Rising Corporate Debt and Value Relevance of Supply-Side Factors in South Africa

Michael Machokoto*, Geofry Areneke†, Boulis Maher Ibrahim‡

November 13, 2019

Abstract

Motivated by the recent findings of marked secular increases in corporate debt in developed economies, we examine the dynamics and determinants of corporate debt in South Africa using a large sample of 775 listed firms. We report an 89% increase in gearing of the average firm, from 11% in 1990 to 21% in 2015. Long-term and short-term debt increased by 103% and 67%, respectively. We find that this increase is pervasive and cannot be explained entirely by either firm attributes or macroeconomic factors, in spite of the importance of the latter. Instead, we find supply-side factors to be the main determinants of the upward trend in corporate debt, highlighting their importance to corporate debt policies in emerging economies.

Keywords: Corporate debt, supply-side factors, demand-side factors, financial constraints, emerging markets.
Paper type: Research paper
JEL classification: G20, G30, G32

*Corresponding author; The Faculty of Business and Law, The University of Northampton, Waterside Campus, University Drive, Northampton, NN1 5HP, UK,
Email: michael.machokoto@northampton.ac.uk, **Tel:** +44 160 489 3484

†Department of Accounting, Finance and Banking,Manchester Metropolitan University Business School, Faculty of Business and Law, Manchester Metropolitan University, All Saints Campus,Oxford Road, Manchester, M15 6B,UK

‡Centre of Finance and Investment, Edinburgh Business School, School of Social Sciences, Heriot-Watt University, Edinburgh, EH14 4AS, UK

1 Introduction

Corporate financing decisions are essential components of corporate strategy that can determine the success or failure of a firm, especially during periods of significant contractions in credit supply. Using more debt can maximise a firm's value, but can also inadvertently lead to bankruptcy in economic downturns (Campello et al., 2010; Campello and Giambona, 2013; Kahle and Stulz, 2013; Garay et al., 2019). Recent research on developed economies documents a marked secular increase in corporate debt (ratio of total debt to total assets). Graham et al. (2015), for example, attribute the four-fold increase in USA corporate debt from 11% in 1945 to 47% in the 1990s to the rise in macroeconomic uncertainty, public debt, and financial development. Campello et al. (2010), Campello and Giambona (2013) and Kahle and Stulz (2013) report a marked surge in corporate debt before the onset of the Global Financial Crisis (GFC) of 2007/2008. Also, Custdio et al. (2013) document significant changes in debt composition as debt maturity continues to decrease in the USA. They attribute this to an influx of young firms with high information asymmetry and limited access to long-term financing. Beside these significant findings in the USA, little is known about the dynamics of corporate debt in emerging markets that are beleaguered with inadequate institutional frameworks.

Emerging markets provide interesting research settings since the weak institutional structures and the low levels of capital market development create greater challenges in accessing external sources of financing. While it is easier for firms in developed countries to raise external finance due to institutional openness and higher levels and quality of information disclosure, firms in emerging markets face difficulties because of high levels of information asymmetry and weak regulatory frameworks that inadequately discourage or restrict adverse practices such as corruption (Areneke and Kimani, 2019). Accordingly, the trends and determinants of corporate debt in emerging economies may be dissimilar to those reported on more developed capital markets (see Custdio et al., 2013; Graham et al., 2015). We conjecture that the rising corporate debt levels and their determinants, as re-

ported on developed economies, may not be entirely generalisable to emerging economies that have markedly different financial infrastructures, degrees of institutional openness, and levels of capital market development.

We test this conjecture and fill the associated research gap by investigating the evolution and determinants of corporate debt in South Africa over the period 1990–2015. The choice of South Africa is motivated by two main factors that make the context utilitarian as an exemplary emerging economy. First, South Africa has the largest, most developed, and best-regulated stock market in Africa (You et al., 2019). This makes it the continent's financial hub South of the Sahara, and the destination of choice for foreign and regional banks, who are the main suppliers of firm credit. Further, unlike other African countries, it has a high level of institutional shareholding and well-diversified ownership and financing sources, of which debt is most prominent (Hearn et al., 2010). Second, relative to other emerging economies, South Africa's economic and political history has interesting similarities as well as differences that make it an ideal case for examining whether macroeconomic and supply-side factors influence corporate financing decisions. Specifically, the country has experienced two distinct political and economic phases (which we include in our sample period). The first phase is from 1990 to 1995 during which the country was isolated due to sanctions imposed by international organisations for practising apartheid (Ntim and Soobaroyen, 2013). Throughout this period, the government regulated financial transactions in assets by requiring most payments be made by domestic equity investments rather than by money-market or bond-market instruments (Kapingura and Makhetha-Kosi, 2014). The second phase began after the abolition of apartheid in 1995, which led to financial liberalisation that included the acceptance of foreign investments and the subsequent growth of the bond market (Adelegan and Radzewicz-Bak, 2009; Kapingura and Makhetha-Kosi, 2014). As a result, South Africa has risen as an 'emerging economy' that bolsters one of the most developed bond markets in the continent. In 2012, it had the highest level of corporate and sovereign debt amongst African countries (Mecagni et al., 2014). It also currently boasts one of the most sophisticated and robust

corporate governance systems in emerging economies, comparable only to the UK and the USA. According to Ntim et al. (2012), South African practice is an exemplification of how corporate governance practices can be customised to meet institutional realities in emerging markets. The South African government has also implemented a corporate governance code (The King Report), and revised it several times, to boost investor confidence in both the local equity and bond markets. This mix makes South Africa a particularly interesting case to study.

PLEASE INSERT FIGURE 1 HERE

We report some comparative statistics to further buttress both the appropriateness and the distinctiveness of the South African context. Figure 1 plots average stock market capitalisation (Graph 1a) and private credit (Graph 1b) as ratios to GDP for South Africa, USA, UK, Sub-Saharan Africa (SSA), and the 'World'.[1] Graph 1a shows that the ratio of stock market capitalisation to GDP for South Africa is rising faster than in other countries. Graph 1b shows that the ratio of private credit to GDP is tracking that of the USA, often higher than that of the UK, and is substantially higher than that of Sub-Saharan African countries. Further, with the highest global investment flow, South Africa is compared to the BRICs (Mensi et al., 2014; You et al., 2019). This combination makes the country a channel through which global economic shocks, such as the recent credit supply shock, can be transmitted to other emerging economies in general and to African economies in particular.

Although these characteristics of South Africa have several important implications related to corporate financing decisions, to our knowledge, these implications have not yet been investigated. Against this background, we formulate and test three hypotheses linked to the following questions: How is corporate debt finance evolving? Do traditional demand-side determinants of corporate debt explain this evolution? If demand-side fac-

[1] All amounts are denominated in USD.

tors do not explain the changes in corporate debt, what other factors could? These questions have not been examined in emerging markets.

PLEASE INSERT FIGURE 2 HERE

Before addressing these research questions, and by way of motivation, we present some observations. Graph 1a of Figure 2 plots the evolution of corporate debt over the sample period. It shows an increase of 89% in average total debt over the entire period. Interestingly, this increase coincides with a marked decrease in collateral (tangible assets, represented by property, plant and equipment, or PPE) and a significant rise in intangible assets and investments.[2] This suggests that a high proportion of intangible assets, the difference between non-current assets and PPE, is being financed by debt, which further increases corporate risk. This is contrary to the theory of Krainer (2014), which posits that firms use capital structure to manage or counteract risk in investment portfolios.[3] We analyse this further and find that changes in firm characteristics over the sample period do not explain the increase in corporate debt, since these characteristics have changed in a way that does not predict leveraging. For example, the downward trend of asset tangibility suggests that corporate debt capacity should be decreasing. Over the entire sample period, and on average without control variables, the basic statistics on overall trends in firm size and profitability are insignificantly different from zero. According to theory, this implies a prediction of neither leveraging nor deleveraging. Yet, we observe significant overall average leveraging. Simultaneously, other factors, such as Tobin's q and non-debt tax shield, which are theoretically associated with low-debt financing, are increasing. These trends are surprising because they suggest that corporate debt should

[2]Appendix E shows that intangible assets (INTANG), the difference between non-current assets and PPE, increased by 201% from a low of 7.2% in 1991 to a peak of 21.6% in 2015. Several other studies in developed economies report similar marked increases in intangible investments, or R&D, which theoretically should lead to a decrease in the usage of debt financing (see Brown and Petersen, 2011; Borisova and Brown, 2013; Brown et al., 2012; Falato et al., 2018; Manikas et al., 2019).

[3]Dierker et al. (2013) also find that firms in the USA adjust capital structure to manage risk, which implies that firms in our sample should deleverage because the risky intangible assets and investments are increasing over time.

be decreasing instead of increasing as attested by the significant positive trends reported in Figure 2. Overall, the upward trend in corporate debt over the sample period does not initially seem to be explained by changes in firm-specific characteristics.

Accordingly, the analysis will proceed by examining whether changes in macroeconomic conditions drive the dynamics in corporate debt (see Goyal et al., 2011; Custdio et al., 2013; Oztekin, 2015; Graham et al., 2015). The macroeconomic factors that we use are: foreign direct investment, total value of stocks traded, GDP growth, interest rate spread, real interest rate, inflation, and domestic credit. We find that macroeconomic factors are important determinants of corporate debt, but can only partially explain the increase in debt financing in South Africa as the trend in corporate debt remains significant even after accounting for these factors. Consequently, we examine whether supply-side factors, which are mostly overlooked in the literature, account for the residual increase in corporate debt. We find that changes in the capital markets explain this residual trend in corporate debt. Our findings suggest that the trend in corporate debt is significantly higher in the pre-crisis periods and post-liberalisation of capital markets relative to the post-crisis and pre-liberalisation periods, respectively. This evidence highlights the significant role of supply-side factors as emerging determinants of corporate debt.

Our study contributes to the literature in three ways. First, we deviate from prior studies in showing the importance of the understudied supply-side factors in explaining the rising corporate debt levels in an emerging market. Most prior studies focus on developed economies and limit the scope of the determinants of corporate debt to demand-side and macroeconomic factors (e.g. Dang, 2011; Custdio et al., 2013; Graham et al., 2015). In doing so, they overlook supply-side factors as possible determinants of corporate debt and the uniqueness of emerging economies in terms of economic growth, financial and institutional structures, and institutional challenges to corporate practices. We advance the literature by showing that supply-side factors are major determinants of the rising corporate debt for firms operating in emerging economies (exemplified by the South

African context), where access to external capital is limited. Second, contrary to theory and the results reported on developed economies (see Leary and Roberts, 2010; Dang, 2011; Oztekin, 2015), we find that demand-side factors (size, tangibility and profitability) are unable to explain the evolution of corporate debt in South Africa, as these factors are not changing in a way that would support the upward trend in corporate debt. Given the actual evolution of demand-side factors, theory predicts that firms should deleverage because their debt capacity is shrinking over time. Instead, we observe a strong increasing trend in leverage. Finally, we provide further evidence on the effects of macroeconomic conditions on rising corporate debt in emerging economies. We find macroeconomic factors to be important but can explain the rising corporate debt levels in South Africa only partially. This is not entirely consistent with the model of Chen (2010), which highlights macroeconomic conditions as the most important determinants of corporate dynamics in developed economies. The most likely reason for this discrepancy is the limited financing choices available to firms that operate in emerging economies. This emphasises supply-side factors as more relevant determinants of the rising corporate debt in these countries.

The rest of the paper is organised as follows: Section 2 presents the theory and hypotheses, Section 3 discusses the methodology, Section 4 presents the data used in the analyses, Section 5 discusses the empirical results, Section 6 presents robustness tests, and Section 7 concludes.

