

Does Manager's Perceived Competition Affect the Capital Structure Decisions of Malaysian Firms? A Text Mining Approach on the Chairman's Statement

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Abstract: This study examines the validity of the limited liability effect theory using the ex-ante measure of competition as a framework for analysing the capital structure determinants of Malaysian firms. The limited liability theory argues that, given the tougher competitive environment, debt has a limited liability effect; hence, debt induces managers to pursue more risky projects. Despite its consistency with the underpinning model, the majority of studies that test the validity of the limited liability effect theory use ex-post measures for competition instead of ex-ante measures. This study endeavours to fill this gap in the literature by introducing a new variable construct for competition utilizing a text mining approach on the chairman's statement. The findings suggest that manager's perceived competition has a positive relationship with the changes in a firm's leverage. Thus, this study confirms the limited liability effect theory in the context of a developing country.

Keywords: Debt, competition, limited liability effect theory, text mining, ex-ante.

JEL classification: G32

1. Introduction

There is a strand in the literature that relates a firm's capital structure and its competitive environment in the product market. One of the theories in this strand of literature is the limited liability effect theory, which predicts a positive relationship between product market competition and debt level. Brander and Lewis (1986) argue that since debt has limited liability, firms in Cournot competition¹ subject to some product market uncertainty will use debt to commit to an aggressive product market behaviour to gain a strategic advantage. The main notion in their theory is that shareholders will ignore reductions in returns in bankrupt states since bondholders become the residual claimants. Maksimovic (1988) extends the strategic effects of the limited liability of debt by considering multiple periods of interaction. He shows that increases in debt make it more difficult for firms to maintain collusive outcomes because high levels of debt create an incentive for shareholders to deviate from a tacit agreement with rivals and produce more than the Cournot equilibrium output level without debt.

From empirical studies, some researchers (Lyandres 2006; Fosu 2013) find a positive relation between product market competition and firm's leverage. However, other researchers (Istaitieh and Rodriguez 2003; Guney *et al.* 2011) show opposite results where they find an inverse relationship between the intensity of competition and the leverage ratio. Moreover, the majority of competition measures in the literature rely on accounting or ex-post data, such as price-cost margin, the Boone indicator or relative profit difference, the

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¹ Cournot competition is an economic model used to describe an industry structure in which companies compete concerning the amount of output they will produce, which they decide on independently of each other and at the same time.

Herfindahl-Hirschman Index, or concentration ratio. Studies (Amir 2003; Griffith *et al.* 2005; Maliranta *et al.* 2007) have shown that the use of ex-post data to measure competition contains bias. Meanwhile, the application of the text mining approach in the area of finance has gained popularity. Two likely factors have contributed to the growing trend in this line of research (Li 2010b). First, a large amount of unstructured textual data has recently become available electronically and is accessible to researchers, and, second, there have been significant developments in research in the fields of computational linguistics, text mining, and machine learning in the past two decades, which provide researchers with powerful tools to understand corporate disclosures better.

Inconclusive findings from the empirical perspective and the bias problem in traditional competition measures require further study. Thus, this study endeavours to fill this gap in the literature by testing the limited liability effect theory using a new measure of product market competition. The new measure proposes that the proxy for product market competition is at the firm-level because competition intensity depends on the manager's perception, which incorporates uncertainty about future competition and the current condition of the firm. This manager's perception can be found in the chairman's statement section of the annual report that contains forward looking information regarding competitive behaviour at the firm level. Hence, unlike measures for product market competition that exist in the literature that rely on ex-post data, the new measure uses ex-ante data to conform with the models of the limited liability effect theory.

The findings suggest that manager's perceived competition does have a positive relationship with the changes in firm's leverage. Moreover, profitability, tangibility, and firm size also have a consistent significant impact on the changes in firm's leverage. However, growth opportunity only significantly impacts the changes in firm's leverage in the accounting-based model, while, in the market-based model, no support was found for the effect on the changes in leverage. Section 2 provides a review of the literature concerning the determinants of government bond spreads. Section 3 describes the data and methodology that are used in this study. Section 4 evaluates the empirical results and discusses the findings. Finally, Section 5 presents the conclusion of this study.

2. Literature Review

The combination of debt and equity is the basic axis of the firm's capital structure. Harris and Raviv (1991) identify four categories of factors that determine the capital structure. First, are the factors that ameliorate the conflicts of interest among various groups with claims to the firm's resources, including managers (the agency approach). Second, are the factors that convey private information to the capital markets or mitigate adverse selection effects (the asymmetric information approach). Third, are the factors that affect the outcome of corporate control contests, and, fourth, are the factors that influence the nature of the products or competition in the product/input market. This last new literature linking capital structure and factor-product markets includes the stakeholder theory of capital structure, market structure, and firms' strategic behaviour.

