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Internal Financial Constraints, External Financial Constraints and Corporate Debt Maturity Structure of Vietnamese Listed Firms

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Abstract

This study focuses on how firms establish debt maturity (DM) structure given certain levels of both internal and external financial constraints in Vietnamese context. Unlike extant studies, this paper employs quantile regression and Oaxaca–Blinder decomposition techniques to dissect in more detail the differences in the debt maturity structure of firms classified based on their constraint type. Our findings show that in general firms facing external and internal financial constraints behave dissimilarly towards the choice of DM structure due to their differing levels of liquidity risk, agency cost and probably the will to seize the market. The results from quantile regression provide strong evidence showing that constrained firms suffer more from liquidity risk and information asymmetry, while unconstrained firms with stronger financial profiles are better equipped to withstand both of these frictions effectively and the desire to use long-term debt is very high for large firms. Both groups show strong preference for a reduction in agency cost associated with high ratios of long-term debt. The results from decomposing the difference in DM between two groups offer a different perspective: large firms tend to be more willing to signal their quality through employing more short-term debt and show strong desire to use long-term debt, but firms with high cash flow do not observe such a trend.

Keywords: Debt Maturity, Quantile Regression, Oaxaca-Blinder Decomposition

Introduction

In comparison with capital structure literature, debt maturity papers are still limited even though the latter field also has important implications towards firm value. Studies on static debt maturity structure have focused on the macro and micro determinants (Cai et al. 2008; Lemma and Negash, 2012). Debt maturity have also been analyzed dynamically, which deals with the dimension of adjustment process towards debt maturity target (Deesomsak et al. 2009; Matues and Terra, 2013). Besides, there are quite few papers for firms in emerging markets, while the majority of debt maturity studies are done in the context of developed economies.

Almost all extant papers assume a constant impact of determinants on the debt maturity structure, regardless of whether firms have long or short debt maturity structure. Zhao (2014) suggests that such assumption is invalid, for short-debt maturity structure firms tend to be

exposed more to liquidity risk, while firms with long-debt maturity have more concern about agency costs. With high liquidity risk, even if firms have potential growth opportunities and so are expected to employ more short-term debt following Myers (1977)'s prediction, managers can be more reluctant in using short-term debt to finance investment to avoid increasing liquidity risk. Similarly, when plagued by high agency cost, firms that have long asset maturity will be less willing to take on more long-term debt so that they can harness the agency cost. Therefore, it implies that depending on the imperfection about which firms most concern, firm will act accordingly to remove such imperfection when deciding their debt maturity strategy.

As both these frictions tend to manifest more in developing economies than in developed counterparts, studies about debt maturity structure that consider the impact of determinants across debt maturity structure are warranted. Additionally, firms operating in emerging markets are more likely to be prone to financial constraints, due to fledgling financial markets and low-quality institutions. As firms face different levels of financial constraints, they respond by adopting various debt maturity strategies (Stephan et al., 2011; Ngo and Pham, 2015). Vietnam is an emerging country with inadequate market and institutions that tend to exacerbate firms' access to long-term capital. But, the reason why firms in Vietnam employ much short-term debt could also stem from the firms' characteristics themselves. Does a firm in Vietnam advocate short-debt maturity due to its high liquidity risk or some other reasons? Also, is it desirable for firms to always take on more long-term debt?

This study has two main objectives. First, it employs quantile regression estimates to see how firms react to implied varying levels of liquidity risk and agency cost associated with short and long-term debt maturity, as in Zhao (2014) for US firms. Second, the study separates financial constraints into 2 categories, namely internal and external constraints, and analyzes how these two types of constraints impose their impact on debt maturity. As shown in Stephan et al. (2011) and Ngo and Pham (2015), firms with different constraint levels have different debt maturity structures, but those papers only discuss the differentials in the coefficients of the variables between the two groups of firms. Our paper applies Oaxaca – Blinder decomposition techniques to understand clearly the proportion of the factors that cause the maturity difference. We aim to answer how much of the difference is associated with the variance in the values of characteristics (or "endowment effect"), and how much is due to the perception regarding the importance of each variable (or "discrimination effect"). In this sense, our paper is the first to analyze in depth the difference of debt maturity structure between firms with various levels of both internal and external constraints, using a popular decomposition method named Oaxaca Blinder (Oaxaca, 1973; Blinder, 1973).

Literature review

Theoretical background

Theories on DM structure

Myers (1977) developed agency cost theory that predicts that firms tend to use short-term debt to tackle agency cost issue. Short-term debt provides lenders with opportunities to observe firms in a more frequent manner, thus lowering the asymmetric information between insiders and lenders.

Stohs and Mauer (1996) suggest that firms should have the maturities of debts and assets well matched in order to remove risk of insolvency from the mismatching of cash flow generated from assets and cash flow required to pay the debt down.

Agency cost theory predicts that firms use more short-term debt to mitigate agency costs (Myers, 1977). This is because short-term debt facilitates lenders to observe more frequently, thus reducing the information asymmetry between firms and lenders.

Brick and Ravid (1985) show that firms can adjust their debt maturity structure depending on whether the term structure of interest rates is sloping upwards or downwards, for this can help firms to increase present value of debt tax shield. Kane et al. (1985) argue that firms should increase debt maturity when corporate tax rates are lower, debt issuance cost is higher and/or firm value fluctuates more.

Flannery (1986) show that in a market plagued by information asymmetry, firms can reduce this friction by borrowing on short-term basis, since this can signal their high credit quality. Diamond (1991) adds that firms with low quality also have to borrow short-term loans because of their high bankruptcy risk, and firms with medium quality borrow long-term debt. Finally, Graham & Harvey (2001) find that CEOs can be opportunistic in that they sense the market and decide to borrow short or long-term debt depending whichever is cheaper.