2 Theory and hypotheses

Several studies in the USA report marked changes in the composition of firms as economies increasingly shift from manufacturing to technology and services sectors. For example, Fama and French (2001, 2004) attribute the increase in new equity issues and the decrease in dividends to an influx of young and less profitable firms. Lee et al. (2000) find that corporate debt dynamics in South Korea are explained by firm-specific factors such as size, growth rate and tangible assets. Cspedes et al. (2010) document that firms in Latin

America are similarly levered as firms in the USA despite the less developed nature of their capital markets. They attribute this puzzling observation to ownership concentration where firms resort to borrowings in a bid to avoid ceding control or dilution. Given such evidence from these studies, amongst others, we formulate the following hypothesis:

Hypothesis 1 (H1) *The increase in corporate debt is attributable to changes in firms-specific (demand-side) factors.*

Further, the extant literature reports that macroeconomic factors also have significant effects on capital structure. For example, Korajczyk and Levy (2003) present a model that predicts leverage to be pro-cyclical and counter-cyclical. Cook and Tang (2010) find that firms adjust capital structure towards a target faster in good macroeconomic environments. Also, Chen (2010) reports that economic growth rate, economic uncertainty, and business-cycle variations have a significant influence on corporate debt. Accordingly, our second hypothesis is:

Hypothesis 2 (H2) *Changes in macroeconomic factors explain the dynamics in corporate debt.*

Finally, the effects of supply-side factors are understudied relative to those of demand-side factors. Yet, prior studies have shown historical, institutional and legal factors which affect credit supply significantly influence firm financing policies. For example, Chen (2004) reports that immature and incomplete legal and institutional frameworks in China appear to be important determinants of capital structure as firm-specific factors. Similarly, Tchakoute Tchuigoua (2014) finds factors such as legal tradition, creditor rights and the stage of financial sector development significantly affect the capital structure of microfinance institutions. Beside these studies, the GFC has brought to the fore the importance of supply-side factors on credit supply and corporate financing decisions, which are pertinent conditions in emerging economies. Examining supply-side factors in emerging economies, however, is limited by data availability on variables such as credit,

credit lines and bond ratings. One way to deal with this challenge is to conduct event studies around credit supply shock events as forms of *quasi-experiments*. Several such studies report significant effects of supply-side factors on corporate financing decisions in the USA. For example, Flannery and Lockhart (2009) and Campello et al. (2011a,b) find that firms with credit lines fared better during the GFC than those without credit lines. Similarly, Leary (2009) reports a significant decrease in the supply of bank loans in the aftermath of the 1966 credit crunch. Using a similar approach, Lemmon and Roberts (2010) show that the collapse of Drexel Burnham Lambert Inc. and the subsequent regulatory changes in 1989 had significant adverse effects on the high-yield (junk) bond market. Motivated by evidence from this literature on the possible relevance of supply-side factors, we examine the changes in corporate debt in South Africa around the GFC, the Tech Bubble, and financial liberalisation events. We thus formulate the following hypothesis:

Hypothesis 3 (H3) *Changes in supply-side factors explain the evolution of corporate debt.*

3 Methodology

To investigate factors affecting the evolution of corporate debt, we estimate several versions of the following general model:-

$$D_{it} = a + \gamma Trend + \boldsymbol{\beta X}_{it-1} + \boldsymbol{\theta Z}_{it-1} + \varepsilon_{it} \quad (1)$$

where D_{it} is corporate debt (ratio of total debt to total assets) of firm i at time t; *Trend* is a time trend; $\boldsymbol{X}_{it-1}$ is a vector of lagged firm-specific variables; $\boldsymbol{Z}_{it-1}$ is a vector of lagged macroeconomic variables; a, γ, $\boldsymbol{\beta}$ and $\boldsymbol{\theta}$ are parameter coefficients to be estimated; and ε_{it} is an error term. The lagged firm-specific variables in $\boldsymbol{X}_{it-1}$ are: Tobin's q, research and development (R&D), size (Size), return on assets (ROA), property, plant, and equipment

(PPE), and non-debt tax shield (NDTS).[4] The lagged macroeconomic variables in $\boldsymbol{Z}_{it-1}$ are: foreign direct investment (FDI), gross domestic product growth (GDP Growth), interest spread (IR Spread), real interest rate (RealIR), inflation (Inflation), and the value of domestic bank credit to the private sector (Domestic Credit). All variables used are defined in Appendix A.

4 Data

Our data consists of annual accounting and macroeconomic variables and economic event dates. Accounting data is obtained from annual reports of publicly listed firms in South Africa drawn from Thomson Reuters Datastream and covers the period from 1990 to 2015.[5] The macroeconomic variables used are from The World-bank Database (WDI). As standard in the literature, we exclude firms in the regulated sectors (financials and utilities) and firms with missing data on key variables (total assets and sales).[6] We set missing R&D observations to zero, and winsorise all firm-level variables used at the upper and bottom 1% to reduce the effects of spurious outliers. The final sample consists of 8,632 firm-year observations on 775 firms. The sample is unbalanced due to the different entry and exit times of firms over the sample period.

PLEASE INSERT TABLE 1 HERE

Table 1 presents descriptive statistics on the variables used. The mean (median) of total debt (TDA), long-term debt (LTDA), and short-term debt (STDA) is 15.2% (13.1%), 9.1% (5.9%) and 6.1% (4.3%), respectively. The high proportion of short-term debt (40%) is in line with Sorge et al. (2017) and reflects the high exposure of South

[4]The firm-level determinants of corporate debt that we use are informed by the existing literature (Dang et al., 2012, 2014; Graham et al., 2015).

[5]Appendix B presents the sample distribution over time and shows the evolution of corporate debt.

[6]Appendix C presents the industrial composition for our sample. The industries are classified based on the Industry Classification Benchmark (ICB) - an industrial classification launched by Dow Jones and FTSE in 2005. The increase in corporate debt is pervasive and significant across all industries.

African firms (and, by example, firms in developing economies) to refinancing risk, as most of the short-term debt is in the form of bank loans. Of particular interest is the significant positive trend in TDA, LTDA, and STDA, which indicates a statistically significant increase over the sample period in the usage of debt financing by South African firms.[7] These trends are consistent with the plots in Figure 2. The basic statistics for the determinants of leverage (Tobin's *q*, R&D, Size, ROA, PPE, and NDTS) in Panel A are comparable to those in the literature. However, the trends of all the variables that should be positively associated with debt financing (i.e., Size, ROA and PPE) are negative, whilst the trends of the variables that should be negatively associated with debt (i.e., Tobin's *q* and NDTS) are positive. These trends predict that debt should be decreasing, which suggests *a priori* that demand-side factors (i.e., Tobin's *q*, R&D, Size, ROA, PPE, and NDTS) are less likely to explain the upward trend in leverage shown in Figure 2.

PLEASE INSERT TABLE 2 HERE

Table 2 presents corporate debt statistics on firms grouped by high or low levels of financial constraints. We use four proxies of financial constraints commonly used in the literature: age, size, tangibility, and the WW Index of Whited (2006). In each year, we partition firms into high and low groups based on whether they are above or below the average of each of the four proxies of financial constraints. This partitioning enables us to test whether binding financial constraints can explain the changes in leverage. The results, presented in Table 2, show that mature, large, high-tangibility and low-WW-Index firms have higher average levels of leverage than young, small, low-tangibility and high-WW-Index firms. These results are consistent with the literature on the effects of financial constraints on financial decisions and show that unconstrained firms have more access to debt financing relative to constrained firms (see Brown et al., 2009, 2012; Brown

[7]The "Trend" in Table 1 is the estimated slope of a regression of the variable of interest (TDA, LTDA, and STDA) on a time trend. The dependent variable in these regressions is leverage (ratio to total assets of total debt (TDA), long-term debt (LTDA), or short-term debt (STDA)) and the independent variable is a time trend.

and Petersen, 2015). Comparisons of differences in the trends show positive values implying stronger trends for highly constrained firms. The statistical significance of this difference is mixed, but is clearer for long term debt.

PLEASE INSERT TABLE 3 HERE

Table 3 presents the Spearman (above diagonal) and Pearson (below diagonal) pairwise correlations between all the variables used. Total debt is positively correlated with size, NDTS, and PPE, and negatively correlated with Tobin's *q*, R&D, and profitability. The correlations are in line with theory, except for NDTS which, apart from its correlation with size and PPE, appears to contradict the negative results reported in the USA (see Dang, 2013; Dang et al., 2014; Oztekin, 2015). This appears to suggest that NDTS has a positive effect on corporate debt in South Africa.

5 Empirical results

We start the discussion of the empirical results in Sub-sections 5.1 and 5.2 by examining whether traditional demand-side determinants explain the positive trend in corporate debt (TDA). We then investigate in Sub-section 5.3 the explanatory power of macroeconomic factors. In the final Sub-section 5.4, we examine the explanatory power of supply-side factors.

5.1 What are the effects of firm-specific factors on corporate debt?

We estimate several variants of our baseline model of Equation (1). The results are summarised in Table 4. Column (1) presents the estimation results using the main traditional firm-specific determinants of corporate debt. Columns (2)–(6) present the estimation results while including the time trend and dummy variables for period and year-of-listing.

PLEASE INSERT TABLE 4 HERE

In general, the results in Table 4 show that R&D, Size, PPE, and NDTS have a positive and significant (except R&D) effect on corporate debt, while Tobin's q and profitability (ROA) have a negative effect. These results are generally consistent with theory except for NDTS, which turns out to be positive while theory predicts a negative effect on corporate debt because NDTS is a substitute for interest-tax shield. Since most of the coefficients of the determinants of corporate debt are of the expected sign, and for brevity, we do not discuss them further and shift our focus to the important trend variables.

Column (2) presents estimation results of the model when the two dummy variables, $\text{Period}^{2000-09}$ and $\text{Period}^{2010-15}$, are included. This allows us to test whether firm-specific characteristics explain the increase in corporate debt over time. The coefficient estimates on these dummies are positive and significant, indicating that demand-side factors, represented by the variables included in model (1), do not fully explain the evolution of corporate debt. A comparison of the coefficient on $\text{Period}^{2000-09}$ with that on $\text{Period}^{2010-15}$ shows that the latter is significantly larger (the *p-value* of the Wald test is 0.019), which suggests that the increase in corporate debt is relatively higher in the latter period. Column (3) presents the estimation results of the model when only the time trend of corporate debt is included with a constant. The coefficient estimate on this time trend is positive and significant, which is consistent with the results in Table 1. The marginal effects of the model in Column (3) suggest that the average firm increases its use of corporate debt by 0.32% each year. Similarly, the coefficient of the time trend in Column (4) shows that the inclusion of the other determinants does not reduce the magnitude and significance of this trend by much, and the average firm increases debt financing by 0.30% each year using the marginal effects.

We next examine the effects of new listings on debt financing in Column (5) of Table 4. We create three dummy variables based on the particular decade in which a firm first appears in the dataset ($\text{Listing}^{1990-99}$, $\text{Listing}^{2000-09}$, and $\text{Listing}^{2010-15}$). Column

(5) presents the estimation results when these listing dummies (*less* one, $\text{Listing}^{1980-89}$) are included and the firm-specific variables excluded. The coefficient on the time trend remains positive and significant, and only the coefficient on $\text{Listing}^{2010-15}$ is significant. The estimation in Column (6) adds the firm-specific variables as controls. The results on the time trend, the listing dummies, and the control variables are similar to those in Columns (4) and (5). This suggests that apart from a slight significance for the 2000–09 decade, the vintage year of listing does not explain the upward trend in corporate debt. The coefficients on the firm-specific variables remain largely unchanged from Column (4), which shows that these variables may be important determinants of corporate debt even though they do not fully explain the rising debt financing levels in South Africa because the coefficient on the time trend remains consistently positive and significant across the different specifications.[8]

Overall, the results in Table 4 show that the increase in corporate debt is persistent and firm-specific variables, though important (apart from R&D), do not fully explain this time trend.

5.2 Do financial constraints matter?

Having established that none of the main firm-specific variables used in the literature fully explains the time trend in corporate debt, we examine the variations in corporate debt across constrained and unconstrained firms. We classify a firm as highly (lowly) constrained if it is above (below) the average age, size, tangibility, or the WW Index. Table 5 presents the estimation results of Equation (1) with a time trend and firm-specific factors for the sub-groups based on the four measures of financial constraints.

