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Rising corporate debt and value relevance of supply-side factors in South Africa

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ABSTRACT

Motivated by the recent discovery of a significant increase in corporate debt in developed countries, we use a large sample of 775 listed companies to examine the dynamics and determinants of South African corporate debt. We find an 89% increase in the leverage 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, despite 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.

1. Introduction

Corporate financing decisions are essential components of a corporate strategy and 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 an economic downturn. Recent research on developed economies documents a marked increase in corporate debt (ratio of total debt to total assets). For example, Graham et al. (2015) attribute the fourfold increase in US 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. In addition, Custódio et al. (2013) document significant changes in debt composition as debt maturity continues to decrease in the United States. They attribute this to an influx of young firms with high information asymmetry and limited access to long-term financing. Other than these significant findings related to the United States, little is known about the dynamics of corporate debt in emerging markets, which are beleaguered by inadequate institutional frameworks.

Emerging markets provide interesting research settings because their weak institutional structures and the low levels of capital market development create greater challenges in accessing external sources of financing. Firms in developed countries find it easier to raise external finance, owing to institutional openness and higher levels and quality of information disclosure. However, firms in emerging markets find it more difficult because of high levels of information asymmetry and weak regulatory frameworks, which 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 identified for more developed capital markets (Custódio et al., 2013; Graham et al., 2015). We conjecture that the determinants of the rising corporate debt levels in developed economies may not be generalizable to emerging economies, which 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 for the period 1990–2015. The choice of South Africa (SA) is motivated by two main factors that make the situation representative of an emerging economy. First, SA 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, which are the main suppliers of firm credit. Furthermore, unlike other African countries, SA has a high level of institutional shareholding and well-diversified ownership and financing sources, of which debt is the most prominent (Hearn et al., 2010).

Second, relative to other emerging economies, SA's economic and

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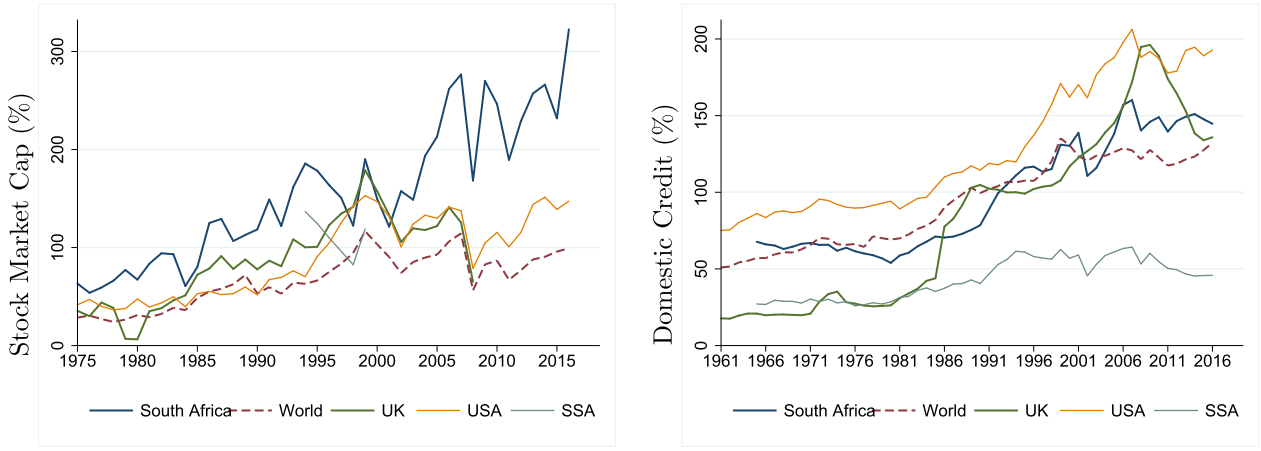

(a) Stock market capitalization-to-GDP (b) Private credit-to-GDP

Fig. 1. Institutional context.

