

Article

Measurement Sensitivity of the Determinants of Financial Flexibility Among JSE-Listed Non-Financial Firms

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Abstract

This study examines the sensitivity of empirical findings in financial flexibility research to alternative measurement approaches. Financial flexibility is widely recognised as a critical determinant of corporate financing and investment decisions, yet there is no consensus on its operational definition. Existing studies employ different proxies, including spare debt capacity, cash holdings, leverage positioning, and composite measures, which may capture distinct dimensions of financial flexibility. Using panel data from 106 non-financial firms listed on the JSE over the period 2000–2019, this study compares two widely used proxies: spare debt capacity derived from predicted leverage models and a composite low-leverage–high-cash measure. Fixed- and random-effects models, along with logistic regression, are employed to assess whether the determinants of financial flexibility remain consistent across these measures. The findings reveal substantial variation in coefficient signs, statistical significance, and economic interpretation across proxies. Classification-overlap analysis based on the common SDC–LLHC sample shows limited agreement between the proxies, with only 17.4% of common-sample firm-year observations classified as flexible under both measures and Cohen’s kappa indicating only slight agreement. Growth opportunities, retained earnings, dividend payout, and selected firm-specific variables exhibit strong sensitivity to measurement choice, while some relationships remain relatively stable. The results demonstrate that financial flexibility, as operationalised through alternative empirical proxies, is not measurement-neutral, and that proxy selection can materially alter empirical and theoretical conclusions. The study contributes to corporate finance literature by highlighting the importance of construct validity, proxy transparency, and robustness testing, particularly in emerging market contexts.

Keywords: financial flexibility; measurement sensitivity; spare debt capacity; capital structure; cash holdings; investment behaviour; corporate finance; JSE-listed firms; emerging markets; financial constraints



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1. Introduction

Financial flexibility remains an important concept in corporate finance because it determines how firms respond to investment opportunities, economic shocks, financing constraints, and periods of uncertainty (Kayiira et al. 2026). Firms with greater financial flexibility can access capital at lower cost, adjust financing structures more efficiently, sustain investment activity during downturns, and reduce the risk of financial distress (Myers 1984; Arslan-Ayaydin et al. 2014). Financial flexibility is therefore closely associated

with corporate resilience, liquidity management, capital structure decisions, investment behaviour, and long-term firm survival.

Despite its importance, financial flexibility remains difficult to measure because it is not directly observable and there is no universally accepted operational definition. Existing studies use different proxies, including spare debt capacity, cash holdings, leverage positioning, and composite measures that combine leverage and liquidity indicators (Marchica and Mura 2010; Arslan-Ayaydin et al. 2014; Ferrando et al. 2017). These proxies may capture different dimensions of financial flexibility and may classify firms differently. Consequently, a determinant that appears significant under one measure may become insignificant, change direction, or carry a different economic interpretation under another measure (de Jong et al. 2012; Rapp et al. 2014; Yung et al. 2015). Although prior studies have examined the determinants and outcomes of financial flexibility, limited research has investigated whether empirical findings remain stable across alternative measurement approaches. Accordingly, this study is guided by the following research questions: RQ1: Do alternative financial flexibility proxies classify the same JSE-listed non-financial firms as financially flexible? RQ2: Do the determinants of financial flexibility remain stable across the spare debt capacity and low-leverage–high-cash proxies? RQ3: Which determinants of financial flexibility are most sensitive to measurement choice?

This study builds on prior evidence on the determinants of financial flexibility among JSE-listed non-financial firms (Kayiira et al. 2026). While earlier evidence focused mainly on identifying firm-level determinants using the spare debt capacity proxy, the present study shifts the emphasis from determinant estimation to measurement sensitivity. Specifically, it examines whether empirical conclusions change when financial flexibility is operationalised using alternative proxy constructions (Gamba and Triantis 2008; Marchica and Mura 2010; Denis 2011). In doing so, the study moves beyond a single-proxy determinant model by comparing spare debt capacity and low-leverage–high-cash classifications, assessing classification overlap, testing alternative LLHC thresholds, and examining whether SDC-based findings remain robust when leverage is excluded from the determinant model.

This issue is particularly important in emerging-market contexts, where firms often face higher financing costs, limited access to long-term capital, weaker institutional environments, and greater macroeconomic volatility (Arslan-Ayaydin et al. 2014; Ferrando et al. 2017; Lemma et al. 2024). These conditions may affect how firms accumulate, preserve, and use financial flexibility. South Africa provides an appropriate setting for examining this issue because the Johannesburg Stock Exchange is the largest and most developed capital market in Africa (JSE 2020). In addition, South African firms operate in an environment characterised by economic volatility, financing constraints, and evolving corporate governance structures (Lemma et al. 2024). Measurement sensitivity may therefore be more pronounced in this context than in developed markets.

This study addresses the gap by examining whether the determinants of financial flexibility remain stable across alternative measures. It compares two widely used proxies: spare debt capacity derived from predicted leverage models, following Marchica and Mura (2010), and a composite low-leverage–high-cash measure, following (Arslan-Ayaydin et al. 2014). Using panel data from 106 JSE-listed non-financial firms over the period 2000–2019, the study shows that financial flexibility, as operationalised through alternative empirical proxies, is not measurement-neutral, as proxy choice produces differences in coefficient signs, statistical significance, firm classification, and economic interpretation. The study contributes to the corporate finance literature by providing direct evidence on measurement sensitivity, showing that proxy choice affects both empirical estimates and theoretical inference, extending financial flexibility research to an African emerging-market context, and highlighting the importance of construct validity, proxy transparency, and

robustness testing. Figure 1 presents the conceptual framework underpinning the study and illustrates how the spare debt capacity and low-leverage–high-cash measures may produce different firm classifications and empirical conclusions regarding the determinants of financial flexibility. The remainder of the paper is organised as follows. Section 2 reviews the literature on financial flexibility and measurement approaches. Section 3 outlines the methodology and variable construction procedures. Section 4 presents the empirical findings. Section 5 concludes the study and discusses implications and future research.

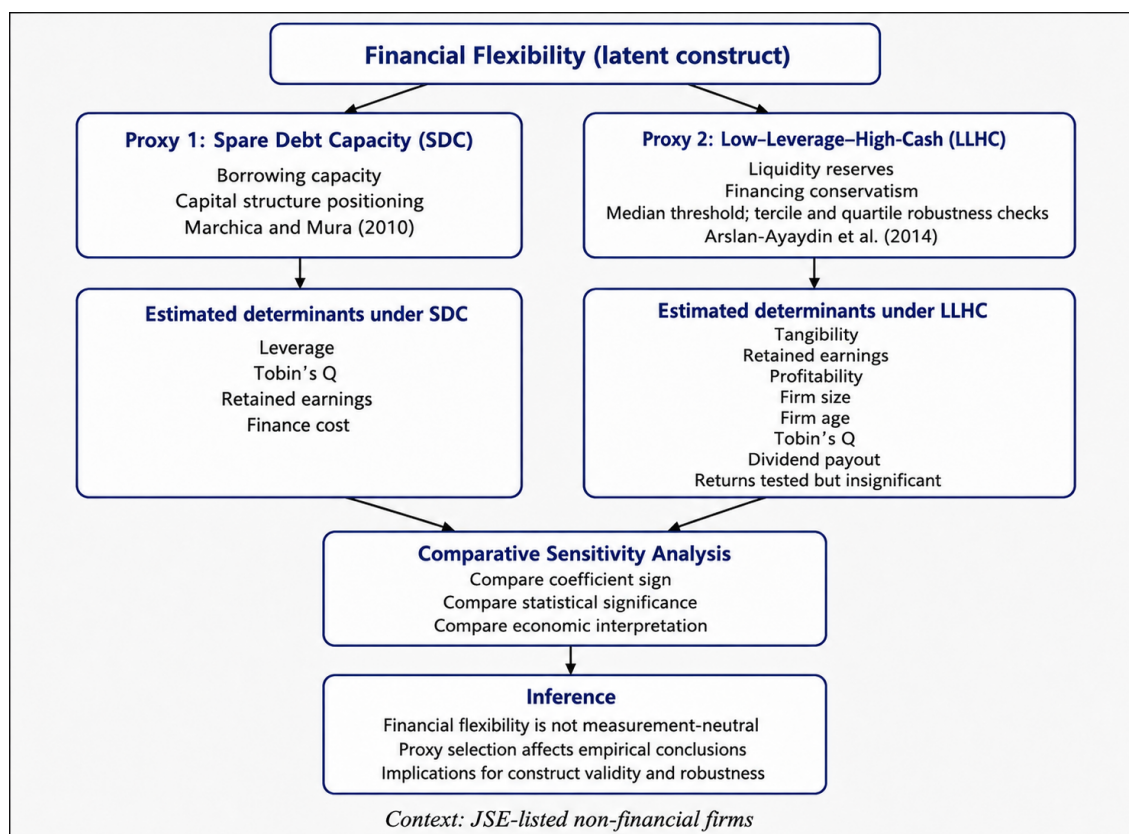


Figure 1. Conceptual framework of measurement sensitivity in financial flexibility. The figure illustrates how alternative operational definitions of financial flexibility, namely spare debt capacity (Marchica and Mura 2010) and low-leverage–high-cash (Arslan-Ayaydin et al. 2014) may produce different empirical conclusions regarding its determinants.