PLEASE INSERT TABLE 5 HERE

[8] Appendix C presents time trend coefficient estimates across industries from regressions of leverage ratios on a time trend variable. Garay et al. (2019), for example, find significant country and industry effects that if ignored lead to mispricing of corporate bonds (spreads) in emerging markets. Our results in Appendix C show a consistent positive and significant trend in all leverage ratios. This is inconsistent with Harris and Raviv (1991) as it shows that leverage ratios of South African firms vary significantly both across and within industries and over time.

The results show that the coefficient on the time trend remains consistently positive and significant across all the sub-samples that are based on age, size, tangibility and the WW Index. Thus, all firms have rising debt levels regardless of their age, size, or the degree of financial constraints. However, the magnitude of the coefficient estimates on the trend is smaller for firms with high financial constraints (young, small, low tangibility and high WW Index) than that for firms with low financial constraints. This suggests a lower rate of increase for constrained firms and is consistent with the consensus in the literature that binding financial constraints limit access to external financing (see Almeida et al., 2004; Whited, 2006; Brown et al., 2012; Dang et al., 2014). Comparisons of the trends in corporate debt (tabulated in columns entitled "Diff"), however, show results that are inconsistent with Hypothesis 1 (H1), since the difference in the trend coefficients between constrained and unconstrained firms is not statistically significant. This is in line with the results of the univariate analysis in Table 2. This suggests that the increase in corporate debt is pervasive and is not explained by differences in financial constraints.

We conclude, therefore, that neither firm characteristics nor financial constraints explain the increase in corporate debt that we document over the sample period. Hence, these findings do not support Hypothesis 1 (H1).

5.3 Do macroeconomic factors matter?

We extend the above analyses by examining the explanatory power of macroeconomic variables. We include foreign direct investment (FDI), value of traded stock (Stock Traded), GDP growth (GDP Growth), interest rate spread (IR Spread), real interest rate (RealIR), inflation (Inflation), and the value of domestic bank credit to the private sector (Domestic Credit) as further possible determinants of corporate debt. Our choice of these variables is motivated by Custdio et al. (2013) and Graham et al. (2015), among others, who find them significant. Table 5 presents the estimation results.

PLEASE INSERT TABLE 5 HERE

These show that FDI, Stock Traded, RealIR and Inflation have a significant positive effect on corporate debt when each is examined separately with firm-specific factors included, while GDP Growth and IR Spread have a negative effect. Although all macroeconomic variables are significant, except for Domestic Credit and the IR Spread, they only partially explain the increase in corporate debt (Hypothesis 2 - H2) as attested by the consistently significant and positive coefficient on the time trend (Trend$\times$100) across the model specifications. This remains to be the case in the model of Column (8) that includes all firm-specific and macroeconomic variables. Worthy of note is the reduction in the magnitude of the trend coefficient when Stock Traded is included (Columns (2) and (8)), which points towards a partial explanatory power from stock markets. These results are consistent with Hypothesis 2 (H2) and with those reported in Table 4, but the time trend in corporate debt still persists.

5.4 Do supply-side factors matter?

We now examine the effects of supply-side factors (Hypothesis 3 - H3) using exogenous economic events that affect credit market conditions. We investigate changes in corporate debt around crises and financial liberalisation events, through pre and post-event periods. We consider financial liberalisation in relation to the end of apartheid in South Africa when the apartheid sanctions that had been put in place in 1961 were lifted in 1994, and the country was re-admitted into the global market in 1995. During the period 1961–1994 the United Nations excluded South Africa from partaking in international unions, and economic and trade sanctions were imposed, effectively stifling the country's economic growth and development (Vaughn and Ryan, 2006). We classify the period before 1995 as pre-liberalisation (see Chipeta et al., 2012; Andreasson, 2011), and we examine whether liberalisation explains the trend in corporate debt relative to the pre-liberalisation period.

For the analyses of crisis events, we restrict the sample periods to ±4 years around the Tech-Bubble of 2000 and the GFC of 2008.[9] Table 6 presents the estimation results of Equation (1) for the sub-periods.

PLEASE INSERT TABLE 6 HERE

Columns (1) and (2) of Table 6 present the results for periods before and after the Tech-Bubble. The trend coefficient estimate changes from a significant 1.159 before the bubble to an insignificant -0.015 after the bubble. The switch in sign and decline in magnitude are clear evidence that the Tech-Bubble had a significant adverse effect on the time trend in debt financing. This suggests that firms in South Africa tend to use more debt when economic conditions are favourable, which is consistent with Cook and Tang (2010) who find that firms in the USA adjust capital structure relatively fast in good times, and with Dierker et al. (2013) who find that they do so to also manage risk. According to Gwatidzo and Ojah (2014), institutional problems such as high information asymmetry, weak creditor rights, and policy uncertainty tend to limit corporate financing choices. The increased use of debt financing prior to the Tech Bubble in South Africa further confirms the findings of Gwatidzo and Ojah (2014) and shows a high negative impact of economic downturns on debt financing in developing markets.

The results in Columns (3) and (4) also show a significant decrease in corporate debt around the GFC, consistent with Hypothesis 3 (H3). This decrease, which follows a substantial economic and liquidity shock, is in line with the literature on the effects of the GFC on financing decisions in the USA (see Campello et al., 2011a,b; Kahle and Stulz, 2013; Garcia-Appendini and Montoriol-Garriga, 2013) and suggests a significant role of supply-side factors in explaining the changes in corporate debt.

Finally, the results in Columns (5) and (6) indicate a significant swing in the trend

[9] Appendix D presents the results using alternative event dates (±5 years) as these cannot be determined precisely, especially since we use aggregate (annual) data. Our results using these alternative event dates remain qualitatively unchanged. We also find the results robust to moving the event dates one-year forward or backwards (not reported, but all results are available from the authors).

of corporate debt from negative to positive around financial liberalisation events. The significantly negative coefficient on the time trend prior to financial liberalisation reflects a substantial decrease in debt usage during the apartheid era of sanctions and economic isolation. The after-less-before difference in the trend coefficient is statistically significant, which is a clear indication that the re-introduction of South Africa to the global market post-apartheid explains why there was a marked increase in corporate debt financing relative to the pre-liberalisation apartheid era. These results support Hypothesis 3 (H3) and, overall, represent strong evidence that supply-side factors have a significant role to play in explaining the evolution of corporate debt in South Africa.

6 Robustness

We conduct robustness checks to our main results using two different estimation techniques (fixed effects and Tobit regressions), alternative definitions of corporate debt, and sample dissection into sub-samples. Columns (1) and (2) of Table 7 present the estimation results of Equation (1) using Tobit regressions because the dependent variable, corporate debt, is bounded between zero and one. Columns (3) and (4), entitled FE, present estimation results using fixed effects that allow for fixed variations across firms and industries. Columns (5) and (6) present results using alternative definitions of corporate debt. Finally, Columns (7)–(11) present results of a sensitivity analysis with sub-sampling and sub-period selections.

PLEASE INSERT TABLE 7 HERE

The results using alternative estimations, namely Tobit and fixed effects, in Columns (1) and (2) and Columns and (3) and (4), respectively, show that the coefficients on the time trend and the period dummies ($Period^{2000-09}$ and $Period^{2010-15}$) are significant and that our results are robust to the choice of the estimation technique. Similarly, the results in Columns (5) and (6) using long-term and short-term debt as measures of corporate

debt show that the trend coefficient remains positive and significant, indicating that our results hold for these alternative definitions of corporate debt.

Several studies report marked changes in the composition of listed firms, which may affect the observed evolution of dividends (see Fama and French, 2001), corporate investments (see Brown and Petersen, 2009) and capital structure (see Custdio et al., 2013; Maes et al., 2019). In Columns (7) and (8), we test whether our results are sensitive to the changing composition of firms by focusing on balanced and unbalanced sub-samples. The coefficient on the time trend for the balanced sub-sample is higher than that for the unbalanced sub-sample. This implies that older firms increased debt more than younger firms and, more importantly, that our findings are robust to this type of sub-sampling concerns.

Finally, we examine the sensitivity of our results to changes in firm characteristics by dividing the sample into three sub-periods: 1990–1999 (the 1990s), 2000–2009 (the 2000s) and 2010–2015 (the 2010s). The results for these three 'decades', presented in Columns (9)–(11), are generally consistent in sign, magnitude and significance with our main results in Table 7. The trend coefficient increases from 0.198 in the 1990s, to 0.540 in the 2000s, and to 0.852 in the 2010s. This confirms the increasing use of corporate debt over time. Coefficients on all the other traditional determinants of corporate debt maintain the same sign with only minor changes in significance across the three periods, and in a manner that is consistent with their inability to fully explain the evolution of corporate debt.

Overall, the robustness tests suggest that changes in firm characteristics do not explain the trend in corporate debt but indicate the greater importance of supply-side factors in explaining corporate financing decisions.

7 Discussion and concluding remarks

This paper analyses the determinants of the pervasive increase in corporate debt in South Africa from 1990 to 2015. Beside being an emerging economy, South Africa is unique in

its history, financial and institutional structure, and development. Apartheid sanctions and the subsequent uplifting of these sanctions have had a substantial impact on the development of its debt and stock markets and, as shown in this paper, on the patterns of debt finance usage by firms.

Our paper complements the growing academic literature on rising corporate debt and its determinants in emerging economies but is in contrast with the findings of prior research that tends to highlight demand-side and macroeconomic factors as more relevant than supply-side factors. Our results show that traditional demand-side factors, though important in the literature (Dang, 2011; Custdio et al., 2013; Graham et al., 2015), do not fully explain the rise in corporate debt, especially that most firm characteristics have changed in a direction contrary to that which would predict an increase in debt financing. This increase is partially explained by changing macroeconomic conditions, of which the development and growth of South Africa' s capital market are particularly relevant. However, supply-side factors emerge as the most important determinants of the rising corporate debt in South Africa as our results suggest that collateral-based lending (tangible assets) is decreasing.

7.1 Theoretical implications

Our finding that corporate debt is rising against a backdrop of falling asset tangibility (collateral) indicates a shift away from traditional collateral-based lending. Decreases in collateral reduces debt capacity, which may limit future access to further financing. This contradicts the finding by Maes et al. (2019) of a strong link between pledgeable assets and access to short-term debt, especially for firms that are more exposed to 'exporter' risk (risk of serving distant export markets). The shift away from collateral lending implies a marked increase in bankruptcy costs as several properties of intangible capital such as irreversisbility, high asset substitution, high information asymmetry, low collateral values, long investment horizons and low chances of success (risky) pose unique challenges for lenders or creditors. This finding corroborates earlier studies on the USA that

document a marked transition of economies towards intangible capital (see Brown and Petersen, 2009; Falato and Sim, 2014; Manikas et al., 2019). Because bankruptcy costs are markedly higher in developing economies (see Menkhoff et al., 2006; Ovtchinnikov, 2010), the pronounced rise in corporate debt and the shift in corporate balance sheets that we document exacerbates bankruptcy concerns as firms are becoming systematically overlevered in a way that increases vulnerability to financial shocks. This finding challenges traditional collateral-based theories as firms are increasingly accessing corporate debt against a background of shrinking collateral values and quality. In summary, our results lead us to question whether the long-established debt-collateral nexus is changing, or a new one is emerging. Perhaps our study echoes calls for new corporate lending theories that emphasise the role of supply-side factors and intangible capital in accessing external financing.

7.2 Practical implications

Our findings also have several important practical implications. First, the rise in corporate debt suggests at least a temporary boon for corporate debt investors in developing countries with likely changes in approaches to corporate financing policies. Our findings complement a discussion paper by the McKinsey Global Institute in June 2018 that documents a 2.5 times increase in the global corporate bond market over the past decade (see Lund et al., 2018). This implies an increased availability of non-equity external financing that promotes economic growth, which is welcome news for managers, especially in the aftermath of the global financial crisis that had dampened both the supply and the appetite for debt financing.

