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Capital Structure and Corporate Strategy in South Africa

An Empirical Analysis

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Supervisor: Prof. Melvin Ayogu

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An Empirical Analysis*

Abstract

Using South African data, this study tests three propositions about capital structure and product market strategy. The results support the hypotheses that oligopolists have relatively high debt-equity ratio; their debt tends to be long term; and firms that produce unique and / or durable goods tend to have less debt-equity ratio.

1. Introduction

Since Modigliani and Miller (1958), fifty years ago, raised the topic of corporation finance and argued that capital structure is irrelevant to the firm's value (no optimal capital structure), many modern economic theories have been developed to demonstrate the determinants of capital structure by relaxing the assumptions¹ made by them. Harris and Raviv (1991) summarise and classify different determinants of capital structure into four categories, namely, the agency approach², the asymmetric information approach³, product and input market approach⁴, and corporate control considerations. The former two categories have been vastly analysed both theoretically and empirically. However the empirical analysis of the product and input market approach is relatively scarce. This paper focuses on the empirical analysis of the relationship between capital structure and product / input market in South Africa.

Unlike the firm theoretic approach where the objective is to maximise profit by choosing a competitive strategy while ignoring the firm's capital structure, and the finance literature where the objective of firms is to maximise the equity value while

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¹ The main assumptions are: the individual can borrow on the same terms as the company can; there are no taxes, no transaction costs, no agency cost, and no costs associated with financial distress, that is perfect financial markets.

² Ameliorate conflicts of interest among various groups with claims to the firm's resource.

³ Convey private information to capital markets or mitigate adverse selection effects.

⁴ The linkage between capital structure and industrial organisation.

generally ignoring the product market strategy, a strand of literature beginning with Brander and Lewis (1986), has developed to analyse the linkage between capital structure and product / input market characteristics. Harris and Raviv (1991) classify these theories into two approaches. One approach focuses on a firm's strategy when competing in the product market, whereas the other addresses the linkages between capital structure and product / input market factors. The former approach can be seen as the role of debt in strategic interactions among competitors and the latter as an attempt to analyse the influence of debt in interactions with customers and / or suppliers.

The rest of the paper is organised as follows. In the next section theoretical suggestions, which are based on the linkage between capital structure and product / input markets are presented. The empirical analysis follows in section 3 and section 4 concludes.

2. Capital Structure and Product / Input Market

1. Debt influences strategic interaction among competitors

Brander and Lewis (1986) argue that because of the limited liability effect of debt financing, the choice of financial structure can affect output markets. Such limited liability effect arises from the conflict of interest between debt and equity holders. By focusing on a Cournot⁵ duopoly, they illustrate that there are two conflicting effects of increasing debt on the value of the firm. One is the conflict of interest between debt and equity holders, which tends to lower the firm's value⁶. The other is the strategic effect of debt that induces lower output of its rival firm, thus raising own profit and the firm's value⁷. Despite these partially offsetting effects of increasing debt, the authors prove that the strategic effect dominates for sufficiently low levels of debt,

⁵ Cournot competition describes a product market rivalry between two firms (duopoly) that compete in terms of output levels.

⁶ The value of a firm is the sum of debt value and equity value. An induced change in output caused by taking on more debt exacerbates the conflict, i.e. equity-holders will choose higher output levels than debt-holders would like, and lower the debt value of a firm.

⁷ A higher level of debt for a firm implies lower output for its rival. This effect, taken by itself, raises both the debt value and equity value of the firm because a lowered output by firm's rival is unambiguously good for the firm.

insuring an interior solution to the firm's value maximization problem. In particular, if debt equals to zero, there is no conflict between debt-holders and equity-holders (there are no debt-holders) and only the latter effect remains. Consider the market structure as monopoly (no rivals), increasing debt level has no strategic effect but has negative effect on the debt value of the firm. Consider the market structure as perfect competition, that is no economic profit, increasing debt level also has no strategic effect but the negative effect on the debt value of the firm. Therefore oligopoly is expected to have more debt than monopoly and perfectly competitive firms, *ceteris paribus*⁸.

When oligopolies persist over time, there may be a tendency for firms to reach implicit agreements with their rivals to limit competition. The choice of capital structure by each firm in the industry will affect the exposure of its equity-holders to the consequences of reneging on such agreements. As a result, the sustainability of implicit agreements with rivals, and thus firm values, will be directly affected by the choice of capital structure. Unlike the model of Brander and Lewis, which examined the effect of capital structure on firm values while taking the type of equilibrium as given, regarding an infinitely repeated game, Maksimovic (1988) argues that capital structure endogenously determines the type of equilibrium (collusive or Cournot) in the product market if managers are assumed to maximize the value of equity as opposed to the value of the firm. He shows that high level of debt creates an incentive for equity-holders to deviate from a tacit agreement with rivals, hence affects the outcome of product market rivalry.

Also Stenbacka (1994) illustrates that debt will reduce the ability of an oligopolistic industry to sustain tacit collusion in the context of infinitely repeated Bertrand competition⁹. By treating debt as an endogenous feature in the model¹⁰, he demonstrates that due to the negative incentive effect of debt¹¹, it induces the equity-holders to deviate from full collusion at a lower level of demand, as the level of

⁸ They point out that tax advantages, bankrupt costs and agency costs may also affect the results of this analysis.

⁹ Bertrand competition refers to a rivalry in which firms compete in terms of price in order to maximise own profit.

¹⁰ Stenbacka (1994) assumes debt financing provides tax savings in comparison with equity financing.

¹¹ In his model, the existence of limited liability implies that there is an essential distinction between maximisation of equity value and maximisation of market value. The model focuses maximising equity-holders value.

financial leverage increases. To overcome this incentive, the oligopolistic industry has to reduce the prices in order to sustain some degree of tacit collusion. He argues that the optimal level of debt depends on the interplay between the negative incentive effect and tax saving effect of debt financing relative to equity financing. Despite the tax saving effect, given the negative incentive effect of debt, with increased financial leverage, the industry will be able to deter the entry for lower levels of the entry barrier. By this effect the incumbent cartel could clearly deter entry for levels of the entry barrier down to a lower initial fixed cost. The debt level can be thus used as a mechanism by which the incumbent industry can decrease the entry barrier for levels above which potential entrants would stay out of the market. Such beneficial effect also influences the consideration of optimal level of debt.

On the other hand, Glazer (1989) shows that when long run relationships are taken into account in the Brander and Lewis model, firms have an incentive to issue long-term debt, which helps in enforcing a form of tacit collusion. Note: this may not be contrary to the previous findings since the previous findings take debt as a whole (no time dimension) while analysing its effect on tacit collusion.

Furthermore, Glazer (1994) shows in the product-market competition price and / or output level may fluctuate more if firms have long-term debt¹² than have short-term debt or no debt at all. By issuing long-term debt, rival firms may induce collusive behaviour over some length of time, which is the length of the maturity date of debt. However, because the debt is long-term, as the maturity date comes closer, the firm's product-market behaviour comes to be more aggressive. In other words, capital structure has a *dynamic* effect on the cooperative strategy. He also points out with limited liability, a firm's behaviour in product-market competition can be strongly affected by its accumulated profits.

¹² Long-term debt refers, in the model, to a situation in which the maturity date of the debt is sufficiently far away, enough to enable the firm to change output / price more than once before the debt is due. Debt in the model refers to any kind of monetary obligation that the firm has and which it must pay before it can pay dividends to its shareholders.

II. Debt influences strategies interaction with customers and / or suppliers

Titman (1984) argues that a firm's liquidation can impose indirect bankruptcy costs¹³ on its consumers, workers, and suppliers. Firms, which can potentially impose high costs on their customers and business associates in the event that they liquidate, choose capital structure with relatively low debt-equity ratios. In general, for unique and / or durable products, the cost imposed on customers when a producer goes out of business is higher than for non-durable products or those made by more than one producer. Correia, Flynn, Uliana and Wormald (2007) suggest that the maintenance of low debt-equity ratio provides assurance to customers, employees and suppliers that the company will continue even if it faces some difficult trading conditions in the future. In other words, firms that produce durable and / or unique goods (such as computer and automobile companies) tend to have relatively low debt-equity ratio, and conversely, firms (such as hotels and retail establishments) tend to have relatively high ratio. He suggests that capital structure can control the incentive / conflict problem of the relationship between a firm and its associates by serving as a pre-positioning or bonding mechanism.

Besides the effect of product characteristics on leverage, Maksimovic and Titman (1991) show that firms for which a reputation for producing high quality products is important may be expected to have less debt, *ceteris paribus*. Debt financing, by changing the relative benefits to equity-holders of immediate and future cash flows, can reduce a firm's incentive to produce a high-quality product in a financing distress, since a reduction in quality can increase current cash flows at the expense of debt-holders who may receive less in the future. However, debt financing needs not to have negative effect on firms' ability to credibly offer high quality products. In industries in which capital goods have high salvage values, that is assets have an alternative use in the liquidation, debt may serve to commit the firm to produce higher quality goods than it might otherwise produce. They demonstrate that if the firm's assets have alternative uses, it will place a lower value on its reputation and will therefore be less

¹³ Indirect bankrupt costs arise from that customers leave as they consider the company will not be able to provide services and spare parts in the future; key employees may look for work elsewhere or be demoralized by the company's weak prospects; bank may impose higher interest rates or may request loans to be repaid; investment opportunities that are profitable and critical for the company's long-term future are not able to be given the go-ahead as the company has limited financing options; competitors will take increasing aggressive actions to reduce to ability of the company to compete (price war).

able to credibly offer a high-quality product. However, the use of debt financing, by altering the equity-holders' payoff in the event of liquidation, may increase the firm's incentive to maintain its reputation. In other words, the effect of debt financing on reputation may be different between industries in which assets are firm-specific and industries in which they have high opportunity costs.