The impact of determinants across debt maturity structure's distribution

Instead of assuming that conventional determinants have constant effects on debt maturity, regardless of whether firms own long or short debt maturity structure, Zhao (2014) points out that firms are faced with different levels of liquidity risk and agency cost if they employ too much short and long-term debt, respectively. With too high liquidity risk associated with short-debt maturity structure, even though firms may have desire to borrow more short-term debt when they have growth opportunities or to signal high quality, they can opt for long-term debt instead to harness liquidity risk. Likewise, firms with many fixed assets that have long maturity may refuse to use more long-term debt to match the maturities of both debt and assets, when they are already prone to high agency cost.

As a consequence, it is clear that we can expect there is a nonlinear response of firms to determinants across debt maturity structure. Indeed, the impacts of such regressors may change in terms of size and direction, which helps explain different findings in empirical studies.

Financial constraints and debt maturity structure

Financial frictions can be of different levels of concern for different types of firms. In general, financial frictions tend to make the long-term debt rate higher than that of short-term debt, dwarfing the use of long-term debt for financially constrained firms. To test for this argument, we follow Stephan et al. (2011) in breaking down study samples into subsamples based on types of constraints faced. Firms in emerging markets can counter both external and internal financial constraints as stated in extant studies as stated in extant studies (Fazzari et al., 1988; Cleary, 1999; Kaplan and Zingales, 1997, Guariglia, 2008). We choose to examine the impact of external (proxied by size) and internal financial constraint (proxied by cash flow) as used in Guariglia (2008) in this study. These two measures have not been analyzed in tandem thus far in literature related to debt maturity structure.

Size is conventionally used as an external financial constraint proxy in multiple studies. We follow Stephan et al. (2011) and use the total assets as a benchmark to cleave the samples into financially constrained and unconstrained. Smaller firms are expected to have less access to external finance, for they are associated with higher asymmetric information and severe agency problems, especially underinvestment. Lenders, moreover, choose to finance larger borrowers since these firms tend to have more collateral assets to offer, establishing a guarantee effect (Holmstrom and Tirole, 1997).

As for internal financial constraint which is measured by cash flow level, a firm with higher levels of internal cash flow can obtain external loans more easily since it can be perceived as less risky by lenders. In fact, KZ (1997) find that variables related to firms' liquidity are strongly correlated with the cash flow and cash flow can be regarded as some source of managers' intent to commit in large investment projects (Leland and Pyle, 1977). In the literature, there are two views regarding the presence of high cash flows. First, "cost effect" hypothesis states that a drop in cash flow will be associated with that in investment, which is to avoid the need for external financing which ultimately leads to higher borrowing and repayment costs and higher liquidity risks for the firm. "Revenue hypothesis, on the other hand, opines that higher levels of investment generate inproportionately higher revenue, which helps to lower default risk. As these two effects can exist at the same time in the economy, which effect is stronger remains an empirical question. Cleary et al. (2007) adds that the revenue effect hypothesis tends to manifest for firms with low internal funds. With a decreasing cash flow, firms will have to increase investment to generate sufficient income to replenish the cash flow and make the firm a healthier profile.

In this study, cash flow – constrained firms are those who can engage in both types of cost and revenue hypotheses. When their cash flow is low, their investment may shrink in tandem to avoid the need for external loans or they may just issue short-term debt if cost hypothesis prevails. Otherwise, they can try to improve the financial profile of the company by investing more with the hope in a future healthier cash flow, so will need long-term financing to be able to invest more.

Cash flow–unconstrained firms are those that tend to have abundant internal funds, and as pecking theory has suggested, these firms can use their internal funds first when financing investments, then short-term and finally long-term debt before equity is counted. Therefore, debt maturity structure of these firms may be less affected by the conventional determinants or the firms may end up using more short-term debt according to the pecking order. However, firms with high cash flow can abuse the surpluses to waste in unprofitable projects, an overinvestment problem. Literature has suggested using more long-term debt to deal with this problem, especially when firms have few growth opportunities.

Empirical studies

The extant empirical studies have provided inconclusive evidence about the impact of determinants of debt maturity structure. Specifically, growth opportunities are negatively related to long-term debt in Barclay and Smith, 1995, Guedes and Opler, 1996; Ozkan, 2002; Cai et al., 2008), yet found to be insignificant in Antoniou et al. 2006 and Shah and Khan (2009). Size is mostly documented to be positively related to long-term debt (Barclay and Smith, 1995; Demirguc-Kunt and Maksimovic, 1999; Shah and Khan, 2009). However, this variable is found to have negative effect in Guedes and Opler (1996). Therefore, these two factors suggest that agency theory is invalid to some extent in the literature.

Signaling motive is not the major cause in debt maturity strategy as stated in Barclay and Smith (1995), Ozkan (2002) and Antoniou et al. 2006 and Arslan and Karan 2006, yet this intention is well cited as a significant determinant of debt maturity structure in Stephan et al. (2011) and Ngo and Pham (2015). Tax theory is invalid in most studies and receives the least support in Barclay and Smith 1995; Ozkan 2002, Antoniou et al. 2006 Arslan and Karan, 2006. On the contrary, maturity matching principle tends to be highly advocated in both developing and developed countries (Shah and Khan, 2009; Antoniou et al. 2006; Stephan et al. 2011). Liquidity risk seems to be strongly advocated, see Orman and Koksal, 2015; Antoniou et al., 2006; Cai et al., 2008.