political history has interesting similarities and differences that make it an ideal case for examining whether macroeconomic and supply-side factors influence corporate financing decisions. Specifically, SA experienced two distinct political and economic phases. The first phase lasted until 1995, before which the country was isolated owing to restrictions imposed by international organizations for the practice of apartheid (Ntim and Soobaroyen, 2013). Throughout this period, the government regulated financial transactions in assets by requiring that most payments be made using domestic equity investments, rather than using money-market or bond-market instruments (Kapingura and Makhetha-Kosi, 2014). The second phase followed the abolition of apartheid in 1995. This phase led to financial liberalization, which included the acceptance of foreign investment and the subsequent growth of the bond market. As a result, SA has risen as an 'emerging economy', boasting one of the most developed bond markets on the continent. In 2012, SA had the highest level of corporate and sovereign debt amongst African countries (Mecagni et al., 2014). It also currently boasts of having one of the most sophisticated and robust corporate governance systems among emerging economies, comparable with those in the United Kingdom and the United States. According to Ntim et al. (2012), SA's practice is an exemplification of how corporate governance practices can be customized to meet institutional realities in emerging markets. Furthermore, the SA government has implemented a corporate governance code (The King Report), which it has revised several times in order to boost investor confidence in the local equity and bond markets. These factors make SA a particularly interesting case study.

We report comparative statistics to further strengthen both the appropriateness and characteristics of the SA context. Fig. 1 plots average stock market capitalization (Graph 1a) and private credit (Graph 1b) as ratios to GDP for SA, the United States, the United Kingdom, Sub-Saharan Africa (SSA), and the 'World'.[1] The figure shows that the capitalization ratio is rising faster than it is in other countries. In addition, private credit is tracking that of the United States, is often higher than that of the United Kingdom, and is substantially higher than that of SSA countries. Furthermore, with the highest global investment flow, SA is comparable with the other BRICS countries (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 SA 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 not, what other factors could do so? These questions have not been addressed sufficiently in the context of emerging markets.

By way of motivation for this study, we present several observations. Graph 1a of Fig. 2 shows that average total debt in SA increased by 89% over the entire sample period. Interestingly, this 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 investment.[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 their capital structure to manage or counteract risk in investment portfolios. We analyse this further, and find that changes in firm characteristics over the sample period do not explain the increase in corporate debt, because these characteristics have changed in a way that does not predict the use of leverage. For example, the downward trend of asset tangibility suggests that corporate debt capacity should be decreasing. Over the entire sample period, and without control variables, the average basic statistics on overall trends in firm size and profitability are not significantly different from zero. According to theory, this predicts neither leveraging nor deleveraging; nevertheless, 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 be decreasing, instead of increasing. Thus, the increase in corporate debt does not initially seem to be explained by changes in firm-specific characteristics.

Accordingly, we examine whether changes in macroeconomic conditions drive the dynamics in corporate debt (Custódio et al., 2013; Oztekin, 2015; Graham et al., 2015). We focus on the following macroeconomic factors: 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

[1] All amounts are denominated in USD.

[2] In untabulated results, we find that intangible assets increased by 201%, from a low of 7.2% in 1991 to a peak of 21.6% in 2015). Several other studies on developed economies report similar marked increases in intangible investments, or R&D, which should, theoretically, lead to a decrease in the use of debt financing (Brown et al., 2012; Borisova and Brown, 2013; Manikas et al., 2019).

