Product Diversification and debt maturity:

an empirical investigation for the USA.

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Abstract:

Product diversification and debt maturity: An empirical investigation for the USA.

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This study investigates whether product diversified firms tend to have more long-term debt compared to non-diversified firms. To conduct this study a sample of 45676 U.S. based firms was taken from a period of 1969 to 2009. Only firms with operations within the United States were considered for this study. Geographic diversified firms were excluded for simplicity. The long-term debt level of non-diversified firms was compared with product diversified firms for various product lines, and the results showed that product diversified firms do have more long term debt compared to non-diversified firm's debt. Additionally debt levels increase with the increase in the number of products.

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Table of Contents

List of Figures and Tables

Chapter 1: Introduction

1.1 Background:

In finance, from an investor's point of view, diversification means to hold a portfolio of stocks with different correlations among the stocks. The main purpose is to minimize the systematic risk and to compensate the loss of one stock with profits from another. From a firms point of view it might want to diversify its business or operations to reduce the bankruptcy or default risk, to increase the growth potential of the company and/or to maintain a steady profit margin. A firm can diversify its business by increasing product lines and operating within the same country or they can also expand their operations across different countries.

Financing structure also plays a crucial role on a firm's diversification strategy as it has various options to finance its business activities, but the most common is equity debt financing. In debt financing a firm might decide to take short-term debt and/or long-term debt. In general, short-term debts are liabilities which are paid within a year, whereas long-term debts are liabilities with a duration of more than 1 year.

We live today in a globalized world. Cross-border trade is a common phenomenon and it also allows firms to operate in various markets, targeting different customers, which leads to diversification being an important topic for most of the firms and grabs the attention of researchers. The literature has a rich array of research to explain why firms might want to diversify their business. To name some of this research work which has tried to explain a firm's choice on product diversifications can include, agency theory (Jensen, 1986), transaction cost economics (Williamson, 1975), the

resource- based view of the firm (Penrose, 1959), industrial organization (Palepu, 1985) and strategic contingency theory (Venkatraman, 1989). Among these topics, agency theory, transaction cost economics and the resource-based view of the firm are perhaps the most promising.

According to the resource based view, a firm should attempt to implement an effective diversification strategy if it has excess resources. Agency theory suggests that the manager of a firm plays an important role in the decision to implement an effective diversification strategy. Diversification generally increases company growth and reduces the risk for a firm's bankruptcy risk, which might lead to a rise in manager's compensation and also diversification minimizes employment risk (Jensen, 1986). Finally, according to transaction cost economics, firms diversify to realize benefits of economies of scope and economies of internal capital markets (Jones and Hill, 1988).

> "Economies of scope arise when the costs of jointly producing two products are lower than the costs of producing them separately". P-2, (Teece, 1982).
>
> "In an internal capital market, the corporate headquarters attracts cash flows, reallocates them to the most attractive investment proposals of the divisions, and monitors their deployment". P-2, (Williamson, 1975).

On the other hand we have also seen significant developments to understand the firm's dynamic financing decision. Debt maturity significantly influences the expected probability of bankruptcy. According to Dangl and Zechner, 2006.

> "If the costs of financial distress are large and the transactions costs for rolling over debt are low, then firm value is generally maximized by choosing short debt maturities. If costs of financial distress are low and costs for rolling over debt are high, then the indirect benefit for equity holders originating from debt reductions is negligible compared to the additional transactions costs associated with short-term debt. In this case, it is better to issue debt with long-term maturity". P-4.

In this paper the main focus is to link these two important strategies of product diversification and financing structure based on short and long-term debt. We would want to find out whether any significant trend exists between firms with diversified product lines and their financing structure and firms with non-diversified product lines and their financing structure.

1.2 Statement of the problem:

Research on the relationship between product diversification and capital structure is scarce. Some of the earlier studies in this area include Barton and Gordon (1987, 1988) and Lowe, Naughton and Taylor (1994). The general finding of these studies is that industry diversified firms with various product lines tend to have steady net income compared to specialized firms. Due to less volatility industry diversified firms can choose debt with long-term maturity and enjoy more favourable interest rates. But the above argument then raises a question which is how many different product lines a firm must have to be considered as an industry diversified firm?