Second, the increase in corporate debt and the shrinking collateral values accentuate the call for practitioners to implement robust and more active strategies in managing financial risks, especially if they belong to exporting companies (Maes et al., 2019). The deterioration of the corporate quality coupled with the shift towards intangible capital, as this study shows, makes active management of capital structure more pertinent.

Third, as most debt financing in developing countries is in the form of short-term bank loans (see Sorge et al., 2017), the attendant maturity mismatches and refinancing risks require the adoption of more active financial management policies.

Fourth, the increase in corporate debt that we document indicates an improvement in access to external financing, some of which could be channelled towards R&D. This could be beneficial in narrowing the technological gap between African and developed countries noted by You et al. (2019). Having said that, the increase in intangible assets coupled with the decrease in R&D (from 2004 onwards; see Appendix E) suggests that firms in South Africa are increasingly importing innovation rather than expending resources to generate new technology or innovation themselves (the caveat here obviously depends on whether resources channelled for innovation are expensed or capitalised, while R&D in our available dataset is an expensed amount). This finding is in line with You et al. (2019) who document a slow rate, or even a reversal, of technological convergence in Africa. Similarly, Seck (2015) argues that African countries will continue to lag behind other developed countries until they start producing innovation rather than continue to rely on the procurement or transfers of technology. This is also supported by George et al. (2016) who show that the marginal benefits of R&D are much higher in developing countries than in developed economies, which highlights the need to increase the allocation of resources into R&D, especially in Africa where it is lower than elsewhere.

In general, our findings signal the need for managers to develop robust active strategies to manage the rising levels of debt given the implicit increase in bankruptcy risk in environments characterised by high or rising bankruptcy costs. This would be more pertinent during periods of heightened uncertainty about credit risk that is reminiscent of the run-up to the recent Global Financial Crisis (GFC) of 2007/2008.

7.3 Limitations and future research

Our study has certain caveats that also suggest directions for future research. First, we acknowledge that our findings relate to the analysis of a single country, which may or

may not be readily generalised to other emerging markets but represent a call to consider supply-side factors that may carry relevant implications to other emerging economies. Extending this supply-focused analysis to other emerging economies appears to be a promising endeavour for future research. Further, our results highlight the general need for researchers to investigate the importance of the often-overlooked supply-side factors as determinants of corporate debt given the global shift towards knowledge-based economies. We were also unable to control for bond characteristic due to the unavailability of bond data at firm-level in South Africa. This ought to be considered in future studies on emerging economies for which such data is available. Finally, we do not examine the implications of rising corporate debt on corporate policies, but our results suggest a call to investigate policies and practices such as dividend pay-out, retention of earnings, risk management and corporate governance.

References

Adelegan, O. J. and Radzewicz-Bak, B. (2009). What Determines Bond Market Development in Sub-Saharan Africa? SSRN Scholarly Paper ID 1486531, Social Science Research Network, Rochester, NY.

Almeida, H., Campello, M., and Weisbach, M. S. (2004). The Cash Flow Sensitivity of Cash. *The Journal of Finance*, 59(4):1777–1804.

Andreasson, S. (2011). Understanding Corporate Governance Reform in South Africa: Anglo-American Divergence, the King Reports and Hybridization. *Business & Society*, 50(4):647–673.

Areneke, G. and Kimani, D. (2019). Value relevance of multinational directorship and cross-listing on MNEs national governance disclosure practices in Sub-Saharan Africa: Evidence from Nigeria. *Journal of World Business*, 54(4):285–306.

Borisova, G. and Brown, J. R. (2013). R&D Sensitivity to Asset Sale Proceeds: New Evidence on Financing Constraints and Intangible Investment. *Journal of Banking & Finance*, 37(1):159–173.

Brown, J. R., Fazzari, S. M., and Petersen, B. C. (2009). Financing Innovation and Growth: Cash Flow, External Equity, and the 1990s R&D Boom. *The Journal of Finance*, 64(1):151–185.

Brown, J. R., Martinsson, G., and Petersen, B. C. (2012). Do Financing Constraints Matter for R&D? *European Economic Review*, 56(8):1512–1529.

Brown, J. R. and Petersen, B. C. (2009). Why has the Investment-Cash Flow Sensitivity Declined so Sharply? Rising R&D and Equity Market Developments. *Journal of Banking & Finance*, 33(5):971–984.

Brown, J. R. and Petersen, B. C. (2011). Cash holdings and R&D smoothing. *Journal of Corporate Finance*, 17(3):694–709.

Brown, J. R. and Petersen, B. C. (2015). Which investments do firms protect? Liquidity management and real adjustments when access to finance falls sharply. *Journal of Financial Intermediation*, 24(4):441–465.

Campello, M. and Giambona, E. (2013). Real Assets and Capital Structure. *The Journal of Financial and Quantitative Analysis*, 48(5):1333–1370.

Campello, M., Giambona, E., Graham, J. R., and Harvey, C. R. (2011a). Access to Liquidity and Corporate Investment in Europe during the Financial Crisis. *Review of Finance*, 16(2):323–346.

Campello, M., Giambona, E., Graham, J. R., and Harvey, C. R. (2011b). Liquidity Management and Corporate Investment During a Financial Crisis. *Review of Financial Studies*, 24(6):1944–1979.

Campello, M., Graham, J. R., and Harvey, C. R. (2010). The real effects of financial constraints: Evidence from a financial crisis. *Journal of Financial Economics*, 97(3):470–487.

Chen, H. (2010). Macroeconomic Conditions and the Puzzles of Credit Spreads and Capital Structure. *The Journal of Finance*, 65(6):2171–2212.

Chen, J. J. (2004). Determinants of Capital Structure of Chinese-Listed Companies. *Journal of Business Research*, 57(12):1341–1351.

Chipeta, C., Wolmarans, H. P. H. P., and Vermaak, F. N. S. (2012). Impact of financial liberalisation on capital structure : Evidence from the Johannesburg Securities Exchange. *African Journal of Business Management*, 6(5):1984–1998.

Cook, D. O. and Tang, T. (2010). Macroeconomic Conditions and Capital Structure Adjustment Speed. *Journal of Corporate Finance*, 16(1):73–87.

Custdio, C., Ferreira, M. A., and Laureano, L. (2013). Why are US firms Using More Short-Term Debt? *Journal of Financial Economics*, 108(1):182–212.

Cspedes, J., Gonzlez, M., and Molina, C. A. (2010). Ownership and capital structure in Latin America. *Journal of Business Research*, 63(3):248–254.

Dang, V. A. (2011). Leverage, Debt Maturity and Firm Investment: An Empirical Analysis. *Journal of Business Finance and Accounting*, 38(1-2):225–258.

Dang, V. A. (2013). Testing Capital Structure Theories Using Error Correction Models: Evidence from the UK, France and Germany. *Applied Economics*, 45(2):171–190.

Dang, V. A., Kim, M., and Shin, Y. (2012). Asymmetric Capital Structure Adjustments: New Evidence from Dynamic Panel Threshold Models. *Journal of Empirical Finance*, 19(4):465–482.

Dang, V. A., Kim, M., and Shin, Y. (2014). Asymmetric Adjustment Toward Optimal Capital Structure: Evidence from a Crisis. *International Review of Financial Analysis*, 33:226–242.

Dierker, M. J., Kang, J.-K., Lee, I., and Seo, S. W. (2013). Do Firms Adjust Capital Structures to Manage Risk? SSRN Scholarly Paper ID 2360903, Social Science Research Network, Rochester, NY, USA.

Falato, A., Kadyrzhanova, D., Sim, J., and Steri, R. (2018). Rising Intangible Capital, Shrinking Debt Capacity, and the US Corporate Savings Glut. SSRN Scholarly Paper ID 3198030, Social Science Research Network, Rochester, NY, USA.

Falato, A. and Sim, J. (2014). Why Do Innovative Firms Hold So Much Cash? Evidence from Changes in State R&D Tax Credits. SSRN Scholarly Paper ID 2503457, Social Science Research Network, Rochester, NY, USA.

Fama, E. F. and French, K. R. (2001). Disappearing Dividends: Changing Firm Characteristics or Lower Propensity to Pay? *Journal of Financial Economics*, 60(1):3–43.

Fama, E. F. and French, K. R. (2004). New Lists: Fundamentals and Survival Rates. *Journal of Financial Economics*, 73(2):229–269.

Flannery, M. J. and Lockhart, G. B. (2009). Credit Lines and the Substitutability of Cash and Debt. SSRN Scholarly Paper ID 1422867, Social Science Research Network, Rochester, NY, USA.

Garay, U., Gonzlez, M., and Rosso, J. (2019). Country and industry effects in corporate bond spreads in emerging markets. *Journal of Business Research*, 102:191–200.

Garcia-Appendini, E. and Montoriol-Garriga, J. (2013). Firms as Liquidity Providers: Evidence from the 20072008 Financial Crisis. *Journal of Financial Economics*, 109(1):272–291.

George, G., Corbishley, C., Khayesi, J., Haas, M., and Tihanyi, L. (2016). Bringing Africa in: Promising Directions for Management Research. *Academy of Management Journal*, pages 377–393.

Goyal, V. K., Nova, A., and Zanetti, L. (2011). Capital Market Access and Financing of Private Firms. *International Review of Finance*, 11(2):155–179.

Graham, J. R., Leary, M. T., and Roberts, M. R. (2015). A Century of Capital Structure: The Leveraging of Corporate America. *Journal of Financial Economics*, 118(3):658–683.

Gwatidzo, T. and Ojah, K. (2014). Firms Debt Choice in Africa: Are Institutional Infrastructure and Non-Traditional Determinants Important? *International Review of Financial Analysis*, 31:152–166.

Harris, M. and Raviv, A. (1991). The Theory of Capital Structure. *The Journal of Finance*, 46(1):297–355.

Hearn, B., Piesse, J., and Strange, R. (2010). Market liquidity and stock size premia in emerging financial markets: The implications for foreign investment. *International Business Review*, 19(5):489–501.

Kahle, K. M. and Stulz, R. M. (2013). Access to Capital, Investment, and the Financial Crisis. *Journal of Financial Economics*, 110(2):280–299.

Kapingura, F. and Makhetha-Kosi, P. (2014). The Causal Relationship between the Bond Market Development and Economic Growth in Africa: Case Study of South Africa. *Mediterranean Journal of Social Sciences*, 5(3):126.

Korajczyk, R. A. and Levy, A. (2003). Capital Structure Choice: Macroeconomic Conditions and Financial Constraints. *Journal of Financial Economics*, 68(1):75–109.

Krainer, R. E. (2014). Financial Aspects of Business Cycles: An Analysis of Balance Sheet Adjustments of U.S. Nonfinancial Enterprises over the Twentieth Century. *Journal of Money, Credit and Banking*, 46(2-3):371–407.

Leary, M. T. (2009). Bank Loan Supply, Lender Choice, and Corporate Capital Structure. *The Journal of Finance*, 64(3):1143–1185.

Leary, M. T. and Roberts, M. R. (2010). The pecking order, debt capacity, and information asymmetry. *Journal of Financial Economics*, 95(3):332–355.

Lee, J.-W., Lee, Y. S., and Lee, B.-S. (2000). The Determination of Corporate Debt in Korea. *Asian Economic Journal*, 14(4):333–356.

Lemmon, M. and Roberts, M. R. (2010). The Response of Corporate Financing and Investment to Changes in the Supply of Credit. *Journal of Financial and Quantitative Analysis*, 45(03):555–587.

Lund, S., Woetzel, J., Windhagen, E., Dobbs, R., and Goldshtein, D. (2018). Rising Corporate Debt: Peril or Promise? Discussion Paper, McKinsey Global Institute, McKinsey&Company, NY, USA.

Maes, E., Dewaelheyns, N., Fuss, C., and Van Hulle, C. (2019). The impact of exporting on financial debt choices of SMEs. *Journal of Business Research*, 102:56–73.

Manikas, A. S., Patel, P. C., and Oghazi, P. (2019). Dynamic capital asset accumulation and value of intangible assets: An operations management perspective. *Journal of Business Research*, 103:119–129.