Istaitieh and Rodriguez (2006) identify two strands of literature that discuss the relation between capital structure and factor-product markets. The first strand of literature argues that firm's non-financial stakeholders, e.g. customers, workers, or suppliers, affect debt level. Thus, one should take into account the shareholders and bondholders as claimants on the firm's cash flow, as well as the firm's non-financial stakeholders. The second strand of literature starts from the industrial organization and firm's strategic management in order to determine the capital structure. It exploits the relationship between the firm's capital structure and its strategy when competing in the product market. Most models of this second approach use capital structure as a commitment or strategic device. Here, capital structure

must be observable and firms are not allowed to change it before production and investment decisions take place. Therefore, rival firms can observe the choice of capital structure and rationally anticipate its effect on subsequent investment and production decisions. One appealing theory in this strand of literature is the limited liability effect theory (Brander and Lewis 1986; Maksimovic 1988; Showalter 1995).

Brander and Lewis (1986) establish that when debt has limited liability, Cournot firms subject to some product market uncertainty will use debt to commit to a large output stance in an attempt to gain a strategic advantage. As firms take on more debt, they will have an incentive to pursue output strategies that raise returns in good states and lower returns in bad states. The basic point here is that shareholders will ignore reductions in returns in bankrupt states, since bondholders become the residual claimants. As the debt levels change, the distribution of returns to shareholders over the different states changes, which, in turn, changes the output strategy favoured by shareholders. Maksimovic (1988) extends the model of Brander and Lewis concerning the strategic effects of the limited liability of debt by considering multiple periods of interaction. He shows that increases in debt make it more difficult for firms to maintain collusive outcomes because high levels of debt create an incentive for shareholders to deviate from a tacit agreement with rivals and produce more than the Cournot equilibrium output level without debt. This is because they receive the residual cash flow after the debt payments today.

In another way, Showalter (1995) argues that the optimal strategic debt choice of firms in Bertrand competition² depends on the type of uncertainty that exists in the output market. In the case of Bertrand competition where costs are uncertain, price-competing firms, unlike Cournot firms, will not use strategic debt. In particular, Bertrand competitors that experience uncertain costs find that the use of debt causes industry prices and expected firm profit to fall, and firms in this case do not become leveraged. Thus, if firms compete in Bertrand competition, the use of strategic debt is only advantageous if demand conditions are uncertain. If demand conditions are uncertain, an increase in the firm's debt induces a rise in the firm's and rival's price, which raises both the debt and equity value of the firm. Consequently, firms will take on at least some debt to raise industry prices and expected profits. Finally, by considering short and long-run debt, Glazer (1994) presents empirical evidence showing that limited liability firms with high short-run debt always act, *ceteris paribus*, more aggressively in the product markets (by increasing sales) while a high proportion of long-run debt seems to reduce this effect, thereby giving no importance to the source of debt in either case (whether it is bank or commercial debt).

Lyandres (2006) tests a model based on Brander and Lewis (1986) using a sample of 148,946 firm-years and finds a positive relation between product market competition and firm's leverage. He uses the number of firms in the industry and the competitive interaction in the industry as a proxy for product market competition. Fosu (2013) investigates the relationship between the degree of industry competition, measured using the Herfindahl-Hirschman Index and the Boone indicator, and capital structure. His result also suggests that there is a positive and significant relationship between the two variables. However, other researchers, such as Istitieh and Rodriguez (2003), and Guney *et al.* (2011), show opposite results where they find an inverse relationship between the intensity of competition and the leverage ratio. As a proxy for product market competition, Istitieh and Rodriguez (2003) use the percentage of product price changes between the current and previous period, while Guney *et al.* (2011) use Tobin's Q.

² Bertrand competition is a model of competition used in economics. It describes the interactions among firms (sellers) that set prices and their customers (buyers) that choose quantities at the prices set.

Moreover, the majority of measures of competition in the literature, such as price-cost margin, the Boone indicator or relative profit difference, the Herfindahl-Hirschman Index, and concentration ratio, rely on ex-post data. The use of ex-post data to measure competition may contain bias. For example, a low price-cost margin indicates a high degree of competition. Conversely, Amir (2003) shows theoretically that there are possible scenarios in which the price-cost margin increases as intense competition also increases. Bikker and Leuvensteijn (2008) study the competition in the Dutch life insurance market, where they calculate the Boone indicator using three different measures of the marginal costs. Their results point to weak competition in the Dutch life insurance industry when compared to other industries; however, the robustness of their results is unclear. Griffith *et al.* (2005) investigate the empirical usefulness of a slightly modified Boone indicator based on relative profits. Using data from the annual report and accounts filed by UK publicly-listed firms during 1986-1999, they compare the relative profit measure with the price-cost margin and the Herfindahl-Hirschman Index. Their main results show a positive correlation between the relative profit measure and price-cost margin but no correlation with the Herfindahl-Hirschman Index, which raises questions about the usefulness of the Herfindahl-Hirschman Index as a measure of competition. Moreover, they provide evidence that cyclical changes have less effect on the relative profit measure than the price-cost margin. However, they cannot derive recommendations concerning which might be the “correct” measure of competition. Maliranta *et al.* (2007) study trend changes in the intensity of competition across the Finnish business sectors. They focus on the service sector and report the results of nine different measures of competition, which include traditional measures like the Herfindahl-Hirschman Index, price-cost margin and the four-firm concentration ratio, as well as six different parameterizations of the Boone indicator. Their results suggest an increase in competitive pressure in Finland in the analysed time interval. However, the outcomes vary a lot with respect to the different parameterizations of the Boone indicator, suggesting that the optimal specification and estimation of the Boone indicator remain an open question.

