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DOES DEBT DIVERSIFICATION LEAD TO A DISCOUNT IN FIRM VALUE?

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Abstract: Corporate firms access multiple sources of debt simultaneously. This study analyses the impact of debt diversification on firm value. We argue that, when firms diversify their debt sources, the monitoring role played by debt holders decreases as a result of the free rider problem. Hence, such firms should experience a value discount in the capital markets. Our empirical analysis provides evidence for the existence of a value discount in the capital markets for firms accessing multiple sources of debt. Our results remain robust for alternative measures of debt diversification.

Keywords: Debt Diversification, Debt Specialization, Firm Value, Free Rider, Agency Costs

1. Introduction

Rauh and Sufi (2010) and Colla et al. (2013) document the existence of debt diversification, i.e., accessing multiple sources of debt, among US corporate firms, as a common occurrence. Johnson (1997) reports that about 73% of US firms use more than one source of debt for a given level of debt. Surprisingly, despite the wide prevalence, the phenomenon of debt diversification is yet to be thoroughly examined. One such pertinent area is the impact of debt diversification on firm value. Managers of a firm are expected to take decisions that increase shareholders' wealth. This then leads us to the question whether the managerial decision to go for multiple sources of debt is a value-adding decision or not. In other words, do firms with diversified sources of debt command a better value in the capital markets?

The theoretical rationale for a relationship between debt diversification and firm value can be traced to Jaffee and Russell (1976) and Stiglitz and Weiss (1981) who argue the existence of credit rationing in the financial markets. Credit rationing limits the ability of firms to raise the required amount of debt from a single source or lender which in turn could potentially restrict managers from undertaking worthwhile projects. In such settings, debt diversification becomes an optimal strategy that managers can implement to overcome the constraints levied by credit rationing. This facilitating nature of the debt diversification decision, therefore, suggests a positive association between debt diversification and firm value. This positive association finds further theoretical ground through Harris and Raviv (1990) and Rajan (1992) who argue that debt plays an essential disciplining role by reducing the agency costs of equity. In the presence of

moral hazard problems, debt holders typically tend to monitor the activities of the firm[1] and thereby, help alleviate the agency costs thereof. One would then expect this monitoring mechanism to be relatively more intense for a firm with multiple debt holders (i.e., greater debt diversification) relative to a firm with fewer debt holders. Consequently, a firm with greater debt diversification should experience lower agency costs and greater firm value, i.e., a positive association between debt diversification and firm value. This argument, however, finds a counter-hypothesis through findings in several studies (Krugman,1988; Carletti et al., 2007; Brunner and Krahnen, 2008) which argue the presence of multiple debt sources may lead to a drop in the efficiency of monitoring, due to the free rider problem and the lesser incentives for an individual debt holder to monitor the activities of the borrowing entity[2]. Carletti et al. (2007) in fact, propose a model in which the efficiency of monitoring is highest in the case of a single debt holder with substantial lending to the firm. This premise suggests a negative association between debt diversification and firm value. The objective of our paper is to therefore, examine whether debt diversification increases (via the financial constraints and the agency costs hypotheses) or erodes (via the free rider hypothesis) the value of the firm.

We employ Tobin's Q as a measure of firm value. Debt diversification is proxied using two measures. The first proxy is the total number of sources from which a firm has accessed debt (i.e., has an outstanding balance at the financial year-end). Since this measure does not account for the dispersion of debt within these sources, we use the normalized Herfindahl-Hirschman Index (HHI) as our second proxy of debt diversification. Our results using both measures support the free rider hypothesis – firms with diversified debt sources experience a value discount in the capital market. We further check the robustness of our results by splitting our sample firms into small and large groups based on the annual median sales. The negative association is observed for all firms irrespective of their size for both measurements of debt diversification.

The rest of the paper is organized as follows: data and methodological aspects are described in the second section, results are presented and discussed in the third section, and conclusions are presented in the last section.

2. Data and methodology

2.1 Data

Our sample period spans from 1962 to 2015, and the financial data for our analysis has been obtained from COMPUSTAT. We exclude financial, regulated and zero debt firms from our analysis[3]. The summary statistics for the variables used in our study are presented in Table 1. Our final sample consists of 149,938 firm-year observations.