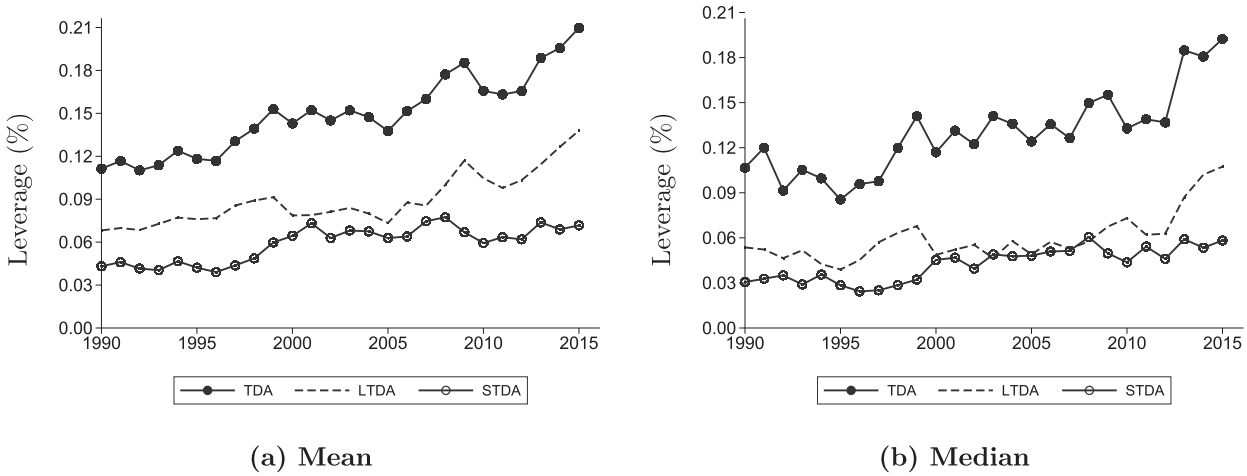

Fig. 2. The evolution of leverage.

determinants of corporate debt, but only partially explain the increase in debt financing in SA, because the trend remains significant even after accounting for these factors. Consequently, we examine whether supply-side factors, which are largely 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. This suggests that the trend is significantly higher in the pre-crisis periods and post-liberalization of the capital markets than that in the post-crisis and pre-liberalization periods, respectively. This evidence highlights the emerging and significant role of supply-side factors as determinants of corporate debt.

Our study contributes to the literature in three ways. First, in explaining the rise in corporate debt levels in emerging markets, we deviate from previous studies to show the importance of unstudied supply-side factors. 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; Custódio et al., 2013; Graham et al., 2015). In doing so, they overlook supply-side factors 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 levels of corporate debt faced by firms in emerging economies (as exemplified by SA), where access to external capital is limited. Second, contrary to theory and the results reported on for developed economies (see Dang, 2011; Leary and Roberts, 2010; Oztekin, 2015), we find that demand-side factors (size, tangibility, and profitability) are unable to explain the evolution of corporate debt in SA. The actual changes in these factors lead to a theoretical prediction of deleveraging, because firms' 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 corporate debt in emerging economies. Here, we find that macroeconomic factors are important, but that they only partially explain the rising levels of corporate debt in SA. 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. Thus, supply-side factors appear to be better determinants of the rising levels of 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 based on the United States report marked changes in the composition of firms as economies shift from a manufacturing to a technology and service orientation. 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. Céspedes et al. (2010) document that, despite the less developed nature of the countries' capital markets, firms in Latin America exhibit similar levels of corporate debt to those of firms in the United States. They attribute this puzzling observation to ownership concentration, where firms resort to debt to avoid ceding control or dilution. Given such evidence, we formulate the following hypothesis:

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

Furthermore, the extant literature reports that macroeconomic factors have significant effects on capital structure. For example, the model of Korajczyk and Levy (2003) predicts that leverage is pro-cyclical and counter-cyclical. Cook and Tang (2010) find that firms adjust their capital structure towards a target more quickly in good macroeconomic environments. In addition, Chen (2010) reports that the economic growth rate, economic uncertainty, and business-cycle variations have a significant influence on corporate debt. Accordingly, our second hypothesis is as follows:

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

Finally, compared with the effects of demand-side factors, the effects of supply-side factors have not been examined sufficiently in the literature. Prior studies show that historical, institutional, and legal factors that affect the credit supply have a significant influence on firms' financing policies. For example, Chen (2004) reports that immature and incomplete legal and institutional frameworks in China (i.e., firm-specific factors) appear to be important determinants of firms' capital structures. Similarly, Tchakoute Tchuigoua (2014) finds that factors such as legal tradition, creditor rights, and the stage of financial sector development significantly affect the capital structure of microfinance institutions. Furthermore, the GFC has brought to the fore the importance of supply-side factors in terms of the credit supply and corporate financing decisions, which are pertinent conditions in emerging economies. However, examining supply-side factors in such economies 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 *quasi-experiments*. Several such studies report significant effects of supply-side factors on corporate financing decisions in the United States. For example, Campello et al. (2011) find that firms with credit lines fared better during the GFC than those without credit lines did. 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 SA around the GFC, the Tech Bubble, and financial liberalization period. 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:

$$D_{it} = \alpha + \gamma Trend + \beta X_{it-1} + \theta Z_{it-1} + \epsilon_{it}, \quad (1)$$

where D_{it} denotes the corporate debt (ratio of total debt to total assets) of firm i at time t; $Trend$ is a time trend; X_{it-1} is a vector of lagged firm-specific variables; Z_{it-1} is a vector of lagged macroeconomic variables; α, γ, β and θ are parameter coefficients to be estimated; and ϵ_{it} is an error term. The lagged firm-specific variables in X_{it-1} are as follows: 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).[3] The lagged macroeconomic variables in Z_{it-1} are as follows: 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 Table 1.

4. Data

Our data consist of annual accounting and macroeconomic variables and economic event dates. The accounting data were obtained from annual reports of publicly listed firms in SA, drawn from Thomson Reuters Datastream, for the period 1990 to 2015. The macroeconomic variables used are taken from The World-bank Database (WDI). As is standard in the literature, we exclude firms in regulated sectors (financial firms and utilities) and firms with missing data on key variables (total assets and sales).[4] We set missing R&D observations to zero, and winsorize all firm-level variables used at the upper and bottom 1% in order to reduce the effects of spurious outliers. The final sample consists of 8,632 firm-year observations on 775 firms, and is unbalanced as a result of different entry and exit points of firms over the sample period.

Table 2 presents the descriptive statistics for the variables used. The means (medians) of total debt (TDA), long-term debt (LTDA), and short-term debt (STDA) are 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 the findings of Sorge et al. (2017), reflecting the high exposure of South African firms (and, by inference, firms in developing economies) to refinancing risk, because most of the short-term debt is in the form of bank loans. Of particular interest are the significant and positive trends in TDA, LTDA, and STDA, which indicate a statistically significant increase during the sample period in the use of debt financing by SA firms.[5] These trends are consistent with the plots in Fig. 2. The basic statistics for the determinants of leverage (Tobin's q, R&D, Size, ROA, PPE, and NDTS) in Panel A are comparable with those in the literature. However, the trends of all variables that should be positively associated with debt financing (i.e., Size, ROA, and PPE) are negative, whereas those 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 Fig. 2.

Table 3 presents the corporate debt statistics for the sample 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 3, 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 greater access to debt financing, relative to constrained firms (see Brown et al., 2009, 2012; Brown and Petersen, 2015). Comparisons of the 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.

Table 4 presents the Spearman (above diagonal) and Pearson (below diagonal) pairwise correlations between all 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 that of NDTS, which, apart from its correlation with size and PPE, appears to contradict the negative results reported for firms in the United States (see Dang et al., 2014; Oztekin, 2015). This appears to suggest that NDTS has a positive effect on corporate debt in SA.

5. Empirical results

In the next three subsections, we examine the explanatory power of traditional demand-side determinants, macroeconomic factors, and supply-side factors.

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

We estimate several variants of our baseline model shown in Eq. (1). The results are summarized in Table 5. Column (1) presents the estimation results using the main traditional firm-specific determinants of corporate debt. Columns (2)–(6) present the estimation results when including the time trend and dummy variables for period and year-of-listing.

In general, the results in Table 5 show that R&D, Size, PPE, and NDTS have a positive and significant (except R&D) effect on corporate debt, whereas Tobin's q and profitability (ROA) have a negative effect. In general, these results are consistent with theory, except for NDTS, which turns out to be positive. In contrast, theory predicts a negative effect on corporate debt, because NDTS is a substitute for interest-tax shield. Most of the coefficients of the determinants of corporate debt have the expected sign. thus, for brevity, we do not discuss these

[3] Our choices of firm-level determinants of corporate debt are informed by the existing literature (Dang et al., 2012; Dang et al., 2014; Graham et al., 2015).