Mecagni, M., Kriljenko, J. I. C., Gueye, C. A., Mu, Y., Yabara, M., and Weber, S. (2014). Issuing International Sovereign Bonds; Opportunities and Challenges for Sub-Saharan Africa. Technical Report 14/02, International Monetary Fund.

Menkhoff, L., Neuberger, D., and Suwanaporn, C. (2006). Collateral-based lending in emerging markets: Evidence from Thailand. *Journal of Banking & Finance*, 30(1):1–21.

Mensi, W., Hammoudeh, S., Reboredo, J. C., and Nguyen, D. K. (2014). Do global factors impact BRICS stock markets? A quantile regression approach. *Emerging Markets Review*, 19:1–17.

Ntim, C. G., Opong, K. K., and Danbolt, J. (2012). The Relative Value Relevance of Shareholder versus Stakeholder Corporate Governance Disclosure Policy Reforms in South Africa. *Corporate Governance: An International Review*, 20(1):84–105.

Ntim, C. G. and Soobaroyen, T. (2013). Black Economic Empowerment Disclosures by South African Listed Corporations: The Influence of Ownership and Board Characteristics. *Journal of Business Ethics*, 116(1):121–138.

Ovtchinnikov, A. V. (2010). Capital structure decisions: Evidence from deregulated industries. *Journal of Financial Economics*, 95(2):249–274.

Oztekin, O. (2015). Capital Structure Decisions around the World: Which Factors Are Reliably Important? *Journal of Financial and Quantitative Analysis*, 50(03):301–323.

Seck, A. (2015). Technology production: A challenge for economic growth and development in Africa. *Journal of African Studies and Development*, 7(8):207–214.

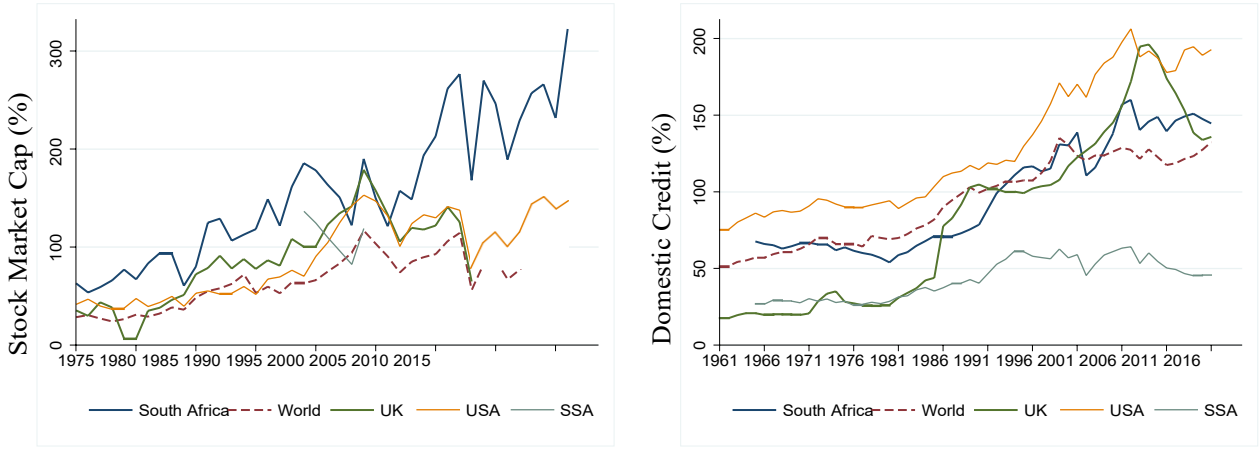
Sorge, M., Zhang, C., and Koufopoulos, K. (2017). Short-Term Corporate Debt around the World. *Journal of Money, Credit and Banking*, 49(5):997–1029.

Tchakoute Tchuigoua, H. (2014). Institutional framework and capital structure of micro-finance institutions. *Journal of Business Research*, 67(10):2185–2197.

Vaughn, M. and Ryan, L. V. (2006). Corporate Governance in South Africa: A bell-wether for the continent? *Corporate Governance: An International Review*, 14(5):504–512.

Whited, T. M. (2006). External Finance Constraints and the Intertemporal Pattern of Intermittent Investment. *Journal of Financial Economics*, 81(3):467–502.

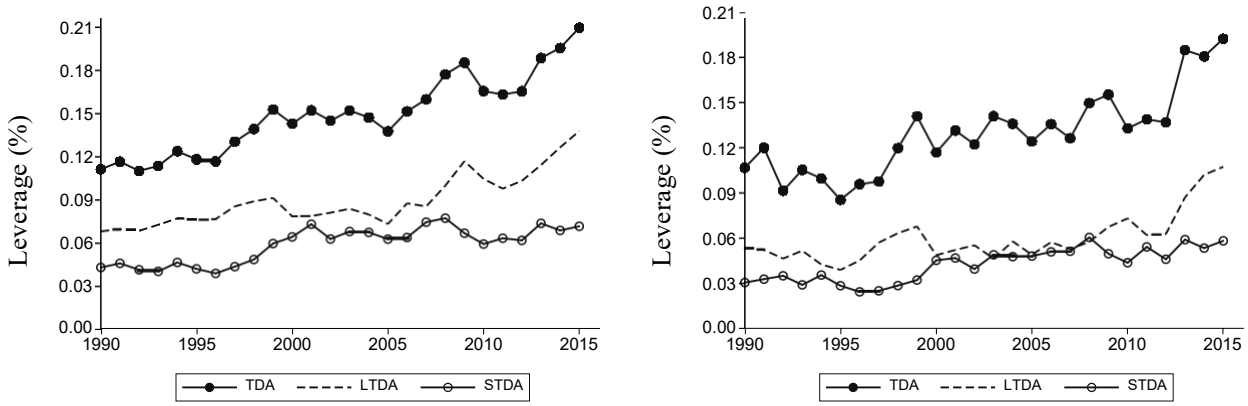
You, K., Dal Bianco, S., Lin, Z., and Amankwah-Amoah, J. (2019). Bridging technology divide to improve business environment: Insights from African nations. *Journal of Business Research*, 97:268–280.



(a) Stock market capitalisation-to-GDP **(b) Private credit-to-GDP**

Figure 1 Institutional context

The figure plots (a) the Stock market capitalisation-to-GDP (Stock Market Cap) and (b) Private credit-to-GDP (Domestic Credit) over time. The variables are drawn from The World Bank Database. All variables used are defined in Appendix A, and are winsorised at the lower and upper one percentiles.



(a) Mean **(b) Median**

Figure 2 The evolution of leverage

The figure plots the (a) mean and (b) median leverage (total debt (TDA), long-term debt (LTDA), and short-term debt (STDA)) over time. The sample consists of listed non-financial firms in South Africa drawn from *Datastream* and covers the period from 1990 to 2015. All variables used are defined in Appendix A, and are winsorised at the lower and upper one percentiles.

Table 1 Basic statistics

This table presents basic statistics and the 'Trend' for all variables used. The 'Trend' is the slope of the regression of leverage (total debt (TDA), long-term debt (LTDA), and short-term debt (STDA)) on the trend variable. The sample consists of listed non-financial and non-utility firms in South Africa drawn from *Datastream* and covers the period from 1990 to 2015. All variables used are defined in Appendix A, and are winsorised at the lower and upper one percentiles. The asterisks ***, **, * indicate significance at the one, five, and ten percent levels, respectively.

Panel A: All firms

										Trend	
Description	N	Firms	Mean	Stdev	Min	p25	p50	p75	Max	Mean	Median
TDA	8632	775	0.152	0.133	0.000	0.041	0.131	0.227	0.773	0.336***	0.305***
LTDA	775	775	0.091	0.107	0.000	0.009	0.059	0.132	0.771	0.204***	0.155***
STDA	8632	775	0.061	0.065	0.000	0.007	0.043	0.093	0.531	0.132***	0.124***
Tobin's q	8632	775	1.635	0.896	0.246	1.033	1.371	2.001	9.951	1.020**	1.039***
R&D	8632	775	0.001	0.004	0.000	0.000	0.000	0.000	0.063	-0.001	0.000
Size	8043	775	15.357	1.678	9.852	14.220	15.531	16.512	19.221	-0.800	-0.639
ROA	8043	775	0.199	0.107	0.004	0.133	0.182	0.243	0.982	-0.024	-0.041
PPE	8043	775	0.376	0.238	0.008	0.175	0.334	0.571	0.978	-0.680***	-0.525***
NDTS	8043	775	0.039	0.024	0.000	0.024	0.036	0.051	0.279	0.070***	0.024***

Panel B: Macroeconomic variables

Variable	N	Mean	Stdev	Min	p25	p50	p75	Max	Trend
FDI	8632	0.014	0.013	-0.001	0.004	0.010	0.022	0.060	0.058**
Stock Traded	8632	0.465	0.237	0.054	0.280	0.517	0.700	0.861	2.970***
GDP Growth	8632	0.027	0.020	-0.021	0.022	0.030	0.042	0.056	0.077
IR Spread	8632	0.042	0.009	0.021	0.033	0.044	0.047	0.058	-0.041
RealIR	8632	0.054	0.028	0.022	0.033	0.045	0.058	0.130	-0.149**
Inflation	8632	0.069	0.031	0.014	0.050	0.059	0.086	0.153	-0.286***
Domestic Credit	8425	1.323	0.185	0.785	1.159	1.382	1.477	1.601	2.383***

Table 2 Difference between firms

This table presents the differences in mean, median and standard deviation of corporate debt. Firms are classified into two groups based on whether the firm has below (Low) or above (High) average age, size, tangibility, and WW Index in each year. The 'Trend' is the slope of the regression of leverage (total debt (TDA), long-term debt (LTDA), and short-term debt (STDA)) on the trend variable for each sub-sample. The sample consists of listed non-financial and non-utility firms in South Africa drawn from *Datastream* and covers the period from 1990 to 2015. All variables used are defined in Appendix A, and are winsorised at the lower and upper one percentiles. The asterisks ***, **, * indicate significance at the one, five, and ten percent levels, respectively.

Financial Constraint		Low					High					Diff (High - Low)			Trend
	Variables	N	Mean	p50	Stdev	Trend	N	Mean	p50	Stdev	Trend	Mean	p50	Stdev	Wald test
Age	TDA	4,731	0.143	0.119	0.131	0.326***	3,901	0.163	0.143	0.134	0.352***	0.020***	0.024***	0.003	0.18
	LTDA	4,731	0.082	0.049	0.100	0.170***	3,901	0.101	0.072	0.113	0.251***	0.019***	0.023***	0.013***	2.33
	STDA	4,731	0.060	0.038	0.071	0.155***	3,901	0.062	0.049	0.058	0.101***	0.002	0.011***	-0.013***	3.50*
Size	TDA	4,358	0.131	0.103	0.125	0.181***	4,274	0.174	0.152	0.138	0.352***	0.043***	0.049***	0.013***	0.18
	LTDA	4,358	0.072	0.037	0.098	0.039	4,274	0.110	0.082	0.112	0.374***	0.038***	0.045***	0.014***	40.50***
	STDA	4,358	0.059	0.035	0.068	0.145***	4,274	0.063	0.050	0.063	0.117***	0.004***	0.015***	-0.005***	1.06
Tangibility	TDA	4,373	0.131	0.113	0.112	0.160***	4,259	0.174	0.152	0.149	0.519***	0.043***	0.039***	0.037***	39.52***
	LTDA	4,373	0.065	0.042	0.077	0.042	4,259	0.117	0.089	0.125	0.374***	0.052***	0.047***	0.048***	48.51***
	STDA	4,373	0.065	0.044	0.071	0.115***	4,259	0.057	0.042	0.059	0.147***	-0.008***	-0.002	-0.012***	0.98
WW Index	TDA	4,365	0.166	0.147	0.134	0.470***	4,267	0.138	0.109	0.130	0.200***	-0.028***	-0.038***	-0.004**	18.93***
	LTDA	4,365	0.103	0.076	0.108	0.344***	4,267	0.078	0.040	0.103	0.062***	-0.025***	-0.036***	-0.005***	26.39***
	STDA	4,365	0.063	0.048	0.064	0.122***	4,267	0.059	0.038	0.067	0.141***	-0.004***	-0.010***	0.003**	0.47

Table 3 Correlation

The table presents the pairwise correlations for all variables used. The sample consists of listed non-financial and non-utility firms in South Africa drawn from *Datastream* and covers the period from 1990 to 2015. All variables used are defined in Appendix A, and are winsorised at the lower and upper one percentiles. The asterisks ***, **, * indicate significance at the one, five, and ten percent levels, respectively.

