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Ownership structure and capital structure dynamics in South African firms

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Background: The ownership structure can impact capital structure decisions as owners are an influential group that govern the financial decisions of firms. Hence, the ownership structure and the categories of its owners have important implications for the capital structure of firms.

Aim: This study investigates the linear and non-linear effects of different ownership types (managerial, foreign, institutional, government, and family) on the debt ratios of firms.

Setting: This study includes 267 non-financial firms listed on the Johannesburg Stock Exchange (JSE) from 2004 to 2021, accounting for fluctuation in listings during this period.

Method: The fixed effects model is used to estimate the impact of ownership structure on capital structure, while the Sasabuchi-Lind-Mehlum test evaluates non-linearity. Additionally, the Durbin-Wu-Hausman test is employed to detect whether endogeneity is present in this study.

Results: The findings indicate that government ownership has a positive linear relation with the total debt and long-term debt ratio, while a non-linear inverse U-shaped relationship is found between institutional ownership and long-term debt, with an optimal level of 34.3%.

Conclusion: The study concludes that the ownership structure is an important factor driving capital structure decisions, with government and institutional ownership directly impacting the debt ratios of firms.

Contribution: This article expands the limited knowledge of the impact of ownership structure on capital structure and is the first to explore non-linear effects in the South African context. The findings offer valuable insights for boards and management that may aid them in strategically configuring ownership structures that optimise their capital structures.

Keywords: ownership structure; ownership types; capital structure; debt; SLM; non-linear; JSE.

Introduction

The capital structure of a firm, involving the strategic mix of debt and equity employed to fund its operations and expansion (Dube 2018), plays a critical role in shaping its financial strategy. Capital structure is considered a significant issue in corporate finance, as it is linked to the financial performance of firms and is crucial to the firm's ability to fulfil the objectives of shareholders (Shubita 2023). Furthermore, Alipour, Mohammadi and Derakhshan (2015) emphasised that the adoption of an unsuitable mix of debt and equity could severely erode the performance of firms and ultimately lead to financial distress or bankruptcy. Hence, given the crucial role of capital structures in the financial well-being of firms, researchers and practitioners have sought insights into the factors influencing capital structure decisions to gain a better understanding of the optimal combination of debt and equity for firms (Shubita 2023). The major factors consistently highlighted in existing literature as influential on capital structure decisions are profitability, risk, asset tangibility, growth prospects, firm size and liquidity (Lo et al. 2016; Shil, Hossain & Ullah 2019).

In addition to these factors, Pindado and Torre (2011) proposed that a firm's ownership structure can also explain the choice between debt and equity as ownership signifies authority over a company's operations, strategy and financial decisions (Jensen & Meckling 1976). This is consistent with the pecking order theory, which argues that the financing decisions of a firm are influenced by its ownership structure, as certain shareholder groups may encourage debt financing to prevent dilution of their ownership stakes (Croci, Doukas & Gonenc 2011), while others may advocate for equity issuance to reduce the risk of financial distress and bankruptcy (Lo et al. 2016). Accordingly, Ang, Cole and Lawson (2010) recognised that the preferences and risk profiles

of individual owners are significant factors in explaining capital structure decisions in firms. This infers that the ownership structure, along with the categories of the owners, may hold important implications for the capital structure of companies (Shahzad, Nazir & Amin 2017). However, these implications are not well understood because of limited research on the relationship between ownership structure and capital structure. In fact, to date, the study of Dube (2018) is the only known research to explore this subject in the South African context.

The linkage between ownership structure and capital structure introduces complexity, as certain owners may prefer investing in firms with lower leverage, thus resulting in the endogeneity bias (Ganguli 2013). Moreover, the relationship may not always be of a linear nature and could instead vary across different proportions of shareholding (Brailsford, Oliver & Pua 2002; Lo et al. 2016). Most of the existing studies on this topic failed to account for the potential of endogeneity and/or non-linearity. Consequently, Dube's (2018) study is constrained as it overlooked the possibility of non-linear relationships.

In this research, we conduct an extensive examination of how different ownership types (managerial, foreign, institutional, government and family ownership) impact the capital structure of firms listed on the Johannesburg Stock Exchange (JSE) from 2004 to 2021. The study focuses on these specific ownership types because of their prominence in the South African business environment. Capital structure is measured using total debt ratio, long-term debt ratio and short-term debt ratio. The Durbin-Wu-Hausman (DWH) test is employed to detect whether endogeneity is present in this study, and an appropriate estimation technique is accordingly adopted to compute the models. In addition, this study also investigates the non-linear influence that ownership types may have on capital structure by employing the Sasabuchi-Lind-Mehlum (SLM) test and determines the optimal ownership levels for those displaying non-linear effects.

This study contributes to the research field of ownership and capital structure in several ways. Firstly, we expand on the limited knowledge of the relationship between ownership structure and capital structure in South Africa. Secondly, our study conducts the DWH test for endogeneity to ascertain whether the relationship should be modelled using estimation techniques suited for endogeneity or exogeneity. This is important because the results of several studies on this subject 'may be biased due to not adequately accounting for endogeneity' (Naidu, Charteris & Moores-Pitt 2022:76). Thirdly, we utilise the SLM test to investigate the non-linear effects of ownership type on capital structure. Prior research that explored non-linear associations (e.g. Brailsford et al. 2002; Chaudhary 2022) adopted quadratic models; however, this method alone has been deemed insufficient (Lind & Mehlum 2010). Lastly, our findings offer useful insights for boards and management to better understand the effects of different ownership types, enabling them to strategically configure ownership structures that optimise their capital structure. If firms lean towards debt financing, they should encourage the shareholding of owners who provide enhanced access to the debt market at lower costs and devise strategies to contend with other ownership types that reduce the use of leverage.

The remainder of this study is organised as follows: Section 2 reviews the related literature and develops research hypotheses. Section 3 discusses the data and methodology. Section 4 presents the obtained findings, and, lastly, Section 5 summarises the results.