Sarig (1998) shows that leverage weakens shareholders' bargaining posture vis-à-vis employees who possess firm-specific human capital. When a firm uses high level of debt in its capital structure, a suspension of the supply of a specialised production factor (such as firm-specific human capital) may bankrupt the firm. Therefore the management of a levered firm, negotiating on behalf of its shareholders, is vulnerable to threats made by suppliers of such factors. Furthermore, this vulnerability increases with the firm's leverage. Hence, without other benefits to leverage, shareholders would like to issue as little debt as possible. Moreover, currently levered shareholders wish to retire some of their debt as their employees acquire firm-specific human capital. He argues that firms in basic industries are often highly levered; hi-tech firms and firms in the development stage, whose employees presumably possess more firm-specific human capital than workers in basic industries, use relatively little debt in their capital structure. In other words, firms employing generic production factors will be more levered than firms employing customised production factors.

Sarig (1998) also suggests that firms employing unionised workers, *ceteris paribus*, use less debt than firms employing un-unionised labour. Unionisation allows employees to obtain wages exceeding their market alternatives, even absent firm-specific human capital. Therefore, firms employing unionised workers find wage bargaining considerations an important determinant of leverage. Similarly, it is expected that the extent of debt usage in unionised firms' capital structure decreases with the power of the labour union.

In sum, both market structure and product / input characteristics can influence a firm's capital structure. The effect of market structure arises from the firm's rivals and the effect of product / input feature arises from the firm's costumers and suppliers. Theories show that oligopolists intend to have relative high debt / equity ratio. And if the tacit collusion is concerned, higher debt level may induce firms to deviate from such collusion in both Cournot and Bertrand duopoly models. Besides such negative

effect on the cooperation, debt may lower the entry barrier above which entry is deterred, benefiting the incumbent firms. However if the cooperation among firms is considered to be long time, then firms have an incentive to issue long-term debt, which helps in enforcing a form of tacit collusion, and the product-market competition will be more aggressive when the maturity date comes closer.

On the other hand, firms that produce unique and / or durable goods tend to have a relative low debt-equity ratio. Besides this effect of product characteristics, firms for which a reputation for producing high quality products is important may be expected to have less debt, *ceteris paribus*. On the other hand, firms employing customised production factors such as firm-specific human capital (feature of input factor) will be less levered than firms employing generic production factors such as elementary workers. Furthermore, firms employing unionised workers tend to have less debt than firms using un-unionised labour.

3. Empirical Analysis

Hypothesis

Given the theoretical expectation above, the following empirical analysis focuses on testing three hypotheses:

- I.* Oligopolists tend to have relatively high debt-equity ratio.
- II.* Oligopolists' debt tends to be long term.
- III.* Firms that produce unique and / or durable goods tend to have low debt-equity ratio.

These hypotheses will illustrate the effects of product market structure and product characteristic on firm's capital structure¹⁴.

¹⁴ Due to the data limitation, effects of input factor features such as human capital and labour unionisation will not be analysed in this study.

Model Specification

Ordinary least square estimation (OLS) is used in this paper. The model is as follows:

$$Y_{i,t} = \alpha + \sum_{j=1}^m \beta_j X_{i,j,t} + \sum_{k=1}^n \beta_k X_{i,k,t} + \varepsilon_{i,t} \quad i = (1, \dots, N); \quad t = (1, \dots, T) \quad (1)$$

let $Y_{i,t} = D_{i,t}/T_{i,t}$, which is the debt-equity ratio of i th firm in a particular year; X_j represents the product market structure “Oligopoly” and the product characteristics “Uniqueness” and “Durable”; β_j are the parameters of the product market structure effect and product characteristic effect; X_k in this model refers to the control variables¹⁵; β_k is the parameters of these control variables; and $\varepsilon_{i,t}$ is the disturbance term assumed to be $E(\varepsilon|X) = 0$ and $Var(\varepsilon|X) = \sigma^2 I_n$, i.e. ε_i is homoscedastic¹⁶ and non-autocorrelated¹⁷, where I_n is the identity matrix.

One of the main drawbacks of using cross-section data is misspecification. In other words, the results may be biased and inefficient due to the unobserved or omitted variables. Panel regression helps to deal with such problems by using fixed effects estimation and random effects estimation. Given the true specification of the capital structure as follows.

$$y_{i,t} = \alpha_{i,t} + \sum_{j=1}^m \beta_j X_{i,j,t} + \sum_{k=1}^n \beta_k X_{i,k,t} + \delta_i + \varepsilon_{i,t} \quad i = (1, \dots, N) \quad (2)$$

where δ_i is an unobserved time-invariant explanatory variable, which is omitted in the model (1). Such unobserved time-invariant effect can be regarded as the different characteristics of the industry in which firms belong to; or it can be the historical background of the firm; or it can be the culture of the region in which firm operates. If we assume δ_i is correlated with one or more explanatory variables, then we can use time-demean transformation. A pooled (panel) OLS estimator that is based on the time-demeaned variables is called the fixed effects estimator. The term “fixed effect”

¹⁵ The effects of agency costs and asymmetric information problem are used as control variables.

¹⁶ Homoscedasticity: $E(\varepsilon_i^2) = \sigma^2$

¹⁷ Non-autocorrelataion: $E(\varepsilon_i \varepsilon_j) = 0 \quad \forall i \neq j$

is due to the fact that, although the intercept may differ across individuals, each individual's intercept does not vary over time (time invariant). On the other hand, if we assume δ_i is uncorrelated with each explanatory variable in all time period, then a random effects model (error components model) is recommended. The key assumptions for Fixed Effects Model (FEM) and Random Effects Model (REM) are as follows¹⁸.

Assumption 1: $E(\varepsilon_i | x_i, \delta_i) = 0$ ($t = 1, \dots, T$), $\varepsilon_i = (\varepsilon_{i1}, \dots, \varepsilon_{iT})'$ and $x_i = (x_{i1}, \dots, x_{iT})'$

Assumption 2: $Var(\varepsilon_i | x_i, \delta_i) = \delta^2 I_T$ ε_i is conditionally homoscedastic and non-autocorrelated.

Assumption 3: $E(\delta_i | x_i) = c$ and $Var(\delta_i | x_i) = \sigma_\delta^2$ δ_i is uncorrelated with explanatory variables (for REM only).

Method of fixed effect estimation and random effect estimation:

Combine $X_{i,t}$ and $X_{j,t}$ to be a single notation $x_{i,t}$, then model (2) can be written as $y_{i,t} = \alpha + \beta x_{i,t} + \delta_i + \varepsilon_{i,t}$, where α is the intercept in the model and δ_i is the unobserved time-invariant variable (no subscript t).

$$\text{FEM: } (y_{i,t} - \bar{y}_i) = \beta(x_{i,t} - \bar{x}_i) + (\varepsilon_{i,t} - \bar{\varepsilon}_i) \quad (3)$$

where $\bar{y}_i = \sum_t y_{i,t} / T_i$, $\bar{x}_i = \sum_t x_{i,t} / T_i$, and $\bar{\varepsilon}_i = \sum_t \varepsilon_{i,t} / T_i$. This method is called "within transformation" or "demean transformation", which gives the "fixed effects" estimation.

$$\text{REM: } (y_{i,t} - \theta \bar{y}_i) = (1 - \theta)\alpha + \beta(x_{i,t} - \theta \bar{x}_i) + (1 - \theta)\delta_i + (\varepsilon_{i,t} - \theta \bar{\varepsilon}_i) \quad (4)$$

where θ is a function of σ_δ^2 and σ_ε^2 , hence it is also called error component model or generalised least squared random effects estimation.

¹⁸ The assumptions and the formulae of the models are adopted from STATA reference manual (2007).

Measure of Leverage

Rajan and Zingales (1995) argue that leverage measurement depends on the objective of the analysis. The agency problem associated with debt largely relate to the past financing background, thus it is more relevant to use the stock of debt relative to the firm's value. On the other hand, the flow measurement like interest coverage ratio is more relevant to corporal control problem. The broadest definition of stock leverage is the ratio of total liabilities to total assets. However total liabilities include accounts payable and pension liability, which may influence the amount of leverage. A more appropriate definition of financial leverage is the ratio of debt (both short-term and long-term) to total assets, however this measurement fails to incorporate the fact that there are some assets that are offset by non-debt liability. The ratio of total debt to net assets is not influenced by non-debt liability but it may be affected by the factors that may have nothing to do with financing such as the pension liability. So they use the ratio of total debt (defined as short-term debt plus long-term debt) to capital (defined as total debt plus equity) for the cross-sectional analysis. The same measurement has been used in Barclay, Smith and Watts (1995), Zotti (1997), and Sarig (1998). Total liability is used in Booth, Aivazian, Demirguc-Kunt and Maksimovic (2001), and Chen and Strange (2005). Bhaduri (2002) split total debt into short-term and long-term in the analysis. Instead of using debt plus equity as the denominator, Titman and Wessels (1988), and Bahng (2002) use debt over equity ratio as the dependent variable. The theoretical expectations that are analysed in this study specify the debt-equity ratio as the financial structure, therefore the debt-equity ratio is used as a dependent variable through out the empirical analysis in this paper.