2. Literature Review

2.1. Theoretical and Conceptual Foundations of Financial Flexibility

Financial flexibility is a fundamental concept in corporate finance. It refers to a firm's ability to obtain, adjust, and restructure financing at relatively low cost in response to changing economic conditions and investment opportunities (Denis 2011). Financially flexible firms can mobilise funds quickly, maintain investment activity during periods of uncertainty, and avoid financial distress. As a result, financial flexibility influences financing decisions, investment behaviour, liquidity management, and long-term firm performance (de Jong et al. 2012; Rapp et al. 2014). The concept gained increasing attention following periods of financial instability and capital market disruptions. During economic downturns, firms with greater financial flexibility were better positioned to absorb liquidity shocks and sustain strategic investments (Arslan-Ayaydin et al. 2014; Ferrando et al. 2017). Financial flexibility has therefore become closely associated with corporate resilience and adaptive capacity. Despite its importance, financial flexibility remains difficult to define precisely because it is not directly observable. Existing studies conceptualise the construct differently

depending on the underlying theoretical perspective. Some studies emphasise financing capacity, while others focus on internal liquidity or capital structure positioning (Marchica and Mura 2010; Arslan-Ayaydin et al. 2014; Ferrando et al. 2017). Consequently, there is no universally accepted operational measure of financial flexibility. The literature identifies borrowing capacity as one of the primary dimensions of financial flexibility. Borrowing capacity reflects a firm's ability to raise external debt when required (Marchica and Mura 2010). Firms that maintain leverage below expected or target levels preserve spare debt capacity. This allows them to access external financing quickly and at lower cost when investment opportunities arise. Borrowing capacity is therefore closely linked to capital structure policy and debt management (Frank and Goyal 2009; Marchica and Mura 2010).

Another important dimension of financial flexibility is internal liquidity. Internal liquidity reflects the availability of cash reserves and liquid assets that can be used to finance operations and investments without relying on external capital markets (Almeida et al. 2004; Arslan-Ayaydin et al. 2014). Firms with high cash balances can respond to unexpected expenditures and financing shocks more effectively. Internal liquidity is particularly important during periods of financial constraints when access to external financing becomes costly or limited (Denis 2011; Rapp et al. 2014). These two dimensions reflect different mechanisms through which firms preserve financing adaptability. Borrowing capacity emphasizes future access to external debt markets, while internal liquidity emphasizes immediate financing availability.

Although related, the two mechanisms are not necessarily equivalent. A firm may maintain low leverage but possess limited cash reserves. Similarly, a firm may hold substantial cash balances while operating with relatively high leverage levels. The multidimensional nature of financial flexibility creates important empirical challenges. Different measurement approaches may capture different aspects of corporate financial behaviour. As a result, empirical findings may vary depending on how financial flexibility is operationalised (de Jong et al. 2012; Yung et al. 2015; Kayiira et al. 2026). This raises concerns regarding construct validity, comparability of findings, and measurement sensitivity in financial flexibility research.

2.2. Measurement Approaches to Financial Flexibility

Empirical research adopts different approaches to measuring financial flexibility. These approaches reflect differences in theoretical orientation, financing behaviour, and the dimensions of flexibility emphasised by individual studies. Since financial flexibility is not directly observable, researchers rely on proxy variables that capture selected aspects of financing adaptability (Denis 2011; Rapp et al. 2014; Kayiira et al. 2026). One of the most widely used approaches measures financial flexibility through spare debt capacity. This approach assumes that financially flexible firms deliberately maintain leverage below expected or target levels in order to preserve future borrowing capacity (Marchica and Mura 2010; de Jong et al. 2012). Firms with unused debt capacity can access external financing quickly when profitable investment opportunities emerge or when adverse economic conditions arise. The spare debt capacity approach is grounded in capital structure theory because it assumes that firms strategically manage leverage in anticipation of future financing needs (Frank and Goyal 2009; Marchica and Mura 2010). Maintaining lower leverage allows firms to reduce borrowing constraints and avoid costly external financing during periods of financial stress. Empirical studies show that firms with spare debt capacity are better able to sustain investment activity during economic downturns and financial crises (Arslan-Ayaydin et al. 2014; Ferrando et al. 2017).

Another important measurement approach focuses on internal liquidity. This approach defines financial flexibility in terms of cash holdings and the accumulation of liquid assets.

Firms accumulate cash reserves to hedge against uncertainty, financing constraints, and unexpected expenditures (Almeida et al. 2004; Denis 2011; Arslan-Ayaydin et al. 2014). High cash balances reduce dependence on external capital markets and allow firms to finance investment internally. The liquidity-based approach is closely linked to precautionary savings motives and financing hierarchy arguments (Myers 1984; Myers and Majluf 1984). Firms facing higher external financing costs may preserve internal liquidity to maintain operational and investment flexibility. Internal cash reserves, therefore, function as a buffer against capital market imperfections and macroeconomic uncertainty (Rapp et al. 2014; Yung et al. 2015). Empirical studies frequently use cash-to-assets ratios or related liquidity indicators as proxies for financial flexibility. These measures capture immediate financing availability rather than future borrowing potential. Consequently, liquidity-based measures may identify financially flexible firms differently from leverage-based measures. Some studies employ composite measures that combine leverage and liquidity dimensions. These approaches classify firms as financially flexible when they simultaneously maintain low leverage and high cash holdings (Arslan-Ayaydin et al. 2014; Ferrando et al. 2017). Composite measures attempt to capture the multidimensional nature of financial flexibility more comprehensively than single-indicator approaches. Despite their usefulness, each measurement approach has limitations. Sparse debt capacity measures may misclassify firms that maintain low leverage because they are unable to access debt markets, rather than because they deliberately preserve borrowing capacity. In such cases, low leverage may reflect financial exclusion rather than financial flexibility. Liquidity-based measures may also be ambiguous because high cash holdings may reflect precautionary financial strength, but they may also indicate limited investment opportunities, managerial risk aversion, or difficulty accessing external finance. Composite low-leverage-high-cash measures address some limitations by combining borrowing capacity and liquidity, but they may still classify financially conservative firms as flexible without distinguishing whether such conservatism is strategic or constraint-driven. These limitations reinforce the need to examine whether empirical conclusions remain stable across alternative measures.

However, composite measures may also introduce additional methodological complexity. The selection of threshold values, classification criteria, and weighting structures may influence empirical outcomes. Different combinations of leverage and liquidity indicators may therefore generate inconsistent classifications of financially flexible firms. The existence of multiple measurement approaches creates an important methodological challenge in financial flexibility research. Different proxies may capture distinct dimensions of financing behaviour and produce varying empirical conclusions (de Jong et al. 2012; Yung et al. 2015; Kayiira et al. 2026). This raises concerns about construct validity, the comparability of findings, and the robustness of empirical results across studies.

2.3. Measurement Sensitivity and Empirical Implications

The existence of multiple proxies raises important concerns regarding measurement sensitivity in financial flexibility research. Financial flexibility is a latent construct that cannot be directly observed. Researchers, therefore, rely on proxy variables that capture selected dimensions of financing adaptability (Denis 2011; Rapp et al. 2014; Kayiira et al. 2026). Since each proxy reflects different theoretical assumptions, empirical findings may vary substantially across measurement approaches. Measurement sensitivity arises when changes in operational definitions alter empirical conclusions. In financial flexibility research, this problem is particularly important because leverage, liquidity, and borrowing capacity capture different aspects of corporate financial behaviour (Marchica and Mura 2010; Arslan-Ayaydin et al. 2014; Ferrando et al. 2017).