Related literature and hypothesis development

There are three theories that can explain the effect of ownership on capital structure decisions, which are the agency theory, the free cash flow hypothesis and the pecking order theory. The agency theory describes the conflict of interests between managers and shareholders, where managers may prioritise their own interests over those of shareholders, resulting in agency costs (Jensen & Meckling 1976). According to the free cash flow hypothesis, agency costs are higher in firms with excess cash flows, as managers tend to waste the surplus on unprofitable investments (Jensen 1986). Excess cash flows also reduce the need for external financing, allowing managers to avoid monitoring by capital providers (Lin & Lin 2013).

To minimise agency conflicts, firms can adjust their capital structure by increasing leverage, which helps reduce agency costs (Zhamg 2013). This is because higher debt levels result in creditors extensively monitoring managers, thereby limiting their ability to act in their own interest (Jensen & Meckling 1976). Furthermore, leverage forces managers to allocate excess cash flows towards interest and loan payments, thus restricting investments in low-return projects (Zhamg 2013). Leverage is therefore considered as a disciplining mechanism for minimising agency costs.

This is consistent with the pecking order theory, which argues that the financing decisions of a firm are influenced by its ownership structure, as certain shareholder groups may encourage debt financing to prevent dilution of their ownership stakes (Croci et al. 2011), while others may advocate for equity issuance to reduce the risk of financial distress and bankruptcy (Lo et al. 2016).

The pecking order theory infers that some owners might support the use of leverage to mitigate agency issues and prevent dilution of their ownership stakes (Croci et al. 2011), while others may resist it because of the heightened financial risk (Lo et al. 2016). This implies that the influence of the ownership structure on the capital structure depends on the types of owners in the firm, as each ownership type has different attitudes and preferences towards leverage. Based on this premise, five hypotheses are proposed regarding the

effects of different ownership types (managerial, foreign, institutional, government and family) on capital structures.

Managerial ownership

The agency theory suggests that managerial ownership can reduce agency costs, as managers are incentivised to increase firm value when they hold shares in the company (Jensen & Meckling 1976). Thus, increased managerial ownership may decrease reliance on debt as a disciplining tool (Shahzad et al. 2017), suggesting a negative relationship between managerial ownership and capital structure. This is observed in the studies of Bathala, Moon and Rao (1994) and Chen and Steiner (1999), who attributed their results to relinquishing the monitoring role of creditors when managers acquire shares. Huang and Song (2006) also observed negative findings in China, but attributed their results to managers becoming more risk averse when they obtain shares, leading to the decreased usage of debt. Butt and Hasan (2009) and Shahzad et al. (2017) reported similar findings in Pakistan, explaining that once managers become shareholders, they aim to reduce the business risk by limiting debt.

Conversely, in South Africa, Dube (2018) found a positive linkage between managerial ownership and the total debt of JSE-listed firms, claiming that managerial shareholders prefer debt financing to avoid the dilution of their ownership and control within firms, as per the pecking order theory.

Brailsford et al. (2002) found a non-linear inverse U-shaped relationship between managerial ownership and the capital structure of Australian listed firms. This suggests that leverage increases when managerial ownership is low but decreases when managerial ownership is highly concentrated. The authors explained that at low levels of ownership, managerial shareholders employ more debt as it is a cheaper source of funding, and they are not opposed to being monitored by creditors because their interests are aligned with shareholders. However, at higher levels, managers become entrenched and reduce debt to minimise their exposure to monitoring by debt providers. Inverse U-shape relationships were also documented in later studies (such as Hayat et al. 2018; Pindado & De La Torre 2011).

Other research (Feng, Hassan & Elamer 2020; Zhamg 2013) did not find significant relationships between managerial ownership and capital structure.

Given the mixed evidence, we hypothesise the following:

H1: The effect of managerial ownership on capital structure varies depending on the level of shareholding and institutional setting.

Foreign ownership

The agency theory perceives foreign shareholders to be effective monitors, Dube (2018:89) thus argued that if foreign investors have sufficient capacity to monitor managers, there is no need to augment leverage to 'perform the same function'. This suggests a negative relationship between foreign ownership and capital structure, which is evidenced by Huang, Lin and Huang (2011) in China and Do, Lai and Tran (2020) in Taiwan. Both studies explained that as foreign investors had the ability to monitor and control management, the need for debt as a monitoring tool was reduced. Gurunlu and Gursoy (2010) also observed a negative relationship between foreign ownership and the long-term debt of Turkish firms but attributed their results to foreign investors providing more capital to investee companies, reducing the need for external financing like loans.

Conversely, a Vietnamese study by Phung and Le (2013) found a positive relationship, claiming that foreign investors are not effective monitors in emerging markets like Vietnam, as their ownership is not highly concentrated. Consequently, they suffer from asymmetric information and therefore encourage debt to increase the monitoring of management by debt providers. This is also evidenced in South Africa, where Dube (2018) reported a positive relationship, explaining that foreign investors are susceptible to information asymmetries because of their limited knowledge of the local environment and thus use debt to reduce agency costs.

The mixed empirical evidence demonstrates that foreign ownership impacts capital structure, but the direction of the impact is inconclusive. We therefore hypothesise the following:

H2: Foreign ownership significantly impacts the capital structure of firms.

Institutional ownership

Because of their large ownership stakes in firms, the agency theory also considers institutional investors as strong monitors of management (Chung & Wang 2014). As such, Hayat et al. (2018) asserted that the presence of concentrated institutional shareholders diminishes the need for debt as a means of disciplining managers, indicating a negative relationship. This aligns with the findings of Grier and Zychowicz (1994), who found that institutional investors acted as a substitute for debt in monitoring management in American firms. Similarly, Chung and Wang (2014:203) reported that 'a firm's leverage decreases when institutional ownership increases', as firms reduce debt because institutional investors assume the monitoring roles typically held by creditors. These results were supported by Rossi and Cebula (2016) for Italian firms.

