW}^* is the predicted value from the model (A), and I_{NEW}^e is the residual value from Model (A). I_{NEW}^* is interpreted as estimated investment, while I_{NEW}^e is the amount of over-investment.

Leverage is (short-term debt + long-term debt) / total assets, Cash is (cash + short-term investments) / total assets, Age is the number of year the firm has been in CRSP, Size is the log of total firm assets in Q1Y1999 dollars, StockReturns is the stock return of firm prior to the investment year computed as the change in the market value of the firm. QuarterIndicators capture the quarterly effects, Industry Indicators capture industry effects (Fama-French, 1997 groupings)

$$CF_{AIR\ i,t} = CFO_{i,t} + RD_{i,t} - I_{MAINTENANCE\ i,t}$$

$CFO_{i,t}$ is quarterly cash flow from operations, RD is quarterly research and development, and $I_{MAINTENANCE}$ is Amortization and Depreciation $_t$

$$FCF_{i,t} = CF_{AIR\ i,t} - I_{NEW\ i,t}^*$$

$FCF_{i,t}$ is an estimate of free cash flow beyond what is needed for expected investment.

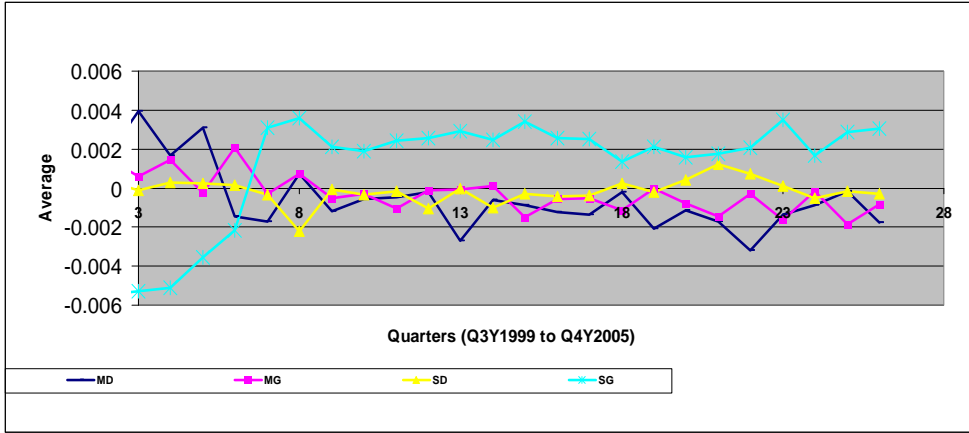


Figure 1. Mean Over-Investment - The trend of the mean over-investment for each diversification group from Q3Y1999 to Q4Y2005.

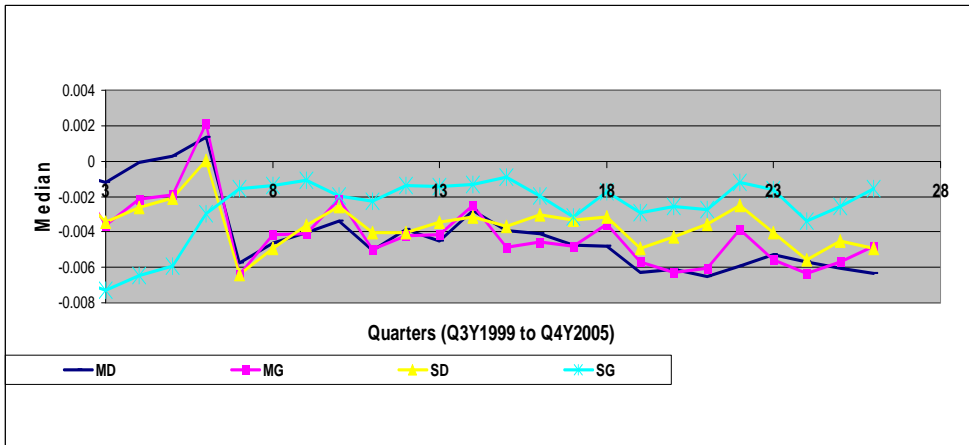


Figure 2. Median Over-Investment - The trend of the median over-investment for each diversification group from Q3Y1999 to Q4Y2005.

Table II is a descriptive statistics of the variables in equation 1 as well as diversification related variables. The sample size is 79,755 firm quarters, and diversified firm-quarters make more than 62% of the sample size. The average degree of over-investment is 0, however the standard deviation of over-investment is 2.7% of total assets per quarter with firms on the lower quartile under-investing and firms on the upper quartile over-investing. The average and the median quarterly free cash flow of firms are both positive with 0.45% and 0.5% of book value of assets, respectively.