1.3 Purpose of the study:

The first objective of this study is to determine whether firms with product diversification tend to have on average more long-term debt compared to specialized firms. To justify product diversification a robust test will be conducted. Diversification will be first defined as a firm with more than 1 product line and we will then test to look for the pattern. Then diversification will be defined for firms with more than 2 product lines and will repeat the test and the findings will be noted and the whole process will be repeated, but every time the number of product lines will increase by 1. The second

objective is to find a reason why a diversified firm tends to go for longer term debt maturity. For the second objective a regression model will be used to support the pattern found in the results of the first objective.

1.4 Justification of the study:

A lot of research work has been done to find out why firms go for product or geographic diversification. Also we have seen some research work for the firms financing choices and what are the key components that determine such choices. But very few studies are found to test the relationship between a company's organization structure and financing activities. So this study will provide additional empirical evidence to see whether any significant trend exists or not between a company's organization structure based on product diversification and financing activities, short-term and long-term debt. We will use recent data of U.S. based companies.

1.5 Organization of the study:

This study is broken down into five distinct chapters: The current chapter has provided a brief review of the research topic and the purpose of the study; Chapter 2 provides a review of the current literature and the subsequent foundation on which this study is built upon; Chapter 3 provides the methodology utilized for this study and Chapter 4 the empirical results and analysis. Finally Chapter 5 will provide a summary of the study and recommendations.

Chapter 2: Literature Review

In this chapter we will provide a review of the literature which mainly focuses on the issue of diversification and leverage and their joint or individual effect on firm's performance or valuation. From the previous research literature we would want to see whether product diversification has some favourable effect on firm's performance which can lead a firm to go for more debt and a trend between diversified firms and their debt maturity compared to specialized firms can be established.

2.1 Diversification and Leverage:

Lots of research work for example, "Debt maturity and dynamics of leverage", Dangl and Zechner, 2006, "Governance structure, product diversification and performance", Oijen and Hendrikse, (2002), has been performed separately between the association of financial leverage and valuation and diversification and valuation. But not a lot of research work is found which considers financial leverage, diversification and valuation jointly. Ruland and Zhou, (2005) explained that diversified firms tend to have higher free cash flows and fewer high net present value investment opportunities. They also found that agency cost is higher for diversified firms due to the higher free cash flows. They have also explained that financial leverage should reduce agency costs for diversified firm, which in turn will increase the value of the firm. Their tests also show a strong support for their hypothesis which is

> "The value of diversified firms increase with leverage and this tendency is not observed for specialized firms". P-277.

So it can be concluded that leverage will be more useful for diversified firms compared to specialized firms in most of the cases as diversified firms tend to have more free cash

flow and are expected to experience more agency costs. Jensen (1986) shows that leverage may be used to reduce free cash flows and the agency costs associated with potential over-investment.

Cash flows and investment opportunities are the two main important criteria which vary between diversified firms and specialized firms. Compared to specialized firms, diversified firms tend to generate high free cash flows (Whited, 2001). According to Ruland and Zhou, 2005, leverage should be more beneficial for diversified firms to reduce agency costs compared to specialized firms as diversified firms tend to carry more free cash flows and have less investment opportunities. On the other hand leverage also has some negative effect on the firm because the risk of bankruptcy and financial distress costs tend to increase with the increase of leverage. But overall leverage contributes to the value of diversified firms, but not for specialized firms (Ruland and Zhou, 2005).

Ruland and Zhou, (2005) used firm-specific financial data from the annual database of Standard and Poor's 2003 *Compustat* Industrial and Merged Industrial Research files. Segment information are obtained from the *Compustat* Segment files and the managerial ownership data are from *ExecuComp*. They collected data from 1990 to 2001. The results they found were that diversified firms compared to specialized firms use more debt, are larger in size and are more profitable and their statement is also consistent with Berger and Ofek (1996). They also confirmed that diversified firms have higher cash flows than specialized firms and the capital expenditure are almost same for both groups. This finding suggests that diversified firms have increased potential for overinvestment relative to specialized firms following the suggestion of Jensen (1986). Ruland and Zhou's (2005) paper suggests that even though leverage has some negative

impact on the firm, that problem should be more applicable to specialized firms than to diversified firms. Therefore, the theory suggests a higher association between leverage and valuation for diversified firms than for specialized firms.

In my research work I want to determine whether a trend exists in an industry diversified firm to have more long term debt compared to specialized firms. Based on those previous research works it looks like leverage does have more favourable effects on diversified firms compared to specialized (non-diversified firms). If my result shows any trend, then I would want to find out why we observe such a trend which can be most likely as diversified firms have more free cash flows and less volatile net income.