With regard to the relationship between financial constraints and debt maturity structure, Stephan et al. (2011) study a sample of thousands of Ukrainian firms and reveal that constrained and unconstrained firms respond differently to liquidity risk and, consequently, adopt different debt maturity strategies. Unconstrained firms can cope with agency conflicts by shortening their debt maturity structure, and if a firm is constrained in terms of size and/or access to bond markets, tax rate is a significant of debt maturity structure.

In summary, there are inconsistencies in the impact of determinants on debt maturity structure in the empirical literature. Most extant papers rely on the assumption that the impact of the regressors stay constant across the debt maturity distribution. This could be the justification why inconsistent evidence emerge about the diverging effect of regressors on debt maturity. Indeed, Zhao (2014) refutes the above assumption and shows in his empirical study that the expected positive impact of some determinants dwindles as firms use more and more long-term debt to total debt, and vice versa. Surprisingly up to now, only Zhao (2014) follows this line of thoughts for a study using a sample of US firms.

Hypotheses and research methodology

Hypotheses

Our paper follows Zhao (2014) in adopting quantile regression to examine the impact of regressors across the debt maturity distribution, but we focus on Vietnamese firms. The markets in Vietnam are still in their early stages and firms are prone to both agency cost and liquidity risk, due to restricted access to external capital market. Consistent with Zhao (2014), it is expected that the determinants that are theoretically positively related to long-term debt such as size and asset maturity will have dwindling effect on debt maturity as firms employ more and more long-term debt. This is a move to reduce agency cost, and in the same vein, firms can reduce liquidity risk by refraining themselves from taking on more short-term debt when they have abundant growth opportunities or want to exploit cheap short-term debt in the market. We, therefore, propose the following hypotheses:

Hypothesis 1: determinants that are expected to be positively associated with long-term debt have weaker impacts as firms have higher long-term debt proportions.

Hypothesis 2: determinants that are expected to be positively associated with short-term debt have increasing impacts as firms have higher and higher long-term debt proportions.

Stephan et al. (2011) find that financial constraints have firms opt for different DM strategies on average. The constraints may be more destructive at high or low ratios of long-term debt, as they may interact with high levels of agency cost or liquidity risk, respectively. Considering the impact of financial constraints, we propose the below hypothesis:

Hypothesis 3: financial constraints change the pattern of the impact of determinants on DM structure.

Research methodology

This study's sample includes all the non-financial firms listed on both HOSE and HNX. The period of research is from 2007-2016. Our aim is to examine the impacts of the conventional determinants on the ratio of long term debt to total debt. Inheriting from similar studies such as Stephan et al. (2011), Cai et al. (2006) and Zhao (2014), we retrieve regressors to use as in the following model:

$$Q\ (Long\_debt_{it}) = size_{it} + growth_{it} + assetmat_{it} + tax_{it} + turnover_{it} + tang_{it} + leverage_{it-1} + term_{t} + bankdev_{t} + stockdev_{t} + \varepsilon_{it}$$

Where, long_debt is the ratio of long-term debt to total debt, the main proxy for DM structure (Stephan et al., 2011, Cai et al., 2006). Long-term debt is defined as debt that has the maturity longer than 1 year. Q (Long_debtit) indicates that this model aims to analyze the impact of regressors on long_debt depending on the quantile of the dependent variable.

Size is measured by the logarithm of total assets, and Tang represents collateralizable assets, measured by the ratio of fixed assets to total assets. Assetmat is the asset maturity, measured by the ratio of fixed assets to depreciation expenses. Growth is measured by the ratio of sales growth to total assets' growth. Tax represents tax rates, measured by the ratio of tax due in the period to the taxable income. Leverage represents financial leverage, measured by the total debt to total assets. Lagged leverage is employed to reduce the endogeneity between leverage and DM. Term represents the term structure of interest rates, measured by the difference of the rates of long-term debt (here 10-year treasury bond) and those of short-term debt (two-year treasury bond). Bankdev is bank development, measured by the ratio of private credit supplied by banks to GDP and Stockdev is stock development, measured by the ratio of stock market capitalization (Demirguc-Kunt and Maksimovic, 1999).

Table 1: Expected sign on average

Variable	Expected sign	Variable	Expected sign
size	+	turnover	-
growth	-	tang	+
assetmat	+	leverage	+
tax	-	term	-
bankdev	-	stockdev	+

To test hypothesis 3, we run quantile regression for model (1) for both samples that are divided based on financial constraints.

Our study employs quantile regression as Zhao (2014) to study the impacts of determinants across long_debt's distribution. Traditional methods such as OLS and GMM can only estimate the responses of the conditional mean, while the reaction of firms can be asymmetric due to the firms' dissimilar concerns about liquidity risk and agency cost at different levels of long_debt. Quantile regression helps estimate the conditional mean response of long_debt to changes in the covariates. Next, we employ Oaxaca-Blinder decomposition to evaluate the contributions of each regressor towards the differentials in DM structure between two firm groups. This technique is well-known in economics literature for decomposing income differentials, etc. However, its use in finance literature has not been recorded in our review, so our paper is the first to apply this technique in this capital structure field.

Results and discussion

Descriptive statistics

We provide general descriptive statistics in Table 1. It is shown that firms in Vietnam only have a low portion of tangible assets (25.9%) to total assets. The speed of sales growth is lower than that of asset growth (about 84% of the speed of asset growth), which may suggest some inefficiency in managing assets to earn income for firms. The average age of the asset in a firm is 28.25 years, and the effective tax rate is circa 20%. The turnover rate is quite high, at 1.27, and firm leverage is kept at low level (24%). The difference between the borrowing rates for long-term and short-term debt in Vietnam is 107.5 bps. Judging from the bankdev and stockdev, it can be concluded that stock market in Vietnam is still developing, and this country tends to be a bank-based market.