Consequently, firms classified as financially flexible under one measure may not necessarily be classified similarly under another measure. Leverage-based measures primarily capture borrowing capacity and capital structure positioning. These measures identify firms that preserve future access to debt markets by maintaining leverage below expected levels (Marchica and Mura 2010; de Jong et al. 2012). However, leverage-based proxies may overlook short-term liquidity constraints and immediate financing needs. A firm with low leverage may still face operational financing difficulties if internal cash reserves are limited. Liquidity-based measures capture internal financing capacity through cash holdings and liquid asset accumulation (Almeida et al. 2004; Denis 2011; Arslan-Ayaydin et al. 2014). These measures reflect precautionary savings behaviour and the immediate availability of financing.

However, cash-based proxies may not adequately capture future borrowing potential or debt market accessibility. Firms with large cash balances may still operate with constrained debt capacity. Composite measures attempt to address these limitations by integrating leverage and liquidity dimensions simultaneously. These approaches recognise that financial flexibility is multidimensional and cannot be represented adequately by a single financial indicator (Arslan-Ayaydin et al. 2014; Ferrando et al. 2017). Nevertheless, composite measures may generate additional classification problems because empirical outcomes depend on selected thresholds, weighting criteria, and variable combinations. Different proxy choices may therefore produce different classifications, coefficient signs, significance levels, and economic interpretations (Yung et al. 2015; Kayiira et al. 2026).

Measurement sensitivity has important implications for empirical research. Determinants that appear statistically significant under one proxy may become insignificant under another. Coefficient signs and economic interpretations may also change depending on the selected measure. As a result, conclusions regarding the determinants and consequences of financial flexibility may lack robustness across studies (de Jong et al. 2012; Rapp et al. 2014; Yung et al. 2015). The problem extends beyond statistical interpretation. Measurement sensitivity also affects theoretical inference, as different proxies may support different explanations of financing behaviour, liquidity management, or capital structure adjustment. This complicates attempts to compare findings across studies and limits the cumulative development of financial flexibility literature.

Despite these concerns, limited research has systematically examined the extent to which empirical findings are sensitive to alternative measurement approaches. Most studies adopt a single proxy without evaluating whether results remain stable under alternative operational definitions (Marchica and Mura 2010; Arslan-Ayaydin et al. 2014; Ferrando et al. 2017). This study addresses this gap by comparing multiple measures of financial flexibility within a unified empirical framework using evidence from JSE-listed non-financial firms.

3. Materials and Methods

This study adopts a quantitative empirical approach using panel data econometric techniques to examine the determinants of financial flexibility (Saunders et al. 2019).

3.1. Sample and Data

The population consisted of non-financial firms listed on the JSE Limited. Financial firms were excluded because their capital structures, regulatory capital requirements, and balance sheet characteristics differ substantially from those of non-financial firms. After applying purposive sampling criteria, 106 non-financial firms with sufficient data coverage over the period 2000–2019 were retained. The sample comprised 43 large, 36 medium-sized, and 27 small firms, classified by market capitalisation. In addition to firm-size classification, the sample was examined by industry composition because leverage policy

and cash-holding behaviour may differ across sectors. The industry distribution is reported in Appendix A Table A7. Industry-level financing conditions were also incorporated in the predicted leverage model through the inclusion of industry leverage. Firms were included if financial data were available for most of the study period, allowing a maximum of three annual observations to be missing. Financial data were obtained from the IRESS Research Domain database. Foreign currency items were translated into South African rand in accordance with IAS 21, The Effects of Changes in Foreign Exchange Rates. The final dataset was organised as an unbalanced panel consisting of 2100 firm-year observations.

The number of observations used in the empirical estimations differs across model specifications because of the data requirements associated with each proxy construction. The spare debt capacity specification requires the estimation of predicted leverage and the application of classification rules based on deviations between actual and predicted leverage. This process reduces the usable SDC estimation sample to 1469 observations. By contrast, the low-leverage–high-cash specification relies on contemporaneous leverage and cash-holding classifications and uses the full 2100 firm-year observations because the relevant variables contained no missing values in the final estimation sample. These differences reflect proxy-specific data requirements rather than changes in the underlying sample frame.

To assess whether the reduction from the full sample to the SDC estimation sample introduced potential selection bias, a sample-attrition diagnostic was conducted. The retained SDC observations were compared with the excluded observations using observable firm characteristics, including firm size, leverage, industry leverage, tangibility, profitability, finance cost, cash holdings, and Tobin's Q. The results, reported in Appendix A Table A6, show that the retained observations are, on average, larger, more leveraged, more tangible, and associated with higher industry leverage than the excluded observations. These differences suggest that potential selection effects cannot be completely ruled out. Therefore, SDC-based results are interpreted as applying to the observations for which predicted leverage could be estimated. However, this concern is mitigated by estimating the LLHC specification using the full sample and by conducting a same-sample LLHC robustness test based on the 1469 SDC observations.

3.2. Measurement of Financial Flexibility and Variables

Financial flexibility is not directly observable. Empirical studies, therefore, rely on proxy variables that capture different dimensions of financing adaptability. Since alternative measures emphasise different aspects of financial behaviour, this study employs two widely used operational definitions to examine measurement sensitivity in financial flexibility research. The first operationalisation follows Marchica and Mura (2010) and measures financial flexibility using spare debt capacity. This approach defines financially flexible firms as firms that maintain leverage below expected or target levels in order to preserve future borrowing capacity. The measure captures financing flexibility derived from conservative capital structure positioning and unused debt capacity. The spare debt capacity proxy was estimated by first determining expected leverage using firm-specific characteristics commonly associated with capital structure decisions. These characteristics include profitability, firm size, asset tangibility, growth opportunities, and liquidity conditions. Actual leverage was then compared with predicted leverage. Firms with actual leverage below predicted leverage were classified as financially flexible because they possessed unused borrowing capacity. Thus, the construct for financial flexibility is as follows:

$$FF_{i,t} = \begin{cases} 1, & \text{if } Lev_{i,t} < \bar{Lev}_{i,t} \\ 0, & \text{otherwise} \end{cases} \quad (1)$$

where $FF_{i,t}$ represents financial flexibility; $Lev_{i,t}$ represents actual leverage; and $\widetilde{Lev}_{i,t}$ represents predicted leverage.

This approach assumes that firms strategically maintain lower leverage to preserve access to external financing during periods of investment expansion or economic uncertainty. Financial flexibility is therefore primarily interpreted as future borrowing potential rather than immediate liquidity.

The second operationalisation follows [Arslan-Ayaydin et al. \(2014\)](#) and measures financial flexibility using a composite low-leverage–high-cash framework. This approach classifies firms as financially flexible when they simultaneously maintain relatively low leverage levels and high cash holdings. The proxy combines external borrowing capacity with internal liquidity reserves and is defined as follows:

$$\text{Highcash}_{i,t} = \begin{cases} 1, & \text{if } \text{Cash}_{i,t} < \widetilde{\text{Cash}}_{i,t} \\ 0, & \text{otherwise} \end{cases} \quad (2)$$

$$\text{FF}_{i,t}^{\text{LC}} = \begin{cases} 1, & \text{if } \text{LowLev}_{i,t} = 1 \text{ and } \text{HighCash}_{i,t} = 1 \\ 0, & \text{otherwise} \end{cases} \quad (3)$$

where $\text{Highcash}_{i,t}$ represents firms with high cash holdings; and $\widetilde{\text{Cash}}_{i,t}$ represents the yearly sample median cash ratio.

The low-leverage component reflects a conservative debt policy and reduced dependence on external financing. The high-cash component reflects precautionary liquidity management and the availability of internally generated funds. Firms satisfying both conditions were classified as financially flexible, while firms failing to satisfy either condition were classified as financially inflexible. The comparative framework adopted in this study is also informed by [Ferrando et al. \(2017\)](#), who conceptualise financial flexibility as the capacity of firms to absorb financing constraints and maintain investment activity during periods of economic stress. This perspective highlights that different operational definitions may capture different dimensions of financing resilience and corporate adaptability. The two proxies, therefore, capture distinct but related dimensions of financial flexibility. The spare debt capacity measure emphasizes future borrowing potential and capital structure positioning. The low-leverage–high-cash measure emphasizes liquidity availability and financing conservatism.