Low and Chen, (2004) examined the effect of international and product diversification on capital structure with 232 firms from 30 countries. Their results also show that product diversification is positively related to financial leverage, indicating that such diversification allows firms to reduce their risk, thereby enabling firms to carry higher debt level. Their study shows that as with international diversification, product diversification is also associated with a reduction in a firm's business risk. Some of the early studies which were performed considered both product diversification with capital structure and viewed diversification to be negatively related to risk and thus positively related to high debt level (see for example Barton and Gordon, 1987, 1988; Lowe, et al, 1994). With business across several product lines, net income of such a firm is less volatile. To test this relationship Low and Chen, (2004) used a hypothesis that there is a positive relationship between product diversification and leverage. They found that international diversification, unlike product diversification, appears not to be a significant

determinant of leverage. Product diversified firms carry higher debt than non-product diversified firms.

Not a lot of research can be found between the relationship of product diversification and capital structure. Some of the earlier studies in this area include Barton and Gordon (1987, 1988) and Lowe, et al (1994). Most of those studies showed that product diversified firms have higher debt ratios due to their low risk level. Some other related research conducted include the agency cost of debt (Jensen and Meckling, 1976; Myers, 1977), the signaling effect on firm's quality (Ross, 1977; Leland and Pyle, 1977) and the use of debt to overcome the free cash flow problem (Jensen, 1986).

2.2 Effect of Product Diversification on firm's performance:

Aswin and George, (2002) studied the diversification strategies of cooperatives and compare them with corporations. Oijen and Hendrikse defined corporations as

> "Corporations have shareholders. The shares give them rights to the assets, including the rents, of the corporation. The shares can be traded with relative ease. The managers of corporations can but do not necessarily have to own shares of the firm". P-1.

And they defined Cooperatives as

> "Cooperatives have members, who have rights to the assets, including the rents of the cooperative. The rights are difficult to transfer from one member to another. In addition, the members are suppliers or customers of the cooperative (or both). Cooperatives are managed by managers who are usually not a member of the cooperative". P-1.

They have used two hypotheses for their research paper. Hypothesis 1: Cooperatives are less diversified than corporations and Hypothesis 2: Cooperatives diversify relatively more into unrelated activities than corporations do. They used 118 companies for their

empirical study. The results of their study had an affirmative answer for the two questions they have raised, which is Q1: do the diversification strategies of corporations and cooperatives differ and Q2: do the diversification strategies of corporations and cooperatives have different implications for financial performance? They found that cooperatives diversify relatively more into unrelated activities than corporations do which has a negative influence on the performance of cooperatives, whereas it has no influence on the performance of corporations. Cooperatives differ from corporations in terms of performance, extent and type of product diversification. Therefore, their main conclusion is that governance structure does matter for product diversification and its performance.

The results of extensive empirical analysis of both product and geographical diversification effects on performance are inconclusive and contradictory, as Datta, et al (1991), and Grant, et al (1988) have discussed at length.

Another research paper by Tallman and Li, (1996) studied the effect of international and product diversification on the performance of the firm. If diversified firms have a favourable effect on their performance then it is more likely that they might go for more long term debt due to their stability in their performance. So all the research that has this finding that diversification has favourable effect on firms performance can be used as a strong supportive point for the reason of why diversified firms both geographic and product diversified tends to go for longer term debt. One of the hypotheses of Tallman and Li, (1996) paper was “Performance should vary positively with degree of product diversity.” Their results show that MNE performance increases as the diversity index increases, but after a certain point, it begins to decrease with further diversification. So this suggests that the relationship between product diversification and

performance is more complex and does not hold a linear relationship. With a sample of large American industrial multinational enterprises (MNEs), it showed a consistent quadratic relationship between product diversification and MNE performance but minimal performance variations across different measures of international diversification.

2.3 Firm's performance and Debt maturity:

There is evidence from previous research that diversification does have a positive effect on a firm's performance and provides stability on firm's earnings. Based on the results of this research, it can be assumed that diversified firms have better access to long-term debt maturity and diversified firms (international and industry diversified firms) do go for more long-term debt compared to specialized firms due to favourable interest rates, steady income and other factors such as size, liquidity etc. Schiantarelli and Sembenelli, (1995) investigated the determinants and consequences of the maturity structure of debt using data from a panel of U.K. and Italian firms. They found that duration plays an important role for firms to choose a maturity structure of debt. They conclude that more profitable firms (as measured by the ratio of cash flow to capital) tend to have more long-term debt due to the dominant role played by firms' fear of liquidation and loss of control associated with short-term debt. Also it reflects that financial markets are willing to go for long-term debt based on the income stability and risk level of the firm.