Table 1: Descriptive statistics (Source: authors calculated)

Variable	Obs	Mean	Std. Dev.	Min	Max
size	4677	19.85276	1.437746	14.45736	25.01373
tang	4674	0.2590704	0.2059465	0	1.157895
growth	3698	0.8401826	5.922816	-110	120
assetmat	4492	28.25162	370.8525	0	19777.06
Tax	4339	19.94383	29.38084	0	1353.22
turnover	4676	1.273562	1.141253	0	12.7907
lev	4601	0.2401643	0.1951188	0	0.95
term	5670	107.5	80.74652	-20	219
bankdev	5103	108.6656	13.31764	86.86	128.35
stockdev	5670	22.569	6.370245	9.56	32.77

In table 2, we provide the quantile regression results for the sample of all firms and we run for the conventional quantiles (10, 25, 50, 75, 90). It is interesting that size has increasing effect from quantile 25 to 75, and decrease in its impact at quantile 90, suggesting that firms try to reduce agency cost here. Tang has the same pattern, but with stronger coefficients, implying the important role of tangible assets in Vietnam in borrowing long-term debt. Firms with high growth opportunities tend to borrow short-term debt, but significant only at 25% and 90%. Matching asset maturity is rather weak impetus, only significantly at 50% and the coefficient is not economically large. It is interesting that firms tend to borrow more long-term debt for tax reason, especially at very high long maturity structure. Firms tend to signal their quality using short-term debt, but at 90% tend to ignore agency cost. Term is especially important and encourage firms to use more short-debt when this is cheaper than long-term debt, especially when firms have much long-term debt. Bank development tend to help shorten firm's debt maturity as banks tend to lend short-term debt, while stock market is associated with lengthening debt maturity. So overall, the signs of the variables are mostly as expected throughout the quantiles, and at extremely short maturity no variable is significant, while at extremely long maturity the coefficient decreases or change to negative sign, showing strong interest in reducing agency cost here.

Quantile regression estimates

Tables 3 and 4 provide estimates for coefficients and standard errors of determinants of debt maturity structure for firms cleaved into subgroups of large and small firms. Tables 5 and 6 provide the same estimates for subgroups of high and low cash flows. In this section, we compare the coefficients of determinants between the unconstrained firms in terms of size and cash flow, and then size-constrained and cash flow-constrained firms.

Table 2: Quantile regression for sample of all firms

	10	*25*	*50*	*75*	*90*
dm	***Coef.***	***Coef.***	***Coef.***	***Coef.***	***Coef.***
size	0.0007786	0.0164225***	0.0330348***	0.0658555***	0.042044***
	(0.0010646)	(0.002428)	(0.0039432)	(0.0065944)	(0.0095754)
tang	0.0077221	0.3812002***	0.8807921***	1.031187***	0.7953952***
	(0.0113346)	(0.0396367)	(0.0277248)	(0.0348328)	(0.0707471)
growth	-0.0000337	-0.0010498***	-0.0003828	0.0003372	-0.0009706***
	(0.000135)	(0.0003363)	(0.0003486)	(0.0009909)	(0.0004488)
assetmat	0.00000562	-0.00000618	0.00000942*	-0.00000317	0.0000907
	(0.00000887)	(0.00000818)	(0.00000494)	(0.00000292)	(0.00025)
tax	0.00000107	-0.0000113	0.0001467	0.0005717	0.0006542*
	(0.0000467)	(0.0000405)	(0.000476)	(0.0011718)	(0.0003887)
turnover	-0.0009607	-0.0190129***	-0.0312345***	-0.0418079***	-0.0756544
	(0.0006428)	(0.0032105)	(0.0036683)	(0.0061078)	(0.0079537)
lag_lev	0.0067883	0.0762618***	-0.0391808	-0.3739428***	-0.746498***
	(0.0087474)	(0.0151208)	(0.0292914)	(0.0533365)	(0.0719904)
term	-0.00000813	-0.0001276***	-0.000286***	-0.0004751***	-0.0006102**
	(0.0000175)	(0.0000314)	(0.0000551)	(0.0001175)	(0.0002438)
bankdev	0.0000169	0.0001378	-0.0009786	0.00049	-0.004672*
	(0.0002181)	(0.0004171)	(0.0007165)	(0.0013793)	(0.0027027)
stockdev	0.0000097	0.0003518	0.0034019***	-0.0007919	0.0091087
	(0.0005138)	(0.0009111)	(0.0016039)	(0.0032592)	(0.0070555)

Note: *, **, *** denote significance at 10%, 5% and 1% respectively.

For unconstrained firms, size is a strong and consistent determinant in that its coefficients are positively significant in most quantiles. It is clear that the larger the firm, the higher the long-term debt proportion. For size-unconstrained firms, the strong coefficients of size reduce strength at 90% quantile (long maturity debt structure), showing that size-unconstrained firms are aware of high agency cost at extremely long debt structure and decide to take on less long-term debt compared to when they are at shorter debt structures. For cash flow unconstrained firms, size is significantly positively related to debt maturity for almost all quantiles, except for 90% quantile. This implies that compared to size-unconstrained firms, cash flow-unconstrained firms are more concerned about agency cost related to underinvestment, and so do not desire to take on more long-term debt at extremely long debt maturity structure. Interestingly, another explanation is that cash flow unconstrained firms have more cash flow, which can accommodate the financing needs and so do not have to borrow either more long-term or short-term debt.