To assess whether the LLHC results are sensitive to the threshold used to classify financially flexible firms, additional robustness specifications were constructed using alternative cut-off points. The main LLHC proxy classifies firms as financially flexible when leverage is below the yearly median and cash holdings are above the yearly median. As robustness checks, alternative LLHC proxies were constructed using tercile and quartile thresholds. Under the tercile specification, firms were classified as financially flexible when leverage fell within the lowest third of the yearly distribution and cash holdings fell within the highest third. Under the quartile specification, firms were classified as financially flexible when leverage fell in the lowest quartile and cash holdings in the highest quartile. These alternative specifications allow the study to examine whether the LLHC findings remain robust under stricter definitions of financial flexibility.

The alternative LLHC classifications were defined as follows. For the median specification, a firm-year observation was classified as financially flexible when leverage was below the yearly median and cash holdings were above the yearly median:

$$\text{FF}_{i,t}^{\text{LCHC_Median}} = \begin{cases} 1, & \text{if } \text{Lev}_{i,t} < \text{Median}(\text{Lev}_t) \text{ and } \text{Cash}_{i,t} > \text{Median}(\text{Cash}_t) \\ 0, & \text{otherwise} \end{cases} \quad (4)$$

For the tercile specification, a firm-year observation was classified as financially flexible when leverage fell within the lowest yearly tercile and cash holdings fell within the highest yearly tercile:

$$FF_{i,t}^{LCHC_Tercile} = \begin{cases} 1, & \text{if } Lev_{i,t} \leq P_{33}(Lev_t) \text{ and } Cash_{i,t} \geq P_{67}(Cash_t) \\ 0, & \text{otherwise} \end{cases} \quad (5)$$

For the quartile specification, a firm-year observation was classified as financially flexible when leverage fell within the lowest yearly quartile and cash holdings fell within the highest yearly quartile:

$$FF_{i,t}^{LCHC_Quartile} = \begin{cases} 1, & \text{if } Lev_{i,t} \leq P_{25}(Lev_t) \text{ and } Cash_{i,t} \geq P_{75}(Cash_t) \\ 0, & \text{otherwise} \end{cases} \quad (6)$$

Comparing these measures allows the study to evaluate whether empirical findings remain stable across alternative operational definitions of financial flexibility.

To estimate firms' expected leverage, the study follows the methodology of Frank and Goyal (2009) and Marchica and Mura (2010), where leverage is modelled as a function of firm-specific characteristics and industry conditions. Expected leverage is estimated as a function of industry leverage, size, profitability, asset tangibility, Tobin's Q, and inflation using the following econometric equation:

$$Lev_{i,t} = \beta_0 + \beta_1 Lev_{i,t-1} + \beta_2 Indlev_{i,t} + \beta_3 TobQ_{i,t} + \beta_4 Size_{i,t} + \beta_5 Tang_{i,t} + \beta_6 Infl_{i,t} + \text{firm fixed effects} + \text{year fixed effects} + \varepsilon_{i,t} \quad (7)$$

where $Lev_{i,t}$ is defined as the ratio of the sum of interest-bearing long-term and short-term debt to the sum of interest-bearing long-term and short-term debt and market value of equity. $Lev_{i,t-1}$ is defined as the lagged value of the ratio of the sum of interest-bearing long-term and short-term debt to the sum of interest-bearing long-term and short-term debt and market value of equity. $Indlev_{i,t}$ is defined as the year-end average leverage ratios of firms in a particular industry. $TobQ_{i,t}$ is defined as the ratio of the market value of equity plus the book value of debt to total assets. $Size_{i,t}$ is the natural logarithm of the firm's total assets. $Tang_{i,t}$ is defined as the ratio of the sum of property, plant and equipment to total assets. $Infl_{i,t}$ is defined as the year-end inflation rate as determined by the SARB.

Firms exhibiting negative deviations between actual and predicted leverage for at least two consecutive years are classified as financially flexible. This two-year persistence rule is retained as the main SDC specification, while alternative one-year, three-year, tercile, and quartile SDC classifications are examined as robustness checks.

3.3. Model Specification

The determinants of financial flexibility were estimated using the following model:

$$FF_{i,t} = \beta_0 + \beta_1 Lev_{i,t} + \beta_2 Div_{i,t} + \beta_3 TobQ_{i,t} + \beta_4 Profit_{i,t} + \beta_5 Cash_{i,t} + \beta_6 retained_{i,t} + \beta_7 Tang_{i,t} + \beta_8 Fincost_{i,t} + \varepsilon_{i,t} \quad (8)$$

where $Lev_{i,t}$ is defined as the ratio of the sum of interest-bearing long-term and short-term debt to the sum of interest-bearing long-term and short-term debt and market value of equity. $Profit_{i,t}$ is defined as the ratio of earnings before interest and tax to total assets. $TobQ_{i,t}$ is defined as the ratio of the market value of equity plus the book value of debt to total assets. $Cash_{i,t}$ is defined as the ratio of the cash and cash equivalents to total assets. $Tang_{i,t}$ is defined as the ratio of the sum of property, plant and equipment to total assets.

$Retained_{i,t}$ is defined as the ratio of retained earnings to total assets. This specification captures firm-specific characteristics and payout policy determinants of financial flexibility. Robustness checks are implemented to ensure consistent and unbiased estimators.

To address the possibility that low leverage may reflect financial exclusion rather than deliberate financial flexibility, an additional heterogeneity validation was conducted. Since direct information on credit applications, loan rejections, credit ratings, or bank lending access was unavailable, the study used observable firm-level characteristics associated with financing access. A financing-access index was constructed using firm size, asset tangibility, profitability, and finance cost. Larger firms with higher asset tangibility, stronger profitability, and lower finance costs were classified as having stronger financing-access characteristics, while smaller firms with weaker collateral capacity, lower profitability, and higher finance costs were classified as having weaker financing-access characteristics. The financial flexibility classifications were then compared across high- and low-financing-access groups. This test is treated as a validation exercise rather than a direct identification of credit exclusion.

3.4. Econometric Estimation

The study employs Fixed Effects (FE) and Random Effects (RE) estimators to fit the derived models. The Hausman test was used to choose between the fixed-effects and random-effects estimators (Nwakuya and Ijomah 2017). Diagnostic tests address heteroscedasticity (Breusch–Pagan), autocorrelation (Durbin–Watson), multicollinearity (VIF), and stationarity (ADF). The results of these diagnostic tests are reported in Appendix A Table A1.

3.5. Data Analysis

Data were analysed using STATA 15. Descriptive statistics were first computed to examine the distributional properties of the variables. Panel regression techniques were then employed to estimate the determinants of financial flexibility. The Hausman specification test was used to select between Fixed Effects and Random Effects estimators. Diagnostic tests for heteroscedasticity, autocorrelation, multicollinearity, and stationarity were also conducted to ensure the reliability of the estimators and the validity of the model.

4. Results and Discussion

The sample consisted of 43 large, 36 medium-sized, and 27 small JSE-listed non-financial firms with sufficient data coverage over the period 2000–2019. This sample was used to estimate the leverage model needed to identify firms with spare debt capacity.

4.1. Descriptive Statistics

The final panel consists of 2100 firm-year observations drawn from 106 non-financial firms listed on the JSE Limited over the period 2000–2019. Table 1 presents the descriptive statistics for the variables used in the study.

The mean leverage ratio of 0.217 falls within the conservative range reported in the literature, where leverage below approximately 0.25 is typically associated with cautious financing behaviour and preserved borrowing capacity, compared with developed-market leverage levels commonly ranging between 0.25 and 0.40 (Rajan and Zingales 1995; Graham and Harvey 2001). The average Tobin's Q of 1.172 reflects moderate growth opportunities, consistent with empirical benchmarks indicating that values between 1 and 1.5 correspond to firms with stable but positive investment prospects, while substantially higher values above 1.5 are associated with high-growth firms (Elsas and Florysiak 2011). Cash holdings of 12.8% fall within the precautionary liquidity range of approximately 10–20% of total assets documented in prior studies, suggesting the presence of buffers against financing frictions and uncertainty, relative to normal operating liquidity levels of about 5–10%

(Almeida et al. 2004). Dividend payouts averaging 3.56% indicate relatively restrained distribution behaviour, as payout intensity below roughly 5–6% is generally associated with earnings retention and internal financing motives, whereas higher payout levels reflect stronger shareholder distribution policies (Fama and French 2001). Financing costs of 1.9% fall within the moderate borrowing cost range typically observed between 1 and 3% of total assets, suggesting manageable debt servicing obligations compared with higher financing cost environments exceeding approximately 3–4% (Titman and Wessels 1988). Recent South African evidence further indicates cautious borrowing behaviour and heterogeneous access to debt markets, with some firms reducing debt financing in response to regulatory and financial constraints (Lemma et al. 2024).