In contrast, positive outcomes were reported for firms in the United Kingdom and South Africa by Sun et al. (2016) and Dube (2018), respectively. Sun et al. (2016) attributed their findings to institutional shareholder activism, which reduces the costs of debt financing. Dube (2018) explained his positive findings through the signalling effect, where debt providers are confident in the repayment capabilities of companies with substantial institutional investors, thus easily granting loans to these firms.

Chaudhary's (2022) study discovered a non-linear U-shaped relationship between institutional ownership and leverage for firms listed on the Bombay Stock Exchange. Low levels of institutional ownership were associated with reduced leverage, suggesting that firms with smaller institutional stakes may adopt more conservative financing strategies and rely less on debt. However, as institutional shareholding increased, the leverage of firms also increased, indicating that higher levels of institutional ownership led to a greater use of debt financing.

Given the mixed empirical evidence, we hypothesise the following:

H3: Institutional ownership significantly impacts the capital structure of firms.

Government ownership

In contrast to other ownership types, government owners prioritise political and social objectives over shareholder wealth, leading to increased agency costs. Hence, the agency theory views government shareholders as potentially harmful to firms because of their detachment from the firm (Alipour et al. 2015). To mitigate agency costs, Zhamg (2013) suggested that SOEs may increase debt usage as a monitoring strategy. However, leverage may already be substantial in government-linked firms because of their privileged access to debt financing (Liu, Tian & Wang 2011). For instance, SOEs benefit from government guarantees, which offer government backing for their debts and lower borrowing costs (Walker et al. 2021). Additionally, governments can directly provide debt or borrow from the market to lend to SOEs (Harris et al. 2020). This implies that government ownership increases the leverage of debt in firms, which aligns with the positive findings observed in the existing literature.

For example, Li, Yue and Zhao (2009) found that state ownership was positively associated with leverage in Chinese manufacturing firms because of greater access to long-term debt. This is supported by Zhamg (2013), who attributed SOE's increased debt levels not only to enhanced access to debt markets but also to their use of debt to resolve agency conflicts.

Dube (2018) reported similar results for JSE-listed companies that contained shares held by the Industrial Development Corporation (IDC), which is a form of government ownership. The IDC is a national development institution that finances industrial firms in project development, implementation and operation phases. In this case, Dube (2018) attributed the positive findings to the signalling effect, where the presence of the IDC as a major shareholder provides comfort to commercial banks, making them more willing to extend credit to the investee company.

Based on the empirical evidence, we propose the following hypothesis:

H4: Government ownership positively impacts the capital structure of firms.

Family ownership

Relative to other organisation forms, family-owned firms experience less agency conflict because families either directly manage the firm or closely monitor hired managers (Arifin 2003). These firms may therefore not require debt to mitigate agency conflicts, suggesting an inverse relationship between family ownership and capital structure. This is observed in the study of Margaritis and Psillaki (2010), who found that French manufacturing family firms had less debt compared to non-family firms. Margaritis and Psillaki (2010) credited this to agency conflicts being less frequent in family firms, thereby diminishing the need for debt as a disciplinary device.

However, positive findings were observed by Croci et al. (2011), who argued that European family owners prefer debt financing to avoid the dilution of their shares that can occur when issuing additional equity, as they seek to maintain control over the firm. Positive relationships between family ownership and leverage were also documented in small capitalisation American firms (Baek, Cho & Fazio 2016) and non-financial listed South African firms (Dube 2018).

In light of the mixed evidence, the following hypothesis is proposed:

H5: Family ownership significantly impacts the capital structure of firms.

Data and methodology

Sample

The data set includes non-financial companies listed on the JSE from 2004 to 2021, covering the aftermath of the 2008–2009 global financial crisis, which could have impacted the ownership structure of companies. The sample period also spans both the pre-coronavirus disease 2019 (COVID-19) era (2004–2019) and the period marked by pandemic-induced market instability (2020–2021). The study encompasses both listed and delisted firms but excludes financial firms because of the fact that 'their financial statements, asset structures, and regulatory environments' are distinct from those of other industries (Naidu et al. 2022:79). The final data sample comprises 267 firms, in an unbalanced panel of 3246 yearly observations. Capital structure data were retrieved from Bloomberg, while ownership percentages were obtained from IRESS and Equity RT.

Variables

Table 1 presents definitions of the dependent, explanatory and control variables used in this study. Following several studies (Dube 2018; Feng et al. 2020; Li et al. 2009), the capital structure of firms is measured by three leverage ratios that serve as dependent variables: total debt, long-term debt and short-term debt ratios.

The key explanatory variables of this research are the five ownership types of interest: managerial, foreign, institutional, government and family ownership. Managerial ownership is

TABLE 1: Measurement of the variables.

Variables	Measure
Dependent variables	
Total debt ratio	The ratio of long- and short-term debts to total assets.
Long-term debt ratio	The ratio of long-term debt to total assets.
Short-term debt ratio	The ratio of short-term debt to total assets.
Independent variables	
Managerial ownership	The percentage of shares owned by managers and directors.
Foreign ownership	The percentage of shares owned by foreigners.
Institutional ownership	The percentage of shares owned by institutions in the firm.
Government ownership	The percentage of shares owned by government.
Family ownership	The percentage of shares owned by family trusts.
Control variables	
ROA	The ratio of net income to total assets.
ROE	The ratio of net income to average common shareholder's equity.
Ln (size)	The natural logarithm of net assets.
Ln (age)	Natural logarithm of the elapsed years from the firm's founding to the observation date.
Dividend payout	Dividends per share divided by earnings per share.
Liquidity	Ratio of current assets to current liabilities.
GDP growth	Ratio of the change in GDP to current GDP.
Industry dummies	Each dummy variable is assigned a value of one if the firm belongs to the specified industry and zero otherwise (Naidu et al. 2022)
Year dummies	Each dummy variable is assigned a value of one if the observation pertains to the specified year and zero otherwise (Naidu et al. 2022).