The data do not support the hypothesis that short-term debt through better monitoring and control, boosts efficiency and growth. If anything, the results support the opposite conclusion. In both countries the data suggest a positive relationship between

initial debt maturity and the firms' subsequent medium-term performance in terms of profitability and growth in real sales. In both countries, total factor productivity depends positively on the length of debt maturity. They document the relationship between firms' characteristics and their choice of shorter or long-term debt by estimating a maturity equation and interpreting the results in light of insights from the theoretical literature, and by analyzing the effects of maturity on firms' later performance in terms of profitability, growth, and productivity.

On the other hand, it is also important to know whether all those research result still hold in recent times, especially after the 2008-2009 financial crisis. Kuppuswamy and Villalonga, (2010), show that diversified firms value actually increased in that crisis period compared to single segment specialized firms. The results were not driven by firm's self-selection into the diversified status. In addition, as the financial crisis reflects exogenous shocks to external capital markets, their results cannot be attributed to endogenous differences in firms' financing constraints. That enables them to provide evidence between external financing constraints and corporate diversification.

Kuppuswamy and Villalonga (2010) also found that the increase in value for diversified firms did not simply reflect changes in investor sentiment or perceptions, but real differences in corporate finance and investment. The two main factors, which increased the value for the diversified firms in the crisis period were: 1) greater access to credit markets as a result of the debt coinsurance provided by conglomerates, and 2) access to (and/or more efficient use of) internal capital markets. While these financing alternatives are always available to diversified firms, the evidence suggests that they became particularly valuable during the crisis.

From the above discussion, in most of the cases it was found that product diversification does create value for the firm by reducing the agency costs, minimizing risk, earnings stability etc. The research paper conducted by Jensen (1986) also discussed the benefit of debt in reducing the agency cost of free cash flow.

The main focus of this paper is to link these two important strategies: product diversification and financing structure based on short and long term-debt. We wish to determine whether any significant trend exists between firms with diversified product lines and their financing structure and firms with non-diversified product lines and their financing structure.

Chapter 3: Research Methodology:

3.1 Sample:

To conduct this study of product diversification and debt maturities and to determine whether diversified firms tend to go for more long-term debt compared to specialized firms, two data files have been used: Compustat1950-2010 and file 173322115. All the data have been collected from S&P Compustat from a period of 1969 to 2009. Altogether there are 45676 firms and the maximum number of different product line is 33. All firms used in this study are U.S. based firms of various industries.

One of the main limitations of the data collection is that is that the data collected are from only one country, the USA and firms included in the sample are from various industries which may have specific and different debt levels.

The Compustat1950-2010 file is used in this study to find the short-term and long-term debt level of each firm. Short-term debt is defined here as debt with a maturity of less than one year and long-term debt is defined as debt with a maturity of more than one year. The description of the Compustat1950-2010 and 173322115 file is given in Appendix A.

3.2 Research Methodology:

This study is conducted to test whether any relationship exists between industry diversified firms (based on different product lines) and their debt levels compared to specialized firms and their debt level. To test the relationship, first two data files Compustat1950-2010 and 173322115 were merged to gather information about a firm's

long-term debt and product lines. The debt level was presented as long-term debt/ Total debt where total debt is the sum of long-term debt and short- term debt. The relationship between diversified firms and their debt level compared to specialized firms and their debt level was tested for any definition of diversification. First firms with single product lines were considered as specialized firms and firms with more than 1 product lines were considered as diversified firms. And then the whole process was repeated, but each time the number of product lines for diversified firms was increased by one as long as it reached the maximum product lines of 33. The whole analysis was conducted using the STATA program and a robust test was conducted to test the relationship.

3.3 The Model:

The model used in this study was taken from Ruland and Zhou, (2005) to find a reason why diversified firm's tend to go for more long term debt. The model derived from Ruland and Zhou, (2005) is given below:

Regression model: 3.1

$$EV = \alpha 1 + \beta 1 D + \beta 2\ DEBT + \beta 3\ D * DEBT + \beta 4\ SIZE + \beta 5\ EBIT + \beta 6\ CAPEX + \varepsilon \ldots\ldots\ldots (3.1)$$

DEBT is the book value of long-term debt / book value of total assets, and $D * DEBT$ is the product of D and DEBT, the interaction term for diversification and leverage.