[4] The increase in corporate debt is pervasive and significant across industries.

[5] The 'Trend' in Table 2 is the estimated slope of a regression of leverage (ratio to total assets of total debt (TDA), long-term debt (LTDA), or short-term debt (STDA)) on a time trend.

Table 1
Variable definitions.

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	Slope of regressing TDA, LTDA, or STDA on a time trend
$Listing^{1990-99}$	Dummy = 1 for firms first listed between 1990 and 1999, and zero otherwise
$Listing^{2000-09}$	Dummy = 1 for firms first listed between 2000 and 2009, and zero otherwise
$Listing^{2010-15}$	Dummy = 1 for firms first listed between 2010 and 2015, and zero otherwise
$Period^{1990-99}$	Dummy = 1 for the period from 1990 to 1999, and zero otherwise
$Period^{2000-09}$	Dummy = 1 for the period from 2000 to 2000, and zero otherwise
$Period^{2010-15}$	Dummy = 1 for the period from 2011 to 2015, and zero otherwise
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 the current year
WW Index	$-0.091 \times \frac{CashFlow}{Assets} - 0.062 \times DivDummy + 0.021 \times \frac{Totaldebt}{Assets} - 0.044 \times Size + 0.102 \times IndustrySalesGrowth - 0.035 \times SalesGrowth$ The WW Index is based on the work of 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 the private sector by banks (% of GDP)
Stock Market Cap	Stock market capitalization to GDP (% of GDP)

Firm-level and macroeconomic variables are taken from *Datastream* and The World Bank, and are winsorized at the lower and upper one percentiles. The sample covers the period 1990 to 2015 for nonfinancial and nonutility firms in South Africa.

Table 2
Basic statistics.

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***

Variables defined in Table 1. Significance: * < .10, **<.05, ***<.01.

coefficients further; instead, we shift our focus to the important trend variables.

Column (2) presents the estimation results for the model when the two dummy variables, $Period^{2000-09}$ and $Period^{2010-15}$, 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

Table 3
Difference between firms.

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	4731	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	4731	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	4731	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	4358	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	4358	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	4358	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	4373	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	4373	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	4373	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	4365	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	4365	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	4365	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

Diff = difference. Significance: * < .10, **<.05, ***<.01.

Table 4
Correlations.

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

Significance: * < .10, **<.05, ***<.01.

Table 5
Determinants of debt.

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

FE = fixed effects. Standard errors in parentheses. Significance: * < .10, **<.05, ***<.01.

explain the evolution of corporate debt. A comparison of the coefficient on $Period^{2000-09}$ with that on $Period^{2010-15}$ 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 shown in Table 2. 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 including the other determinants does not reduce the magnitude and significance of this trend by much; in tihs case, the average firm increases its debt financing by 0.30% each year, using the marginal effects.

We next examine the effects of new listings. We create three dummy variables, based on the particular decade in which a firm first appears in the data set ($Listing^{1990-99}$, $Listing^{2000-09}$, and $Listing^{2010-15}$). Column (5) presents the estimation results when these listing dummies (*less* one, $Listing^{1980-89}$) are included, and the firm-specific variables are excluded. The coefficient on the time trend remains positive and significant, and only the coefficient on $Listing^{2010-15}$ is significant. The estimation in Column (6) includes the firm-specific variables as controls. The results on the time trend, listing dummies, and control variables are similar to those in Columns (4) and (5). This suggests that, apart from the slight significance of the 2000–09 decade, the year in which a firm was listed does not explain the upward trend in corporate debt. The coefficients on the firm-specific variables remain largely unchanged from Column (4). Therefore, these variables may be important determinants of corporate debt, even though they do not fully explain the rising levels of corporate debt in SA, because the coefficient on the time trend remains consistently positive and significant across the various specifications.[6]

Overall, the results in Table 5 show that the increase in corporate debt is persistent. Furthermore, 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 identified in the literature fully explain the time trend in corporate debt, we examine the variation in corporate debt across constrained and unconstrained firms. We classify a firm as highly (low) constrained if it is above (below) the average age, size, tangibility, or WW Index. Table 6 presents the estimation results for Eq. (1), with a time trend and firm-specific factors for the sub-groups, based on the four measures of financial constraints.