For size-constrained firms, size is significantly positively related to long-term debt at quantiles 50% and 75%, suggesting that these firms cannot borrow long-term debt when they have high liquidity risk (at short maturity structure or quantiles 10% and 25%). When the firms are less risky in terms of liquidity, they can borrow more long-term debt as their size is larger, but this variable is insignificant at 90%. This again suggests that size-constrained firms are more plagued by agency cost that is associated with underinvestment problem, in comparison with size-unconstrained firms. For cash flow-constrained firms, these firms can borrow long-term debt from quantile 25% to 90%, showing that because of high liquidity risk (at 10% quantile) these firms again cannot borrow long-term debt and that these firms have less concern about agency cost related to underinvestment problem, and so still desire to take on more long-term debt even at long debt maturity structure.

Table 3: Quantile regression for large firms (source: authors calculated)

	10	25	50	75	90
dm	Coef.	Coef.	Coef.	Coef.	Coef.
size	0.012779***	0.0236653***	0.0384029***	0.0690293***	0.0420302***
	(0.0040314)	(0.00642)	(0.0075863)	(0.0091963)	(0.0151178)
tang	0.274866***	0.64304***	1.031993***	1.049467***	0.8417176***
	(0.0405993)	(0.0441487)	(0.0312018)	(0.044243)	(0.0814127)
growth	-0.0009865*	-0.0009615	-0.0000186	0.0007713	-0.0008895**
	(0.0005617)	(0.0008775)	(0.0004477)	(0.0007003)	(0.0004343)
assetmat	0.000000513	-0.000005	-0.0000128	0.0000383	0.0001309
	(0.0000135)	(0.0000107)	(0.00000804)	(0.0004419)	(0.0002847)
tax	0.0000185	-0.0000194	-0.000099**	-0.0002475***	0.0006439
	(0.0000733)	(0.0000585)	(0.0000431)	(0.000035)	(0.0004077)
turnover	-0.0165286***	-0.0257987***	-0.0362146***	-0.0464708***	-0.0702295***
	(0.004486)	(0.0052857)	(0.0055932)	(0.0094421)	(0.0076233)
lag_lev	0.0794276***	0.0292961	-0.1069825***	-0.4581692***	-0.693204***
	(0.017678)	(0.0289396)	(0.0351208)	(0.0643456)	(0.0844777)
term	-0.0001311***	-0.0001692***	-0.0002117***	-0.0001679	-0.0002567
	(0.0000389)	(0.0000588)	(0.0000687)	(0.0001408)	(0.0002509)
bankdev	-0.0008115	-0.000459	-0.0014063	0.0008149	-0.0037062
	(0.0005083)	(0.0007339)	(0.0009773)	(0.001951)	(0.002768)
stockdev	0.0020695*	0.002145	0.003625*	-0.0034782	0.0056944
	(0.0011054)	(0.0016124)	(0.0020972)	(0.004058)	(0.0067799)

Note: *, **, *** denote significance at 10%, 5% and 1% respectivdy.

The coefficients of the variable representing tangible assets (Tang) have similar patterns with that of size. The coefficients are significantly positive across all the quantiles for both size and cash flow–unconstrained firms, confirming the consistency and robustness of this factor in an asymmetry information–plagued market like Vietnam. The coefficients are high and keep increasing, but taking a significant dip at quantiles 90 for both samples, clearly indicating that unconstrained firms with more tangible assets take more long-term debt, but with considerably lower magnitudes to cut down on the agency cost related on the underinvestment problem when at long debt maturity structure.

For size-constrained firms and cash flow–constrained firms, the patterns are highly consistent, in that both show their inability to borrow long-term debt at high liquidity risk, while at long debt maturity where firms are prone to higher agency cost, managers reduce their rates of employing on more long-term debt.

Table 4: Quantile regressions for small firms (source: authors calculated)

	10	25	50	75	90
dm	Coef.	Coef.	Coef.	Coef.	Coef.
size	0	0.0008892	0.0133837*	0.0363966*	-0.0307905
	(0.0027405)	(0.0019405)	(0.0072513)	(0.019189)	(0.0404068)
tang	0	0.0206328**	0.5712899***	0.971697***	0.6298444***
	(0.0167662)	(0.0105121)	(0.0845007)	(0.0904988)	(0.1437781)
growth	0	0.0000279	0.000407	0.0011257	-0.0026536
	(0.0003901)	(0.0003024)	(0.0008639)	(0.0018771)	(0.0035288)
assetmat	0	0.0000523***	0.0000216***	-0.0000022	0.000118
	(0.0003777)	(0.00000362)	(0.00000531)	(0.00000392)	(0.000296)
Tax	0	0.0001226	0.00115	0.0014767	0.0005467

	(0.0002123)	(0.0001841)	(0.0007587)	(0.0011208)	(0.0008496)
turnover	0	-0.0019028*	-0.0209256***	-0.0320911***	-0.0398379
	(0.0017315)	(0.0010896)	(0.0046483)	(0.0082954)	(0.0407935)
lag_lev	0	0.0284195***	0.0677224	-0.2644837**	-0.8621615***
	(0.0131453)	(0.0110438)	(0.0440832)	(0.1094414)	(0.1529451)
term	0	-0.0000233	-0.0002673***	-0.0008497***	-0.0009689***
	(0.0000284)	(0.0000229)	(0.0000775)	(0.0002548)	(0.0003744)
bankdev	0	-0.0000384	-0.0001261	0.0005566	0.0006538
	(0.0003569)	(0.0002741)	(0.0008884)	(0.001977)	(0.0063427)
stockdev	0	0.0001906	0.0017779	0.002844	-0.0028774
	(0.0008017)	(0.0006502)	(0.0021729)	(0.0054521)	(0.0136786)

Note: *, **, *** denote significance at 10%, 5% and 1% respectively.