The long-term debt measure is consistent with the view that leverage effectively locks the firm into a long-term commitment (Jensen, 1986).

In Model (3.1), the association between EV and leverage for specialized firms is reflected by $\beta 2$. For diversified firms, this association is reflected by $\beta 2+\beta 3$.

B2 should have a negative sign and as the hypothesize is that leverage is more beneficial for diversified firms; β3 is predicted to have a positive sign.

Hypothesis:

H0: Product diversified firms tend to go for more long-term debt compared to specialized firms.

H1: Product diversified firms do not tend to go for more long-term debt compared to specialized firms.

Chapter 4 Results and Findings:

This study provides an analysis to find a trend between product diversified firm's and debt maturity compared to specialized firms and debt maturity. To test the relationship and to comply with any definition of diversification, a robust test was conducted using Stata programing. First a firm with one product line was considered to be a specialized firm and firms with more than one product lines were considered as diversified firms. Then the debt level of each firm was compared. Second a firm with one product lines was considered to be a specialized firm and firms with more than two product lines were now considered to be diversified and again their debt levels were compared. The whole process was repeated and each time the number of product lines for diversified firms was increased by one until it reached the maximum product lines of 33. Each time the debt level between diversified firms and specialized firms was noted and it was found that every time the number of product lines was increased for diversified firms, the debt level also increased compared to specialized firms. So based on the results we cannot reject the null hypothesis, H0: Product diversified firms tend to go for more long-term debt compare to specialized firms.

Also another important trend found in this study was the risk indicator. The risk indicator is tested by measuring the net income volatility of the firm. It was found that for product diversified firms, first the risk level of the firm increased with the increase of debt as more product lines were added. Then at one level, with the increase of both debt and product lines, the risk level of the firm decreased. And for the specialized firm it was always upward trend as more debt increased.

All the results are presented in Table 4.1 below:

Number of Product lines to consider as diversified firms	Long-term debt percentage of non-diversified firms (%)	Long-term debt percentage of diversified firms (%)	Risk indicator of non-diversified firms	Risk indicator of diversified firms
1 and above	54.11524	63.84166	519.9091	1061.072
2 and above	55.7235	64.38699	471.3882	1110.809
3 and above	55.29716	68.29152	456.9261	1279.988
4 and above	56.85828	68.19391	554.2111	1308.554
5 and above	57.65048	68.19526	587.0576	1339.59
6 and above	58.19864	68.91773	627.3738	1390.865
7 and above	58.40364	69.20981	641.5922	1413.495
8 and above	58.62665	69.52274	652.8324	1442.764
9 and above	59.2242	71.19173	678.1353	1576.773
10 and above	59.47728	71.59394	699.7957	1613.539

11 and above	59.66658	71.93613	703.2231	1663.839
12 and above	60.53696	72.49197	727.3952	1902.354
13 and above	60.7158	72.58422	731.8728	1978.709
14 and above	60.89323	72.76271	740.3457	2067.77
15 and above	61.32648	73.24854	780.68	2324.281
16 and above	61.45525	73.25119	793.6352	2427.55
17 and above	61.5738	73.0764	803.1427	2547.379
18 and above	61.81772	72.61353	833.3247	2888.369
19 and above	61.86096	72.89329	852.6809	2918.673
20 and above	61.87773	74.44898	856.2626	3146.126
21and above	62.00461	73.67375	934.8074	2616.148
22 and above	62.02726	74.22361	954.0884	2340.079
23 and above	62.05424	74.03007	976.798	1679.157
24 and above	62.0918	74.69401	981.144	1681.606
25 and above	62.11162	74.12177	983.1458	1676.803
26 and above	62.12263	74.20198	984.8566	1678.75

27 and above	62.15467	71.90874	985.717	1897.558
28 and above	62.15841	73.22002	987.6824	1847.944
29 and above	62.16624	72.17664	987.8761	1952.085
30 and above	62.17825	71.98016	991.662	1526.602
31 and above	62.17939	76.20829	992.717	817.7213
32 and above	62.18101	84.21353	992.872	766.0206
33 and above	62.18737		993.0383	

Table: 4.1: Long-term debt for product diversified firms and non-diversified firms and risk indicators.