Qualification of Leverage

Should market or book value of the measurement be used? Bahng (2002) argues that market value based leverage measure is preferred since it reflects a firm's economic reality more accurately and timely. Titman and Wessels (1988) also suggests that their measurement would be better if the market value of debt was available. The majority of the empirical research (Titman & Wessels 1988, Rajan & Zingales 1995, Zotti 1997, Booth, et al. 2001, Bahng 2002, Chen & Strange 2006) uses book value of its debt, and uses both book and market value of equity separately unless there are data

limitations. More often Quasi-market value of assets¹⁹ is used in the analysis in which the leverage is measured as the ratio of debt to assets.

In this paper, the ratio of total debt (long-term liability plus short-term liability) to the common share equity²⁰ (debt-equity ratio) is used as the dependent variable, Debt is measured as the book value only and equity is measured in terms of both book value and market value separately. Thus, in this paper, the book value of the debt-equity ratio refers to both debt and equity are measured by book value, while market value of the ratio refers to book value of debt over market value of equity²¹. Also, long-term debt over total debt (both book value) is used as the dependent variable when the debt structure is analysed.

Hypothesis Variables

Oligopoly: it is a dummy variable determined by Herfindahl-Hirschman Index (HHI)²². By using a function of all the individual firms' market shares to measure concentration, HHI is the most common index in measuring market concentration. Dillingham, Skaggs and Carlson (1992) show that HHI less than 1000 represents un-concentrated industry, between 1000 and 1800 is moderately concentrated, and above 1800 is considered to be highly concentrated industry²³. The market share of each firm is based on the super-sector classification. HHI between 1800 and 9000 is defined as oligopoly²⁴, which has dummy variable equal to 1, 0 otherwise. It is expected to have positive association with debt-equity ratio, that is oligopolists are expected to have more debt than monopolists and the firms in the perfectly competitive market, *ceteris paribus* (Brander & Lewis 1986).

¹⁹ Quasi market value of assets is defined as book value of assets minus shareholders' equity plus market value of equity. Market value is computed at the end of the corresponding fiscal year.

²⁰ It is measured as total assets minus total liabilities, i.e. net worth. Note: the value of shareholders equity can be negative if the firm made a loss. It often occurs at the beginning of the establishment.

²¹ It is measured as the number of ordinary shares multiplied by average share price, which is strictly positive. It is reasonable why the market value of equity is positive while its book value is negative. Since investors expect new establishment will make profits in the near future while it made a loss in the current year.

²² $HHI = \sum_{i=1}^n s_i^2$, where s_i is the market share of firm i in the market, and n is the number of firms.

HHI=10000 means there is only one firm in the market, i.e. monopoly.

²³ The classification based on HHI is developed by Justice Department of US.

²⁴ The reason to choose 1800-9000 as oligopoly is that 1800 is the lower boundary of highly concentrated industry and 9000 is very close to the true monopoly, hence it is chosen as upper boundary in this paper.

Durable: it represents whether the goods firms produce are durable. Again it is a dummy variable. Durable=1 if the product is durable, 0 otherwise. It is determined by the sub-sector where the firm belongs. Durable is expected to be negatively associated with debt-equity ratio because it potentially imposes high costs on its consumers when the firm liquidates (Titman 1984).

Uniqueness: it is measured as the ratio of research and development expenditure to sales (Titman & Wessels 1988, Bhaduri 2002), that is firms with unique products are likely to spend more on R&D because their products are less likely to be duplicated by other firms. In other words, “uniqueness” here refers to the degree of uniqueness, which is not a dummy variable. Note: the degree of uniqueness may change along with the development process of the product as the cost of research input changes. It is expected to have a negative association with debt-equity ratio²⁵ (Titman 1984, Titman & Wessels 1988).

Control Variables

Besides the above variables, which test the correlation between capital structure and the product/market structure characteristics, other variables which represent agency costs and asymmetric information problems are used as controls. They indicate whether the degree correlation between capital structure and hypothesis variables is solid when other major determinants of capital structure are taken into account. These are profitability, size, feasibility, business risk and growth opportunities.

Profitability: it is measured as earnings before interest and tax (EBIT) over total assets (Chui, Lloyd and Kwok 2002). There are conflicting theoretical prediction on the effects of profitability. Myers and Majluf (1984) argue that a negative relationship between leverage and profitability (or past profitability) because of the asymmetric information (“pecking order” theory of financing), that is capital structure will be driven by firms’ desire to finance new investment, first internally (retained earnings), then with low-risk debt, and finally with equity as a last resort. On the contrary, Jensen (1986) predicts a positive association if the market for corporate control is effective and forces firms to commit to pay out cash by leveraging up. Also Bhaduri

²⁵ Titman & Wessels (1988) also argue that R&D expense can be treated as a proxy for growth opportunities, which has a negative empirical relation with leverage as well.

(2002) argues that static trade-off theories envisage a positive association, that is firms with high profit would require high tax shelter and would have more debt taking capacity. However empirical studies (Rajan & Zingales 1995, Wald 1999, Booth et al. 2001 and Chui, et al. 2002) show a negative association, which support the expectation of Myers & Majluf.

Size: it refers to firm's sale value in the market, which is measured as natural logarithm of sale in this paper. It is often used as a proxy for firm size in the corresponding industry (Titman & Wessels 1988, Rajan & Zingales 1995, Booth et al. 2001, and Chui, et al. 2002). Size is expected to have positive impact on the supply of debt since relatively large firms tend to be more diversified and less prone to bankruptcy. Warner (1977), Ang & McConell (1982), Rajan & Zingales (1995), and Chui, et al. (2002) provide evidence in this regard. On the other hand, the cost of issuing debt and equity is also related to firm's size. Small firms may pay much more than large firms to issue new equity and also somewhat more to issue long-term debt. This suggests that small firms may be more leveraged than large firms and may prefer to borrow short-term rather than long-term because of the lower fixed costs associated with this alternative (Titman & Wessels 1988). It may explain why Titman & Wessels (1988), Booth, et al. (2001), Bhaduri (2002) and Chen & Strange (2006) find that the impact of size²⁶ is not consistent when the measurement of leverage changes from total debt to long-term debt and from book value to market value.

Tangibility: It is often measured as fixed assets over total assets (Rajan & Zingales 1995, Booth, et al. 2001, Chui, et al. 2002). Theories suggest that if a large fraction of a firm's assets are tangible, then assets should serve as collateral, diminishing risk of the lender suffering the agency costs of debt. Assets should also retain more value in liquidation. Therefore, the greater the proportion of tangible assets, the more willing should lenders to be supply loans, and leverage should be higher. Empirical evidence from Rajan & Zingales (1995) supports this expectation while Booth, et al. 2001 and Chui, et al. 2002 show that the impacts of tangibility varies across the countries.

²⁶ Bhaduri 2002, and Chen & Strange 2006 use natural logarithm of total assets as their proxy. Although sales and total assets are highly correlated, the effect on the capital structure may not be consistent.

Business risk: Bradley, et al. (1984) suggest that a firm's leverage ratio will be negatively related to the volatility of its earnings if costs of financial distress are non-trivial. Furthermore, a firm's optimal debt level is suggested to be a decreasing function of the volatility of earnings (Titman & Wessels 1988). Empirically, return volatility has been found to be negatively associated with leverage (Bradley, et al. 1984, Friend & Lang 1988, Titman & Wessels 1988 and Booth, et al. 2001) and to be positively associated with leverage (Baral, 2004). Different measurements of business risk have been in different papers (see for instance Bradley, et al 1984; Friend & Lang 1988; Titman & Wessels 1988; Booth, et al 2001 and Baral 2004. Because of the different measurements of business risk that have been used, findings in this regard remain inconclusive. On the theoretical side, the analysis ignores the possibility of non-linear relationship between leverage and business risk. There are ranges of debt levels that may increase the profitability of a firm, that is, stabilise the firm. Business risk as used in this paper refers to the return volatility on assets, which measured as the standard deviation of EBIT over total assets. However, Booth, et al. (2001) argue that increased variability of the return on assets implies an increase in the short-term operational component of business risk. The drawback is that this variable cannot capture longer-term risks, such as competitive entry. Instead of using a single value across the sample period, as some of the above mentioned authors have done a standard deviation of return on assets based on five years correspondingly ahead of the dependent year is used in this paper to overcome this drawback. In other words, an overlapping rolling standard deviation with five-year window is implemented to reduce the temporal aggregation bias.