Variables	TDA	LTDA	STDA	Tobin's q	R&D	Size	ROA	PPE	NDTS
TDA	1	0.853***	0.765***	-0.188***	0.167***	0.178***	-0.129***	-0.055***	0.299***
LTDA	0.865***	1	0.412***	-0.158***	0.090***	0.240***	-0.125***	0.035*	0.286***
STDA	0.605***	0.131***	1	-0.177***	0.286***	0.147***	-0.100***	-0.197***	0.285***
Tobin's q	-0.134***	-0.113***	-0.077***	1	-0.069***	-0.101***	0.606***	-0.165***	0.029
R&D	-0.003	-0.042**	0.064***	-0.066***	1	0.370***	0.016	-0.082***	0.181***
Size	0.137***	0.168***	0.023	-0.085***	0.103***	1	-0.189***	0.268***	-0.060***
ROA	-0.155***	-0.149***	-0.062***	0.586***	0.007	-0.128***	1	-0.119***	0.282***
PPE	0.003	0.135***	-0.207***	-0.110***	-0.089***	0.273***	-0.101***	1	-0.102***
NDTS	0.204***	0.153***	0.179***	-0.008	0.146***	-0.089***	0.254***	-0.195***	1

Table 4 The determinants of corporate debt

The table presents the estimation results of Equation (1) that relates corporate debt (total debt-to-total assets (TDA)) to the 'Trend' and firm-specific variables. The sample consists of listed non-financial and non-utility firms in South Africa drawn from *Datastream* and covers the period from 1990 to 2015. All variables used are defined in Appendix A, and are winsorised at the lower and upper one percentiles. The asterisks ***, **, * indicate significance at the one, five, and ten percent levels, respectively.

Variables	(1)	(2)	(3)	(4)	(5)	(6)
Trend×100			0.321***	0.304***	0.415***	0.358***
			(0.043)	(0.044)	(0.054)	(0.053)
$Period^{2000-09}$		0.032***				
		(0.006)				
$Period^{2010-15}$		0.044***				
		(0.008)				
$Listing^{2000-09}$					-0.032***	-0.017*
					(0.010)	(0.009)
$Listing^{2010-15}$					-0.017	-0.015
					(0.016)	(0.014)
Tobin's q	-0.009**	-0.004		-0.007**		-0.008**
	(0.003)	(0.003)		(0.003)		(0.003)
R&D	0.189	0.150		0.201		0.155
	(0.668)	(0.627)		(0.643)		(0.658)
Size	0.013***	0.013***		0.013***		0.012***
	(0.002)	(0.002)		(0.002)		(0.002)
ROA	-0.115***	-0.133***		-0.114***		-0.112***
	(0.029)	(0.028)		(0.028)		(0.028)
PPE	0.110***	0.107***		0.110***		0.105***
	(0.023)	(0.023)		(0.023)		(0.022)
NDTS	0.715***	0.704***		0.672***		0.655***
	(0.158)	(0.153)		(0.153)		(0.152)
Constant	-0.154***	-0.157***	0.092***	-0.170***	0.089***	-0.154***
	(0.042)	(0.041)	(0.010)	(0.041)	(0.010)	(0.042)
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes
Time FE	Yes	No	No	No	No	No
N	8,043	8,043	8,632	8,043	8,632	8,043
R^2	0.199	0.184	0.102	0.192	0.110	0.194

Table 5 Financial constraints and corporate debt

The table presents the estimation results of Equation (1) that relates corporate debt (total debt-to-total assets (TDA)) to the 'Trend' and firm-specific variables. The sample consists of listed non-financial and non-utility firms in South Africa drawn from *Datastream* and covers the period from 1990 to 2015. All variables used are defined in Appendix A, and are winsorised at the lower and upper one percentiles. The asterisks ***, **, * indicate significance at the one, five, and ten percent levels, respectively.

	Age			Size			Tangibility			WW Index		
	Young	Mature	Diff	Small	Large	Diff	Low	High	Diff	Low	High	Diff
Variables	(1)	(2)	p-value	(3)	(4)	p-value	(5)	(6)	p-value	(7)	(8)	p-value
Trend $\times$100	0.282***	0.310***	0.760	0.220***	0.305***	0.285	0.218***	0.300***	0.321	0.271***	0.248***	0.750
	(0.060)	(0.071)		(0.061)	(0.059)		(0.047)	(0.069)		(0.049)	(0.064)	
Tobin's q	0.002	-0.023***	0.001	0.004	-0.014***	0.001	-0.010***	-0.001	0.120	-0.010**	-0.003	0.231
	(0.004)	(0.007)		(0.004)	(0.004)		(0.004)	(0.005)		(0.004)	(0.005)	
R&D	-0.310	0.848	0.318	-0.995**	3.507***	0.000	-0.092	1.913	0.192	1.241	-1.045*	0.011
	(0.702)	(0.952)		(0.466)	(1.111)		(0.616)	(1.465)		(0.877)	(0.617)	
Size	0.003	0.026***	0.000	0.001	0.017***	0.038	0.010***	0.020***	0.044	0.018***	0.007*	0.044
	(0.003)	(0.005)		(0.004)	(0.006)		(0.003)	(0.004)		(0.004)	(0.004)	
ROA	-0.143***	-0.023	0.035	-0.173***	-0.050	0.005	-0.084**	-0.155***	0.162	-0.068**	-0.153***	0.045
	(0.035)	(0.045)		(0.033)	(0.035)		(0.038)	(0.036)		(0.031)	(0.037)	
PPE	0.084***	0.151***	0.226	0.083***	0.138***	0.181	0.028	0.158***	0.019	0.127***	0.087***	0.231
	(0.024)	(0.050)		(0.029)	(0.032)		(0.042)	(0.034)		(0.028)	(0.028)	
NDTS	0.607***	0.505*	0.754	0.104	1.637***	0.000	-0.158	1.130***	0.000	1.615***	0.160	0.000
	(0.176)	(0.278)		(0.162)	(0.260)		(0.171)	(0.215)		(0.221)	(0.157)	
Constant	-0.022	-0.387***	0.000	0.052	-0.296***	0.004	-0.011	-0.337***	0.000	-0.303***	-0.036	0.002
	(0.054)	(0.069)		(0.058)	(0.100)		(0.052)	(0.068)		(0.065)	(0.061)	
Industry FE	Yes	Yes		Yes	Yes		Yes	Yes		Yes	Yes	
Time FE	No	No		No	No		No	No		No	No	
N	4,249	3,794		3,948	4,095		4,027	4,016		4,151	3,892	
R^2	0.17	0.26		0.11	0.30		0.12	0.26		0.30	0.11	

Table 6 The effects of macroeconomic factors on corporate debt

The table presents the estimation results of Equation (1) that relates corporate debt (total debt-to-total assets (TDA)) to the trend, firm-specific and macroeconomic variables. The sample consists of listed non-financial and non-utility firms in South Africa drawn from *Datastream* and covers the period from 1990 to 2015. All variables used are defined in Appendix A, and are winsorised at the lower and upper one percentiles. The asterisks ***, **, * indicate significance at the one, five, and ten percent levels, respectively.

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Trend×100	0.289***	0.131**	0.316***	0.294***	0.327***	0.352***	0.273***	0.203***
	(0.044)	(0.052)	(0.045)	(0.044)	(0.044)	(0.049)	(0.053)	(0.053)
FDI	0.297***							0.257**
	(0.076)							(0.107)
Stock Traded		0.059***						0.066***
		(0.011)						(0.014)
GDP Growth			-0.267***					-0.243***
			(0.079)					(0.070)
IR Spread				-0.158				0.096
				(0.260)				(0.231)
RealIR					0.123*			0.092
					(0.064)			(0.068)
Inflation						0.206***		0.063
						(0.064)		(0.071)
Domestic Credit							0.017	-0.021
							(0.011)	(0.018)
Tobin's q	-0.007**	-0.008**	-0.007**	-0.007**	-0.007**	-0.008**	-0.007**	-0.008**
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
R&D	0.182	0.170	0.253	0.229	0.139	0.298	0.187	0.151
	(0.645)	(0.652)	(0.650)	(0.652)	(0.651)	(0.648)	(0.643)	(0.670)
Size	0.013***	0.013***	0.013***	0.013***	0.013***	0.013***	0.013***	0.013***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
ROA	-0.113***	-0.113***	-0.117***	-0.116***	-0.109***	-0.117***	-0.115***	-0.116***
	(0.028)	(0.028)	(0.028)	(0.028)	(0.028)	(0.028)	(0.028)	(0.028)
PPE	0.110***	0.111***	0.109***	0.110***	0.110***	0.109***	0.116***	0.115***
	(0.023)	(0.023)	(0.023)	(0.023)	(0.023)	(0.023)	(0.023)	(0.023)
NDTS	0.674***	0.688***	0.701***	0.679***	0.669***	0.702***	0.628***	0.680***
	(0.153)	(0.153)	(0.156)	(0.155)	(0.153)	(0.156)	(0.153)	(0.158)
Constant	-0.173***	-0.173***	-0.159***	-0.160***	-0.181***	-0.186***	-0.188***	-0.165***
	(0.041)	(0.041)	(0.041)	(0.044)	(0.041)	(0.041)	(0.042)	(0.045)
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time FE	No	No	No	No	No	No	No	No
N	8,043	8,043	8,043	8,043	8,043	8,043	7,845	7,845
R^2	0.19	0.20	0.19	0.19	0.19	0.19	0.19	0.20

Table 7 Supply-side factors and corporate debt

This table presents the estimation results of Equation (1) that relates corporate debt (total debt-to-total assets (TDA)) to the 'Trend' and firm-specific variables. The pre-crisis and crisis periods for the Tech-Bubble and Global Financial Crisis are defined as 4 years around the years 2000 and 2008, respectively. The 'Before' and 'After' periods are any periods before 1995 and after 1995 (the Liberalisation period), respectively. The sample consists of listed non-financial and non-utility firms in South Africa drawn from *Datastream* and covers the period from 1990 to 2015. All variables used are defined in Appendix A, and are winsorised at the lower and upper one percentiles. The asterisks ***, **, * indicate significance at the one, five, and ten percent levels, respectively.