With regard to growth opportunities, there is supporting evidence that size-unconstrained firms prefer to reduce underinvestment problem by employing more short-term debt as Myers (1977) suggested, and this variable is significant at high liquidity risk quantile (10%) and at longest debt maturity quantile (90%). For cash flow–unconstrained firms, growth opportunities are not significant at any quantile, indicating that these firms may have decent internal funds to cover investment needs, and so do not have to access debt market and alter their debt maturity structure.

For size-constrained firms, growth opportunities do not have any significant impact on debt maturity structure, probably on account of strong interest in reducing liquidity risk by not employing more short-term debt, while accessing long-term debt is highly costly for these firms. On the other hand, cash flow–constrained firms with high growth opportunities tend to finance the investments with short-term debt (at 25 and 50% quantiles). However, at long debt maturity (75 and 90% quantiles) firms no longer wish to take on more short-term debt or long-term debt. Together with the evidence for size-unconstrained firms, we offer evidence of the prevalent underinvestment problem for firms in Vietnam, whereas Cai et al. (2008) suggest Chinese companies are more prone to overinvestment issue.

Table 5: Quantile regression for firms unconstrained by cash flow

	10	25	50	75	90
dm	Coef.	Coef.	Coef.	Coef.	Coef.
size	0.0069687***	0.0185007***	0.0339543***	0.0631126***	0.0191277
	(0.0027008)	(0.0039724)	(0.0074455)	(0.0106949)	(0.0156354)
tang	0.0991843***	0.5065483***	0.9202243***	1.086086***	0.935125***
	(0.0339778)	(0.0534769)	(0.0466156)	(0.0533488)	(0.1020797)
growth	0.0002466	0.0015521	0.0015956	0.0015643	-0.0014662
	(0.0007257)	(0.001002)	(0.0016861)	(0.0015666)	(0.006679)
assetmat	-0.0000923	-0.0000382	-0.0001557	-0.000219***	0.0013834***
	(0.0001514)	(0.0001753)	(0.0003263)	(0.0000679)	(0.0005265)
tax	0.0002831	-0.0002047	-0.00047	0.0008948	0.0000613
	(0.0004642)	(0.0006466)	(0.000922)	(0.0011357)	(0.0014177)
turnover	-0.0080556***	-0.0203241***	-0.0318652***	-0.0395758***	-0.0131948
	(0.0029054)	(0.0064786)	(0.0090456)	(0.0123296)	(0.0197996)
lag_lev	0.0915921***	0.1642368***	-0.058472	-0.5041959***	-0.8251182***
	(0.0220787)	(0.0321217)	(0.0520411)	(0.0751081)	(0.100621)
term	-0.0000747	-0.0001746**	-0.0003909***	-0.000666***	-0.000796***
	(0.0000515)	(0.0000766)	(0.000099)	(0.0001597)	(0.0002869)

bankdev	0.0001243	0.0008768	-0.0003096	-0.0008431	-0.0055797
	(0.000662)	(0.0009862)	(0.0014411)	(0.0020274)	(0.003636)
stockdev	0.000552	0.0001215	0.0023607	0.00293	0.0134415
	(0.0015067)	(0.0021716)	(0.0030612)	(0.00459)	(0.0083364)

Note: *, **, *** denote significance at 10%, 5% and 1% respectively.
(Source: authors calculated)

With regard to asset maturity, size-unconstrained firms do not seem to care for matching principle, probably due to their low liquidity risk. Meanwhile, the coefficients for cash flow–unconstrained firms have unexpected negative sign at quantile 75%, but then change to positive at 90%. Therefore, this is evident that firms with high cash flow tend to be prone to overinvestment problem, and are more willing to take on more long-term debt to control for it, as well as to ensure the matching principle.

Size-constrained firms show more concern about matching principle at low debt maturity structure in order to avoid liquidity risk from mismatching, but at longer debt maturity these firms tend to reduce the long-term debt to diminish underinvestment cost. Cash flow-constrained firms also showcase their interest in matching the maturities of assets and debts, but only at median quantile (at low quantiles these firms may fail to borrow more long-term debt to match with the increase in asset maturity due to high liquidity risk, while at high quantiles these firms suffer more from agency risk and so refrain themselves from taking on more long-term debt).

When it comes to tax factor, size-unconstrained firms manage to exploit the benefit from debt tax shield (at 50 and 75% quantiles) (as tax rates increase, firms choose to have shorter liabilities structure). Cash flow-unconstrained firms do not exploit such luxury, and this could be due to the fact that these firms are supported with sufficient internal funds and demand less outside debts (according to pecking order theory), which is why the debt maturity does not alter significantly. Size-constrained and cash flow-constrained firms are similar to cash flow–unconstrained counterparts in that they do not prioritize tax-related incentives.

As for turnover variable, size-unconstrained firms show themselves an advocate of signaling theory, as this variable is significantly negative throughout the distribution of debt maturity structure and even get stronger at longest debt maturity structure (90% quantile). These firms tend to ignore liquidity risk at shortest debt maturity and just take on more short-term debt to signal their creditworthiness. Meanwhile, cash flow-unconstrained firms also support this theory and this variable is significantly negative for all quantiles except for 90% (so it is clear that these firms are less concerned about underinvestment-related agency cost, rather what may be detrimental to these firms is the overinvestment problem). This could be that at longest debt maturity, cash flow-unconstrained firms are those who prefer to use internal funds rather than taking on more external debt to save agency cost.