Growth opportunity: Jensen & Meckling (1976), Titman & Wessels (1988) and Stulz (1990) argue that leverage increases with lack of growth opportunities resulting from agency problems. Kim & Sorensen (1986), and Titman & Wessels (1988) provide evidence in this regard. However Bhaduri (2002) found that such a negative relationship only exists for short-term debt. He found a positive relationship between growth opportunities and long-term debt (and total debt). Asset growth used as a proxy for growth opportunity in this paper.

Data

The data is provided by McGregor BFA, which contains 341 public companies listed in the Johannesburg Stock Exchange (JSE) listed during the study period. In 2000, there were 239 firms listed in JSE and 279 firms listed in 2005. McGregor BFA provides the financial statements based on three different standards (published statement²⁷, non-gold standardised statement and gold standardised statement²⁸). The non-gold standardised statement provides more details than published statements. It splits aggregated information into details, which makes it more comparable among the industries, and thus the information in the non-gold standardised financial statements is used in this analysis. Most of the variables are measured as the book value at the end of fiscal year of each firm correspondingly and market value of equity is measured as the ordinary share issued multiplied by the average share price of the financial year correspondingly. The reason of using the average share price instead of end year price is to avoid valuating market value of equity based on a particular point of time. It may mislead firms' true equity value. Thus using average share price across the firms' fiscal year may smooth out such volatility. The financial industry is excluded from the regression analysis because of the different measurements of its financial statements. Information regards to the input factor market such as human capital and labour union are not available in the financial statements; hence the empirical analysis only focuses on the impacts of product market structure and the characteristics of firm's product on its capital structure.

The overview of the debt-equity ratio of the JSE listed companies from 1992 to 2007 is given in *Appendix I*. The time series overview shows that from 1996 the market for debt and equity have shown increased activities that have not been seen in the past. Such increased activities result from the choices offered by the new vigorous bond exchange. The choice of time period reflects analytical convenience in that the year 2000 and 2005 were selected but it may well have been any other pairs of five-year intervals since 1992.

The data description of 2000 & 2005 based on the JSE classification are given in *Appendix II-V*. Note: the JSE classification is different from the widely used Standard

²⁷ Published statement refers to the statement provided by firm's auditing company.

²⁸ Gold standardised statement refers to the financial statements of mining companies. The measurement of these statements is different from other industries.

Industrial Classification (SIC), therefore the detailed categories such as super-sector and sector are also provided in this regard. The results provide evidence that basic industry has higher leverage than Hi-tech firms (Sarig 1998). In other words, firms that use more firm-specific input factor such as specialized human capital should use *ceteris paribus* relatively little debt. Results indicate that basic materials industry, mainly mining firms, has higher debt-equity ratio than technology industry such as software and computer services. The results are consistent for both book value and market value measures except for the book value in 2005 (*Appendix IV*).

Regression Analysis

First, the analysis focuses on the year 2000 and 2005 by using the cross-sectional analysis method. The reason of choosing two different years within a gap of six years is to see the pattern of capital structure changes over time, that is whether the explanatory variables have the same impact on leverage across time.

Second, in order to consolidate and compare the results found in two separate years, a regression analysis of an independently pooled dataset²⁹ based on six years (from 2000 to 2005) is also provided. One of the benefits of using pooled data is to increase the sample size, which can help us get more precise estimators and test statistics with more power (Wooldridge, 2003)

A combination of time series and cross section data (panel data) is also used to generate over two hundred observations³⁰ in each year within the six-year time dimension. Baltagi (1995) argues that by combining time series of cross-section observations, panel data give “more informative data, more variability, less collinearity among variables, more degrees of freedom and more efficiency.” Panel data is also better suited to deal with the bias from unobserved or omitted variables, misspecification problem, and to study *change*.

²⁹Independently pooled data is different from panel data. The former refers to treat the observations in each year independently. For example, a firm in two different years is concerned as two firms.

³⁰ The paper uses an unbalanced panel data, i.e. the number of observations differs among panel members (time dimensions).

Table 1 reports shows the hypothesis test of the effects of market structure (hypothesis I) and product characteristic (hypothesis III) on leverage in year 2000. Based on the book value of the leverage, column 1 and 2 give the test results without control variables and with control variables respectively, while columns 3 and 4 show the results based on the alternative measure of leverage ratio. Column 1 supports the theoretical expectation that oligopolists have relative higher debt-equity ratio (positive association) than non-oligopolists (monopolists and perfectly competitive firms); firms that produce unique and / or durable goods have relative low debt-equity ratio (negative association), *ceteris paribus*. When the control variables (agency costs and asymmetric information problems) are taken into account the impact of market structure (“Oligopoly”) still has the positive effect on leverage, while the product effects are varied. “Durable” in this case changes to a positive impact and “Uniqueness” still follows the theoretical expectation. Note: most of the estimates in Table 1 are not statistically significant, hence only the predicted qualitative impact (signs) of both the explanatory and the control variables are discussed.

The positive impact of profitability is consistent with the prediction of Myers & Majluf (1984), and Jensen (1986) based on asymmetric information problems and corporate control considerations. The positive impacts of size and tangibility are also consistent with the theoretical expectation and empirical evidence in Rajan & Zingales (1995) and Chui, et al. (2002). Business risk gives a positive impact on the capital structure, which is consistent with the finding in Baral (2004). Note: Business risk in this paper takes long-term variation into account; therefore its impact does not follow the conventional expectation³¹. Growth opportunity (assets growth) has a negative impact, which is consistent with the literature. Most of the findings based on the book value are consistent with the literature although these impacts are not statistically significant. However when the leverage is measured in terms of market value, some of the results change their impacts such as Oligopoly, Durability, Size and Growth given in column 3 and 4.

³¹ Because the overlap rolling standard deviation of return on assets is used here, which is different from the conventional empirical studies. The outcome does not follow the conventional empirical expectation. Also, conventional theoretical expectation ignores the possibility of non-linear relationship between leverage and business risk.

Table 1. Estimated Coefficients from the OLS Regression Model *Year 2000*

<i>Variable</i>	<i>Debt / Equity ratio</i>		<i>Debt / Equity ratio</i>	
	<i>(Book value)</i>		<i>(Market value)</i>	
	<i>(1)</i>	<i>(2)</i>	<i>(3)</i>	<i>(4)</i>
Oligopoly	1.295 (1.232)	0.195 (1.052)	-0.004 (0.004)	-0.003 (0.004)
Uniqueness	-6.011 (32.006)	-101.111 (101.344)	-0.220 (0.057)**	-0.360 (0.131)**
Durable	-0.489 (1.636)	1.213 (0.866)	0.012 (0.005)*	0.010 (0.006)
Profitability		0.010 (0.010)		0.000 (0.000)
Size		0.133 (0.200)		-0.002 (0.001)*
Tangibility		0.560 (1.542)		0.015 (0.008)
Business Risk		0.050 (0.045)		-0.000 (0.000)
Growth		-0.164 (0.108)		0.000 (0.000)
Constant	-0.111 (0.722)	-1.930 (3.640)	0.014 (0.003)**	0.043 (0.015)**
Observations	174	141	171	140
R-squared	0.01	0.03	0.07	0.10

*Robust standard errors in parentheses * significant at 5%; ** significant at 1%*

Note: Debt measured as long-term liability plus short-term liability, i.e. total debt; Equity is the ordinary share's interest measured by total assets minus total liabilities. The market value of equity is measured as number of the ordinary share issued multiple the average share price of the fiscal year. Oligopoly (dummy) is determined by Herfindahl-Hirschman Index. Uniqueness is measured as R & D expense over sales. Durable (dummy) is determined in terms of industry and sub-sectors. Profitability is calculated as EBIT over total assets. Size is calculated as natural logarithm of sales. Tangibility is measured as total fixed assets over total assets. Business risk is the standard deviation of return on assets between 1992 and 1999. Growth, i.e. growth opportunity, is measured as assets growth³².

Same analysis for year 2005 is reported in Table 2. The impacts differ from the results obtained for year 2000. First, oligopolists no longer have the positive association with leverage for both book value and market value, which means the impact of market structure on capital structure is not consistent across time. Second, the negative impact of product characteristics, “uniqueness” and “durability”, on capital structure is consistent with the theory in both book value and market value. Third, the impacts of agency cost and asymmetric information problem (control variables) vary from book value to market value measurements. Again the coefficients are not statistically significant.

³² Assets growth is calculated as $(asset_t - asset_{t-1}) / asset_{t-1}$.

Note: the outliers³³ have been eliminated from the analysis in both 2000 and 2005; the transformation of the dependent variable is also used (results omitted). However this treatment provides similar results qualitatively; the signs coefficients remain the same as in Tables 1 and Table 2. In order to minimise the heteroscedasticity³⁴ and autocorrelation of the disturbance, where $Var(\varepsilon | X) = \sigma^2 I_n$ is validated, robust standard errors are given in the tables.