B. Univariate Tests of Factors that Affect Over-Investment of Free Cash Flows

Table III is a univariate test of the factors that determine the amount of over-investment. Firms are classified between two groups. Firm quarters with over-investment greater than the median are classified into one group, and firm quarters with over-investment below the median are classified into another group. T- test and Wilcoxon Z-score is conducted for the each diversification group. Firms with above average level of over-investment tend to be larger, with more free cash flow, less industrially diversified, more internationally diversified, and with higher Market-to-Book ratio. Firms with above the median level of over-investment have higher amount of free cash flow than firms below the median over-investment. The same holds for all diversification groups, with the largest difference being for single-segment and multi-segment internationally diversified firms. Thus, the univariate test of the relationship between over-investment and free cash flow is consistent with positive relationship between free cash flow and over-investment as documented in the literature.

Table II

Descriptive Statistics for free cash flow and over-investment variables

The sample includes a quarterly data from active and research files of Compustat from Q3Y1999 to Q4Y2005. **OverInvestment** (I_{NEW}^e) is residuals from a regression of New Investment on determinants of New Investment as defined in Table I. **Free Cash Flow** is Cash Flow from Operation + R&D expenditure – Depreciation Expense – fitted value of New Investment from a regression on determinants of New Investment (Richardson, 2006). **TFSALEP** is percentage of foreign sales to total firm sales and is used as a measure of international diversification. **HR_INDEX** is (1 - Herfindahl Index), and is used as proxy for industrial diversification. **Real Size** is the log of total firm assets in Q1Y1999 dollars, **Market-To-Book** is (Book Value of Total Assets – Book Value of Equity + Market Value of Equity)/ Book value of Total Asset. I_{TOTAL} and I_{NEW} are defined in Table I.

Label	N	Mean	Lower Quartile	Median	Upper Quartile	Std Dev
<i>SD Proportion</i>	79755	0.3789	0.000	0.000	1.000	0.485
<i>SG Proportion</i>	79755	0.1794	0.000	0.000	0.000	0.384
<i>MD Proportion</i>	79755	0.1770	0.000	0.000	0.000	0.382
<i>MG Proportion</i>	79755	0.2648	0.000	0.000	1.000	0.441
<i>HR_INDEX</i>	79755	0.1960	0.000	0.000	0.444	0.258
<i>Total Foreign Sales</i>	79755	0.1699	0.000	0.000	0.293	0.259
<i>Over Investment (I_{NEW}^e)</i>	74914	0.0000	-0.012	-0.004	0.007	0.026
I_{TOTAL}	79735	0.0231	0.006	0.015	0.032	0.027
I_{NEW}	79735	0.0096	-0.004	0.003	0.019	0.028
<i>Real Size</i>	79755	5.7517	4.405	5.606	6.919	1.820
<i>Market-To-Book</i>	79260	1.8807	1.057	1.401	2.077	1.855
<i>Free Cash Flow</i>	74917	0.0045	-0.017	0.005	0.027	0.044

Table III**Univariate tests of variables for firms above the median over-investment and firms below the median over-investment**

Firm quarters are classified into groups. Firm quarters above the median over-investment are classified into groups with High over-investment rate and firm quarters below the median are classified into groups with Low over-investment. The univariate test of mean between the variables of the two groups are provided in the table. The sample includes a quarterly data from active and research files of Compustat from Q3Y1999 to Q4Y2005. *OverInvestment* is residuals from a regression of New investment on determinants of new investment as defined in Table I. *Free Cash Flow* is Cash Flow from Operation + R&D expenditure – Depreciation Expense – fitted value of New Investment from a regression on determinants of New Investment (Richardson, 2006). *TFSALEP* is percentage of foreign sales to total firm sales and is used as a measure of international diversification. *HRINDEX* is (1 - Herfindahl Index), and is used as proxy for industrial diversification. *Real Size* is the log of total firm assets in Q1Y1999 dollars, *Market-To-Book* is (Book Value of Total Assets – Book Value of Equity + Market Value of Equity) / Book value of Total Asset. *** p<0.01, ** p<0.05, * p<0.1

	Two-Groups	Real Size	FCF	HRINDEX	TFSALEP	Market-To-Book
Total	High	5.806	0.0097	0.1922	0.1786	1.9036
	Low	5.7037	-7.40E-04	0.1994	0.1622	1.8604
	T-test	7.93***	33.09***	-3.95***	8.93***	3.31***
	Z-Score	7.67***	35.76***	-4.69***	7.75***	11.38***
SD	High	5.344	0.0075			1.824
	Low	5.1319	-0.003			1.792
	T-test	11.35***	17.89***			1.56
	Z-Score	11.71***	19.19***			6.81***
SG	High	5.5266	0.0132		0.4269	2.43
	Low	5.6972	0.0016		0.4045	2.356
	T-test	-6.16***	15.59***		4.84***	1.54
	Z-Score	-6.88***	17.31***		5.65***	7.28***
MD	High	5.7734	0.0086	0.4079		1.665
	Low	5.5578	-0.003	0.4024		1.617
	T-test	7.06***	16.41***	1.6		2.50**
	Z-Score	7.95***	16.44***	1.12		2.80***
MG	High	6.6936	0.0113	0.4707	0.3686	1.8194
	Low	6.6157	0.002	0.4686	0.3531	1.788
	T-test	3.04***	17.9***	0.77	4.44***	1.64
	Z-Score	2.51**	19.81***	0.64	5.09***	3.44***

V. Multivariate Tests

To test the two hypothesis, we run a fixed-effects regression model as shown in Table IV. Table IV is fixed-effect regression of all firms as well as for each diversification group

separately. The fixed effect regression controls for firm effect as well as time effect and the standard errors for the coefficients are robust. We run the regression for the entire sample as well as for each diversification group. The free cash flow is significant for the entire sample, as well as for each diversification groups. Thus, we find significant and positive relationship between free cash flow and degree of over-investment in our sample, as documented in the literature.