	Tech-Bubble			Global Financial Crisis			Liberalisation		
	Pre-crisis	Crisis	Diff	Pre-crisis	Crisis	Diff	Before	After	Diff
Variables	(1)	(2)	p-value	(3)	(4)	p-value	(5)	(6)	p-value
Trend×100	1.159***	-0.015	0.004	0.988***	-1.173***	0.000	-0.569***	0.311***	0.000
	(0.318)	(0.227)		(0.262)	(0.252)		(0.196)	(0.053)	
Tobin's *q*	-0.010	-0.016**	0.490	-0.010	-0.005	0.501	-0.007	-0.005	0.763
	(0.007)	(0.006)		(0.008)	(0.006)		(0.006)	(0.003)	
R&D	-2.669***	2.572***	0.000	1.013	0.317	0.709	1.210*	0.081	0.292
	(0.365)	(0.913)		(0.903)	(1.851)		(0.727)	(0.645)	
Size	0.010*	0.016***	0.215	0.007**	0.010***	0.416	0.019***	0.012***	0.108
	(0.006)	(0.004)		(0.003)	(0.004)		(0.004)	(0.003)	
ROA	-0.352***	-0.073	0.007	-0.119**	-0.079**	0.493	-0.177***	-0.117***	0.265
	(0.103)	(0.047)		(0.052)	(0.035)		(0.052)	(0.029)	
PPE	0.057	0.152***	0.032	0.100***	0.253***	0.000	-0.028	0.148***	0.000
	(0.040)	(0.034)		(0.033)	(0.046)		(0.021)	(0.026)	
NDTS	1.343***	0.481**	0.007	0.664***	-0.278	0.003	2.625***	0.396**	0.000
	(0.323)	(0.228)		(0.225)	(0.328)		(0.239)	(0.159)	
Constant	-0.104	-0.182***	0.432	-0.190**	0.129	0.002	-0.176**	-0.168***	0.923
	(0.109)	(0.061)		(0.075)	(0.082)		(0.071)	(0.043)	
Industry FE	Yes	Yes		Yes	Yes		Yes	Yes	
Time FE	No	No		No	No		No	No	
Observations	1,046	1,345		1,542	1,588		1,035	7,008	
R^2	0.12	0.18		0.24	0.26		0.43	0.19	

Table 8 Robustness

The table presents the estimation results of Equation (1) that relates corporate debt (total debt-to-total assets (TDA), long-term debt-to-total assets (LTDA) and short- term debt-to-total assets (STDA)) to the trend and firm-specific variables. The sample consists of listed non-financial and non-utility firms in South Africa drawn from *Datastream* and covers the period from 1990 to 2015. All variables used are defined in Appendix A, and are winsorised at the lower and upper one percentiles. The asterisks ***, **, * indicate significance at the one, five, and ten percent levels, respectively.

	Tobit		FE		OLS						
							Sub-samples				
					Alternative Definitions		Balanced	Unbalanced 1990s		2000s	2010s
	TDA	TDA	TDA	TDA	LTDA	STDA	TDA	TDA	TDA	TDA	TDA
Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Trend×100		0.312***		0.241***	0.207***	0.094***	0.619***	0.236***	0.198*	0.540***	0.852***
		(0.021)		(0.067)	(0.034)	(0.021)	(0.127)	(0.045)	(0.117)	(0.106)	(0.187)
$Period^{2000-09}$	0.033***		0.030***								
	(0.003)		(0.006)								
$Period^{2010-15}$	0.044***		0.027***								
	(0.004)		(0.010)								
Tobin's q	-0.007***	-0.010***	0.010***	0.006*	-0.006***	-0.000	0.017	-0.005*	-0.012**	-0.005	-0.011
	(0.002)	(0.002)	(0.004)	(0.003)	(0.002)	(0.002)	(0.011)	(0.003)	(0.005)	(0.004)	(0.008)
R&D	0.138	0.204	0.047	-0.076	-1.086***	1.346**	-3.428	-0.357	-2.000***	1.656**	-0.749
	(0.364)	(0.376)	(0.279)	(0.288)	(0.349)	(0.523)	(2.641)	(0.638)	(0.507)	(0.777)	(2.022)
Size	0.016***	0.015***	0.036***	0.030***	0.012***	0.001	0.020*	0.008***	0.015***	0.010***	0.015***
	(0.001)	(0.001)	(0.005)	(0.006)	(0.002)	(0.001)	(0.010)	(0.003)	(0.004)	(0.003)	(0.004)
ROA	-0.163***	-0.142***	-0.105***	-0.077***	-0.081***	-0.030**	-0.252	-0.114***	-0.268***	-0.120***	-0.044
	(0.019)	(0.019)	(0.020)	(0.022)	(0.022)	(0.013)	(0.234)	(0.026)	(0.051)	(0.034)	(0.042)
PPE	0.105***	0.108***	0.121***	0.117***	0.139***	-0.028***	0.095**	0.102***	0.000	0.154***	0.214***
	(0.010)	(0.010)	(0.027)	(0.027)	(0.019)	(0.010)	(0.036)	(0.024)	(0.026)	(0.028)	(0.042)
NDTS	0.829***	0.796***	0.318***	0.318***	0.456***	0.240***	-0.754	0.631***	1.792***	0.278	0.213
	(0.072)	(0.072)	(0.105)	(0.107)	(0.124)	(0.062)	(0.466)	(0.149)	(0.255)	(0.188)	(0.211)
Constant	-0.202***	-0.215***	-0.480***	-0.390***	-0.209***	0.034	-0.123	-0.102**	-0.095	-0.171***	-0.396***
	(0.018)	(0.018)	(0.079)	(0.082)	(0.028)	(0.022)	(0.178)	(0.045)	(0.074)	(0.046)	(0.074)
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time FE	No	No	No	No	No	No	No	No	No	No	No
N	8,043	8,043	8,043	8,043	8,043	8,043	1,144	6,899	2,318	3,680	2,045
R^2			0.11	0.11	0.21	0.10	0.43	0.18	0.18	0.21	0.25
Pseudo R^2	-0.27	-0.28									

Appendix A Variable definitions

The table below lists the definitions of all variables used. All firm-level variables are drawn from Thomson *Datastream* and macroeconomic variables are from The World Bank. The sample consists of listed non-financial and non-utility firms in South Africa drawn from *Datastream* and covers the period from 1990 to 2015.

Variable	Definition
TDA	Total debt to total assets (Corporate debt).
LTDA	Long-term debt to total assets.
STDA	Short-term debt to total assets.
Trend	The time trend.
$\text{Listing}^{1990-99}$	Is a dummy variable that takes the value of one for firms that were first listed between 1990 to 1999 and otherwise, zero.
$\text{Listing}^{2000-09}$	Is a dummy variable that takes the value of one for firms that were first listed between 2000 to 2009 and otherwise, zero.
$\text{Listing}^{2010-15}$	Is a dummy variable that takes the value of one for firms that were first listed between 2010 to 2015 and otherwise, zero.
$\text{Period}^{1990-99}$	Is a dummy variable that takes the value of one for the period from 1990 to 1999 and otherwise, zero.
$\text{Period}^{2000-09}$	Is a dummy variable that takes the value of one for the period from 2000 to 2000 and otherwise, zero.
$\text{Period}^{2010-15}$	Is a dummy variable that takes the value of one for the period from 2011 to 2015 and otherwise, zero.
Tobin's q	Market-to-book ratio.
R&D	Research and development to total assets.
Size	Logarithm of total assets.
ROA	Earnings before interest and tax plus depreciation to total assets.
PPE	Property, plant and equipment to total assets.
NDTS	Depreciation to total assets.
Age	The difference between the year when a firm first appears in the database and current year.
WW Index	$-0.091 \times \frac{Cash\ Flow}{Assets} - 0.062 \times DivDummy + 0.021 \times \frac{Total\ debt}{Assets}$ $-0.044 \times Size + 0.102 \times IndustrySalesGrowth - 0.035 \times SalesGrowth$ The WW Index is based on Whited (2006).
FDI	Foreign direct investment, net inflows (% of GDP).
Stock Traded	Stocks traded, total value (% of GDP).
GDP Growth	GDP growth (annual %).
IR Spread	Interest rate spread (lending rate minus deposit rate %).
RealIR	Real interest rate (%).
Inflation	Inflation, consumer prices (annual %).
Domestic Credit	Domestic credit to private sector by banks (% of GDP).
Stock Market Cap	Stock market capitalisation to GDP (% of GDP).

Appendix B The time-series variation in leverage

The table presents the mean and median for leverage (total debt (TDA), long-term debt (LTDA), and short-term debt (STDA)) in each year. The 'Trend' is the slope of the regression of the leverage ratio on the trend variable. The sample consists of listed non-financial and non-utility firms in South Africa drawn from *Datastream* and covers the period from 1990 to 2015. All variables used are defined in Appendix A, and are winsorised at the lower and upper one percentiles. The asterisks ***, **, * indicate significance at the one, five, and ten percent levels, respectively.

	Mean			Median			Mean	Median
Year/Decades	TDA	LTDA	STDA	TDA	LTDA	STDA	LTDA-STDA	LTDA-STDA
1990	0.111	0.068	0.043	0.107	0.054	0.031	0.025***	0.023***
1991	0.117	0.070	0.046	0.120	0.052	0.033	0.024***	0.019***
1992	0.110	0.068	0.042	0.091	0.046	0.035	0.026***	0.011***
1993	0.114	0.073	0.040	0.105	0.052	0.029	0.033***	0.023***
1994	0.124	0.077	0.047	0.100	0.043	0.036	0.030***	0.007***
1995	0.118	0.076	0.042	0.085	0.039	0.028	0.034***	0.011***
1996	0.117	0.077	0.039	0.096	0.045	0.024	0.038***	0.021***
1997	0.131	0.086	0.044	0.098	0.057	0.025	0.042***	0.032***
1998	0.139	0.089	0.049	0.120	0.063	0.029	0.040***	0.034***
1999	0.153	0.091	0.060	0.141	0.068	0.032	0.031***	0.036***
2000	0.143	0.079	0.064	0.117	0.049	0.045	0.015***	0.004***
2001	0.152	0.079	0.073	0.131	0.052	0.047	0.006	0.005
2002	0.145	0.081	0.063	0.122	0.055	0.040	0.018***	0.015*
2003	0.152	0.084	0.068	0.141	0.046	0.049	0.016***	-0.003***
2004	0.147	0.080	0.068	0.136	0.058	0.048	0.012**	0.010***
2005	0.138	0.073	0.063	0.124	0.049	0.048	0.010**	0.001***
2006	0.152	0.088	0.064	0.136	0.057	0.051	0.024***	0.006***
2007	0.160	0.086	0.075	0.126	0.053	0.051	0.011*	0.002
2008	0.177	0.100	0.077	0.150	0.058	0.061	0.023***	-0.003***
2009	0.185	0.117	0.067	0.155	0.067	0.050	0.050***	0.017***
2010	0.166	0.105	0.059	0.133	0.073	0.044	0.046***	0.029***
2011	0.163	0.098	0.063	0.139	0.062	0.054	0.035***	0.008***
2012	0.166	0.103	0.062	0.137	0.063	0.046	0.041***	0.017***
2013	0.189	0.114	0.074	0.185	0.087	0.059	0.040***	0.028***
2014	0.196	0.127	0.069	0.181	0.102	0.053	0.058***	0.049***
2015	0.210	0.138	0.072	0.192	0.107	0.058	0.066***	0.049***
1990s	0.126	0.079	0.046	0.106	0.053	0.031	0.033***	0.022***
2000s	0.156	0.087	0.068	0.136	0.054	0.049	0.019***	0.005***
2010s	0.178	0.112	0.066	0.158	0.076	0.053	0.046***	0.023***
Total	0.152	0.091	0.061	0.131	0.059	0.043	0.030***	0.016***
Trend× 100	0.336***	0.204***	0.132***	0.305***	0.155***	0.124***		

Appendix C The changes in corporate debt across industries

The table presents summary statistics and the 'Trend' of total debt (TDA), long-term debt (LTDA), and short-term debt (STDA) by industry. The Industry Classification Benchmark (ICB), a taxonomy launched by Dow Jones and FTSE in 2005, is used to classify firms into seven industries: Basic Materials (BM), Consumer Goods (CG), Consumer Services (CS), Health Care (HC), Industrials (IND), Technology (TECH) and Telecommunications (TELC). The 'Trend' is the slope of the regression of the leverage ratio on the trend variable. The sample consists of listed non-financial and non-utility firms in South Africa drawn from *Datastream* and covers the period from 1990 to 2015. All variables used are defined in Appendix A, and are winsorised at the lower and upper one percentiles. The asterisks ***, **, * indicate significance at the one, five, and ten percent levels, respectively.