Table 2. Estimated Coefficients from the OLS Regression Model Year 2005

Variable	Debt / Equity ratio (Book value)		Debt / Equity ratio (Market value)	
	(1)	(2)	(3)	(4)
Oligopoly	-2.008 (1.465)	-2.339 (1.751)	-0.005 (0.004)	-0.005 (0.005)
Uniqueness	-95.098 (121.134)	-179.482 (189.584)	-0.329 (0.215)	-0.236 (0.154)
Durable	-0.757 (1.218)	-1.410 (1.547)	-0.002 (0.003)	-0.002 (0.003)
Profitability		-0.000 (0.002)		0.000 (0.000)
Size		0.493 (0.442)		-0.001 (0.001)**
Tangibility		-3.461 (2.828)		0.012 (0.015)
Business Risk		-0.004 (0.005)		-0.000 (0.000)
Growth		0.189 (0.459)		-0.002 (0.004)
Constant	3.181 (1.537)*	-1.880 (4.396)	0.013 (0.004)**	0.031 (0.009)**
Observations	196	181	191	177
R-squared	0.01	0.03	0.01	0.04

Robust standard errors in parentheses *significant at 5%; **significant at 1%

Note: business risk in 2005 is the standard deviation of return on assets between 2000 and 2004.

The effect of market structure on long-term debt is reported in Table 3, where the dependent variable is measured as long-term debt over total debt (hypothesis II). The explanatory variable “Oligopoly” shows a positive association with debt structure. By isolating the product feature effects and other control variables effects, the influence of market structure on debt structure is solid although it is not statistically significant.

³³ See Appendix II and IV footnotes.

³⁴ Kmenta (1971) argues that the assumption of homoscedasticity is frequently reasonable in the case of models describing the behaviour of aggregates over time, but that its plausibility is questionable when microeconomic relations are estimated from cross-sectional data.

Note: “Oligopoly” is a dummy and a dependent variable is the proportion of long-term debt in total debt, and thus no matter how market structure affects leverage, given the debt that firm employed, oligopolists tend to choose long-term debt. When read in conjunction with the results reported in Table 1 (book value), overall findings that oligopolists have relatively higher debt-equity ratio than others, and that debt tends to be long-term.

Table 3. Association between debt structure and market structure *Book value*

<i>Variable</i>	<i>Year 2000</i>		<i>Year 2005</i>	
	(1)	(2)	(3)	(4)
Oligopoly	1.209 (3.370)	3.383 (3.470)	4.192 (3.084)	2.307 (2.966)
Uniqueness	302.445 (95.952)**	443.279 (187.844)*	243.237 (345.481)	512.736 (186.628)**
Durable	-8.704 (3.214)**	-8.736 (3.803)*	-7.990 (2.837)**	-5.693 (2.649)*
Profitability		0.099 (0.079)		-0.006 (0.005)
Size		-2.435 (1.325)		-1.259 (0.720)
Tangibility		39.097 (8.657)**		39.475 (7.406)**
Business Risk		0.048 (0.202)		0.044 (0.013)**
Growth		0.273 (0.481)		0.611 (2.072)
Constant	22.833 (2.808)**	42.445 (20.105)*	22.987 (2.330)**	28.110 (10.995)*
Observations	175	142	197	182
R-squared	0.05	0.27	0.04	0.27

*Robust standard errors in parentheses *significant at 5%; **significant at 1%*
Note: dependent variable is measured as long-term liability over total liability.

The impacts of market structure and product characteristics in Table 1 and 2 (two different years) based on different measurement are not consistent with each other. In other words, the findings based on the cross-section data in two different years cannot confidently explain the impacts of market structure and product nature on the firm’s capital structure. One may argue that this finding is due to a structural change or misspecification of the model. To deal with structural change, an independently pooled dataset is introduced as follows:

Ordinary least squared estimation based on the independent pooled data (from 2000 to 2005) is given in Table 4. The outliers and robust standard errors are taken into account. The effect of product market structure (“Oligopoly”) is consistent with both book value and market value of the leverage, and it is consistent with the theoretical expectation based on Brander & Lewis (1986). The overall³⁵ product nature effect follows theoretical expectation (negative association with leverage) from Titman (1984). The results verify that even if there was a structural change in the financial market or in the industry, the impacts between product market structure and product characteristics on capital structure still hold.

Table 4. Estimated Coefficients from the independently Pooled OLS 2000~2005

Variable	Debt / Equity ratio (Book value)		Debt / Equity ratio (Market value)	
	(1)	(2)	(3)	(4)
Oligopoly	0.522 (1.422)	0.434 (1.519)	0.043 (0.071)	0.061 (0.085)
Uniqueness	-1.139 (1.346)	-4.099 (2.239)	-0.068 (0.042)	0.133 (0.144)
Durable	-0.355 (0.968)	0.148 (0.922)	-0.046 (0.042)	-0.066 (0.059)
Profitability		-0.001 (0.001)		0.000 (0.000)
Size		-0.398 (0.415)		0.047 (0.039)
Tangibility		-0.017 (3.307)		-0.185 (0.153)
Business Risk		0.035 (0.036)		-0.000 (0.000)
Growth		-0.173 (0.097)		0.020 (0.024)
Constant	1.982 (0.711)**	7.031 (5.358)	0.052 (0.025)*	-0.525 (0.471)
Observations	1113	1026	1093	1012
R-squared	0.00	0.01	0.00	0.02

*Robust standard errors in parentheses *significant at 5%; **significant at 1%*

Table 5 reports the effect of the market structure on debt structure. By including observations within the six-year period into the regression analysis, the impact of market structure is found not consistent both with the results in Table 3 and the theoretical expectation. The coefficient of “Oligopoly” is negatively associated with debt structure in both “with” control variables case and “without” control variables

³⁵ Except for the effects of “Durable” in column 2 and “Uniqueness” in column 4.

case. In other words, oligopolist's debt is no longer tended to be long term, hence the impact of long-term debt on enforcing long-term tacit collusion no longer holds in the model.

Table 5. Association between debt structure and market structure *Pooled OLS*

<i>Variable</i>	<i>Long-Term Debt over Total Debt</i>	<i>Year 2000 ~ 2005</i>
	(1)	(2)
Oligopoly	-1.441 (1.310)	-2.140 (1.246)
Uniqueness	-18.481 (3.469)**	-17.630 (3.541)**
Durable	-8.775 (1.257)**	-6.420 (1.237)**
Profitability		0.004 (0.001)**
Size		-1.418 (0.357)**
Tangibility		37.944 (3.106)**
Business Risk		0.023 (0.019)
Growth		0.404 (0.126)**
Constant	25.716 (1.058)**	33.422 (5.544)**
Observations	1116	1029
R-squared	0.03	0.22

*Robust standard errors in parentheses *significant at 5%; **significant at 1%*
Note: dependent variable is measured as long-term liability over total liability.

Comparing the analysis results from cross-section data and independently pooled data, indicates that oligopolists have relatively higher debt-equity ratio than non-oligopolists (except for year 2005), and that the firms which produce durable and / or unique goods tend to have relatively low debt-equity ratio. Both findings support the hypothesis. However, the hypothesis of oligopolistics predilection to long-term debt cannot be verified in the analysis.

One of the main drawbacks of using cross-section data and independently pooled data is the misspecification. In other words, the results may be biased and inefficient due to the unobserved or omitted variables. Therefore panel regression based on year 2000 to year 2005 is used to deal with such problems. The results are reported in Table 6 to 8. Between effects, fixed effects and random effects are reported in each table for

comparison. The “between effects” estimation is obtained by using weighted least square regression on the time-averaged observations. The main drawback of “between effects” estimation is its ignorance of the important information about how the variables change over time (Wooldridge 2003). The “fixed effects” estimation is the time-demean method, which eliminates the unobserved time-invariant effects. If we believe such time-invariant effects are uncorrelated with any explanatory variables, then “random effects” estimation is recommended.

The impact of “Oligopoly” is negative in the “between effects” estimation in Table 6, however such impact is not accountable since “Oligopoly” is a dummy variable. By averaging across time for every observation it loses the time-variant information. On the contrary, a positive impact of “Oligopoly” is found in both fixed and random effects estimations. These two models take into account both the time-variant concern of “Oligopoly” and the unobserved effects from omitted variables. For example, market structure of a particular industry may change from oligopoly to another or the other way around since it is measured as HHI, which may vary across years, hence the dummy value varies. The theoretical expectation of oligopolists tending to have high debt-equity ratio is supported by the panel empirical analysis. Furthermore, the linkage expectation between the nature of product and capital structure is also verified by the panel regression. The negative impacts of uniqueness and durable on the ratio support the theory that firms which can potentially impose high costs on their customers (producing unique and / or durable goods) choose capital structure with relative low debt / equity ratio (Titman 1984). Note: the “Durable” is dropped in the fixed effects estimation because of the time-invariance. This dummy variable is defined in terms of the industry and sub-sector of the firm, hence this value stays the same across years.

The impacts of control variables (agency costs and asymmetric information problems) are consistent in both fixed and random effects estimations. Profitability has a negative impact, which is consistent with the theoretical expectation³⁶. Size is negatively associated with the capital structure in the model, which is not consistent

³⁶ Myers & Majluf (1984). And Rajan & Zingales (1995), Wald (1999), Booth et al. (2001) and Chui, et al. (2002) found the evidences to support the theory.

with the theoretical expectation³⁷. The impact of tangibility is negative in the panel model. Researchers argue that tangibility is positively associated with debt-equity ratio because of agency costs, while they also find that such expectation varies across countries³⁸. Empirically, business risk is predicted to be negatively associated with leverage³⁹. However, the finding is that of positive impact on the debt-equity ratio in the panel models. Growth opportunity is negatively associated with the debt-equity ratio, which is consistent with the theoretical expectation⁴⁰. The panel regression models provide evidence of market structure and product nature that are consistent with the theoretical expectations although most of the coefficients are not statistically significant. Table 7 shows that the qualitative predictions of the models still held under the market value measure of equity, thus suggesting robustness of the results⁴¹.