GDP, gross domestic product; ROA, return on assets; ROE, return on equity; Ln, natural logarithm.

denoted by the shares owned by directors and managers. Foreign ownership encompasses the percentage of shares held by all foreign entities. Institutional ownership is gauged by the portion of shares held by asset management firms, banks, brokerage houses and insurance companies (Komati 2017). Following Dube (2018), government ownership is measured by the percentage of shares held by the Public Investment Corporation, Government Employees Pension Fund and SOEs such as Transnet, South African Broadcasting Corporation, Eskom, Passenger Rail Agency of South Africa and the IDC. Lastly, family ownership constitutes the shares held by family trusts (Komati 2017).

Various control variables are incorporated. Return on assets (ROA) and return on equity (ROE) are included as profitable firms use less debt since they have access to retained earnings (Lo et al. 2016). However, DeAngelo and Masulis (1980) argued that profitable firms increase their debt usage to benefit from tax shields. Consequently, the expected association between company performance and capital structure is not clear. Capital structures are impacted by company size. As larger firms are less likely to fail and liquidate compared to smaller firms, they have cheaper access to external financing, such as loans (Dube 2018). This implies a positive linkage between firm size and capital structure.

Firm age is also considered, as older firms achieve greater corporate credibility, which enhances their access to debt at lower borrowing rates (Chen & Strange 2005). Hence, a positive relationship is expected between firm age and leverage. The dividend payout ratio is identified as the fifth control variable. Low dividend payout ratios signal an increase in the equity base for debt capital and a low probability of bankruptcy, which may increase the company's attractiveness to lenders (Umer 2014). As such, a negative relationship is anticipated. A firm's capital structure can also be influenced by its liquidity ratio. Sharma and Paul (2015) claimed that firms with more liquid stocks benefit from lower costs of equity issuance and may thus prefer equity financing. Therefore, a positive relationship is expected between liquidity and capital structure.

We control for macroeconomic influences on capital structure by including the South African gross domestic product (GDP) growth rate. The relationship between GDP growth and leverage is unclear, as De Jong, Kabir and Nguyen (2008) postulated that firms are more willing to use debt during economic expansions. However, Giroud and Mueller (2015) argued that firms may increase their debt levels during recessionary periods because of financial distress. Lastly, dummy variables for industry and year specifications are included. The industry dummies adjust for unique characteristics and shocks specific to each industry, as categorised by the Industrial Classification Benchmark, while 'year dummies account for contemporaneous correlations in the errors across firms' (Naidu et al. 2022:80).

Model specification

To assess whether different ownership types have a linear effect on capital structure, Equation 1 is proposed:

$$Y_{it} = \alpha + \beta OWN_{it} + \eta x_{it} + \gamma d_{it} + e_{it} \quad \text{[Eqn 1]}$$

where $i = 1...N$ and $t = 1...18$; Y_{it} is either total debt ratio, long-term debt ratio or short-term debt ratio; OWN_{it} is the set of ownership variables (managerial, foreign, intuitional, government and family ownership); x_{it} is the group of control variables (ROA, ROE, ln[size], ln[age], dividend payout, liquidity and GDP growth); d_{it} indicates the industry and time dummies; and e_{it} encloses the random error term.

To account for potential non-linear relationships between the ownership types and capital structure, Equation 1 is expanded by including a quadratic term for each type of ownership, as seen in Equation 2:

$$Y_{it} = \beta_0 + \alpha OWN_{it} + \lambda\left(OWN_{it}\right)^2 + \eta x_{it} + \gamma d_{it} + e_{it} \quad \text{[Eqn 2]}$$

Significant coefficients on the quadratic term (λ) indicate the presence of non-linear relationships. However, this criterion alone is insufficient (Lind & Mehlum 2010). If the true relationship is convex but remains linear across relevant data ranges, this method will incorrectly produce a threshold value and a false U-shaped relation (Naidu et al. 2022). Therefore, to ensure accurate results, we also adopt Lind and Mehlum's (2010) SLM test that identifies the form of a non-linear relationship, determining whether it is U-shaped or inversely U-shaped, and detects the threshold point within

that relationship. The U-shaped curve displays a negative slope at lower values that shifts to a positive slope at higher values (Lind & Mehlum 2010). Conversely, an inverse U-shaped curve increases at low values and declines at high values.

The constraint in Equation 3 illustrates the U-shaped curve:

$$\alpha + \lambda\left(\text{OWN}_{\min}\right) < 0 \ < \alpha + \lambda\left(\text{OWN}_{\max}\right) \quad \text{[Eqn 3]}$$

If any inequalities in Equation 3 are breached, the curve cannot be considered U-shaped; instead, it is either linear or inversely U-shaped (Naidu et al. 2022).

To determine if the data sample satisfies the conditions of these inequalities, the following composite null (inverse U-shaped) and the alternative hypotheses (U-shaped) are tested in Equation 4 and Equation 5:

$$H_0: \alpha + 2\lambda\left(\text{OWN}_{\min}\right) \geq 0 \ \text{and}/_{\text{or}} \ \alpha + 2\lambda\left(\text{OWN}_{\max}\right) \leq 0 \quad \text{[Eqn 4]}$$

$$H_1: \alpha + 2\lambda\left(\text{OWN}_{\min}\right) < 0 \text{ and } \alpha + 2\lambda\left(\text{OWN}_{\max}\right) > 0 \quad \text{[Eqn 5]}$$

The selection of the minimum and maximum values is based on the observed data ranges for the five ownership variables. The SLM test is computed through a Stata module developed by Lind and Mehlum (2010). This module includes the Fieller confidence interval that generates the threshold values for rejecting the null hypothesis.