The results show that the coefficient on the time trend remains consistently positive and significant across all sub-samples based on age, size, tangibility, and the WW Index. Thus, all firms have rising debt levels, regardless of their age, size, or financial constraints. However, the magnitude of the coefficient estimate on the trend is smaller for firms with high financial constraints (young, small, low tangibility, and high WW Index) than it is 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; Brown et al., 2012; Dang et al., 2014; Whited, 2006). However, comparisons of the trends in corporate debt (tabulated in the columns titled 'Diff') show results that are inconsistent with H1, because 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 3, suggesting that the increase in corporate debt is pervasive, and is not explained by differences in financial constraints.

Therefore, we conclude that neither firm characteristics nor financial constraints explain the increase in corporate debt documented over the sample period. Hence, these findings do not support H1.

5.3. Do macroeconomic factors matter?

We extend the above analyses by examining the explanatory power of FDI, Stock Traded, GDP Growth, IR Spread, RealIR, Inflation, and Domestic Credit as possible determinants. Our choice of these variables is motivated by Custódio et al. (2013) and Graham et al. (2015), among others, who find them significant. Table 7 presents the estimation results.

These results show that FDI, Stock Traded, RealIR, and Inflation have significant and positive effects on corporate debt when each is examined separately with firm-specific factors included; however, 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 (H2), as shown by the consistently significant and positive coefficient on the time trend (Trend×100) across the model specifications. This remains true in the model shown in Column (8), which includes all firm-specific and macroeconomic variables. Note that the magnitude of the trend coefficient decreases when Stock Traded is included (Columns (2) and (8)), indicating the partial explanatory power of the stock markets. These results are consistent with (H2) and with those reported in Table 5, although the time trend in corporate debt remains.

5.4. Do supply-side factors matter?

We now examine the effects of supply-side factors (H3) using exogenous economic events that affect credit market conditions. We investigate the changes in corporate debt before and after crises and financial liberalization events. Here, we consider financial liberalization in relation to the end of apartheid in SA, when the apartheid sanctions imposed 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 SA from partaking in international unions, and economic and trade sanctions were imposed, effectively stifling economic growth and development (Vaughn and Ryan, 2006). We classify the period before 1995 as the pre-liberalization period (Andreasson, 2011; Chipeta et al., 2012), and examine whether the liberalization event explains the trend in corporate debt, relative to that of the pre-liberalization period. For the analyses of crisis events, we initially restrict the sample periods to ±four years around the Tech Bubble of 2000 and the GFC of 2008.[7] Table 8 presents the estimation results for Eq. (1) for the sub-periods.

Columns (1) and (2) of Table 8 present the results around the Tech Bubble. The trend coefficient estimate change from a significant 1.159 before the bubble to a nonsignificant −0.015 after the bubble. The switch in sign and the decrease 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 SA tend to use more debt when economic conditions are favourable. These findings are consistent with those of Cook and Tang (2010), who find that firms in the United States adjust their capital structure relatively quickly in good times, and with

[6] Garay et al. (2019), for example, find significant country and industry effects that, if ignored, lead to the mispricing of corporate bonds (spreads) in emerging markets. Our results show a consistent positive and significant trend in all leverage ratios across industries. This is inconsistent with the findings of Harris and Raviv (1991), because it shows that the leverage ratios of SA firms vary significantly, both across and within industries and over time.

[7] We also check alternative event dates (±five years), because our aggregate (annual) data mean that these cannot be determined precisely. Our results remain qualitatively unchanged, and are robust to moving the event dates one year forwards or backwards (not reported, but all results are available upon request).

Table 6
Financial constraints.

	Age			Size			Tangibility			WW Index		
Variables	Young (1)	Mature (2)	Diff p-value	Small (3)	Large (4)	Diff p-value	Low (5)	High (6)	Diff p-value	Low (7)	High (8)	Diff p-value
Trend×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	

Diff = difference. Standard errors in parentheses. Significance: * < .10, **<.05, ***<.01.