Table 1. Descriptive statistics of the study variable.

Variables	Obs.	Mean	Std. Dev.	Min	Max	Skewness	Kurtosis
Investment (Inv)	2100	0.0752	0.1019	−0.6967	1.1286	1.3352	22.7437
Tobin's Q (firm growth) (MTB)	2100	1.1723	0.8914	0.0000	8.5326	2.24716	11.5430
Leverage (MDR)	2100	0.2168	0.2333	0.0000	1.8994	1.66433	6.5674
Cash (Cash and cash equivalents)	2100	0.1282	0.1253	0.0000	0.9882	2.54201	13.1324
Returns (return)	2100	0.1096	0.5893	−8.1850	7.2635	−0.56340	45.2359
Firm Age (Age)	2100	31.0233	23.7354	1.0000	124.0000	1.05178	3.5122
Firm Size (Size)	2100	15.0362	2.3565	0.0000	21.286	−0.44625	4.1418
Sales Growth(Sales growth)	2100	0.1284	0.4201	−4.3038	8.1316	2.47793	88.7648
Retained earnings (Ret)	2100	0.2323	0.5286	−10.4870	1.1570	−6.49744	94.6012
Firm profitability (Prof)	2100	0.1018	0.1592	−1.9606	1.3070	−2.19793	31.1399
Payout (Actual dividend paid)	2100	0.0356	0.0534	−0.0001	0.9077	5.29824	57.1524
Finance cost (Fincost)	2100	0.0190	0.0201	0.0000	0.3070	4.02647	40.8892
Asset tangibility (Tang)	2100	0.9107	0.1548	0.0000	4.3610	3.66780	123.5284
Industry Leverage (IndLev)	2100	0.2190	0.0995	0.0000	0.6955	0.49097	2.8384
Inflation	2100	0.0569	0.0239	0.0000	0.1340	0.86980	5.0435

The variables in Table 1 are defined as follows: Inv represents investment, which is measured as the ratio of the net changes in property, plant, and equipment deflated by the total assets. TobQ represents Tobin's Q, measured as the market-to-book ratio (MTB). Lev represents Leverage, and it is measured as the market-to-debt ratio (MDR). Cash represents the cash and cash equivalents measured as cash and cash equivalents deflated by total assets. Return represents the annual stock return, which is measured as the % change in the market capitalization of the company in two periods. Firm age represents the age of a firm which is measured as the number of years of the firm's existence since incorporation. Firm size represents the size of the firm which is measured as the natural logarithm of the total assets. Sg represents sales growth which is measured as the percentage year to year change in revenue deflated by total assets. Ret represents Retained earnings which are measured as the distributable or retained earnings deflated by total assets. Prof represents Firm profitability which is measured as earnings before interest and tax (EBIT) deflated by total assets. Div represents Payout and it is measured as the total actual cash dividends paid in a year deflated by total assets. Fincost represents Finance cost which measured as finance and interest charges deflated by total assets. Tang represents Asset tangibility which measured as the total value of property, plant and equipment to total assets. Industry leverage (IndLev) is the industry average of the leverage ratios of the sampled firms. Inflation (Inf) is the inflation rate at a firm's financial year end as determined by SARB. The descriptive statistics show that some variables exhibit high skewness and kurtosis, indicating the presence of extreme observations and non-normal distributions. This is common in firm-level panel data, particularly for variables such as returns, sales growth, retained earnings, dividend payout, finance cost, and asset tangibility. These distributional features were considered in the econometric estimation by using heteroscedasticity-robust standard errors. The use of robust standard errors reduces the likelihood that statistical inference is driven by heteroscedasticity or distributional irregularities in the data.

4.2. Correlation Analysis

The correlation matrix in Table 2 indicates that none of the pairwise correlation coefficients exceed the conventional multicollinearity threshold of 0.70. The highest positive correlation is observed between Tobin's Q and dividend payout (0.471), followed by leverage and finance cost (0.445), and retained earnings and profitability (0.441). These results suggest that multicollinearity is unlikely to distort the regression estimates.

Table 2. Correlation matrix.

Variables	Lev	TobQ	Cash	Ret	Age	Size	Sg	Re	Prof	Div	Fincost	Tang	Infl
Lev	1.000												
TobQ	−0.360	1.000											
Cash	−0.276	0.061	1.000										
Ret	−0.191	0.456	0.040	1.000									
Age	0.045	−0.000	−0.060	−0.037	1.000								
Size	0.115	0.099	−0.247	0.016	0.250	1.000							
Sg	−0.103	0.055	−0.002	0.134	−0.113	−0.064	1.000						
Re	−0.207	0.055	0.095	0.076	0.069	0.256	0.057	1.000					
Prof	−0.238	0.293	0.140	0.209	0.002	0.075	0.090	0.441	1.000				
Div	−0.276	0.471	0.238	0.094	0.049	0.014	−0.022	0.232	0.437	1.000			
Fincost	0.445	−0.105	−0.276	−0.095	−0.115	−0.055	−0.090	−0.366	−0.173	−0.203	1.000		
Tang	0.041	−0.113	0.064	−0.016	0.160	0.073	−0.022	0.063	0.008	0.023	−0.017	1.000	
Infl	0.011	0.020	0.005	−0.079	−0.020	0.009	0.105	−0.004	0.051	0.016	0.020	−0.009	1.000

Notes: Lev = Leverage; TobQ = Tobin's Q; Cash = Cash holdings; Ret = Returns; Age = Firm age; Size = Firm size; Sg = Sales growth; Re = Retained earnings; Prof = Profitability; Div = Dividend payout; Fincost = Finance cost; Tang = Asset tangibility; Infl = Inflation.

4.3. Determinants of Financial Flexibility Under the Spare Debt Capacity Proxy

The panel regression results using FE and RE estimators indicate a consistent pattern. Model 2 was estimated using the GLS random-effects (RE) estimator. The Hausman test for random effects was used to decide which estimator was appropriate to fit the model. The Hausman test statistics reported in Appendix A indicate a χ^2 of 11.62, with a probability of 0.1690. Since the p -value is greater than 5% ($p > 0.05$), the test fails to reject the null hypothesis that the random-effects estimator is appropriate. Therefore, the model was fitted using the random-effects estimator. To control for heteroscedasticity, robust standard errors were used. The results of the model are shown in Table 3 below.

Table 3. Results of the Random-effects estimator.

Variable	Coefficient	Robust Std. Error
$Lev_{i,t}$	−0.85138 ***	0.12748
$Div_{i,t}$	−0.39534	0.30595
$TobQ_{i,t}$	−0.11541 ***	0.02167
$Profit_{i,t}$	0.04067	0.07581
$Cash_{i,t}$	0.02105	0.13469
$Retained_{i,t}$	−0.06962 *	0.03658
$Tang_{i,t}$	0.03638	0.08026
$Fincost_{i,t}$	−2.20544 *	1.17004
Constant	0.94402 ***	0.08689

Model statistics: $\sigma_u = 0.26614$; $\sigma_e = 0.37805$; $\rho = 0.33136$; Wald $\chi^2(8) = 96.47$; Prob $> \chi^2 = 0.0000$; Number of observations = 1469. Notes: The dependent variable is financial flexibility measured using the spare debt capacity proxy. Robust standard errors are reported. Significance levels: * $p < 0.10$; *** $p < 0.01$. Table 3 presents the results of the Random-effects estimator. $FF_{i,t}$ is defined as in Section 3.4. $Lev_{i,t}$ is defined as the ratio of the sum of interest-bearing long-term and short-term debt to the sum of interest-bearing long-term and short-term debt and market value of equity. $Profit_{i,t}$ is defined as the ratio of earnings before interest and tax to total assets. $TobQ_{i,t}$ is defined as the ratio of the market value of equity plus book value of debt to total assets. $Cash_{i,t}$ is defined as the ratio of the cash and cash equivalents to total assets. $Tang_{i,t}$ is defined as the ratio of the sum of property, plant and equipment to total assets. $Retained_{i,t}$ is defined as the ratio of retained earnings to total assets.