Method

The most common obstacle faced in ownership and capital structure research is the issue of endogeneity. The endogeneity bias can stem from three sources: dynamic endogeneity, simultaneity and unobserved heterogeneity (Wintoki, Linck & Netter 2012). Dynamic endogeneity arises when a firm's current ownership structure is influenced by its previous debt levels, as certain investors prefer investing in companies with lower total leverage. Simultaneity describes the case where an independent variable is also influenced by the dependent variable (Schultz, Tan & Walsh 2010). For instance, increased foreign ownership may result in capital structures with more debt; but higher levels of debt also contribute to a greater influx of foreign ownership. Lastly, unobserved heterogeneity pertains to firm-specific attributes (fixed effects), which could impact a company's capital structure, ownership structure and/or control features, but is challenging to measure (Wintoki et al. 2012).

If endogeneity is present, traditional panel estimation methods such as ordinary least squares (OLS) and fixed effects model (FEM) may lead to biased estimates (Schultz et al. 2010). A robust alternative is the system generalised method of moments (GMM) model, which provides 'unbiased and consistent estimates' in the presence of endogeneity issues (Schultz et al. 2010:146). However, if no endogeneity is found, the FEM provides more efficient parameter estimates compared to their GMM counterparts (Schultz et al. 2010). Therefore, in the absence of endogeneity, the FEM is preferred for the analysis.

We therefore perform the DWH test for endogeneity in order to determine the most appropriate estimation approach for this study. The DWH test is a statistical method used to examine whether the independent variables in a model are exogenous or endogenous (Hausman 1978). The test's null hypothesis posits that the regressors are exogenous, while the alternative hypothesis states that they are endogenous (Schultz et al. 2010). A significant test statistic leads to the rejection of the null hypothesis, indicating that the ownership and/or control variables may be endogenous. Conversely, an insignificant test statistic implies that the null hypothesis cannot be rejected and that all variables are likely exogenous (Guo, Lin & Lu 2018).

Results and analysis

Descriptive statistics

Table 2 displays the descriptive statistics of the variables used in this study. In line with prior South African studies (Dube 2018; Komati 2017), institutional ownership is the predominant ownership type on the JSE, accounting for an average of 37.9% of shares. This is followed by foreign ownership, which has a mean of 18.2%, significantly exceeding Dube's (2018) reported average of 9.27% between 2004 and 2014. This indicates that the JSE experienced a significant surge in foreign ownership post-2014. Managerial ownership comprises 13.6% of the shares on the JSE, while government ownership constitutes 5.2%. These estimates are slightly below Komati's (2017) documented mean values of 14.58% for managerial ownership and 7.72% for government ownership. The lowest level of shareholding on the JSE is demonstrated by

TABLE 2: Descriptive statistics.

Variables	Mean	Std. Dev.	Min	Max	Skewness	Kurtosis
Total debt	0.180	0.177	0.000	2.115	2.342	16.342
Long-term debt	0.110	0.143	0.000	1.817	2.838	18.99
Short-term debt	0.071	0.100	0.000	2.115	5.366	72.964
Managerial Ownership	0.136	0.199	0.000	0.965	1.761	5.453
Foreign Ownership	0.182	0.198	0.000	0.997	1.385	4.606
Institutional Ownership	0.379	0.251	0.000	0.999	0.362	2.158
Government Ownership	0.052	0.076	0.000	0.421	1.496	4.760
Family Ownership	0.007	0.041	0.000	0.763	12.629	193.359
ROA	0.062	0.132	-0.860	1.375	-0.102	15.526
ROE	0.130	0.236	-0.991	1.160	-0.815	7.435
Ln (size)	20.602	2.057	1.665	26.155	-0.390	5.068
Ln (age)	3.559	0.997	0.000	7.609	-0.079	4.995
Dividend payout	0.240	0.267	0.000	1.520	0.826	2.705
Liquidity	2.831	12.330	0.000	435.650	20.932	581.395
GDP growth	0.021	0.027	-0.064	0.056	-1.309	5.443

GDP, gross domestic product; ROA, return on assets; ROE, return on equity; Ln, natural logarithm; std. dev., standard deviation; min, minimum; max, maximum.

TABLE 3: Correlation matrix.

Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
(1) Total debt	1.000	-	-	-	-	-	-	-	-	-	-	-	-	-	-
(2) Long-term debt	0.821	1.000	-	-	-	-	-	-	-	-	-	-	-	-	-
(3) Short-term debt	0.584	0.036	1.000	-	-	-	-	-	-	-	-	-	-	-	-
(4) Managerial ownership	-0.027	-0.064	0.047	1.000	-	-	-	-	-	-	-	-	-	-	-
(5) Foreign ownership	0.050	0.084	-0.043	-0.308	1.000	-	-	-	-	-	-	-	-	-	-
(6) Institutional ownership	0.031	0.030	0.012	-0.262	-0.280	1.000	-	-	-	-	-	-	-	-	-
(7) Government ownership	0.073	0.092	0.000	-0.331	0.246	-0.053	1.000	-	-	-	-	-	-	-	-
(8) Family ownership	0.000	0.005	-0.005	0.032	-0.080	-0.053	-0.064	1.000	-	-	-	-	-	-	-
(9) ROA	-0.217	-0.156	-0.163	0.015	0.038	-0.044	0.041	-0.014	1.000	-	-	-	-	-	-
(10) ROE	-0.102	-0.074	-0.078	0.042	0.058	-0.088	0.052	-0.019	0.713	1.000	-	-	-	-	-
(11) Ln (size)	0.050	0.107	-0.069	-0.416	0.392	0.007	0.511	-0.071	0.132	0.107	1.000	-	-	-	-
(12) Ln (age)	0.083	0.061	0.058	-0.250	0.200	0.092	0.283	-0.010	0.068	0.082	0.379	1.000	-	-	-
(13) Dividend payout	-0.101	-0.065	-0.093	-0.094	0.167	-0.038	0.184	-0.043	0.303	0.358	0.305	0.207	1.000	-	-
(14) Liquidity	-0.108	-0.075	-0.086	-0.024	-0.038	0.049	-0.018	-0.013	0.021	-0.011	-0.045	-0.071	-0.066	1.000	-
(15) GDP growth	-0.085	-0.097	-0.021	0.016	-0.053	-0.124	-0.104	-0.035	0.134	0.159	-0.137	-0.064	0.001	-0.023	1.000

GDP, gross domestic product; ROA, return on assets; ROE, return on equity; Ln, natural logarithm.

family ownership, with an average of 0.07%. This can be attributed to a substantial portion of family shareholding in South Africa being associated with unlisted SMEs (Venter & Farrington 2009).