Meanwhile, understanding the textual information in corporate disclosure is important in finance research (Li 2010b). First, the textual disclosure contains information about the data generating function of the numeric financial data, and, indeed, comprises the bulk of financial data. Second, managers’ communication patterns could reveal certain managerial characteristics and thus have significant implications for understanding corporate decisions. Finally, communication by managers provides a useful background for academicians to understand managers’ incentive and private information sets, and, hence, it could help to better understand firm behaviour. In addition, examining the textual disclosures or corporate disclosure decisions by managers could prove to be a fruitful area to study earnings quality for two reasons. First, managers make many decisions based on future profitability, and, arguably, have more precise and complete information about their firm’s profitability than do other stakeholders. Therefore, to the extent that information asymmetry exists between managers and outsiders, the earnings quality inferred from managerial disclosures and decisions can be incremental or even superior to existing empirical measures. Second, earnings quality is a function of management incentives and the textual communications by managers can provide a means for researchers to assess these incentives.

Most studies in the information content of textual disclosures have found that textual disclosures are informative with respect to fundamentals and market reactions. Li (2010a) studies the tone (positive and negative tone) and content (profitability, operations, liquidity, etc.) of forward-looking statements in 10-K filings and 10-Q filings using the Naïve Bayesian machine learning algorithm. He concludes that the tone of the forward-looking statements is a function of current performance, accruals, firm size, market-to-book ratio,

return volatility, Management Discussion and Analysis (MD&A) Fog (transparency), and firm age. He shows that the tone of the forward-looking statements is positively correlated with future performance. More specifically, he argues that firms with more positive forward-looking statements in the MD&A have better current performance, lower accruals, lower market-to-book ratio, and less return volatility. Kothari *et al.* (2009) study the tone of the words in the disclosure content using three sources – company's management, business press, and analyst – and relate this content tone to the company's cost of capital and return volatility. They argue that the business press provides a more consistent finding that a positive (negative) tone in the business press results in reduced (increased) cost of capital and return volatility. Moreover, they find that when there are favourable disclosures, the firm's risk (as proxied by the cost of capital, stock return volatility, and analyst forecast dispersion) declines. On the other hand, unfavourable disclosures are accompanied by increases in each of the risk measures used in their study. Nelson and Pritchard (2007) investigate the disclosures of cautionary language and their association with litigation risk. Their findings indicate that firms facing greater litigation risk use more cautionary language in disclosures. This evidence is consistent with managers attempting to reduce expected litigation costs by altering their disclosure choices.

Li *et al.* (2011) provide an example of studying earnings quality based on management's views on firms' competitive environment extracted from textual disclosures. An important aspect of consideration when assessing a firm's profitability and earnings quality is its competitive environment. Standard microeconomic theory argues that when a firm faces strong competition, its abnormal profits mean reverts faster. Hence, the earnings quality of such firms is lower compared to firms facing little competition. Li *et al.* (2011) test this hypothesis using a very simple textual analysis of the firm's 10-K filing to gauge its competitive environment. They find that a firm's profit mean reverts faster when the frequency of references to competition in the 10-K is higher, suggesting that the information about competition from a firm's 10-K report contains information about earnings quality. Another contribution of this paper is that it proposes and validates firm-specific measures of competition that could be used to test other interesting economic hypotheses. The most common measures of competition used in the prior literature, the Herfindahl-Hirschman Index and the four-firm concentration ratio, focus on the distribution of production across firms within the industry. However, these measures are only defined at the industry level, while there is potentially considerable variation in competition within an industry.

Levine and Smith (2011) study a large sample of Critical Accounting Policy (CAP) disclosures from SEC filers and examine the extent to which CAP disclosures associated with exiting financial statement information provide new information, and with existing measures of accounting quality. They find that CAP disclosures can be directly traceable to a specific balance sheet account. For example, firms that cite accounts receivable as a critical accounting policy have higher accounts receivable as a percentage of total assets and a higher time-series variance of scaled accounts receivable than firms that do not. Similar results are found for the other balance sheet accounts that they examined. Merkley (2011) examines the relation between R&D-related disclosure and firm performance. He finds that firms provide more R&D-related disclosure when current performance decreases. His results are based on an analysis of within-firm variation and year-to-year changes. The result also indicates that this relation is more significant for firms with higher R&D spending and outside monitoring. Li (2010c) provides such evidence using textual disclosures by studying managers' self-serving attribution bias (SAB) and its implications for corporate financial policies. The SAB refers to individuals taking responsibility for successful outcomes but blaming circumstances or other persons for unsuccessful outcomes (Libby and Rennekamp 2010). Li (2010c) finds that managers tend to use more first-person

pronouns (relative to second- and third-person pronouns) in the MD&A of the 10-K filings when firm performance is better. The evidence in Li (2010c) also supports the argument that managers with more SAB are more overconfident and their firms tend to make less optimal investment decisions, have higher leverage, are more likely to repurchase stocks, and are less likely to issue dividends.