Because the spare debt capacity proxy is constructed by comparing actual leverage with predicted leverage, the coefficient on leverage in the main SDC model is interpreted with caution. Leverage is retained in the main specification because it is theoretically central to the borrowing-capacity dimension of financial flexibility. However, since actual leverage also enters the classification rule used to identify spare debt capacity, the estimated leverage coefficient may partly reflect the mechanical structure of the proxy. To address this concern, an additional robustness test was conducted by excluding leverage from the SDC determinant model. The results, reported in Appendix A Table A2, show that Tobin's Q and finance cost remain statistically significant after leverage is excluded, while retained earnings becomes statistically insignificant. This suggests that the SDC findings are not driven solely by the leverage-based construction of the proxy, although leverage-related results should be interpreted cautiously.

4.4. Determinants of Financial Flexibility Under the Low-Leverage-High-Cash Proxy

Table 4 presents the logistic regression results for the determinants of financial flexibility under the low-leverage-high-cash (LLHC) specification. The model was estimated using 2100 firm-year observations. The omnibus test of model coefficients is statistically significant ($\chi^2 = 282.442$; $p < 0.001$), indicating that the explanatory variables jointly improve the model's predictive power relative to the null specification. The Nagelkerke R^2 value of 0.177 indicates moderate classification model explanatory power. The results show that tangibility, retained earnings, profitability, firm size, firm age, Tobin's Q, and dividend payout are statistically associated with financial flexibility, although dividend payout is only weakly significant at the 10% level. Returns are positive but statistically insignificant. These findings differ substantially from those obtained under the spare debt capacity specification, providing evidence that empirical conclusions regarding financial flexibility are sensitive to proxy selection.

Table 4. Logistic Regression Results for the Low-Leverage-High-Cash Proxy.

Variable	B	S.E.	Wald	Sig.	Exp(B)	95% CI for Exp(B)
Tangibility	0.702	0.345	4.143	0.042	2.018	1.026–3.967
Retained earnings	0.721	0.132	29.849	0.000	2.056	1.588–2.663
Profitability	1.236	0.406	9.258	0.002	3.443	1.553–7.635
Firm size	−0.283	0.025	124.889	0.000	0.754	0.717–0.792
Firm age	0.007	0.002	10.798	0.001	1.007	1.003–1.012
Tobin's Q	0.428	0.079	29.617	0.000	1.535	1.315–1.791
Dividend payout	2.211	1.305	2.869	0.090	9.126	0.707–117.867
Returns	0.009	0.099	0.009	0.924	1.009	0.832–1.225
Constant	1.613	0.457	12.467	0.000	5.016	2.049–12.278

Model diagnostics: Omnibus $\chi^2 = 282.442$, $df = 8$, $p < 0.001$; $-2 \text{ Log Likelihood} = 2328.874$; Cox & Snell $R^2 = 0.126$; Nagelkerke $R^2 = 0.177$; $N = 2100$. Notes: Dependent variable = financial flexibility measured using the low-leverage-high-cash proxy. Exp(B) represents the odds ratio. Significance levels: $p < 0.10$, $p < 0.05$, $p < 0.01$.

As explained in Section 3.1, the full-sample LLHC model is retained as the main LLHC specification because the LLHC proxy can be constructed for all 2100 firm-year observations. To ensure that the comparison with the SDC results is not driven by differences in estimation sample size, the LLHC model was also re-estimated using the same 1469 observations as the SDC specification. The same-sample results, reported in Appendix A Table A3, remain broadly consistent with the main LLHC findings and are therefore discussed here to ensure a more symmetrical comparison with the SDC specification. In the restricted 1469-observation sample, retained earnings, profitability, firm size, firm age, and Tobin's Q remain statistically significant, while tangibility is weakly significant. Returns become statistically significant in the restricted sample, while dividend payout becomes statistically insignificant, indicating some sample sensitivity in market-performance and payout-related

effects. Overall, the same-sample results suggest that the main differences between the SDC and LLHC specifications are not driven solely by the larger LLHC sample size, but reflect differences in how the proxies operationalise financial flexibility.

4.5. Comparative Sensitivity Analysis Across Proxies

Table 5 compares the empirical findings obtained under the spare debt capacity (SDC) and low-leverage-high-cash (LLHC) measures of financial flexibility. The comparison shows that several determinants change in sign, statistical significance, or economic interpretation across the two proxies. This provides direct evidence that financial flexibility is sensitive to operational definition. Under the SDC approach, financial flexibility is mainly explained by leverage, Tobin's Q, retained earnings, and financing costs. Under the LLHC approach, however, financial flexibility is mainly explained by retained earnings, profitability, tangibility, firm age, Tobin's Q, dividend payout, and firm size.

Table 5. Comparative Sensitivity Analysis across Financial Flexibility Proxies.

Variable	Spare Debt Capacity (SDC) Proxy	Low-Leverage-High-Cash (LLHC) Proxy	Sensitivity Interpretation
Leverage	Negative and significant under SDC	Not included in LLHC model	Excluded because leverage forms part of LLHC proxy construction; interpreted cautiously under SDC because actual leverage is also involved in the SDC classification rule
Cash holdings	Positive but insignificant under SDC	Not included in LLHC model	Excluded because cash forms part of LLHC proxy construction
Tobin's Q	Negative and significant	Positive and significant	Strong measurement sensitivity; sign reversal
Dividend	Negative and insignificant	Positive and weakly significant	Measurement sensitivity; sign changes, but LLHC significance is marginal
Retained earnings	Negative and significant	Positive and significant	Strong measurement sensitivity; sign reversal
Profitability	Positive but insignificant	Positive and significant	Direction stable; stronger under LLHC
Tangibility	Positive but insignificant	Positive and significant	Direction stable; significance changes
Firm size	Not central in SDC interpretation	Negative and significant	Proxy-specific determinant under LLHC
Firm age	Not central in SDC interpretation	Positive and significant	Proxy-specific determinant under LLHC
Returns	Not included in SDC model	Positive but insignificant	No robust proxy-specific effect under LLHC
Finance cost	Negative and significant	Not included in LLHC model	SDC-specific determinant

The results therefore indicate that the two proxies capture related but distinct dimensions of financial flexibility. An important implication of these findings is that proxy choice should be guided by the economic dimension of financial flexibility under investigation. The results do not imply that one proxy is universally superior to the other. Rather, each proxy is more appropriate under different conceptual objectives. The SDC proxy is more suitable when financial flexibility is defined as unused borrowing capacity and the ability to access future debt financing. By contrast, the LLHC proxy is more suitable when financial flexibility is viewed as a broader liquidity-and-leverage reserve that combines conservative debt policy with internal cash availability. Therefore, the quality of a financial flexibility proxy should be assessed using five criteria: theoretical alignment with the intended construct, coverage of the relevant flexibility dimension, clarity of economic interpretation, validity of firm classification, and robustness to alternative threshold definitions. On this basis, SDC is stronger for studies focused on borrowing capacity, while LLHC is stronger for studies focused on liquidity resilience and shock absorption.

Sensitivity was assessed by comparing coefficient direction, statistical significance, and economic interpretation across the two proxy specifications. A determinant was treated

as measurement-sensitive where its sign changed, its significance status changed, or its interpretation differed across the spare debt capacity and low-leverage-high-cash measures.

These findings should be interpreted in light of the South African institutional context. Although the JSE is the largest and most developed capital market in Africa, firms operating in South Africa still face financing conditions shaped by macroeconomic volatility, varying access to long-term capital, relatively high borrowing costs, and evolving governance structures (JSE 2020; Lemma et al. 2024). These conditions, together with ownership and governance structures, may influence whether firms preserve spare debt capacity, accumulate cash reserves, or combine low leverage with high liquidity (Arslan-Ayaydin et al. 2014; Ferrando et al. 2017). In this context, the SDC proxy may be particularly informative where firms have access to debt markets but choose to preserve borrowing capacity, while the LLHC proxy may be more informative where firms rely on internal liquidity to manage uncertainty and financing frictions (Denis 2011; Rapp et al. 2014).

Tables 3 and 4 show that the determinants of financial flexibility differ substantially across the spare debt capacity (SDC) and low-leverage-high-cash (LLHC) proxies. Under the SDC specification, leverage, Tobin's Q, retained earnings, and finance cost are statistically significant, while dividend payout, profitability, cash holdings, and tangibility are statistically insignificant. This pattern suggests that the SDC proxy primarily captures borrowing-capacity flexibility, in which firms preserve financial adaptability by maintaining unused debt capacity and lower leverage than expected. This interpretation is consistent with capital structure theory and the financial flexibility view, which emphasise the role of leverage policy in preserving financing capacity (Myers 1984; Myers and Majluf 1984). Firms may therefore deliberately maintain lower leverage to preserve future access to debt markets and avoid costly external financing during periods of uncertainty or investment expansion (Marchica and Mura 2010; Denis 2011; Ferrando et al. 2017).