The mean of the total debt ratio indicates that, on average, firms only used 18% of debt to finance their assets. This suggests that JSE-listed companies rely more on equity financing, making them less risky. The average long-term debt ratio over the sample period is 12.8%, which is higher than the short-term debt ratio of 7.1%, suggesting that firms prefer using more long-term debt than short-term debt. This coincides with the findings of Chipeta and Mbululu (2013), who observed that long-term debt ratios exceeded short-term debt ratios for 191 non-financial JSE-listed firms from 2000 to 2010. Large dispersions are observed between the minimum and maximum values, which demonstrates a substantial degree of variability in the leverage levels among firms. For example, the total debt ratio exhibits a range from 0% to 211.5%, signifying that some firms are entirely financed by equity, whereas others have debt levels that are more than twice their total assets.

The average ROA and ROE are 6.2% and 13%, respectively. These values are lower than Komati's (2017) findings of 9.48% and 15.27% from 2004 to 2014, suggesting a decline in performance for JSE-listed firms. On average, the firms in the sample have net assets worth R885 798 450[1] and are in operation for 35[2] years. The mean score of the dividend payout ratio indicates that firms distributed 23.9% of their earnings to shareholders, which is significantly lower than Dube's (2018) reported average of 41.56%. This decrease could be attributed to the impact of the COVID-19 pandemic, which resulted in the suspension of dividend payments by 65 JSE-listed firms (Brown 2021). The mean liquidity ratio reveals that on average, firms have 2.806 times more current assets than current liabilities, suggesting that they have the capacity to pay their short-term obligations. Lastly, the average GDP growth of 2.1% infers that South Africa attained favourable economic expansion during the sample period (Amadeo 2022).

Table 3 presents the correlation matrix for the variables. As anticipated, the long-term and short-term debt ratios exhibit strong correlations with the total debt ratio. Both the total debt ratio and the long-term debt ratio show positive correlations with all ownership categories, except for managerial ownership. In contrast, the short-term debt ratio displays positive correlations with managerial ownership, as well as institutional ownership and government ownership, while exhibiting negative correlations with foreign ownership and family ownership.

The Durbin-Wu-Hausman test

The results of the DWH test are presented in Table 4.

The *p*-values for the DWH test statistics range from 0.472 to 0.714, thereby demonstrating statistical insignificance across all measures of capital structure (i.e. total debt ratio, long-term debt ratio and short-term debt ratio). Consequently, the null hypothesis, stating that the explanatory and control variables are exogenous, cannot be rejected. The DWH test results therefore indicate that all variables used in this study are exogenous, suggesting that endogeneity is not a significant concern when using total debt, long-term debt and short-term debt ratios as capital structure proxies. Thus, it can be inferred that the ownership structures of JSE-listed firms are not impacted by their leverage usage. This may be because of the fact that the investment decisions of potential and existing shareholders are primarily influenced by the financial performance of firms, as investors are mainly focused on capital gains (Crisóstomo, De Souza Freire & De Vasconcellos 2011).

In light of these results, all variables are treated as exogenous. Accordingly, the FEM is employed to model Equation 1.

1. $e^{20.600} = 885\,798\,450.30$,

2. $e^{3.557} = 35.128$

Main results

Table 5 displays the results of the fixed effects regression analysis.

The results indicate that all control variables have a role in explaining the capital structure of JSE-listed firms. ROA exhibits a negative effect on the capital structure measures in Equations 1 and 2, while ROE has a positive impact on the total debt ratio and short-term debt ratio. This suggests that firms reduce leverage when their ROA is high because of the availability of retained earnings as a source of funding (Lo et al. 2016). However, when experiencing high ROE, firms increase their debt levels to capitalise on tax-saving benefits (Khémiri & Noubbigh 2018).

Firm size is inversely associated with the total debt ratio and short-term debt ratio, inferring that larger firms have less leverage compared to their smaller counterparts. This may be attributed to the fact that larger companies are more well established, which enables them to issue equity at fair prices (Rajan & Zingales 1995). For this reason, they are less reliant on debt (Butt & Hasan 2009). Positive associations exist between firm age and all capital structure measures, indicating that older firms raise more debt than younger firms. This may be because of the reputational advantage of older firms, in which they attain greater access to debt financing and benefit from lower interest rates because of their corporate credibility (Chen & Strange 2005). The negative linkage between the dividend payout ratio and the debt ratios is consistent with the notion that lenders are inclined to avoid firms with high dividend payouts, as it signals a diminished equity base and an increased risk of bankruptcy (Dube 2018; Umer 2014).

The observed negative influence of liquidity on the total debt ratio and long-term debt ratio can be ascribed to the fact that equity issuance is cheaper for firms with liquid stocks. This may lead to an increased reliance on equity and the reduced usage of debt (Sharma & Paul 2015). A negative association is observed between GDP growth and the total debt ratio and short-term debt ratio. This indicates that companies decrease their use of debt during expansionary periods, as economic growth facilitates the increase of internal resources for financing, thereby reducing the need for external debt (Bastos, Nakamura & Basso 2009).