Size-constrained firms also try to signal themselves by using more short-term debt, but not at 10% (too high liquidity risk) and unexpectedly at 90%. Meanwhile, cash flow-constrained firms are extremely concerned about signaling throughout their debt maturity structure, and the incentive is more intense towards the right end of the distribution. Therefore, for these firms, signaling and reducing underinvestment agency cost are chief reasons when deciding debt maturity structure.

As for leverage variable, size-unconstrained firms are more vigilant at short-debt maturity structure with increased leverage, for the variable is positively related to debt maturity to reduce the liquidity risk. At longer debt maturity structure, firms no longer need more long-term debt and in fact reduce them to tackle agency cost. Cash flow-unconstrained firms also tend to use more long-term debt at short-debt maturity, but then turn to short-term debt to resolve underinvestment agency cost.

Size-constrained firms only take on more long-term debt at 25%, but use more short-term debt when at longer debt maturity structure to reduce underinvestment agency cost. Cash flow-constrained firms also follow suite closely in this case. Unfortunately, it is clearly not possible for constrained firms to issue long-term debt at shortest debt maturity structure (quantile 10%) even when they wish to reduce the liquidity risk the most, probably due to their inherent low creditworthiness in this very context.

Regarding the spread between long and short-term debts, it is comprehensible that size-unconstrained firms have the conditions to exploit cheaper financing source between the two, even at shortest liability structure, but this relationship only last from quantiles 10% to 50%. This may suggest that the demand for long-term debt of large firms tend to be very high even when short-term debt is cheaper than long-term one, but we should bear in mind that thanks to their reputation long-term debt should be inexpensive for large firms in comparison with small firms. In the meantime, cash flow unconstrained firms also favor cheaper short-term debt but not at the shortest maturity debt structure (10% quantile).

Table 6: Quantile regression for firms constrained by cash flow

	10	25	50	75	90
dm	Coef.	Coef.	Coef.	Coef.	Coef.
size	7.34E-05	0.0150534***	0.032592***	0.0667588***	0.0598468***
	(0.001377)	(0.0025873)	(0.004899)	(0.0076393)	(0.0119828)
tang	0.000301	0.2908785***	0.8512467***	0.952335***	0.755579***
	(0.0140746)	(0.049171)	(0.0398119)	(0.0582134)	(0.0915788)
growth	-6.6E-06	-0.001141***	-0.0005785*	-0.00072	-0.00081
	(0.0001175)	(0.0003628)	(0.000346)	(0.000633)	(0.0008463)
assetmat	6.26E-06	-4.8E-06	0.0000102*	-2.4E-06	7.77E-06
	(0.00000799)	(0.00000756)	(0.00000542)	(0.00000362)	(0.0001573)
tax	9.44E-08	-1.2E-05	0.00012	0.000215	0.000328
	(0.0000425)	(0.0000374)	(0.0005516)	(0.0008663)	(0.0004644)
turnover	-8.9E-05	-0.01684***	-0.031695***	-0.049264***	-0.076792***
	(0.0006339)	(0.0034604)	(0.004869)	(0.0092077)	(0.0068924)
lag_lev	0.000479	0.0421189***	-0.01276	-0.259491***	-0.659683***
	(0.0099498)	(0.0164125)	(0.0305992)	(0.0670418)	(0.1039761)
term	-6.8E-07	-0.000111***	-0.000258***	-0.0003815**	-0.0005842**
	(0.0000201)	(0.0000322)	(0.0000662)	(0.0001585)	(0.0002373)
bankdev	9.46E-07	-4.5E-06	-0.001	0.000466	-0.00385
	(0.0002478)	(0.0004131)	(0.0008419)	(0.0016858)	(0.0032264)
stockdev	-4.7E-07	0.000601	0.003044	-9E-06	0.006131
	(0.000585)	(0.000927)	(0.0018975)	(0.0039205)	(0.007024)

Note: *, **, *** denote significance at 10%, 5% and 1% respectively.
(Source: authors calculated)

Size-constrained firms also time the debt issuance according to the market, but they are willing to borrow short-term debt to capitalize on the advantage only at rather long maturity structure (50% to 90%). Meanwhile, cash flow-constrained firms also try to benefit from the market timing, even at short debt maturity structure (25% quantile). This suggests that cash flow-constrained firms have better liquidity than their size-constrained counterparts.

It is interesting to find that bank development does not have considerable impact on the firm debt maturity structure, though the impact is negative at 90% quantile for the whole sample as in Table 2. Stock development tend to favor only large firms which is consistent with the findings from Demirguc-Kunt and Maksimovic (1999), and the impact is significant only at 10% and 50%, implying that large firms may have better access and cheaper long-term financing source so they tend to use this long-term source to reduce liquidity risk yet avoid too high agency cost. Stock development is associated with faster and stronger information flow within the market, and this trend helps reduce the information asymmetry, especially for large firms.