Summarizing, the limited liability effect theory provides a theoretical framework for the relationship between capital structure and competitive strategy. The theory is based on the limited liability feature of corporations where the limited liability status of shareholders protects their wealth when firms suffer during bad times, but gain wealth during good times. Hence, the limited liability effect theory predicts a positive relationship between capital structure and product-market competition. However, the empirical findings of this theory suggest mixed results. Although the limited liability effect theory implies that competition is an ex-ante event, previous empirical studies use the ex-post measure of competition. Meanwhile, textual information in corporate disclosure is also important in finance. This is because textual disclosure contains information about the data generating function of the numeric financial data, managers' communication patterns, and useful background to understand managers' incentive and private information sets. The text mining approach provides a tool for extracting the implicit information in managers' statements, which include managers' perception on future competition and their level of confidence. Thus, this study endeavours to fill this gap in the literature by suggesting a new measure for product market competition. The new measure proposes that the proxy for product market competition is at the firm-level because the competition intensity depends on the manager's perception, which incorporates uncertainty about the future competition and current condition of the firm. Part of the corporate disclosure that contains forward looking information regarding the competitive behaviour at the firm level is the chairman's statement section of the annual report. In addition, unlike the measures for product market competition that exist in the literature that rely on ex-post data, the new measure uses ex-ante data to conform with the model of limited liability effect theory.

3. Data and Methodology

According to Khotari *et al.* (2009), managers tend to understate unfavourable information. Hence, managers' disclosure regarding the competition level of their companies containing unfavourable information may be understated. This may be especially true when the market cannot differentiate or observe changes in the competition level of a particular firm during a particular period. However, companies that experience changes in the level of competition where the market can be easily observed may find it difficult to skew the information. Publicly listed firms that engage in horizontal acquisitions transactions are a good example of companies that experience changes in the level of competition due to changes in the market structure and are observable by the market because publicly listed firms are obliged by regulation to disclose their corporate action. Acquirers in horizontal acquisition may expect to decrease the degree of competition by reducing the number of competitors (Kim 2009). This effect on the level of competition of the acquirer should be expected in the subsequent period of the transaction. Additionally, a reduction in the level of competition implies a greater inclination to an oligopoly market structure, which conforms to the Brander and Lewis (1986) model.

Data on firms engaging in acquisition activities are provided by the Knowledge Centre of Bursa Malaysia Berhad. The data contains information, such as deal type, announcement date, completion date, deal status, payment type, target name, target industry sector, acquirer name, acquirer industry sector, and transaction total value. The data population consists of 1971 firms engaged in 2891 acquisition cases during 2001-2012. For the sample

selection, acquisition not in the same industry is excluded to control for acquisition type other than horizontal acquisition, and multiple acquisitions in the same financial period are regarded as one firm with one case of acquisition to avoid redundancy of the financial data involved. The number of samples selected for the study consists of 398 bidder companies engaged in 453 acquisition transactions. The number of firms selected for the sample is lower than the number of the population due to five reasons, in addition to the two previously mentioned. First, not all bidders' industries are disclosed in the list. The study excludes undisclosed bidders' industries to ensure that all transactions in the sample are horizontal acquisitions. Second, bidders engaged in a diversified industry are also excluded from the sample in order to retain only horizontal acquisitions in the sample. Third, bidders of foreign origin are excluded due to the scope of this study. Fourth, bidders of private companies or government agencies are excluded due to the unavailability of annual reports that contain the chairman's statement. Finally, some bidders do not have their financial data available in DataStream, and, hence, are excluded from the sample. The chairman's statements are collected from the annual reports of the respective firms, which are made available through the Bursa Malaysia website: <http://www.bursamalaysia.my>. Furthermore, financial data are downloaded from DataStream. The financial data collected includes earnings before interest, taxes, depreciation and amortization; total assets; property, plant and equipment net of depreciation; long-term debt; equity; and market capitalization of the respective firms.