By contrast, the LLHC specification identifies tangibility, retained earnings, profitability, firm size, firm age, Tobin's Q, and dividend payout as statistically associated with financial flexibility, although dividend payout is only weakly significant. Returns are positive but statistically insignificant. This pattern indicates that the LLHC proxy captures liquidity-reserve flexibility, where firms are classified as financially flexible only when they simultaneously maintain low leverage and high cash holdings. This is consistent with the pecking order theory, which suggests that firms preserve internal funds to reduce dependence on costly external finance (Myers 1984; Myers and Majluf 1984). It also aligns with precautionary liquidity arguments, which emphasise the role of cash reserves in protecting investment capacity during periods of financing constraints (Almeida et al. 2004; Denis 2011; Arslan-Ayaydin et al. 2014; Rapp et al. 2014).

The strongest evidence of measurement sensitivity is observed in retained earnings and Tobin's Q. Retained earnings are negatively associated with financial flexibility under the SDC proxy but positively associated under the LLHC proxy. This suggests that internally generated funds may play different roles depending on how financial flexibility is measured. Under the SDC approach, retained earnings may be actively deployed to finance investment and operating needs, thereby reducing unused borrowing capacity. Under the LLHC approach, retained earnings may instead reflect accumulated internal equity and liquidity reserves that support conservative leverage and high cash holdings. This contrast is consistent with the multidimensional view of financial flexibility, in which internal funds can either be preserved as financial slack or used to finance investment, depending on firm conditions and the measurement approach (de Jong et al. 2012; Arslan-Ayaydin et al. 2014). It also supports recent evidence that conclusions about financial flexibility may vary when alternative proxies capture different dimensions of financing behaviour (Yung et al. 2015; Kaya et al. 2026).

Tobin's Q also changes direction across the two proxies. Under SDC, the negative relationship suggests that firms with stronger growth opportunities may use available borrowing capacity to finance investment, thereby reducing spare debt capacity. This is consistent with the pecking order view that firms may exhaust internal resources and draw on financing capacity when investment opportunities arise (Myers and Majluf 1984). Under LLHC, however, the positive relationship suggests that growth-oriented firms may preserve both liquidity and conservative leverage in anticipation of future investment opportunities. This interpretation aligns with the underinvestment and financial flexibility arguments, which suggest that firms with valuable growth options may maintain financial slack to avoid underinvestment when external finance becomes costly or constrained (Myers 1977; Marchica and Mura 2010). It is also consistent with later evidence that financially flexible firms preserve investment capacity during periods of financing stress (Ferrando et al. 2017).

Profitability and tangibility are more important under the LLHC specification than under the SDC specification. The positive profitability effect supports the pecking order theory because profitable firms generate internal funds that allow them to preserve liquidity and reduce reliance on external financing (Myers 1984; Myers and Majluf 1984). It also aligns with the view that internally generated funds strengthen corporate liquidity and financial flexibility (Denis 2011). The positive tangibility effect is consistent with trade-off theory, which predicts that collateralizable assets reduce borrowing constraints and improve debt capacity (Harris and Raviv 1991; Myers 2001). Under the LLHC proxy, these variables appear to support the joint maintenance of low leverage and high cash holdings, suggesting that liquidity-reserve flexibility depends not only on internal funds but also on asset structure and financing access.

Dividend payout also illustrates proxy sensitivity. Under SDC, dividend payout is negative but statistically insignificant, suggesting that payout policy does not systematically explain spare debt capacity. Under LLHC, dividend payout is positive but weakly significant, which may indicate that dividend-paying firms are financially stronger and capable of preserving liquidity even after distributions to shareholders. This interpretation is consistent with dividend signalling arguments, where dividend payments may reflect stable earnings and managerial confidence (Fama and French 2001). It also aligns with maturity-based explanations, which suggest that dividend-paying firms are often more established and financially stable (Grullon et al. 2002).

Overall, the comparative results show that financial flexibility, as operationalised in empirical research, is not measurement-neutral. The SDC proxy emphasises borrowing-capacity flexibility, capital structure positioning, and unused debt capacity, whereas the LLHC proxy emphasises liquidity-reserve flexibility, internal financial slack, and financing conservatism. These findings support the view that financial flexibility is a multidimensional latent construct (Denis 2011; Rapp et al. 2014). They also show that empirical conclusions may differ depending on whether the selected proxy captures future debt capacity, internal liquidity reserves, or both (de Jong et al. 2012; Yung et al. 2015). This reinforces the need for proxy transparency, robustness testing, and classification-based validation in financial flexibility research.

The heterogeneity validation results provide additional insight into the concern that low leverage may reflect financial exclusion rather than deliberate financial flexibility. As shown in Appendix A Table A4, financial flexibility classifications are more frequent among firms with stronger financing-access characteristics. Under the SDC proxy, 60.3% of high-access firm-year observations are classified as financially flexible, compared with 44.6% among low-access observations. Under the LLHC proxy, the difference is also pronounced, with 40.9% of high-access observations classified as financially flexible compared with 21.7% of low-access observations. These results suggest that financial flexibility classifications are

more strongly associated with firms that have observable characteristics consistent with financing access, supporting the interpretation of strategic financial flexibility. However, the presence of flexible classifications among low-access firms indicates that low leverage should still be interpreted cautiously, as it may partly reflect financing constraints or possible exclusion rather than unused debt capacity.

4.6. Sub-Period Robustness Across Macroeconomic Conditions

To assess whether measurement sensitivity varies across macroeconomic conditions, an additional sub-period robustness check was conducted. The sample was divided into pre-crisis, crisis, and post-crisis periods. The results, reported in Appendix A Table A5, show that differences between the SDC and LLHC classifications persist across macroeconomic phases. This suggests that the study's main conclusion is not driven solely by the global financial crisis or one specific macroeconomic period. However, the crisis-period results are interpreted cautiously because the 2007–2009 window is relatively short.

4.7. Robustness Check: Alternative LLHC Thresholds

To assess whether the low-leverage-high-cash results are sensitive to the threshold used in classifying financially flexible firms, additional robustness tests were conducted using alternative LLHC cut-off points. The main LLHC specification classifies firms as financially flexible when leverage is below the yearly median and cash holdings are above it. As robustness checks, the logistic regression model was re-estimated using stricter tercile and quartile thresholds. Under the tercile specification, firms were classified as financially flexible when leverage fell within the lowest third of the yearly distribution and cash holdings fell within the highest third. Under the quartile specification, firms were classified as financially flexible when leverage fell in the lowest quartile and cash holdings in the highest quartile. The purpose of this robustness test was to determine whether the main LLHC findings remain stable when financial flexibility is defined more restrictively. Table 6 reports the robustness pattern across the median, tercile, and quartile classifications.

Table 6. Robustness of LLHC Results under Alternative Classification Thresholds.

Variable	Median Threshold	Tercile Threshold	Quartile Threshold	Robustness Interpretation
Tangibility	Positive and significant	Positive and significant	Positive and significant	Robust
Retained earnings	Positive and significant	Positive and significant	Positive and significant	Robust
Profitability	Positive and significant	Positive and significant	Positive and weakly significant	Mostly robust
Firm size	Negative and significant	Negative and significant	Negative and significant	Robust
Firm age	Positive and significant	Positive and significant	Positive but insignificant	Partially robust
Tobin's Q	Positive and significant	Positive and significant	Positive and weakly significant	Mostly robust
Dividend payout	Positive and weakly significant	Positive and significant	Positive and significant	Robust, but magnitude-sensitive
Returns	Positive but insignificant	Positive but insignificant	Positive but insignificant	Not robust

The robustness results indicate that the main LLHC findings are generally stable across alternative threshold definitions. Tangibility, retained earnings, firm size, and Tobin's Q retain broadly consistent signs across the median, tercile, and quartile specifications. Profitability also remains positively associated with financial flexibility, although its significance weakens under the stricter quartile threshold. Firm age remains positive but loses significance under the quartile specification, suggesting partial threshold sensitivity. The dividend payout remains positively associated with the LLHC proxy, though its magnitude should be interpreted cautiously, as the effect varies across specifications. Returns remain

statistically insignificant across the alternative thresholds, indicating that market performance is not a robust determinant of LLHC financial flexibility in this sample. Overall, the robustness analysis supports the main conclusion that several determinants of financial flexibility remain stable under alternative LLHC classifications, while others are sensitive to the strictness of the proxy definition. This reinforces the study's central argument that empirical conclusions in financial flexibility research may depend on how the construct is operationalised (de Jong et al. 2012; Arslan-Ayaydin et al. 2014; Yung et al. 2015).