³⁷ Warner (1977), Ang & McConell (1982), Rajan & Zingales (1995), Chui, et al. (2002) provide evidences for negative assoication. On the contrary, Titman & Wessels (1988), Booth, et al. (2001), Bhaduri (2002) and Chen & Strange (2006) shows that the impacts of size are not consist when the measurement of leverage changes.

³⁸ See Booth, et al. (2001) and Chui, et al. (2002).

³⁹ See Bradley, et al. (1984), Friend & Lang (1988), Titman & Wessels (1988) and Booth, et al. (2001).

⁴⁰ Jensen & Meckling (1976), Titman & Wessels (1988) and Stulz (1990); and the evidences are also provided by Kim & Sorensen (1986) and Titman & Wessels (1988)

⁴¹ The comparison is based on the fixed and random effect estimation. Note: "Uniqueness" effect in Table 7 – column (4) and (6) is not the same.

Table 6. Estimated Coefficients from the Panel Regression Model

Variable	Debt-Equity Ratio			Book value		
	Between Effects		Fixed Effects	Random Effects		
	(1)	(2)	(3)	(4)	(5)	(6)
Oligopoly	-0.380 (1.494)	-0.564 (1.702)	2.936 (5.279)	3.877 (5.540)	0.522 (1.422)	0.572 (1.692)
Uniqueness	-0.145 (16.135)	-3.602 (16.244)	-2.614 (1.612)	-6.081 (5.852)	-1.139 (1.346)	-3.949 (2.180)
Durable	-0.393 (1.398)	0.242 (1.599)	Dropped	Dropped	-0.355 (0.968)	0.154 (0.988)
Profitability		-0.001 (0.003)		-0.001 (0.002)		-0.001 (0.001)
Size		-0.573 (0.330)		-0.143 (3.831)		-0.367 (0.433)
Tangibility		2.513 (3.350)		-19.457 (18.608)		-0.512 (3.508)
Business Risk		0.005 (0.024)		0.054 (0.052)		0.033 (0.037)
Growth		1.128 (0.588)		-0.329 (0.254)		-0.192 (0.102)
Constant	2.371 (0.993)*	9.086 (4.781)	0.867 (1.953)	7.425 (51.083)	1.982 (0.711)**	6.678 (5.588)
Observations	1113	1026	1113	1026	1113	1026
Nr of idcode	205	191	205	191	205	191
R-squared	0.00	0.06	0.00	0.01		

Robust standard errors in parentheses *significant at 5%; **significant at 1%

Note: the standard errors reported in the "between effects" are not robust since the weighed least square between-effects estimator is used; robust standard errors are reported in the fixed and random effects estimators for the suspicion of heteroscedasticity in the idiosyncratic disturbance term.

Table 7. Estimated Coefficients from the Panel Regression Model *Market value*

<i>Variable</i>	<i>Debt-Equity Ratio</i>			<i>Market value</i>		
	<i>Between Effects</i>		<i>Fixed Effects</i>		<i>Random Effects</i>	
	(1)	(2)	(3)	(4)	(5)	(6)
Oligopoly	-0.050 (0.113)	0.008 (0.122)	0.288 (0.249)	0.257 (0.219)	0.151 (0.151)	0.174 (0.165)
Uniqueness	-0.211 (1.213)	0.527 (1.166)	-0.004 (0.006)	0.558 (0.416)	-0.020 (0.024)	0.208 (0.191)
Durable	-0.050 (0.106)	-0.090 (0.115)	Dropped	Dropped (0.000)	-0.052 (0.078)	-0.093 (0.117)
Profitability		-0.000 (0.000)		0.000 (0.000)		0.000 (0.000)
Size		0.004 (0.025)		0.421 (0.291)		0.099 (0.088)
Tangibility		-0.138 (0.241)		-0.820 (0.568)		-0.436 (0.333)
Business Risk		-0.010 (0.004)*		0.002 (0.002)		0.001 (0.001)
Growth		0.206 (0.070)**		0.012 (0.012)		0.015 (0.018)
Constant	0.093 (0.075)	0.120 (0.372)	-0.065 (0.091)	-5.516 (3.863)	0.020 (0.041)	-1.196 (1.064)
Observations	1093	1012	1093	1012	1093	1012
Nr of idcode	204	190	204	190	204	190
R-squared	0.00	0.06	0.01	0.08		

*Robust standard errors in parentheses *significant at 5%; **significant at 1%*

Note: the standard errors reported in the “between effects” are not robust since the weighed least square between-effects estimator is used; robust standard errors are reported in the fixed and random effects estimators for the suspicion of heteroscedasticity in the idiosyncratic disturbance term.

Table 8 shows the effect of market structure on debt structure in the panel model. Again “Oligopoly” does not reflect long-term tacit collusion through long-term debt. However the nature of product (serves as control variable here) has a significant negative impact on the debt structure. Profitability has a positive association with long-term debt ratio. Size is negatively associated with debt structure, while the business risk has a positive relationship. Growth opportunity (assets growth rate) is positively associated with long-term debt, together with tangibility (fixed assets over total assets).

Table 8. Association between debt structure and market structure *Panel Model*

<i>Variable</i>	<i>Long-term debt over total debt</i>				<i>Book value</i>	
	<i>Between Effects</i>		<i>Fixed Effects</i>		<i>Random Effects</i>	
	(1)	(2)	(3)	(4)	(5)	(6)
Oligopoly	-1.724 (3.059)	-2.331 (2.868)	-0.854 (1.918)	0.400 (1.852)	-0.760 (1.570)	-0.840 (1.551)
Uniqueness	-28.199 (33.055)	-17.924 (27.371)	-10.119 (7.642)	-16.062 (5.977)**	-11.367 (5.065)*	-15.067 (3.246)**
Durable	-8.826 (2.863)**	-5.946 (2.694)*	Dropped	Dropped	-9.201 (2.465)**	-6.756 (2.411)**
Profitability		0.012 (0.005)*		0.002 (0.001)		0.003 (0.001)**
Size		-1.393 (0.556)*		-3.093 (1.278)*		-1.699 (0.651)**
Tangibility		41.683 (5.648)**		13.971 (8.874)		26.787 (5.395)**
Business Risk		0.010 (0.041)		0.074 (0.042)		0.045 (0.029)
Growth		0.814 (0.996)		0.402 (0.082)**		0.382 (0.065)**
Constant	25.891 (2.029)**	31.789 (8.043)**	22.971 (0.869)**	59.101 (18.179)**	25.696 (1.839)**	39.568 (10.040)**
Observations	1116	1029	1116	1029	1116	1029
Nr of idcode	205	191	205	191	205	191
R-squared	0.05	0.29	0.00	0.08		

*Robust standard errors in parentheses *significant at 5%; **significant at 1%*

Note: the standard errors reported in the "between effects" are not robust since the weighed least square between-effects estimator is used; robust standard errors are reported in the fixed and random effects estimators for the suspicion of heteroscedasticity in the idiosyncratic disturbance term.

Most of the results based on the book value are consistent with different regression models given the same business and economic environment and taxation policy. Comparing the results from South Africa with other developing countries can offer solid conclusions about the hypotheses examined in this study. Empirical analysis based on these hypotheses is relatively scarce. However, abundant analysis based on agency costs and asymmetric information problems, by means of the control variables in this study, can shed some light in this regard. In other words, if other empirical studies have the same impact as these control variables, it lends support to the analysis conducted here and in at least one small way advances the literature.

The empirical study chosen to compare is the paper by Booth, et al. (2001), who use both pooled and panel regression to analyse the capital structure on the developing countries from 1980 to 1990. Among ten countries, nine countries⁴² belong to the emerging market⁴³ under which South Africa is also categorised. So the environment of the financial market is relatively the same, which makes the comparison more acceptable. The variables they define in the analysis are as follows. Total book-debt ratio (total liability over total liability plus net worth); assets tangibility (total assets less current assets over total assets); business risk (standard deviation of return on assets); size (natural logarithm of local currency sales); and return on assets (EBIT over total assets). The latter is the same as the profitability in the current analysis. Thus, the measurement of each variable (except the dependent variable) is identical to what is used in this paper. Note: the comparison is based on Table 6 and the results from the authors' regression using the nine countries in their study.

Both assets tangibility and return on assets are negatively associated with leverage, which are the same as the finding in this paper. Size is mostly positively associated with leverage, which is not the same as the finding in this paper. Half of the countries (Mexico, India, Jordan, Malaysia) Show a positive impact of business risk, which is the same as the finding in this paper. Thus, the results based on the South African data are consistent with other emerging countries, which leads to the belief that the remaining impacts of market structure and product nature are acceptable. On the other hand, the impacts on the long-term book-debt ratio are different from the results in this paper, which leads to the conjecture that the linkage between market structure and debt structure is questionable.