Table IV
Fixed-Effects Regression of Over-investment of Free Cash Flow

Dependent Variable is Quarterly *OverInvestment*. The models are fixed-effects regressions of quarterly *OverInvestment* on *Percentage of Foreign Sales*, *HR_INDEX*, *Free Cash Flow*, and interaction variables. The sample includes a quarterly data from active and research files of Compustat from Q3Y1999 to Q4Y2005. The first regression is a fixed effects regression on the entire sample, while the other four regressions are fixed effects regressions for each diversification group. *OverInvestment* is residuals from a regression of New investment on determinants of new investment as defined in Table I. *Free Cash Flow* is Cash Flow from Operation + R&D expenditure – Depreciation Expense – fitted value of New Investment from a regression on determinants of New Investment (Richardson, 2006). *Total Foreign Sales* is percentage of foreign sales to total firm sales and is used as a measure of international diversification. *HR_INDEX* is (1 - Herfindahl Index), and is used as proxy for industrial diversification. Robust t statistics in parentheses *** p<0.01, ** p<0.05, * p<0.1

COEFFICIENT	Total	SD	SG	MD	MG
<i>Total Foreign Sales</i>	0.00471** * (3.276)		0.00990** * (2.694)		0.000416 (0.134)
<i>HR_INDEX</i>	0.00382** * (2.936)			-0.0019 (-0.504)	0.00576* * (2.099)
<i>Free Cash Flow</i>	0.0610*** (16.5)	0.0579** * (13.42)	0.0624*** (4.983)	0.0481*** (3.299)	0.0442** * (2.933)
<i>TotalForeign Sales* Free Cash Flow</i>	0.0221* (1.706)		0.0490* (1.809)		0.0187 (0.826)
<i>HR_INDEX * Free Cash Flow</i>	0.0454*** (3.287)			0.0994*** (2.621)	0.0611** (1.997)
<i>Constant</i>	-0.000788 (-1.303)	0.00156* * (2.001)	- 0.00756** * (-3.931)	0.00581** * (2.731)	-0.00312 (-1.615)
Observations	74914	27944	13647	13170	20153
Number of groups	5262	3044	1129	1077	1278
R-squared	0.014	0.014	0.029	0.026	0.013
F	19.13	9.143	5.489	7.221	5.291

Total Foreign Sales and *HR_INDEX* are positive and significant for the firms in the regression, indicating that both types of diversification are associated with over-investment. However, the positive impact of *Total Foreign Sales* on the amount of over-investment only holds for single-segment diversified firms, and the positive impact of *HR_INDEX* on the amount of over-investment holds only for the multi-segment geographic firms. Thus, there is evidence that both types of diversification strategies positively affect the amount of over-investment. We find evidence that international diversification has positive impact on the degree of over-investment for single-segment internationally diversified firms but not for multi-segment diversified firms. On the other hand, industrial diversification has positive impact on the amount of over-investment for multi-segment internationally diversified firms but not for multi-segment domestic firms. In addition, although each diversification group has a positive relationship between free cash flow and the amount of over-investment, single-segment internationally diversified firms tend to have the highest coefficient of free cash flow, which is in consistent with Figures 1 and 2, indicating single segment internationally diversified firms tend to over-invest their free cash flow more than the other groups do.

When we examine, the effect of the two diversification strategies on the relationship between free cash flow and amount of over-investment, we find the interaction of *Total Foreign Sales* with *Free Cash Flow* to be barely significant, while the interaction of *HR_INDEX* with *Free Cash Flow* is positive and significant at less than 1% for two of the regressions and at less than 5% for the last regression. Thus, we find strong evidence that industrial diversification increases the propensity of firms to use their free cash flow to invest in negative NPV projects. This is in consistent with agency motivated explanation of industrially diversified firms being valued at discount.

VI. Conclusion

In this paper we examine the relationship between over-investment and free cash flow in light of international and industrial diversification. We examine whether internationally and industrially diversified firms are more or less inclined to over-invest as their free cash flow increases. That is, do the two types of diversification strategies affect the relationship between over-investment and free cash flow of firms?

After looking at compustat's quarterly data from the first quarter of 1999 to the last quarter of 2005, we find that over-investment of the free cash flow is strong across all diversification groups and consistent with existing literature. However, our strongest finding is that that industrial diversification exasperates the over-investment of free cash flow. The result is in consistent with agency motivated explanation of industrially diversified firms being valued at discount.

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