The aim of this study is to investigate the role of manager's perceived competition in determining the capital structure decisions of the firms. As a result, the dependent variable for this study is changes in the leverage ratio; while the independent variables are manager's perceived competition along with a vector for the control variables. Control variables are used to ensure that manager's perceived competition effect does not simply capture some trade-off, pecking order, or market timing factors. The control variables adopted in this research are the ones that are found to be significant in Rajan and Zingales (1995), and subsequently used by Baker and Wurgler (2002). These variables are also identified to be the significant capital structure determinants in Malaysia (Booth *et al.* 2001). The following equation is used to determine the relationship between manager's perceived competition and leverage changes:

$$\Delta DER_i = \beta_0 + \beta_{1,i}COMP_i + \beta_{2,i}GROW_i + \beta_{3,i}PROF_i + \beta_{4,i}TANG_i + \beta_{5,i}SIZE_i + \varepsilon_i \quad (1)$$

where ΔDER is the changes in leverage (changes in long-term debt divided by book value of equity for accounting-based leverage and divided by the market value of equity for market-based leverage), $COMP$ is the manager's perceived competition, $GROW$ is the growth opportunities (sum of total assets and market value of equity minus book value of equity, divided by total assets), $PROF$ is the profitability (earnings before interest, taxes, depreciation and amortization divided by total assets), $TANG$ is the tangibility (net of property, plant and equipment divided by total assets), $SIZE$ is the size (natural logarithm of market value of equity), and ε_i is the error term.

The independent variable in this study is perceived competition in chairman's statements. Since the chairman's statement provides unstructured textual data, it requires text mining or content analysis to extract and quantify the perceived competition from the chairman's statement. Latent Semantic Analysis (LSA) is used to extract the meaning or information from the chairman's statement. This technique was developed in the late 1980s to recognize patterns in large sets of textual data. Principally, LSA mimics the way people interpret what they read and creates an assessment of meaning based on the word choice used in the documents. In determining words to include and exclude in a group of passages,

LSA calculates the relationship of statistical occurrence which then translates into an overall interpretation. In the LSA framework, the meaning of a text passage is a function of the properties of the words contained within. Thus, the meaning of a document is the sum of the meanings of its individual words. The meaning of an individual word is not explicitly defined but rather is situated with respect to all the other words used in the collection of documents. Word order is disregarded in LSA and the meaning of the text is extracted using the occurrence frequency of the individual words. Meaning is derived from the relation among words so words do not have meaning in isolation; words only have meaning by virtue of their relation to other words (Kintsch 2007). Meaning is derived from the circumstances in which it is and is not used. Landauer *et al.* (1998) suggest that the meaning of a word is the average of the meanings of all the passages and the meaning of a passage is the average of the meanings of all the words in the documents. Style, syntax and grammar are ignored by LSA; instead, the calculations are based on the detailed patterns of the occurrences of each word over a large array of written passages. It is important to keep this in mind because LSA does not look at the sentence arrangement to find meaning but looks at the direct relationship between the word choice and the word choice within a passage. The opponents of LSA mainly argue that it ignores the word order and relies on word choice exclusively. However, the proponents of LSA estimate that word choice alone accounts for 80%-90% of the meaning of a passage of text, thereby explaining why LSA performs so well in a wide range of applications (Hendry and Madeley 2010).

The application of LSA requires a “bag of words” or a dictionary to parse the chairman’s statement documents into vectors of words and word counts. The word list to reflect competition is taken from Li *et al.* (2011). The list includes 11 words, such as competition, competitor, rival, and contend. Once all the documents are collected, the first step in implementing LSA is to pre-process the documents by removing formatting, such as punctuation, capitalization, numbers, and any special characters. The next step is to arrange the group of documents into a matrix (X) where each row represents a word (t) and each column represents a document (d). Each cell of the matrix is the weighted frequency (x_{ij}) of row t ’s word in column d ’s document, where, at first, it represents the number of times the associated term appears in the indicated document (tf_{ij}).

$$X = \begin{bmatrix} x_{1,1} & \cdots & x_{1,n} \\ \vdots & \ddots & \vdots \\ x_{m,1} & \cdots & x_{m,n} \end{bmatrix} \quad (2)$$

The X matrix is an $m \times n$ matrix where m is the total number of words and n is the total number of documents. Typically, m is much larger than n but this need not be true. The matrix is also usually sparse with most entries being zero so that each document contains only a small subset of the words from the dictionary.

Once the term-document matrix (tf_{ij}) is constructed, the next processing stage requires both local and global weights to be calculated for each non-zero element of the X matrix. The purpose of this is to either increase or decrease the importance of each term within documents and across all documents. This helps to distinguish the documents from each other and allows a better representation of the most important words by giving low weight to high-frequency terms (occur in many documents) and high weight to low frequency terms (occur in some documents). Jurafsky and Martin (2009) note that term weighting “has an enormous impact on the effectiveness of a retrieval system.” Essentially term weighting acknowledges that raw word counts are not the best measure of a word’s information content. Weighting schemes address three components: the importance of a term within a document (often measured by proportional occurrence or the log of frequency); some form

of normalization for document length; and the importance of a term within the entire corpus (typically measured by inverse document frequency). Term weighting is expressed as:

$$x_{td} = l_{td} \cdot g_t \quad (3)$$

where l_{td} is the local weighting for word t in document d , and g_t is the word's global weighting. The within-document relative frequency calculation is the most common example of a local term weighting scheme where the more often a term appears within a particular document, the more it contributes to the content of that document.

$$l_{td} = \frac{tf_{td}}{\max_t tf_{td}} \quad (4)$$

l_{td} for a particular term t in a particular document d is calculated by dividing the frequency tf_{td} of term t in document d by the highest frequency across all the words in document d .