From the above Table 4.1 we can discern a clear trend that product diversified firms do tend to go for more long-term debt compared to non-diversified firms. Also we can see an intersecting trend of the risk indicator which initially increases for the product diversified firms and then it gradually decreases as more product lines are added. On the other hand, for non-diversified firms the risk indicator is always upward sloping.

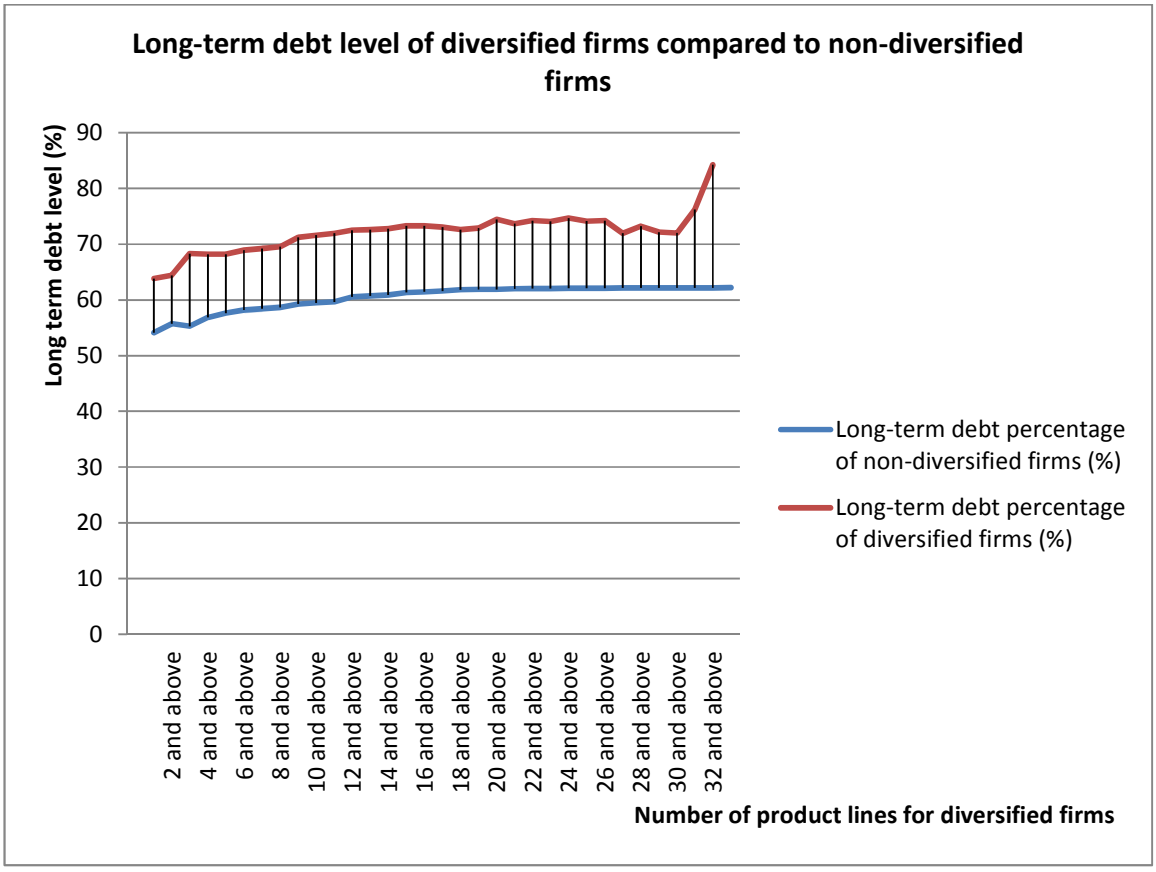

Figure 4.1: Long-term debt level of diversified firms compared to non-diversified firms

Figure 4.1 above also shows that when we consider firms with 2 or more product lines to be diversified and firms with 1 product lines to be non-diversified, then the long-term debt level is greater compared to non-diversified firms. This phenomenon continues for all levels of diversification. When we consider firms with product lines 32 or above are diversified and firms with 1 product lines are non-diversified, we still find the same result that product diversified firms go for more long-term debt compared to non-diversified firms. And the more the product lines are added, the higher the debt level rises for the firm.

One of the main reasons why product diversified firms go for more debt is less volatility of net income and the paper Debt, Diversification and Valuation conducted by Ruland and Zhou, 2005 also showed that the values of Diversified firms increase with leverage and this tendency is not observed for specialized firms.