Oaxaca-Blinder decomposition

This study employs Oaxaca-Blinder decomposition technique to identify which variable plays important role in explaining the difference between the two groups divided by different constraint proxies. Firstly, it is clear that firms with more constraint take on more short-term debt, regardless of proxies. Firms constrained by size and cash flow have 22% and 24% as the proportions of long term debt to total debt, while unconstrained firms' ratios are 31% and 32%. The differences are then broken down into explained and unexplained parts as below.

a) Size-constrained and size-unconstrained firms

For the explained part, the results suggest that the debt maturity structure of size-unconstrained firms is longer than that of size-constrained firms mostly due to the differences in their own characteristics. Size is an important factor because the difference in its average values between the 2 groups accounts for most part of the explained part (0.099% out of 10.35%). Tangible assets of size-unconstrained companies are higher than that of size-constrained counterparts (0.013% out of 10.35%). Lower turnover is

another factor explaining the longer debt maturity structure of size-unconstrained firms, but its magnitude is just about 0.006%. Finally, the leverage of size-unconstrained firms is on average higher than that of size-constrained companies, thwarting the maturity difference between the 2 groups by 0.015%.

For the unexplained part, one unit of tangible assets in unconstrained firms is associated with longer maturity debt (the difference in the coefficients is 0.85%). One unit of term variable (the gap between the rates for long- and short-term debt) is associated with longer maturity debt (the difference in the coefficients is 0.048%). This is interesting, and can be explained as follows. As term structure of interest rate is upward-sloping, the economy is signaled to be in its bloom and encouraging firms to invest more. In this context, large firms can be seen to forego the minimization in the cost of debt, and try to seize the market trend. Large firms show more concern about signaling as the coefficient is more negative (0.039%) as opposed to small firms. Large firms tend to value debt-related tax shield as they opt for more short-term debt as their tax rates increase (coefficient is 0.032 more negative).

b) Cash flow-constrained and cash flow-unconstrained firms

For the explained part, cash flow-unconstrained firms have smaller size, lowering the difference by 0.008%. Turnover of cash flow-unconstrained firms is higher than that of constrained firms, further lowering the difference by 0.042%. Unconstrained firms tend to have more tangible assets and lower leverage than constrained peers, which explains longer debt maturity structure by 0.085% and 0.0023% respectively.

For the unconstrained part, cash flow-unconstrained firms have lower coefficient of size, which reduces the maturity difference by 0.33%. Meanwhile, unconstrained firms have higher coefficient of tangible assets and lower coefficient of turnover, furthering the maturity difference by 0.0485% and 0.038% respectively. Therefore, it can be concluded that cash flow-unconstrained firms rely more on their tangible assets to borrow more long-term debt, and have less motive for signaling.

Table 7 - Oaxaca Blinder decomposition result

	Size		**Cash flow**	
dm	Coef.	Std. Err.	Coef.	Std. Err.
	Differential			
Prediction_1	0.3101584***	0.0082351	0.3195942***	0.0102411
Prediction_2	0.2212866***	0.0095317	0.2398918***	0.0078208
Difference	0.0888718***	0.0125965	0.0797024***	0.0128858
Explained				
size	0.0989667***	0.013128	-0.0084518***	0.0025459
tang	0.0134395**	0.0057305	0.0853614***	0.0068658
tax	0.0001288	0.0002903	-0.000575	0.0010612
turnover	0.006072***	0.0020095	-0.01442***	0.0027915
lag_lev	-0.0154862***	0.0038657	0.002354*	0.0012079
Total	**0.1035218*** **	**0.0144546**	**0.0631758*** **	**0.0088416**
Unexplained				
size	0.4189416	0.2805545	-0.3229892*	0.1808685
tang	0.0856792***	0.0166163	0.0485585***	0.018185
taxmodel	-0.0320445***	0.0098578	-0.0039173	0.0179756
turnover	-0.0396067**	0.0167856	0.0381135*	0.0202869
lag_lev	-0.01244	0.0181291	-0.0105906	0.018287
term	0.0312856**	0.0158534	-0.0098027	0.0156389
Total	**-0.01465**	**0.0165127**	**0.0165266**	**0.0121395**

Note: *, **, *** indicate significance at 10%, 5% and 1% respectively. Prediction_1 (Prediction_2) is the respective value of DM for unconstrained (constrained) firms.

In summary, Oaxaca-Blinder decomposition provides us with another view of the anatomy of the difference in debt maturity structures between constrained and unconstrained firms. The size-unconstrained firms tend to have larger size, more tangible assets and lower turnover and leverage, so understandably they have longer debt maturity structure. Meanwhile, in a similar vein, cash flow-unconstrained firms have more tangible assets and lower leverage. When it comes to the unexplained part which is of more interest in this study, large firms are more likely to forego the minimization principle of borrowing cost; instead, they are more willing to seize the blooming economy to invest more to reap the benefit by using more long-term debt. Tangible assets are of higher aid in accessing long-term debt for the unconstrained firms, but larger size is associated with more short-term debt or less long-term debt for unconstrained firms in comparison with constrained ones, implying that there is a view that unconstrained firms may be more prone to underinvestment problem. Finally, large firms are more willing to signal their creditworthiness by using more short-term debt, while firms with large cash flow have lower incentive to do this, compared to firms with low cash flow.

Conclusion

This paper analyses the different behaviour of financially constrained and unconstrained listed firms in terms of DM choices in Vietnam. Our approaches are twofold: quantile regression to find out how firms react to the differing levels of liquidity risk and agency cost across the DM distribution and Oaxaca Blinder decomposition to dissect the contributors of the difference in the average DM of constrained and unconstrained firms.

Our findings from quantile regression provide strong evidence showing that constrained firms suffer more from liquidity risk and information asymmetry, while unconstrained firms with stronger financial profiles are better equipped to withstand both of these frictions effectively and the desire to use long-term debt is very high for large firms. Both groups also show strong interest in reducing agency cost associated with high ratios of long-term debt. The results from decomposing the difference in DM between two groups offer a different perspective: large firms tend to be more willing to signal their quality through employing more short-term debt, but firms with high cash flow do not observe such a trend.

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