Based on Equation 1, institutional ownership and government ownership demonstrate statistically significant linear relationships with the capital structure of JSE-listed firms, when measured by the total debt ratio and long-term debt ratio. In particular, institutional ownership has a negative linear impact on capital structure, while government ownership exhibits a positive impact that coincides with the proposed hypotheses. Conversely, no significant effects are observed from managerial, foreign and family ownership.

The inclusion of quadratic ownership terms in Equation 2 shows that the relationship between government ownership

TABLE 4: The Durbin-Wu-Hausman test for endogeneity.

Variable	Total debt ratio	Long-term debt ratio	Short-term debt ratio
DWH test statistic	8.641	6.260	8.495
P-value	0.4711	0.7137	0.4852
df	9	9	9

Note: The test is based on the levels of debt ratios on the ownership and control variables. The first lags of the differenced debt ratios, ownership and control variables are employed as instruments.

*, ** and *** indicate the significance and the rejection of the null hypothesis at the 10%, 5% and 1% levels, respectively. The test statistic follows a chi-squared distribution. Year, industry dummies and firm age are treated as exogenous variables.

df, degrees of freedom; DWH, Durbin-Wu-Hausman.

TABLE 5: The impact of ownership and control variables on capital structure.

Variable	Equation 1			Equation 2		
	Total debt ratio	Long-term debt ratio	Short-term debt ratio	Total debt ratio	Long-term debt ratio	Short-term debt ratio
Intercept	0.285***	-0.022	0.232***	0.279***	-0.033	0.237***
Managerial ownership	0.005	0.004	0.000	-0.005	-0.058	0.035
Foreign ownership	-0.014	-0.020	0.005	0.013	-0.036	0.045
Institutional ownership	-0.035**	-0.023*	-0.011	0.026	0.088**	-0.044
Government ownership	0.191***	0.151***	0.052	0.259*	0.251**	-0.008
Family ownership	-0.029	-0.052	0.026	-0.121	-0.169	0.081
Managerial ownership²	-	-	-	0.016	0.093	-0.053
Foreign ownership²	-	-	-	-0.049	0.015	-0.059
Institutional ownership²	-	-	-	-0.071	-0.129***	0.036
Government ownership²	-	-	-	-00.33	-0.499	0.269
Family ownership²	-	-	-	0.144	0.184	-0.09
ROA	-0.258***	-0.140***	-0.128***	-0.257***	-0.139***	-0.129***
ROE	0.038**	0.016	0.022**	0.038**	0.016	0.022**
Ln (size)	-0.014***	0.000	-0.012***	-0.015***	0.000	-0.012***
Ln (age)	0.077***	0.055***	0.029***	0.078***	0.057***	0.028***
Dividend payout	-0.05***	-0.037***	-0.016**	-0.051***	-0.037***	-0.016**
Liquidity	-0.001***	-0.001***	0. 000	-0.001***	-0.001***	0.000
GDP growth	-0.409***	-0.146	-0.25**	-0.402***	-0.147	-0.243**
R-squared	0.104	0.070	0.051	0.105	0.074	0.053
F statistic	110.390***	100.730***	60.390***	110.24***	100.62***	60.350***

GDP, gross domestic product; ROA, return on assets; ROE, return on equity; Ln, natural logarithm.

Note: Equation 1 and Equation 2 represent the linear and non-linear relationships between ownership types and capital structure, respectively. These regressions are calculated with the FEM and robust standard errors. Significance levels are denoted by *, ** and *** for 10%, 5% and 1% levels, respectively.

and capital structure is strictly linear, as the quadratic coefficients are insignificant for both the total debt ratio and long-term debt ratio. The positive linear impact of government shareholding on leverage is in line with the National Treasury's (2018) observation that many South African SOEs have capital structures that rely heavily on debt. This can be attributed to the superior access that government-linked firms have to the debt market, primarily because of government guarantees that enable them to obtain loans at a reduced cost (Li et al. 2009; Liu et al. 2011; Walker et al. 2021).

According to Marimuthu (2020), the corporate failures of South African SOEs prompted various forms of government intervention, including the provision of government guarantees. Notably, SOEs such as Eskom, Trans-Caledon Tunnel Authority, South African Airways and Transnet are significant recipients of these government guarantees (IMF 2020). Marimuthu (2020) claimed that providing such guarantees encourages recipient firms to use more debt, thus reinforcing the positive linkage between government ownership and the capital structure of JSE-listed firms. Accordingly, the South African Reserve Bank (2023) reported that South African SOEs have one of the highest debt ratios among emerging markets, with Eskom being the primary contributor to SOE debt.

In contrast to government ownership, Equation 2 reveals that institutional ownership exhibits a non-linear impact on the long-term debt ratio, characterised by a significant positive linear coefficient (a_1 of 0.088) followed by a significant negative quadratic coefficient (a_2 of -0.129). These findings illustrate an inverse U-shaped effect of institutional ownership on capital structure, where the initial increase in institutional shareholding amplifies the long-term debt levels of JSE-listed firms; however, when the concentration of institutional ownership exceeds a certain percentage, the debt levels of these firms begin to decline. The finding of an inverse U-shape differs from Chaudhary's (2021) of a U-shape relationship in India. The disparity in findings may be because of the different economic, legal, cultural and institutional environments of India and South Africa.

In Table 6, the findings of the SLM test validate the inverse U-shaped association between the long-term debt ratio and institutional ownership, as a positive slope (0.088) is reported at the minimum level and a negative slope (-0.169) is reported at the maximum level of institutional ownership. Furthermore, the extreme point (0.343) and the lower and upper bounds of the Fieller interval (0.105 to 0.449) lie within the data range of institutional ownership in JSE-listed firms (0 to 0.999).