Variables		ICB Code	1000	3000	5000	4000	2000	9000	6000	
		ICB Industry	BM	CG	CS	HC	IND	TECH	TELC	ALL
		N	2,933	1,028	1,654	187	2,496	403	178	8,879
		Firms	274	84	129	26	218	39	19	789
		Proportion	33.0%	11.6%	18.6%	2.1%	28.1%	4.5%	2.0%	100.0%
TDA		Mean	0.141	0.149	0.129	0.312	0.187	0.114	0.173	0.156
		Median	0.112	0.130	0.101	0.295	0.170	0.088	0.190	0.131
		Stdev	0.136	0.116	0.124	0.178	0.139	0.112	0.107	0.136
	Trend	Mean	0.134***	0.146***	0.124***	0.290***	0.187***	0.085***	0.186***	0.152***
		Median	0.108***	0.133***	0.089***	0.248***	0.175***	0.054***	0.198***	0.131***
LTDA		Mean	0.092	0.070	0.083	0.199	0.102	0.051	0.121	0.091
		Median	0.063	0.045	0.049	0.160	0.071	0.015	0.134	0.059
		Stdev	0.112	0.077	0.099	0.184	0.112	0.072	0.081	0.108
	Trend	Mean	0.087***	0.073***	0.078***	0.197***	0.105***	0.040***	0.136***	0.091***
		Median	0.059***	0.050***	0.044***	0.143***	0.075***	0.014***	0.140***	0.060***
STDA		Mean	0.049	0.078	0.046	0.113	0.084	0.061	0.052	0.064
		Median	0.026	0.060	0.021	0.061	0.068	0.027	0.060	0.042
		Stdev	0.066	0.076	0.060	0.121	0.076	0.077	0.036	0.073
	Trend	Mean	0.046***	0.071***	0.047***	0.093***	0.081***	0.045***	0.049***	0.061***
		Median	0.027***	0.055***	0.022***	0.058***	0.069***	0.019***	0.055***	0.043***

Appendix D The impact of supply-side factors on corporate debt

The table presents the estimation results of Equation (1) that relates corporate debt (total debt-to-total assets (TDA)) to the 'Trend' and firm-specific variables. The Tech-Bubble, Global Financial Crisis and liberalisation periods are defined as 5 years around the years 2000, 2008 and 1995, respectively. The sample consists of listed non-financial and non-utility firms in South Africa drawn from *Datastream* and covers the period from 1990 to 2015. All variables used are defined in Appendix A, and are winsorised at the lower and upper one percentiles. The asterisks ***, **, * indicate significance at the one, five, and ten percent levels, respectively.

	Tech-Bubble			Global Financial Crisis			Liberalisation		
	Pre-crisis	Crisis	Diff	Pre-crisis	Crisis	Diff	Before	After	Diff
Variables	(1)	(2)	p-value	(3)	(4)	p-value	(5)	(6)	p-value
Trend×100	0.780***	-0.086	0.007	0.654***	-0.807***	0.000	-0.569***	0.780***	0.000
	(0.248)	(0.179)		(0.200)	(0.181)		(0.196)	(0.248)	
Tobin's *q*	-0.009	-0.013**	0.591	-0.013*	-0.005	0.298	-0.007	-0.009	0.834
	(0.007)	(0.006)		(0.007)	(0.006)		(0.006)	(0.007)	
R&D	-2.427***	2.036***	0.000	1.574*	-0.104	0.375	1.210*	-2.427***	0.000
	(0.398)	(0.719)		(0.876)	(1.857)		(0.727)	(0.398)	
Size	0.010*	0.013***	0.555	0.008**	0.010***	0.652	0.019***	0.010*	0.126
	(0.005)	(0.004)		(0.003)	(0.004)		(0.004)	(0.005)	
ROA	-0.437***	-0.119***	0.002	-0.111**	-0.076**	0.510	-0.177***	-0.437***	0.013
	(0.099)	(0.042)		(0.049)	(0.034)		(0.052)	(0.099)	
PPE	0.050	0.138***	0.051	0.124***	0.254***	0.002	-0.028	0.050	0.054
	(0.040)	(0.031)		(0.031)	(0.044)		(0.021)	(0.040)	
NDTS	1.553***	0.603***	0.003	0.452**	-0.221	0.029	2.625***	1.553***	0.000
	(0.304)	(0.212)		(0.219)	(0.308)		(0.239)	(0.304)	
Constant	-0.068	-0.122**	0.578	-0.146**	0.061	0.011	-0.176**	-0.068	0.341
	(0.104)	(0.055)		(0.062)	(0.070)		(0.071)	(0.104)	
Industry FE	Yes	Yes		Yes	Yes		Yes	Yes	
Time FE	No	No		No	No		No	No	
Observations	1,283	1,718		1,891	1,961		1,035	1,283	
R^2	0.13	0.18		0.22	0.25		0.43	0.13	

Appendix E The time-series variation of firm-specific factors

The sample consists of listed non-financial and non-utility firms in South Africa drawn from *Datastream* and covers the period from 1990 to 2015. All variables used are defined in Appendix A, and are winsorised at the lower and upper one percentiles.

Panel A: Mean

Year	N	New Firms	TDA	LTDA	STDA	Tobin's q	R&D×10³	Size	ROA	PPE	NDTS	INTANG
1990	198	198	0.111	0.068	0.043	1.685	0.679	15.700	0.266	0.485	0.028	0.076
1991	207	9	0.117	0.070	0.046	1.497	0.604	15.800	0.230	0.482	0.028	0.072
1992	217	10	0.110	0.068	0.042	1.512	0.813	15.700	0.207	0.483	0.030	0.075
1993	232	15	0.114	0.073	0.040	1.435	0.837	15.700	0.184	0.482	0.030	0.072
1994	251	19	0.124	0.077	0.047	1.605	0.856	15.600	0.176	0.487	0.031	0.083
1995	245	8	0.118	0.076	0.042	1.792	0.926	15.600	0.176	0.473	0.029	0.081
1996	262	28	0.117	0.077	0.039	1.652	1.169	15.600	0.181	0.452	0.029	0.085
1997	269	23	0.131	0.086	0.044	1.713	1.921	15.600	0.171	0.433	0.029	0.091
1998	335	87	0.139	0.089	0.049	1.622	2.022	15.500	0.162	0.428	0.031	0.109
1999	359	46	0.153	0.091	0.060	1.439	2.367	15.100	0.174	0.391	0.037	0.077
2000	363	26	0.143	0.079	0.064	1.441	1.002	15.000	0.178	0.412	0.039	0.106
2001	355	37	0.152	0.079	0.073	1.539	1.410	14.900	0.201	0.364	0.041	0.134
2002	368	27	0.145	0.081	0.063	1.347	1.540	14.900	0.199	0.319	0.041	0.129
2003	387	38	0.152	0.084	0.068	1.331	1.693	15.000	0.204	0.321	0.044	0.120
2004	396	23	0.147	0.080	0.068	1.332	1.955	15.000	0.210	0.343	0.049	0.131
2005	410	29	0.138	0.073	0.063	1.462	1.384	15.100	0.203	0.335	0.048	0.137
2006	421	27	0.152	0.088	0.064	1.774	1.098	15.100	0.230	0.326	0.045	0.162
2007	421	27	0.160	0.086	0.075	2.044	0.995	15.300	0.222	0.330	0.038	0.164
2008	434	39	0.177	0.100	0.077	2.234	1.048	15.400	0.236	0.329	0.036	0.181
2009	407	9	0.185	0.117	0.067	1.674	0.874	15.400	0.222	0.318	0.034	0.189
2010	432	40	0.166	0.105	0.059	1.492	0.985	15.500	0.192	0.340	0.038	0.176
2011	413	10	0.163	0.098	0.063	1.614	0.847	15.500	0.199	0.361	0.043	0.179
2012	373	0	0.166	0.103	0.062	1.662	0.811	15.400	0.194	0.346	0.042	0.173
2013	329	0	0.189	0.114	0.074	1.782	0.810	15.500	0.188	0.359	0.043	0.175
2014	299	0	0.196	0.127	0.069	1.821	0.623	15.700	0.176	0.372	0.046	0.194
2015	249	0	0.210	0.138	0.072	1.889	0.368	15.700	0.178	0.351	0.047	0.216
1990–1999	2,575	443	0.126	0.079	0.046	1.592	1.298	15.600	0.189	0.456	0.031	0.083
2000–2009	3,962	282	0.156	0.087	0.068	1.632	1.289	15.100	0.212	0.339	0.042	0.146
2010–2015	2,095	50	0.178	0.112	0.066	1.690	0.770	15.500	0.189	0.354	0.043	0.183
Total	8632	775	0.152	0.091	0.061	1.635	1.160	15.400	0.199	0.376	0.039	0.137

Appendix E The time-series variation of firm-specific factors (continued)

Panel B: Median

Year	N	New Firms	TDA	LTDA	STDA	Tobin's q	R&D×10³	Size	ROA	PPE	NDTS	INTANG
1990	198	198	0.107	0.054	0.031	1.386	0.000	15.900	0.228	0.431	0.031	0.059
1991	207	9	0.120	0.052	0.033	1.148	0.000	16.000	0.208	0.430	0.032	0.051
1992	217	10	0.091	0.046	0.035	1.197	0.000	15.800	0.192	0.407	0.033	0.046
1993	232	15	0.105	0.052	0.029	1.121	0.000	15.700	0.179	0.427	0.032	0.037
1994	251	19	0.100	0.043	0.036	1.324	0.000	15.800	0.160	0.431	0.032	0.041
1995	245	8	0.085	0.039	0.028	1.496	0.000	15.800	0.159	0.450	0.033	0.046
1996	262	28	0.096	0.045	0.024	1.438	0.000	15.800	0.154	0.381	0.030	0.048
1997	269	23	0.098	0.057	0.025	1.435	0.000	15.700	0.161	0.338	0.030	0.055
1998	335	87	0.120	0.063	0.029	1.422	0.000	15.700	0.161	0.358	0.031	0.061
1999	359	46	0.141	0.068	0.032	1.093	0.000	15.400	0.164	0.332	0.036	0.041
2000	363	26	0.117	0.049	0.045	1.181	0.000	15.200	0.171	0.363	0.037	0.055
2001	355	37	0.131	0.052	0.047	1.300	0.000	15.100	0.184	0.318	0.042	0.097
2002	368	27	0.122	0.055	0.040	1.171	0.000	15.000	0.176	0.249	0.040	0.082
2003	387	38	0.141	0.046	0.049	1.149	0.000	15.100	0.184	0.271	0.042	0.073
2004	396	23	0.136	0.058	0.048	1.177	0.000	15.200	0.205	0.288	0.047	0.095
2005	410	29	0.124	0.049	0.048	1.409	0.000	15.300	0.197	0.283	0.044	0.091
2006	421	27	0.136	0.057	0.051	1.561	0.000	15.300	0.210	0.281	0.039	0.119
2007	421	27	0.126	0.053	0.051	1.755	0.000	15.500	0.203	0.272	0.033	0.119
2008	434	39	0.150	0.058	0.061	1.929	0.000	15.600	0.206	0.313	0.030	0.137
2009	407	9	0.155	0.067	0.050	1.482	0.000	15.600	0.206	0.283	0.030	0.144
2010	432	40	0.133	0.073	0.044	1.290	0.000	15.600	0.174	0.290	0.036	0.130
2011	413	10	0.139	0.062	0.054	1.411	0.000	15.600	0.166	0.357	0.037	0.123
2012	373	0	0.137	0.063	0.046	1.318	0.000	15.500	0.169	0.316	0.036	0.110
2013	329	0	0.185	0.087	0.059	1.393	0.000	15.600	0.169	0.330	0.037	0.121
2014	299	0	0.181	0.102	0.053	1.466	0.000	15.900	0.152	0.335	0.039	0.144
2015	249	0	0.192	0.107	0.058	1.538	0.000	16.000	0.161	0.326	0.038	0.177
1990–1999	2,575	443	0.106	0.053	0.031	1.293	0.000	15.700	0.175	0.405	0.032	0.049
2000–2009	3,962	282	0.136	0.054	0.049	1.416	0.000	15.300	0.193	0.291	0.039	0.103
2010–2015	2,095	50	0.158	0.076	0.053	1.370	0.000	15.600	0.167	0.326	0.037	0.130
Total	8632	775	0.131	0.059	0.043	1.371	0.000	15.500	0.182	0.334	0.036	0.093