The results of equation (3.1), EV = $\alpha 1 + \beta 1 D + \beta 2$ DEBT + $\beta 3\ D * $ DEBT + $\beta 4$ SIZE + $\beta 5$ EBIT +$\beta 6$ CAPEX + ε, showed that while leverage also has negative implications for valuation, these problems should be more applicable to specialized firms than to diversified firms. Therefore, the theory suggests a higher association between leverage and valuation for diversified firms than for specialized firms. So this study provides a strong support and explains why product diversified firms tend to go for more debt.

Chapter 5: Conclusions and Recommendation:

This study was conducted using a sample of 45676 firms, which have different product lines from 1 to 33. Data were collected from 1969 to 2009 and all the firms were from the United States. Firms with production line outside U.S were excluded.

The main purpose of this empirical study was to see whether product diversified firms tend to have more long-term debt compared to non-diversified firm's long-term debt levels. Non-diversified debt levels were compared with all possible product lines to be considered as diversified. And the results show a clear trend that diversified firms do have more long-term debt compared to non-diversified firms. To find a reason why diversified firms tend to have more debt levels a model was derived from Ruland and Zhou, (2005) which shows that the values of diversified firms increase with leverage and this tendency is not observed for specialized firms.

One limitation of this present study is that firms from different industries were considered for this study but we know that operations and debt levels vary by industry. Another limitation of this study was only including firms having different product lines operating within the U.S. So all the multinational firms, having product lines in different countries were excluded. So considering those two limitations, this study can be improved in the future and that will give a more precise and clearer picture between the relationship of diversified firms and debt maturity compared to non-diversified firms and debt maturity.

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Appendix: A:

Description of Compustat 1950-2010 file:

variable name	variable label
gvkey	Compustat firm identifier
fyear	Data Year - Fiscal
year	Compustat data year, may be different from the fiscal year
act	Current Assets - Total
aedi	Accrued Expenses and Deferred Income
at	Assets - Total
capx	Capital Expenditures
ceq	Common/Ordinary Equity - Total
che	Cash and Short-Term Investments
csho	Common Shares Outstanding
dlc	Debt in Current Liabilities - Total
dltt	Long-Term Debt - Total

dp	Depreciation and Amortization
dv	Cash Dividends (Cash Flow)
dvt	Dividends - Total
ib	Income Before Extraordinary Items
lct	Current Liabilities - Total
prstkc	Purchase of Common and Preferred Stock
sale	Sales/Turnover (Net)
txdb	Deferred Taxes (Balance Sheet)
prcc_c	Price Close - Annual - Calendar
prcc_f	Price Close - Annual - Fiscal
q	Duchin (2010) Tabin's q measure
sic	Four-digit SIC for the firm
cf_at	Cash flow to Total assets following Duchin (2010)
ni	Net Income (Loss)

Sorted by: gvkey fyear

Description of 173322115 file:

Variable name	variable label
gvkey	Standard & Poor's Indentifier
dnum	Standard Industry Classification Code
cnum	CUSIP Issuer Code
cic	CUSIP Issue Number and Check Digit
coname	Company Name
smbl	Ticker Symbol
incorp	Incorporation ISO Country Code
naics	N. American Ind. Classification Sys. Code
gic	Global Industry Code
srcyr	Source Year
srcfyr	Source Fiscal Year End Month
stype	Segment Type
sid	Segment Identifier
year	Data Year

fyr	Data Fiscal Year End Month
cyr	Calendar Year
sale	Net Sales (MM$)
oibd	Operating Income Before Deprec (MM$)
dp	Depreciation and Amortization (MM$)
oiad	Operating Income After Deprec (MM$)
capx	Capital Expenditures (MM$)
at	Identifiable/Total Assets (MM$)
eqearn	Equity in Earnings (MM$)
inveq	Investments at Equity (MM$)
emp	Employees (Actual)
rd	Research and Development (MM$)
obklg	Order Backlog (MM$)
export	Export Sales (MM$)
intseg	Intersegment Eliminations (MM$)
pi	Pretax Income (MM$)
ib	Income Before Extraordinary Items (MM$)

ni	Net Income (Loss) (MM$)
ops	Operating Profit (MM$)
salef	Footnote - Sales
opincf	Footnote - Operating Profit
capxf	Footnote - Captial Expenditures
eqearnf	Footnote - Equity in Earnings
empf	Footnote - Employees
rdf	Footnote - Research and Development
sname	Segment Name
soptp1	Operating Segment Type 1
soptp2	Operating Segment Type 2
sgeotp	Geographic Segment Type
snaics1	First NAICS Code this segment
snaics2	Second NAICS Code this segment
ssic1	First SIC Code this segment
ssic2	Second SIC Code this segment
ssicb1	Segment SIC Code #1 (Source: SEGSICB data set)

ssicb2	Segment SIC Code #2 (Source: SEGSICB data set)
srccyr	Calendar Year
ssrce	Source Document Code
sucode	Update Code
hnaics	Primary Historical NAICS
curcd	ISO Currency Code
srccur	Source ISO Currency Code