Table 7
Macroeconomic factors.

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

Standard errors in parentheses. Significance: * < .10, **<.05, ***<.01.

those of Dierker et al. (2013), who find that firms also do so to 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 SA further confirms the findings of Gwatidzo and Ojah (2014), and shows a high negative impact of economic downturns on debt financing in developing markets.

Table 8
Supply-side factors.

	Tech Bubble			Global Financial Crisis			Liberalisation		
Variables	Pre-crisis (1)	Crisis (2)	Diff p-value	Pre-crisis (3)	Crisis (4)	Diff p-value	Before (5)	After (6)	Diff 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	

Crisis periods are four years around 2000 (Tech Bubble) and 2008 (GFC). 'Before' and 'After' 1995 - Liberalization year. Significance: * < .10, **<.05, ***<.01.

The results in Columns (3) and (4) also show a significant decrease in corporate debt around the GFC, consistent with 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 United States (Campello et al., 2011; Kahle and Stulz, 2013). Thus, supply-side factors appear to play a significant role in explaining the changes in corporate debt.

Finally, the results in Columns (5) and (6) indicate a significant swing in the trend of corporate debt from negative to positive around financial liberalization events. The significant and negative coefficient on the time trend prior to financial liberalization 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 SA to the global market post-apartheid explains why there was a marked increase in corporate debt financing relative to the pre-liberalization apartheid era. These results support H3 and, overall, present strong evidence that supply-side factors play a significant role in explaining the evolution of corporate debt in SA.

6. Robustness

We check the robustness of the results using two estimation techniques (fixed effects and Tobit regressions) and alternative definitions of corporate debt, as well as by dividing the overall sample into subsamples. Columns (1) and (2) of Table 9 present the results of the Tobit regressions, where the dependent variable, corporate debt, is bounded between zero and one. Columns (3) and (4), titled FE, present the results when using fixed effects across firms and industries. Columns (5) and (6) present the results when using alternative definitions of corporate debt. Finally, Columns (7)–(11) present the results of a sensitivity analysis with subsampling and subperiod selections.

The results for the Tobit, fixed effects, and different definitions of debt show significant coefficients on the time trend and on the period dummies ($Period^{2000-09}$ and $Period^{2010-15}$), indicating that our results hold for alternative estimation techniques and definitions of corporate debt.

Several studies report marked changes in the composition of listed firms, which may affect the observed evolution of dividends (Fama and French, 2001), corporate investment (Brown and Petersen, 2009), and capital structure (Custódio 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 subsamples. The coefficient on the time trend for the balanced subsample is higher than that for the unbalanced subsample. This implies that older firms increased their levels of debt by more than younger firms did, and that our findings are robust to this type of subsampling.

Finally, we examine the sensitivity of our results to changes in firm characteristics by dividing the sample into three subperiods: 1990–1999 (the 1990s), 2000–2009 (the 2000s), and 2010–2015 (the 2010s). The results, presented in Columns (9)–(11), are, in general, consistent in terms of the signs, magnitudes, and significance levels presented in Table 5. The trend coefficient increases from 0.198 in the 1990s to 0.540 in the 2000s, and then to 0.852 in the 2010s. This confirms the increasing level of corporate debt over time. The coefficients on all other traditional determinants of corporate debt maintain the same signs. Furthermore, we find only minor changes in significance across the three periods, supporting our finding that they cannot fully explain the evolution of corporate debt.

Overall, the robustness tests suggest that, while changes in firm characteristics do not explain the trend in corporate debt, supply-side factors do play an important role in this regard.

7. Conclusion

This study analyses the determinants of the pervasive increase in corporate debt in South Africa (SA) between 1990 and 2015. In addition to being an emerging economy, SA is unique in terms of its history, financial and institutional structure, and development. The imposition and subsequent lifting of apartheid sanctions had a substantial impact on the development of corporate debt, the country's stock markets, and the patterns of debt finance employed by firms.