The optimal level of institutional shareholding is indicated by the threshold point of 0.343. This implies that a positive relationship exists between capital structure and institutional ownership when shareholding is 34.3% or less. However, the relationship turns negative once institutional ownership surpasses this threshold value, as shown in Figure 1.

This figure plots the inverse U-shaped relationship between long-term debt and institutional ownership from the sample of JSE-listed firms from 2004 to 2021.

Although the agency theory infers that institutional ownership and debt are substitutes for monitoring managers, the results in Table 6 suggest that at lower levels, institutional investors may not effectively monitor management. These investors may instead employ long-term debt in a complementary role to mitigate agency costs (Chung & Wang 2014), thus explaining the positive relationship observed when institutional ownership is less than 34.3%. Moreover, companies with institutional investors secure debt at lower costs, which may further contribute to the positive relation (Dube 2018; Sun et al. 2016).

On the contrary, the decline in long-term debt observed when institutional ownership exceeds 34.3% can be attributed to the enhanced monitoring capabilities of these investors under concentrated ownership (Belcredi et al. 2017). This implies that, at higher levels, institutional ownership serves as a substitute for debt in monitoring management (Chung & Wang 2014; Dube 2018). Consequently, this diminishes the reliance on debt as a monitoring mechanism (Hayat et al. 2018), thereby elucidating the decreased usage of long-term debt in JSE-listed firms when institutional investors surpass 34.3%.

Conversely, when institutional ownership surpasses 34.3%, the use of long-term debt declines. This shift is attributed to the increased incentive of highly concentrated institutional investors to monitor managers (Belcredi et al. 2017), suggesting that, at higher ownership levels, institutional investors effectively substitute debt in monitoring management (Chung & Wang 2014; Dube 2018). As a result, this reduces the reliance

TABLE 6: The Sasabuchi-Lind-Mehlum test.

Variable	Long-term debt ratio
Slope at IO_{min}	0.088**
Slope at IO_{max}	-0.169***
U-test statistic	2.23**
Threshold point	0.343
95% Fieller interval	[0.105; 0.449]

Note: This table reports the results of the SLM test for an inverse U-shaped relationship between long-term debt and institutional ownership. *, ** and *** indicate significance at 10%, 5% and 1% levels, respectively.

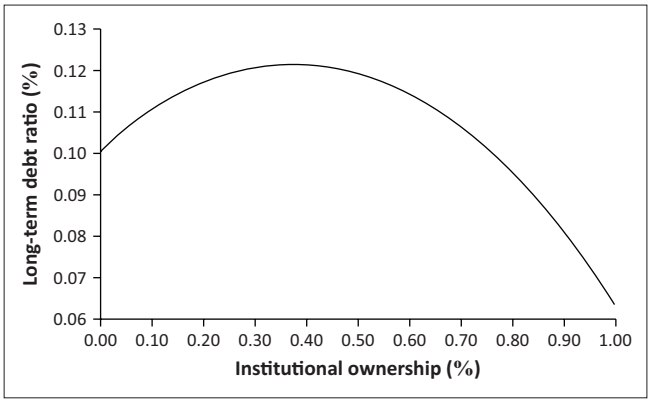

FIGURE 1: Non-linear relationship between institutional ownership and long-term debt showing an inverse U-shape.

on debt as a monitoring tool (Hayat et al. 2018), explaining the decreased usage of long-term debt in JSE-listed firms when institutional investors surpass 34.3%.

Conclusion

The aim of this study was to investigate the effects of different ownership types (managerial, foreign, institutional, government and family) on the capital structure of non-financial firms listed on the JSE. The results from the linear analyses revealed that government ownership had a positive impact on the total debt ratio and long-term debt ratio, which was associated with the increased access that government-linked firms have to the debt market.

A non-linear inverse U-shaped relationship was found between institutional ownership and long-term debt, with an optimal value of 34.3%. This indicates that the relationship between institutional ownership and capital structure evolves with the level of institutional shareholding. Specifically, at lower levels, institutional ownership and long-term debt complement each other in mitigating agency costs. However, at higher levels, institutional ownership functions as a substitute for the monitoring roles carried out by long-term debt providers, which then results in a decline of long-term debt.

The findings of this study have important policy implications for regulators and corporate governance in non-financial firms listed on the JSE. Given the positive relationship between government ownership and increased access to debt markets, policymakers should consider the potential risk of over-leveraging in government-linked firms. Effective regulatory oversight may be needed to ensure that debt levels remain sustainable and do not compromise the financial stability of these firms.

The non-linear relationship between institutional ownership and long-term debt suggests that firms should aim for an optimal level of institutional ownership of 34.3% to maximise the benefits of monitoring and minimise the risks of excessive leverage. This balance can help firms efficiently manage agency costs while avoiding the adverse effects of concentrated ownership.

Future research could involve other emerging countries to determine whether the relationships observed in this study hold true across different economic and regulatory environments. By expanding the scope beyond the JSE-listed firms, researchers could gain a broader understanding of how different ownership structures influence firm behaviour and financial decisions in a variety of contexts. Additionally, researchers could examine the role of different industry sectors and firm sizes in moderating the relationship between ownership types and capital structure to provide a more nuanced understanding of how these factors interact in different business contexts.

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Competing interests

The author declares that she has no financial or personal relationship(s) that may have inappropriately influenced her in writing this article.

Author's contributions

D.N. declares that they are the sole author of this research article.

Ethical considerations

The author confirms that the research does not involve human participants or the use of their data. The author confirms that they have collected data that are freely accessible in the public domain only. As a result, this research does not necessitate ethical considerations such as obtaining a clearance certificate.

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Data availability

The data that support the findings of this study are publicly available from IRESS, Equity RT and Bloomberg Inc.

Disclaimer

The views and opinions expressed in this study are those of the author(s) and are the product of professional research. It does not necessarily reflect the official policy or position of any affiliated institution, funder, agency or that of the publisher. The author(s) are responsible for this study's results, findings and content.

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