Appendix: B:

STATA Code:

```
*Starting with the data sorting*

*Getting the diversification indicator of the companies*


clear all


*Loading the file, and excluding Geographic segments*

set memory 1g

use "C:\Users\User\Desktop\MRP data\new\173322115.dta"

keep if stype=="BUSSEG"



*Getting the maximum number of segment of each firm*

*Identifying the firm by gvkey*

*Excluding unuseful data in order to save memory*

bysort gvkey year: gen maxnum=_N

keep gvkey year sid maxnum sale oibd



*Creating a variable to indicate if a firm is diversified*

*When div=1, the firm is diversified*


gen div=0

replace div=1 if maxnum>1
```

```
save Mpart1, replace

*Starting to merge data from another file*
*Gathering the information of debts*
clear all
use "C:\Users\User\Desktop\MRP data\new\compustat1950_2010.dta"
sort gvkey year
merge gvkey year using Mpart1
drop _merge
drop if div==.



*Gathering the amount of total debt*
*Variable td is the total debt of the firm*
*Calculating td by adding long-term and current debt*
gen td= dltt+ dlc
drop if td==.
sort gvkey year

*Getting the percentage of long-term debt in total debt*
*Variable longper is the long-term percentage*
gen longper= dltt/td

*Getting the sum of percentage of long-term debt of each group*
```

```
sum maxnum
scal mbs=r(max)
local i=1
while `i'<=mbs {
quietly replace div=1 if maxnum>`i'
quietly replace div=0 if maxnum<=`i'
quietly bysort div: gen sumper=sum( longper)
quietly sum sumper if div==0
scal non_div_per=r(max)
*Getting the number of firms in each group*

quietly bysort div: gen firmnumber=_N
quietly sum sumper if div==1
scal div_per=r(max)
*Getting the equally weighted average long-term percentage*
*of each group*
quietly gen percentage=non_div_per/ firmnumber if div==0
quietly replace percentage=div_per/ firmnumber if div==1

*Evaluating the valitility of the net income of each firm*
*Then, evaluating the standard diviation of the valitility*
*the standard diviation is the risk indicator, variable risk_ind*
quietly bysort gvkey: egen risk=sd(ni)
quietly bysort div: egen risker=sd(risk)
*quietly gen risk_ind=risker/ firmnumber if div==0
```

```
*quietly replace risk_ind=risker/ firmnumber if div==1
quietly sum percentage if div==0
scal non_per=r(max)
quietly sum percentage if div==1
scal div_per=r(max)
quietly sum risker if div==0
scal non_risk=r(max)
quietly sum risker if div==1
scal div_risk=r(max)
dis "The longterm debt percentage of non-diversified firms is: " non_per
dis "The longterm debt percentage of diversified firms is: " div_per
dis "The risk indicator of non-diversified firms is: " non_risk
dis "The risk indicator of diversified firms is: " div_risk

drop firmnumber percentage risk risker sumper
local i=`i'+1
}



*Draw the relationship between diversification and risk indicator*
*twoway (line div risk_ind)
save Mpart2, replace



*Testing*
```

```
*clear all
*use Mpart2
*set more off
*sort gvkey year
*bysort gvkey year: gen n=_n
*keep if n==1
*gen last_div=.
*gen lastyr=year-1
*sum year
*scal yrmax=r(max)
*scal yrmin=r(min)
*sum gvkey
*scal gvmax=r(max)
*scal gvmin=r(min)

*local k=gvmin
*while `k'<=gvmax{
*local i=yrmin
*while `i' <= yrmax {
*gen last=div if year==`i'-1 & gvkey==`k'
*sum last
*gen f=r(max)
*replace last_div= f if year==`i' & gvkey==`k'
*drop f
*drop last
```

```
*local i=`i'+1
*}
*local k=`k'+1
*}
```