The most common global term weighting function is the inverse document frequency (IDF), whereby the more documents in which a term occurs, the less discriminating it is.

$$g_t = \log \frac{n}{1 + df_i} \quad (5)$$

This global term frequency is the logarithm of the inverse of the document frequency, the number of documents in which word i occurs (df_i) divided by the number of all documents in the collection (n).

Finally, to ensure that longer documents do not dominate the results, the documents are normalized to adjust for differences in length. Different normalizations are used but the most common is cosine normalization. Finally, we have the following for each element of the X matrix.

$$x_{td} = \frac{l_{td} \cdot g_t}{\sqrt{\sum_{t=1}^T l_{td} \cdot g_t}} \quad (6)$$

A row in the X matrix is a vector relating to a term and providing its relation to each document.

$$t_i^T = [x_{i,1} \quad \cdots \quad x_{i,n}] \quad (7)$$

Likewise, a column in the X matrix is a vector corresponding to a document and giving its correlation to each term:

$$d_j = \begin{bmatrix} x_{1,j} \\ \vdots \\ x_{m,j} \end{bmatrix} \quad (8)$$

Singular Value Decomposition (SVD) is vital to the success of LSA since it is what creates or maps the relationships between the words across the documents taking account of not only where words are used but where they are not used. SVD is a generalized form of

principal component analysis in which any arbitrary rectangular matrix can be exactly decomposed into the product of three characteristic matrices: $X=USV^T$. The columns of U ($m \times n$) and V ($n \times n$), referred to as the left and right singular vectors of X , represent the orthonormal eigenvectors of XX^T and $X^T X$, respectively. S ($n \times n$) is a diagonal matrix of singular values where the diagonal entries are the non-negative square roots of the eigenvalues of XX^T and $X^T X$, ordered by decreasing size. SVD yields a unique decomposition of X up to the sign of the singular vectors in U and V . The U matrix describes words (m rows) as vectors of the derived orthogonal factor values (n columns) while the V matrix describes the documents (n rows) as vectors of the same factors (n columns). These factors may be thought of as underlying concepts or themes that run through the documents. The meaning of each word or document can then be characterized by a vector of weights indicating the importance of each of these underlying themes. The i,j^{th} element of U is the contribution or importance of the i^{th} word to the meaning of the j^{th} theme. Similarly, the i,j^{th} element of V represents the importance of the j^{th} theme in the i^{th} document. It is these rows of V that are investigated for their importance in manager's perceived competition. The S matrix represents the importance of each theme for explaining the variance of meaning across the documents.

It should be noted that most applications of LSA do not attempt or even require interpretation of the themes. LSA is typically used to create numerical representations of documents (vectors) that are used to find similarities between documents; however, this is a rather simplistic view of what a very powerful tool actually achieves. LSA does not use the full decomposition of the X matrix. Instead, a k -dimensional approximation is found by only using the first k columns of U and V and the $k \times k$ upper left matrix of S . This approximation, $\hat{X}_k = U_k S_k V_k^T$, of X is found to remove much useless "noise" or extraneous information that is in the document set and focuses on only those factors that explain the important variation in meaning across documents. The matrix \hat{X}_k is the least-squares best fit of X . Performing the SVD and truncating it is what captures the important underlying semantic structure of the words and documents while excluding the noise. Words that have similar meanings are found to be "near" each other in k -dimensional vector space even if they never occur in the same documents. Similarly, documents that have similar conceptual meaning are near each other even if they share no words in common.

Table 1 shows the descriptive statistics of the sample. The manager's perceived competition ($COMP$) ranges from -0.1462 to 0.1785. The highest value for manager's perceived competition is for Teo Seng Capital Berhad in 2010. Meanwhile, the lowest value is for QL Resources Berhad in 2011. Both are agricultural-based groups of companies. However, in terms of asset size for the same financial year, Teo Seng Capital Berhad is much smaller than QL Resources Berhad. Further, the changes in leverage ($ADER$) range from -1.1319 to 2.1997 (accounting-based leverage) and from -1.5180 to 2.3854 (market-based leverage). A positive sign in the changes in leverage indicates additional debt recorded in the next financial year. Similarly, a negative sign indicates a reduction in debt for the next financial year. The positive sign in growth opportunity ($GROW$) indicates that all the observations still have room to grow. Nevertheless, in terms of profitability ($PROF$) there are companies that recorded losses or negative profitability.

Table 2 presents pairwise correlation among the variables included in the models. It shows that there is a positive and significant correlation between change in accounting-based leverage ($ADER_A$) and manager's perceived competition ($COMP$), tangibility ($TANG$) and firm's size ($SIZE$). On the other hand, there is negative and significant correlation between $ADER_A$ and growth opportunities ($GROW$), and profitability ($PROF$). Meanwhile, the matrix also suggests that there is positive and significant correlation between change in market-based leverage ($ADER_M$) and manager's perceived competition ($COMP$), tangibility

(*TANG*), and firm's size (*SIZE*). On the other hand, there is a negative and significant correlation between ΔDER_A and growth opportunities (*GROW*), and profitability (*PROF*).