As indicated by our first proxy for debt diversification, Debt Number, the average number of debt sources for our sample firms is about 2.6 with a median of 2. Since our sample comprises non-zero debt firms only, the minimum and the maximum debt

[1] This monitoring activity is aided by their access to private information of the firms, especially for banks. Bond holders on the other hand, typically form trusts to oversee the activities of the firm.

[2] Lender's rent is divided among many debt holders.

[3] We winsorized the data at 5% to limit the spurious effect of outlier and further restricted values of Tobin's Q, Tangibility, R&D ratio and DPR to non-negative values. Values of ROA less than negative one and of lagged leverage greater than one have also been dropped.

number are one and eight respectively. HHI which adjusts for the dispersion aspect of debt diversification is spread between a minimum and maximum of 0 and 0.957 respectively.

Table 1: Summary statistics

Tobin's Q is the ratio of the market value to the book value of the firm's total assets. Debt Number is the total number of debt sources that a firm has used. HHI is the dispersion-adjusted measure of debt diversification. Firm Size is log of firm sales. ROA is the return on total assets. Tangibility is the ratio of net investments in plant and machinery to total assets. Asset growth rate is the change in total assets over lagged total assets. R&D Ratio is the ratio of research and development expenditure to total assets. DPR is the ratio of total dividends to total assets. Leverage is the ratio of total debt to total assets. The values are rounded up to the nearest decimal.

Variable	Observations	Mean	Std. Dev.	Min	Max
Tobin's Q	149,938	1.468	1.281	0.442	6.170
Debt number	149,938	2.564	1.332	1.000	8.000
HHI	149,938	0.365	0.277	0.000	0.957
Firm Size	149,938	4.775	2.287	-0.038	8.689
Asset growth rate	149,938	0.142	0.324	-0.329	1.116
ROA	149,938	0.017	0.209	-0.779	0.231
Tangibility	149,938	0.302	0.207	0.026	0.762
R&D ratio	149,938	0.030	0.057	0.000	0.231
DPR	149,938	0.009	0.014	0.000	0.047
$Leverage_{t-1}$	149,938	0.293	0.209	0.015	0.895

2.2 Methodology

To estimate the marginal impact of debt diversification on firm value, we use Eq. (1) as our baseline model.

$$Y_{it} = \alpha_i + \beta_1\, Debt\ Diversification_{it} + \beta_2\, Firm\ Size_{it} + \beta_3\, ROA_{it} + \beta_4\, Tangibility_{it} + \beta_5\, Asset\ growth\ rate_{it} + \beta_6\, R\&D\ ratio_{it} + \beta_7\, DPR_{it} + + \beta_8\, Leverage_{it-1} + \varepsilon_{it} \quad (1)$$

Where, Y_{it}, the dependent variable, is the Tobin's Q calculated as the ratio of the market value to the book value of a firm's total assets. Of the two measures of debt diversification used, the first is Debt Number, which is the number of debt sources that a firm has accessed. We consider eight mutually exclusive debt sources in our study. They are: capitalized lease obligations (dclo); senior convertible debt (dcvsr); subordinated convertible debt (dcvsub); debt debentures (dd), debt notes (dn); subordinated debt (ds); notes payables (np) and other long-term debt (dlto)[4].

Our second measure of debt diversification is the HH index that accounts for dispersion of debt between the debt sources by assigning a higher weight to those sources with a higher proportion in the overall debt. This measure is computed using the same eight

[4] The variable codes used in the Compustat database are provided in parentheses.

sources of debt thus: we measure the concentration of debt, the Herfindahl-Hirschman scores, by summing the squared ratios of individual debt to total debt.

$$HHI_{it} = \sum_{i=1}^{8} \left(\frac{Debt\ Sources_i}{Sum\ of\ all\ debt\ sources} \right)^2 \quad (2)$$

The value obtained in (2) is then normalized using Eq. (3) to arrive at the normalized HH index.

$$HHI_{it} = \frac{HHI_{it} - (1/8)}{1 - (1/8)} \quad (3)$$

Greater *HHI* values indicate lesser debt diversification. The *HHI* variable, therefore, bears a negative correlation with debt diversification and with *Debt Number*. We subtract *HHI* (obtained in Eq.3) from one to make its interpretation consistent with that of *Debt Number* and use this modified proxy for the rest of the paper.