Our study complements the growing body of literature on rising corporate debt and its determinants in emerging economies. However, our results do not support those of prior studies, which tend to highlight demand-side and macroeconomic factors as being more relevant than supply-side factors. Furthermore, our results show that traditional demand-side factors, though important, do not fully explain the increasing

Table 9
Robustness tests.

	Tobit		FE		OLS						
							Sub-samples				
					Alternative Definitions		Balanced	Unbalanced	1990s	2000s	2010s
Variables	TDA (1)	TDA (2)	TDA (3)	TDA (4)	LTDA (5)	STDA (6)	TDA (7)	TDA (8)	TDA (9)	TDA (10)	TDA (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									

levels of corporate debt. In particular, our findings show that most firm characteristics have evolved in a direction contrary to the prediction of an increase in debt financing. Macroeconomic conditions, especially growth in capital markets, are partially relevant. However, supply-side factors emerge as the most important determinants of the rising levels of corporate debt in SA, because collateral-based lending (tangible assets) has decreased.

7.1. Theoretical implications

The increasing level of debt, but decreasing level of tangibility, indicates a shift away from traditional collateral-based lending. Decreases in collateral reduce debt capacity, which may limit access to further financing. This contradicts the finding of Maes et al. (2019) of a strong link between pledgeable assets and access to short-term debt, especially for firms exposed to the risk of serving distant export markets. This shift away from collateral lending implies a marked increase in bankruptcy costs, because several properties of intangible capital (e.g., irreversibility, 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 those of earlier studies based on the United States that document a marked transition of economies towards intangible capital (Brown and Petersen, 2009; Manikas et al., 2019). Because bankruptcy costs are markedly higher in developing economies (Menkhoff et al., 2006; Ovtchinnikov, 2010), this increase in corporate debt and the shift in corporate balance sheets exacerbate firms' bankruptcy concerns. This is because firms are becoming systematically overleveraged in a way that increases vulnerability to financial shocks. This finding challenges traditional collateral-based theories, because firms are increasingly employing corporate debt, owing to the decreasing value and quality of their collateral. In summary, our results lead us to question whether the long-established debt–collateral nexus is changing, or whether a new one is emerging. Thus, further research is required to establish new corporate lending theories that emphasize the role played by 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 (Lund et al., 2018). This implies an increased availability of nonequity external financing, which promotes economic growth.

Second, the increasing level of debt and the shrinking collateral accentuate the call for practitioners to implement robust and more active strategies in managing financial risks, especially if they are exporters (Maes et al., 2019). The deterioration of corporate quality, coupled with the shift towards intangible capital, makes active management of a firm's capital structure more pertinent.

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

Fourth, the increase in corporate debt identified here indicates an improvement in accessing external financing, some of which could be channelled towards R&D. This could help narrow the technological gap between African and developed countries noted by You et al. (2019). However, the increase in intangible assets, coupled with the decrease in R&D (from 2004 onwards) suggests that SA firms 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 capitalized, whereas R&D in our data set is an expensed amount). This finding is in line with that of 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 continuing to rely on procurement or transfers of technology. This is supported by George et al. (2016), who show that the marginal benefits of R&D are much higher in developing countries than they are in developed economies. This highlights the need to increase the allocation of resources to 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 increasing debt in environments characterized by high or rising bankruptcy risk and costs. This would be more pertinent during periods of heightened uncertainty about credit risk, as in the run-up to the GFC.

7.3. Limitations and future research

Our study has certain caveats, which also suggest directions for future research. First, although the results for a single country may not be generalizable to other emerging markets, this study represents a call to consider the often overlooked supply-side factors as determinants of corporate debt in emerging and other economies, given the global shift towards knowledge-based economies. In addition, we were unable to control for bond characteristics, owing to the unavailability of firm-level bond data. This ought to be considered in future studies on emerging economies, when such data are available. Finally, we do not examine the implications of rising debt on corporate policies. However, our results suggest a call to investigate policies and practices such as dividend pay-outs, the retention of earnings, risk management, and corporate governance.

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Appendix A. Supplementary material

Supplementary data associated with this article can be found, in the online version, at https://doi.org/10.1016/j.jbusres.2019.11.039.

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