Table 1: Descriptive statistics

	ΔDER_A	ΔDER_M	<i>COMP</i>	<i>GROW</i>	<i>PROF</i>	<i>TANG</i>	<i>SIZE</i>
Mean	0.0212	0.0282	0.0072	1.3530	0.1125	0.3838	5.3511
Median	-0.0001	0.0004	0.0050	1.0061	0.1061	0.3742	5.1613
Max	2.1997	2.3854	0.1785	6.9220	0.4968	0.9119	7.9987
Min	-1.1319	-1.5180	-0.1462	0.2537	-0.2216	0.0068	3.9415
Std. deviation	0.2437	0.3819	0.0463	1.1259	0.1176	0.2043	0.7998

Table 2: Correlation matrix

Variable	ΔDER_A	ΔDER_M	<i>COMP</i>	<i>GROW</i>	<i>PROF</i>	<i>TANG</i>	<i>SIZE</i>
ΔDER_A	1.0000						
ΔDER_M	0.7769	1.0000					
<i>COMP</i>	0.2387	0.3229	1.0000				
<i>GROW</i>	-0.2757	-0.1547	0.0150	1.0000			
<i>PROF</i>	-0.2536	-0.1852	-0.0119	0.4678	1.0000		
<i>TANG</i>	0.2665	0.2070	0.0208	-0.1419	-0.0267	1.0000	
<i>SIZE</i>	0.3713	0.3313	0.0948	0.0925	0.1284	0.1891	1.0000
	0.0000	0.0000	0.0451	0.0506	0.0066	0.0001	

4. Findings and Discussion

Prior testing of the hypotheses, and regression diagnostics are required before the final models are presented. The first diagnostic is to identify any possible outlier that might distort the results. This is performed by observing the studentized residuals of the models. Studentized residual values greater than 2 are considered outliers and are truncated. The second diagnostic is to check the normality of the residuals. The p-value from the Shapiro-Wilk test is very large, indicating that we cannot reject that the residuals are normally distributed. The third diagnostic is to check the homoscedasticity of the residuals. The p-values from the White's test and Breusch-Pagan test are very small, indicating that we would have to reject the hypothesis and accept the alternative hypothesis that the variance is not homogenous. The problem of heteroscedasticity is likely to be common in cross-sectional data and is usually affected by the size of the firms in the sample (Gujarati 1995). Thus, the regression models were weighted by the manager's perceived competition to eliminate the potential effects of heteroscedasticity. The fourth diagnostic is to check for multicollinearity. The VIF statistics show a value of less than 10, indicating that multicollinearity is not a problem. The fifth diagnostic is to check for autocorrelation. Since the data collected were cross-sectional, there was no problem of autocorrelation, with the Durbin-Watson statistics showing values of approximately two. The last diagnostic is to check for the model specification error. This is performed by running a model specification link test for single-equation models. This test indicates that the model is specified correctly. From the above diagnosis, we can conclude that the distribution of the data satisfy the assumptions of a multiple regression.

The hypotheses were tested using stepwise regression analysis. The regression equations were weighted by manager's perceived competition in order to eliminate any heteroscedasticity that existed in the models. Model 1 in Table 3 shows the independent and control variables that were entered into the regression in the first step. The R^2 was found to be 0.1230 and the manager's perceived competition (*COMP*) indicates a positive impact on the changes in accounting-based leverage. Meanwhile, the growth opportunity (*GROW*) indicates a negative impact on the changes in accounting-based leverage. In step 2, by adding the profitability variable, R^2 increased to 0.1447 and the profitability (*PROF*) indicates a negative impact on the changes in accounting-based leverage. In step 3, the tangibility variable was entered into the equation as a control variable in order to gauge its impact as an independent predictor. The R^2 increased to 0.2072 and the tangibility (*TANG*) indicates a positive impact on the changes in accounting-based leverage. In the final step, another control variable was entered into the model. The R^2 increased from 0.2072 to 0.3364, indicating a change of about 13 percent. The positive coefficient indicates that there is a positive relationship between the firm size (*SIZE*) and the changes in accounting-based leverage.

Table 3: Estimation results for the model in accounting-based leverage

	Model 1		Model 2		Model 3		Model 4	
Constant	0.0868	***	0.1038	***	-0.0196		-0.5761	***
<i>OMP</i>	1.2995	***	1.2795	***	1.2297	***	1.0491	***
<i>GROW</i>	-0.0554	***	-0.0388	***	-0.0309	***	-0.0384	***
<i>PROF</i>			-0.3489	***	-0.3654	***	-0.4404	***
<i>TANG</i>					0.2994	***	0.2015	***
<i>SIZE</i>							0.1147	***
R square	0.1230		0.1447		0.2072		0.3364	
Adjusted R square	0.1191		0.1389		0.2000		0.3288	
F-statistics	31.14	***	24.99	***	28.88	***	44.70	***
Root MSE	0.2344		0.2313		0.2218		0.2032	

Note: 1. Dependent variable ΔDER_A .