The control variables used in this study are: *Firm Size* is log of firm sales, *ROA* is return on total assets, *Tangibility* is the ratio of net investments in plant and machinery to total assets, *Asset growth rate* is the change in total assets over lagged total assets, *R&D ratio* is the ratio of research and development expenditure to total assets, *DPR* is the ratio of total dividends to total assets, and *Leverage* is the ratio of total debt to total assets. We use a one-year lagged value of *Leverage* to avert issues from a possible contemporaneous relationship between a firm's leverage and its debt number.

We use fixed effects estimator[5] to estimate the coefficients of our model presented in Eq. (1). This technique helps to control for unobserved time-invariant variables that might impact firm value proxied by Tobin's Q. The year-effects on firm value are controlled by using year dummies. We also use firm fixed effects to account for unobserved firm-level factors.

3. Results and discussion

The impact of debt diversification on firm value is examined by regressing *Tobin's Q* on our measure of debt diversification. The financial constraints and the agency costs hypotheses predict a positive association while the free rider hypothesis predicts a negative association. The results of the analysis using *Debt Number* are presented in Table 2.

The coefficient for *Debt Number* for the full sample analysis, presented in Model I, is negative and statistically significant at 1% significance level in support of the free rider hypothesis. This result is consistent with Carletti et al. (2007) who examined the impact of multiple banking relationships[6] on the value of Danish firms. To check the robustness of this negative association, we classify our sample firms into small and large firms based on the yearly median value of firm size (captured by the log of firm sales). Firms with below (above)-median firm size are classified as small (large) firms. We re-estimate Eq. (1) for these sub-samples separately. As presented in Model II and Model III, the coefficients of *Debt Number* for both small and large firms respectively are negative and significant. The

[5] Our data rejected the null of Hausman test at 1% confidence level.
[6] Their study is concerned with multiple banking relationships whereas our study is concerned with multiple sources of debt.

results, shown in Table 3, based on the normalized HHI as the measure of debt diversification, support the findings in Table 2, based on *Debt Number*. Overall, the analyses offer substantial evidence that firms which use diversified debt sources experience a value discount in capital markets.

Table 2: Regression analysis using Debt Number

Dependent Variable: Tobin's Q is the ratio of the market value to the book value of the firm's total assets. The main independent variable is Debt Number, which is the total number of debt sources that a firm has used. The control variables are defined as: Firm Size is log of firm sales, ROA is the return on total assets, Tangibility is the ratio of net investments in plant and machinery to total assets, Asset growth rate is the change in total assets over lagged total assets, R&D Ratio is the ratio of research and development expenditure to total assets, DPR is the ratio of total dividends to total assets, and Leverage is the ratio of total debt to total assets. The coefficients are estimated using fixed effects estimator, and heteroscedasticity-adjusted standard errors, clustered at the firm level, are presented in parentheses. ***, ** and * denotes significance at 1%, 5% and 10% respectively.

	Full Sample	Small Firms	Large Firms
VARIABLES	**Model I**	**Model II**	**Model III**
Debt number	-0.042***	-0.053***	-0.018***
	(0.004)	(0.006)	(0.004)
Firm Size	-0.183***	-0.233***	-0.135***
	(0.009)	(0.013)	(0.011)
ROA	0.066	-0.511***	3.140***
	(0.051)	(0.053)	(0.104)
Tangibility	-0.131**	-0.239***	0.110*
	(0.051)	(0.067)	(0.064)
Asset growth rate	0.586***	0.602***	0.350***
	(0.013)	(0.017)	(0.014)
R&D ratio	3.467***	2.991***	2.601***
	(0.231)	(0.250)	(0.485)
DPR	7.704***	3.439***	7.153***
	(0.528)	(0.741)	(0.625)
$Leverage_{t-1}$	0.494***	0.668***	0.141***
	(0.031)	(0.040)	(0.040)
Constant	1.929***	2.075***	1.493***
	(0.049)	(0.098)	(0.074)
Observations	149,938	74,959	74,959
R-squared	0.136	0.150	0.245
Number of firms	15,780	12,593	6,524
Year FE	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes

Table 3: Regression analysis using HHI

Dependent Variable: Tobin's Q is the ratio of the market value to the book value of the firm's total assets. The main independent variable is HHI which is the dispersion-adjusted measure of debt diversification. The control variables are: Firm Size is log of firm sales, ROA is the return on total assets, Tangibility is the ratio of net investments in plant and machinery to total assets, Asset growth rate is the change in total assets over lagged total assets, R&D Ratio is the ratio of research and development expenditure to total assets, DPR is the ratio of total dividends to total assets, and Leverage is the ratio of total debt to total assets. The coefficients are estimated using fixed effects estimator, and heteroscedasticity-adjusted standard errors, clustered at the firm level, are presented in parentheses. ***, ** and * denotes significance at 1%, 5% and 10% respectively.

	Full Sample	Small Firms	Large Firms
VARIABLES	**Model I**	**Model II**	**Model III**
HHI	-0.179***	-0.182***	-0.133***
	(0.016)	(0.024)	(0.018)
Firm Size	-0.184***	-0.236***	-0.132***
	(0.009)	(0.013)	(0.011)
ROA	0.076	-0.499***	3.141***
	(0.051)	(0.053)	(0.104)
Tangibility	-0.132**	-0.248***	0.116*
	(0.051)	(0.067)	(0.064)
Asset growth rate	0.582***	0.596***	0.351***
	(0.013)	(0.017)	(0.014)
R&D ratio	3.476***	2.996***	2.614***
	(0.231)	(0.250)	(0.483)
DPR	7.727***	3.495***	7.107***
	(0.528)	(0.741)	(0.625)
$Leverage_{t-1}$	0.492***	0.664***	0.148***
	(0.031)	(0.040)	(0.040)
Constant	1.893***	2.028***	1.452***
	(0.050)	(0.098)	(0.075)
Observations	149,938	74,959	74,959
R-squared	0.136	0.150	0.246
Number of firms	15,780	12,593	6,524
Year FE	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes

5. Conclusion

This study examines the impact of debt diversification on firm value. Our results suggest there is a negative impact of debt diversification on firm value. Prior studies maintain that the presence of debt in the capital structure tends to decrease agency costs; however, our results reveal that having debt from multiple sources tends to reduce that advantage. Thus, managers using diversified debt sources in an attempt to overcome

financial constraints engendered by credit rationing might potentially erode shareholder wealth.

References

Brunner, A., Krahnen, J. P., 2008. Multiple lenders and corporate distress: Evidence on debt restructuring. The Review of Economic Studies 75(2), 415-442.

Carletti, E., Cerasi, V., Daltung, S., 2007. Multiple-bank lending: Diversification and free-riding in monitoring. Journal of Financial Intermediation 16(3), 425-451.

Colla, P., Ippolito, F., Li, K., 2013 Debt specialization. The Journal of Finance 68(5), 2117-2141.

Jaffee, D. M., Russell, T., 1976. Imperfect information, uncertainty, and credit rationing. The Quarterly Journal of Economics 90(4), 651-666.

Johnson, S. A., 1997. An empirical analysis of the determinants of corporate debt ownership structure. Journal of Financial and Quantitative Analysis 32(1), 47-69.

Harris, M., Raviv, A., 1990. Capital structure and the informational role of debt. The Journal of Finance 45(2), 321-349.

Krugman, P., 1998. Financing vs. forgiving a debt overhang. Journal of Development Economics 29(3), 253-268.

Rajan, R. G., 1992. Insiders and outsiders: The choice between informed and arm's-length debt. The Journal of Finance 47(4), 1367-1400.

Rauh, J. D., Sufi, A., 2010. Capital structure and debt structure. The Review of Financial Studies 23 (12), 4242-4280.

Stiglitz, J. E., Weiss, A., 1981. Credit rationing in markets with imperfect information. The American Economic Review, 71(3), 393-410.