4. Conclusions

The theory of the linkage between the product market and the firm's capital structure has been developed since the early 1980s. However the empirical analysis has been relatively scarce. This paper provides evidence to support the theoretical predictions

⁴² Brazil, Mexico, Indian, South Korea, Jordan, Malaysia, Pakistan, Thailand and Turkey.

⁴³ The term emerging markets is commonly used to describe business and market activity in industrializing or emerging regions of the world. There are 25 countries categorised as emerging markets. Among these countries, nine countries are included in the study by Booth, et al. (2001).

regarding the impacts of both market structure and product characteristics on the firm's capital structure. By using panel data analysis this research overcomes the problem of certain misspecifications raised by unobserved time-invariant effects. Such effects could be generated from the historical background of the firms, the culture of the firms, characteristics of the industry, regional difference between firms, etc. The empirical work illustrates that oligopolists have higher debt-equity ratio than monopolists or firms in competitive industries. Firms that produce unique and / or durable goods have relatively low debt-equity ratio, *ceteris paribus*. Such findings have been verified by taking into account the impacts of agency costs and asymmetric information problems on the capital structure. This paper also illustrates that long-term financing does not hold for oligopolists. However long-term debt financing is positively associated with profitability and growth opportunity.

By comparing the results with other emerging market economies, it is found that the influence of agency costs on the capital structure is consistent with the South Africa case, which confirms South Africa as a typical emerging market economy in this context. However, the linkage between market structure and debt structure remains questionable.

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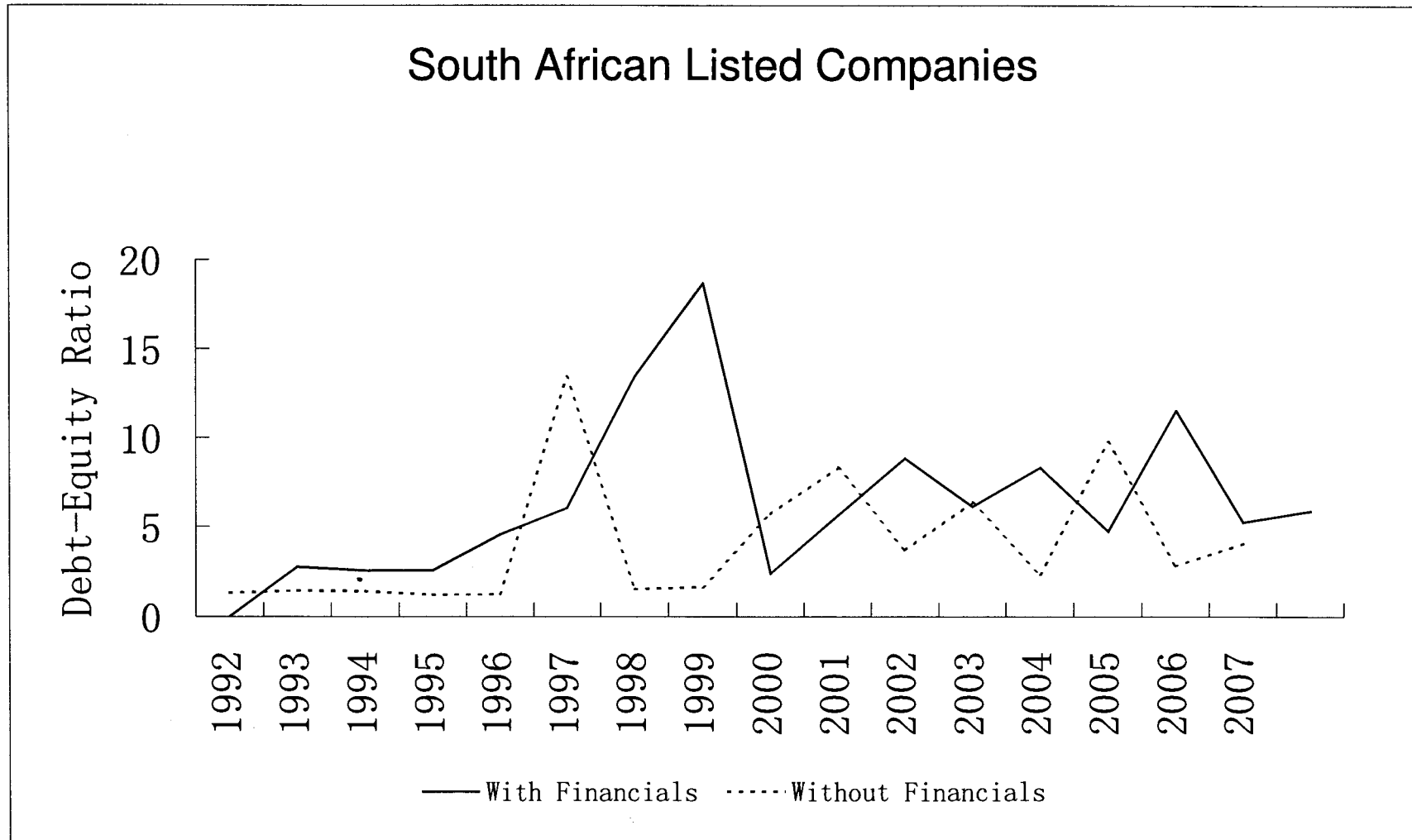
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Appendix

I. The movement of average Debt-Equity ratio listed in the JSE (Book Value)



Note: The debt-equity ratio in the graph is the weighted average ratio based on the number of firms in each industry.

II. Data Description - Mean value of debt-equity ratio, number of observations and percentage in different classifications. Year 2000 Book value

Industry	Mean	Freq.	%	Super Sector	Mean	Freq.	%	Sector	Mean	Freq.	%
Basic Materials	11.176	24	10.62	Automobiles & Parts	0.938	4	1.77	Automobiles & Parts	0.938	4	1.77
Consumer Goods	18.085	27	11.95	Banks	8.821	7	3.10	Banks	8.821	7	3.10
Consumer Services	1.643	36	15.93	Basic Resources	12.452	21	9.29	Beverages	114.899	4	1.77
Financials	5.504	58	25.66	Chemicals	2.243	3	1.33	Chemicals	2.243	3	1.33
Health Care	0.665	2	0.88	Construction & Materials	1.957	13	5.75	Construction & Materials	1.957	13	5.75
Industrials	1.734	55	24.34	Financial Services	5.696	33	14.60	Electronic & Electrical Equipment	1.915	10	4.42
Oil & Gas	0.449	1	0.44	Food & Beverage	31.680	15	6.64	Equity Investment Instruments	0.619	8	3.54
Technology	2.138	20	8.85	Health Care	0.665	2	0.88	Fixed Line Telecommunications	2.018	1	0.44
Telecommunication	1.446	3	1.33	Industrial Goods & Service	1.665	42	18.58	Food & Drug Retailers	1.645	3	1.33
				Insurance	6.457	10	4.42	Food Producers	1.419	11	4.87
				Investment Instruments	0.619	8	3.54	Forestry & Paper	1.041	2	0.88
				Media	2.318	6	2.65	General Financial	4.039	16	7.08
				Oil & Gas	0.449	1	0.44	General Industrials	1.159	7	3.10
				Personal & Household Goods	1.168	8	3.54	General Retailers	1.582	16	7.08
				Retail	1.592	19	8.41	Health Care Equipment & Services	0.665	2	0.88
				Technology	2.138	20	8.85	Household Goods	1.257	1	0.44
				Telecommunications	1.446	3	1.33	Industrial Engineering	2.507	8	3.54
				Travel & Leisure	1.363	11	4.87	Industrial Metals	0.680	2	0.88
								Industrial Transportation	1.337	7	3.10
								Leisure Goods	1.361	2	0.88
								Life Insurance	10.153	5	2.21
								Media	2.318	6	2.65
								Mining	15.180	17	7.52
								Mobile Telecommunications	1.160	2	0.88
								Non-life Insurance	2.762	5	2.21
								Oil & Gas Producers	0.449	1	0.44
								Personal Goods	1.073	5	2.21
								Real Estate	7.255	17	7.52
								Software & Computer Services	2.383	16	7.08
								Support Services	1.326	10	4.42
								Technology Hardware & Equipment	1.161	4	1.77
								Travel & Leisure	1.363	11	4.87
Total	5.660	226			5.660	226			5.660	226	

Note: 239 firms listed in JSE in 2000 given this dataset. However 13 firms record negative debt-equity ratio in the dataset and are treated as outliers.