2. Estimation method: WLS.

3. ***Significant at 1% level, **significant at 5% level, *significant at 10% level.

The result from the accounting-based regression model suggest that manager's perceived competition has a positive relationship with the changes in firm's leverage. This finding supports the limited liability effect theory (Brander and Lewis 1986; Maksimovic 1988; Showalter 1995). Brander and Lewis (1986) pointed out that financial decisions and product market decisions follow in sequence. Prior to making financial decisions, managers make an assessment of the future product market competition and the current condition of the company. Based on this assessment, managers decide how much quantity to produce or the price to sell to win the competition. Subsequently, managers also make decisions concerning how much investment is required to align with the planned quantity or price. Finally, managers must resolve the financing issue for the investment, in which the capital structure decision takes place. From this process, one can understand that future product market competition is more relevant in making capital structure decisions, together with the current situation of the company itself. On the other hand, the limited liability feature of corporations also contributes to manager's decisions. The shareholders' limited liability feature helps to protect shareholders' wealth. That is, if the firm's performance deteriorates during bad times, the shareholders' liability is only limited to its paid-up capital. However,

if the firm's performance is satisfactory during good times, the shareholders gain the remaining benefit in the company. Therefore, if the manager's perception is that the future product market competition is going to be tough, he or she is more likely to be more aggressive by pushing the production up. The increase in production requires investment and investment needs financing, hence escalating the demand for extra debt.

Moreover, the growth opportunity shows a significant impact at the 1% level with a negative relationship with the changes in leverage, which confirms previous studies (Bradley *et al.* 1984; Rajan and Zingales 1995; Fama and French 2002). Likewise, profitability exhibits a significant impact at the 1% level with a negative relationship with the changes in leverage, which supports prior studies (Booth *et al.* 2001; Deesomsak *et al.* 2004). Meanwhile, tangibility indicates a significant impact at the 1% level with a positive relationship with the changes in leverage, which validates past studies (Rajan and Zingales 1995). Finally, firm size shows a significant impact at the 1% level with a positive relationship with the changes in leverage, which also confirms earlier studies (Rajan and Zingales 1995; Booth *et al.* 2001; Deesomsak *et al.* 2004).

The robustness analysis is performed to check the stability of the relation between the changes in leverage and the explanatory variables. Table 4 reports the results of the robustness analysis over a different measure of the changes in leverage, i.e. market-based leverage. The result from the market-based regression model also suggests that manager's perceived competition has a positive relationship with the changes in firm's leverage. This finding is consistent with the accounting-based regression model. The control variables also show a significant impact on the changes in leverage with the same sign as in the accounting-based model, except for growth opportunity. Unlike in the accounting-based model, the growth opportunity variable in the market-based model only exhibits a significant impact on the changes in firm's leverage at the 10% level.

Table 4: Estimation results for the model in market-based leverage

	Model 1		Model 2		Model 3		Model 4	
Constant	0.0812	***	0.1026	***	-0.0487		-0.7853	***
COMP	2.6774	***	2.6568	***	2.6035	***	2.3435	***
GROW	-0.0534	***	-0.0316	*	-0.0196		-0.0264	*
PROF			-.4513	***	-0.4901	***	-0.6035	***
TANG					0.3644	***	0.2538	***
SIZE							0.1501	***
R square	0.1286		0.1440		0.1807		0.2744	
Adjusted R square	0.1247		0.1382		0.1733		0.2662	
F-statistics	32.77	***	24.84	***	24.38	***	33.35	***
Root MSE	0.3581		0.3551		0.3483		0.3296	

Note: 1. Dependent variable ΔDER_M .

2. Estimation method: WLS.

3. ***Significant at 1% level, **significant at 5% level, *significant at 10% level.

5. Conclusion and Implications

This study suggests a positive relationship between manager's perceived competition and capital structure decisions. That is, when manager's perceived competition is high, the firm's leverage in the subsequent year is more likely to increase. This confirms the findings of other studies (Lyandres 2006; Fosu 2013) to validate the limited liability effect theory. As pointed out by Brander and Lewis (1986), the theory is based on the limited liability feature of corporations in which the shareholders' limited liability status protects their wealth when

firms suffer during bad times, but gain wealth during good times. Hence, the limited liability effect theory predicts a positive relationship between the capital structure and product-market competition. In addition, previously, the limited liability effect theory was only tested in developed countries (Istaitieh and Rodriguez 2003; Lyandres 2006; Guney *et al.* 2011; Fosu 2013). This study confirms the validity of the limited liability effect theory in the context of a developing country. Moreover, this study presents the use of the text mining application in the field of finance. The text mining approach is used to extract manager's perceived competition. Understanding textual data in finance is important because textual data contains accompanying information and explanation concerning the numerical financial data, and, in fact, comprises the bulk of data in the disclosure of a company (Li 2010b).

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