Beverages sector has an average debt-equity ratio of 114.899. It results from a company "Awethu Breweries Limited", which has the ratio of 457.814

III. Data Description - Mean value of debt-equity ratio, number of observations and percentage in different classifications. Year 2000 Market value

Industry	Mean	Freq.	%	Super Sector	Mean	Freq.	%	Sector	Mean	Freq.	%
Basic Materials	0.051	29	12.24	Automobiles & Parts	0.021	4	1.69	Automobiles & Parts	0.021	4	1.69
Consumer Goods	0.013	27	11.39	Banks	0.060	7	2.95	Banks	0.060	7	2.95
Consumer Services	0.035	36	15.19	Basic Resources	0.055	26	10.97	Beverages	0.008	4	1.69
Financials	0.021	59	24.89	Chemicals	0.011	3	1.27	Chemicals	0.011	3	1.27
Health Care	0.008	3	1.27	Construction & Materials	0.027	13	5.49	Construction & Materials	0.027	13	5.49
Industrials	0.023	59	24.89	Financial Services	0.015	34	14.35	Electricity	0.006	1	0.42
Oil & Gas	0.003	1	0.42	Food & Beverage	0.009	15	6.33	Electronic & Electrical Equipment	0.029	10	4.22
Technology	0.004	20	8.44	Health Care	0.008	3	1.27	Equity Investment Instruments	0.009	8	3.38
Telecommunication	0.003	2	0.84	Industrial Goods & Service	0.021	46	19.41	Food & Drug Retailers	0.005	3	1.27
Utilities	0.006	1	0.42	Insurance	0.024	10	4.22	Food Producers	0.010	11	4.64
				Investment Instruments	0.009	8	3.38	Forestry & Paper	0.011	2	0.84
				Media	0.013	7	2.95	General Financial	0.015	16	6.75
				Oil & Gas	0.003	1	0.42	General Industrials	0.020	8	3.38
				Personal & Household Goods	0.017	8	3.38	General Retailers	0.068	15	6.75
				Retail	0.058	18	7.59	Health Care Equipment & Services	0.009	2	0.84
				Technology	0.004	20	8.44	Household Goods	0.007	1	0.42
				Telecommunications	0.003	2	0.84	Industrial Engineering	0.021	8	3.38
				Travel & Leisure	0.012	11	4.64	Industrial Metals	0.017	4	1.69
				Utilities	0.006	1	0.42	Industrial Transportation	0.027	7	2.95
								Leisure Goods	0.012	2	0.84
								Life Insurance	0.042	5	2.11
								Media	0.013	7	2.95
								Mining	0.067	20	8.44
								Mobile Telecommunications	0.003	2	0.84
								Non-life Insurance	0.007	5	2.11
								Oil & Gas Producers	0.003	1	0.42
								Personal Goods	0.022	5	2.11
								Pharmaceuticals & Biotechnology	0.005	1	0.42
								Real Estate	0.015	18	7.59
								Software & Computer Services	0.002	16	6.75
								Support Services	0.014	13	5.49
								Technology Hardware & Equipment	0.010	4	1.69
								Travel & Leisure	0.012	11	4.64
Total	0.024	237			0.024	237			0.024	237	

Note: Two firms do not have the share price information of year 2000. One is the fixed line communication firm and the other is in the general retailers sector.

IV. Data Description - Mean value of debt-equity ratio, number of observations and percentage in different classifications. Year 2005 Book value

Industry	Mean	Freq.	%	Super Sector	Mean	Freq.	%	Sector	Mean	Freq.	%
Basic Materials	2.725	28	10.94	Automobiles & Parts	0.533	4	1.56	Automobiles & Parts	0.533	4	1.56
Consumer Goods	0.926	29	11.33	Banks	8.281	8	3.13	Banks	8.281	8	3.13
Consumer Services	37.028	39	15.23	Basic Resources	2.861	24	9.38	Beverages	1.773	3	1.17
Financials	13.194	72	28.13	Chemicals	1.905	4	1.56	Chemicals	1.905	4	1.56
Health Care	1.713	3	1.17	Construction & Materials	3.265	12	4.69	Construction & Materials	3.265	12	4.69
Industrials	2.098	58	22.66	Financial Services	17.142	45	17.58	Electricity	0.733	1	0.39
Oil & Gas	3.918	2	0.78	Food & Beverage	1.049	17	6.64	Electronic & Electrical Equipment	1.973	8	3.13
Technology	5.097	21	8.20	Health Care	1.713	3	1.17	Equity Investment Instruments	0.428	8	3.13
Telecommunication	1.542	3	1.17	Industrial Goods & Service	1.793	46	17.97	Fixed Line Telecommunications	1.516	1	0.39
Utilities	0.733	1	0.39	Insurance	9.899	11	4.30	Food & Drug Retailers	425.993	3	1.17
				Investment Instruments	0.428	8	3.13	Food Producers	0.894	14	5.47
				Media	1.244	7	2.73	Forestry & Paper	1.372	2	0.78
				Oil & Gas	3.918	2	0.78	General Financial	13.658	20	7.81
				Personal & Household Goods	0.860	8	3.13	General Industrials	1.000	9	3.52
				Retail	67.277	21	8.20	General Retailers	7.491	18	7.03
				Technology	5.097	21	8.20	Health Care Equipment & Services	0.628	2	0.78
				Telecommunications	1.542	3	1.17	Household Goods	2.110	1	0.39
				Travel & Leisure	2.052	11	4.30	Industrial Engineering	1.585	8	3.13
				Utilities	0.733	1	0.39	Industrial Metals	1.401	2	0.78
								Industrial Transportation	2.071	8	3.13
								Leisure Goods	0.836	2	0.78
								Life Insurance	10.251	6	2.34
								Media	1.244	7	2.73
								Mining	3.156	20	7.81
								Mobile Telecommunications	1.554	2	0.78
								Non-life Insurance	9.477	5	1.95
								Oil & Gas Producers	3.918	2	0.78
								Personal Goods	0.619	5	1.95
								Pharmaceuticals & Biotechnology	3.885	1	0.39
								Real Estate	19.929	25	9.77
								Software & Computer Services	5.875	17	6.64
								Support Services	2.188	13	5.08
								Technology Hardware & Equipment	1.791	4	1.56
								Travel & Leisure	2.052	11	4.30
Total	10.720	256			10.720	256			10.720	256	

Note: 279 firms listed in JSE in 2005 given this dataset. However 23 firms record negative debt-equity ratio in the dataset and are treated as outliers. In the Food and Drug Retailers the average value of debt-equity ratio is 425.993 which arises from Pick'n' Pay's ratio as 1268.767. This ratio is treated as outlier in the regression analysis.

<i>V. Data Description - Mean value of debt-equity ratio, number of observations and percentage in different classifications.</i>									<i>Year 2005</i>	<i>Market value</i>	
Industry	Mean	Freq.	%	Super Sector	Mean	Freq.	%	Sector	Mean	Freq.	%
Basic Materials	4.596	36	13.28	Automobiles & Parts	0.004	4	1.48	Automobiles & Parts	0.004	4	1.48
Consumer Goods	0.007	29	10.70	Banks	0.050	7	2.58	Banks	0.050	7	2.58
Consumer Services	0.008	40	14.76	Basic Resources	5.169	32	11.81	Beverages	0.012	4	1.48
Financials	0.039	73	26.94	Chemicals	0.008	4	1.48	Chemicals	0.008	4	1.48
Health Care	0.003	4	1.48	Construction & Materials	0.010	13	4.80	Construction & Materials	0.010	13	4.80
Industrials	0.014	60	22.14	Financial Services	0.041	47	17.34	Electricity	0.007	1	0.37
Oil & Gas	0.003	2	0.74	Food & Beverage	0.007	17	6.27	Electronic & Electrical Equipment	0.007	9	3.32
Technology	0.010	23	8.49	Health Care	0.003	4	1.48	Equity Investment Instruments	0.005	8	2.95
Telecommunication	0.005	3	1.11	Industrial Goods & Service	0.015	47	17.34	Fixed Line Telecommunications	0.008	1	0.37
Utilities	0.007	1	0.37	Insurance	0.048	11	4.06	Food & Drug Retailers	0.005	4	1.48
				Investment Instruments	0.005	8	2.95	Food Producers	0.005	13	4.80
				Media	0.003	7	2.58	Forestry & Paper	0.005	2	0.74
				Oil & Gas	0.003	2	0.74	General Financial	0.071	21	7.75
				Personal & Household Goods	0.009	8	2.95	General Industrials	0.006	9	3.32
				Retail	0.010	21	7.75	General Retailers	0.011	17	6.27
				Technology	0.010	23	8.49	Health Care Equipment & Services	0.003	2	0.74
				Telecommunications	0.005	3	1.11	Household Goods	0.010	1	0.37
				Travel & Leisure	0.007	12	4.43	Industrial Engineering	0.007	7	2.58
				Utilities	0.007	1	0.37	Industrial Metals	0.014	3	1.11
								Industrial Transportation	0.010	8	2.95
								Leisure Goods	0.004	2	0.74
								Life Insurance	0.075	6	2.21
								Media	0.003	7	2.58
								Mining	6.125	27	9.96
								Mobile Telecommunications	0.004	2	0.74
								Non-life Insurance	0.017	5	1.85
								Oil & Gas Producers	0.003	2	0.74
								Personal Goods	0.011	5	1.85
								Pharmaceuticals & Biotechnology	0.003	2	0.74
								Real Estate	0.018	26	9.59
								Software & Computer Services	0.009	19	7.01
								Support Services	0.032	14	5.17
								Technology Hardware & Equipment	0.013	4	1.48
								Travel & Leisure	0.007	12	4.43
Total	0.627	271			0.627	271			0.627	271	

Note: Eight firms do not have the average share price of their fiscal year in 2005.

Two in Technology industry; two in Financials. Basic Materials, Consumer Goods, Consumer Services and Industrials have one firm in this regard.