To further examine whether the SDC results depend on the persistence rule used to define spare debt capacity, additional SDC classification robustness checks were conducted. The original negative-deviation classification was compared with stricter persistence-based rules requiring two and three consecutive years of negative deviations. Additional classifications were also constructed using the lowest tercile and lowest quartile of standardised leverage deviations. The results, reported in Appendix A Table A8, show that the proportion of firms classified as financially flexible declines as the SDC definition becomes stricter. However, the overlap with the LLHC proxy remains limited across all SDC definitions. This indicates that although the level of SDC classification is sensitive to the strictness of the threshold, the main conclusion remains unchanged: the SDC and LLHC proxies identify related but distinct dimensions of financial flexibility.

4.8. Classification Overlap Between Financial Flexibility Proxies

To further assess measurement sensitivity, Table 7 reports the classification overlap between the spare debt capacity and low-leverage-high-cash proxies. The purpose of this analysis is to examine whether the two proxies identify the same firm-year observations as financially flexible. A high degree of overlap would indicate proxy consistency, while limited overlap would suggest that the two measures capture different dimensions of financial flexibility.

Table 7. Classification Overlap Between SDC and LLHC Financial Flexibility Proxies.

Classification Category	Description	Frequency	Percentage
Flexible under both proxies	Firm-years classified as financially flexible under both SDC and LLHC	256	17.4%
Flexible under SDC only	Firm-years classified as flexible under SDC but not LLHC	515	35.1%
Flexible under LLHC only	Firm-years classified as flexible under LLHC but not SDC	140	9.5%
Inflexible under both proxies	Firm-years classified as inflexible under both SDC and LLHC	558	38.0%
Total	Common SDC–LLHC estimation sample	1469	100.0%

Notes: SDC = spare debt capacity; LLHC = low-leverage-high-cash. The table reports classification overlap using the common 1469 observations available for both the main SDC specification and the restricted LLHC comparison. Cohen's Kappa = 0.128, indicating slight agreement between the SDC and LLHC classifications. McNemar's test: $\chi^2 = 213.6$; $p < 0.001$, indicating a statistically significant difference in classification between the two proxies.

The classification overlap results provide additional evidence that the SDC and LLHC proxies do not classify the same firm-year observations identically. Using the common 1469 observations available for both the main SDC specification and the restricted LLHC comparison, only 17.4% of firm-year observations are classified as financially flexible under both proxies. A further 35.1% are classified as flexible under the SDC proxy only, while 9.5% are classified as flexible under the LLHC proxy only. The largest category is firm-years classified as inflexible under both proxies, representing 38.0% of the common sample. Cohen's Kappa of 0.128 indicates only slight agreement between the two classifications, suggesting that the proxies share limited common structure and do not identify financially flexible firms in a highly consistent manner (Cohen 1960; Landis and Koch 1977). McNemar's test further confirms that the classification difference is statistically significant ($\chi^2 = 213.6$; $p < 0.001$), indicating that the SDC and LLHC proxies do not classify firm-years symmetrically. Specifically, the SDC proxy identifies substantially more firm-years as financially flexible than the LLHC proxy. These findings indicate that the two proxies capture related

but distinct dimensions of financial flexibility. The SDC proxy identifies a wider set of flexible firm-years based on sustained unused borrowing capacity, whereas the LLHC proxy applies a stricter joint condition requiring both low leverage and high cash holdings. This strengthens the measurement-sensitivity argument by showing that proxy choice affects not only regression estimates, but also the underlying classification of firms as financially flexible or inflexible (de Jong et al. 2012; Arslan-Ayaydin et al. 2014; Yung et al. 2015).

This common-sample overlap analysis complements the same-sample LLHC robustness test reported in Appendix A Table A3, where the LLHC model is re-estimated using only the 1469 observations included in the SDC specification. Together, the classification-overlap and same-sample regression results indicate that the observed measurement sensitivity is not driven solely by differences in sample size.

5. Conclusions, Implications, and Future Research

This study examined measurement sensitivity in financial flexibility research using evidence from 106 non-financial firms listed on the JSE Limited over the period 2000–2019. The study was motivated by the lack of consensus on how financial flexibility should be operationalised in corporate finance research. Specifically, it compared two widely used proxies: spare debt capacity (SDC), which emphasises unused borrowing capacity, and the low-leverage-high-cash (LLHC) measure, which combines conservative leverage with internal liquidity reserves.

The findings show that financial flexibility, as operationalised through alternative empirical proxies, is not measurement-neutral. The SDC and LLHC proxies produce differences in coefficient signs, statistical significance, economic interpretation, and firm classification. Under the SDC specification, borrowing-capacity-related variables play a stronger role, while under the LLHC specification, liquidity-reserve characteristics such as profitability, cash-related strength, firm size, and firm age become more prominent. The common-sample classification-overlap analysis further shows that only 17.4% of firm-year observations are classified as financially flexible under both proxies, with Cohen's kappa indicating only slight agreement. This confirms that SDC and LLHC capture related but distinct dimensions of financial flexibility.

The study contributes to the corporate finance literature in three ways. First, it extends financial flexibility research to an African emerging-market context. Second, it demonstrates that conclusions about the determinants of financial flexibility depend on proxy choice. Third, it highlights the importance of proxy transparency, construct validity, and robustness testing. The findings suggest that researchers should not treat alternative financial flexibility proxies as interchangeable. Instead, proxy selection should be guided by the specific economic dimension under investigation: SDC is more appropriate for studies focused on borrowing capacity, while LLHC is more suitable for studies concerned with liquidity resilience and shock absorption.

The findings also have managerial and policy implications. Corporate managers should recognise that financial flexibility involves both conservative financing structures and effective liquidity management. Investors and analysts should interpret financial flexibility measures cautiously because different proxies may reflect different dimensions of corporate financial strength. For policymakers in emerging markets, the findings highlight the importance of financing accessibility and liquidity resilience in supporting corporate investment sustainability during periods of uncertainty.

The study has limitations that provide avenues for future research. It focuses on two proxies, one market, and the 2000–2019 period; therefore, the findings should not be interpreted as covering all possible operationalisations of financial flexibility. Although the study adds heterogeneity validation based on observable financing-access characteristics, it

does not directly observe credit applications, loan rejections, bank lending relationships, credit ratings, or bond-market access. In addition, the SDC estimation sample differs from the excluded observations in firm size, leverage, tangibility, and industry leverage, suggesting that SDC-based findings should be interpreted with this sample-selection issue in mind. Finally, although the study includes a sub-period robustness check, it does not conduct full crisis-specific time-series regressions because the crisis window is short and the study is based on firm-level panel data. Future studies could examine additional proxies, markets, institutional settings, direct measures of credit access, ownership concentration, institutional or block ownership, debt-market conditions, and the effect of measurement sensitivity on outcomes such as investment efficiency, firm performance, sustainability investment, and crisis resilience.

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Abbreviations

The following abbreviations are used in this manuscript:

JSE	Johannesburg Stock Exchange
FF	Financial flexibility
RE	Random effects
SARB	South African Reserve Bank
FE	Fixed effect

Appendix A

Table A1. Diagnostic Test Results.

Diagnostic Test	Purpose	Test Statistic/Result	<i>p</i> -Value/Threshold	Decision
Hausman specification test	Selection between fixed-effects and random-effects estimators	$\chi^2(8) = 11.62$	$p = 0.1690$	Random-effects estimator preferred
Breusch–Pagan test	Test for heteroscedasticity	$LM \chi^2(8) = 52.75$	$p < 0.001$	Heteroscedasticity detected; robust standard errors used
Durbin–Watson test	Test for first-order autocorrelation	DW = 1.15	Benchmark = 2.00	Possible positive autocorrelation; robust inference applied
Variance Inflation Factor	Test for multicollinearity	Mean VIF = 1.33; Maximum VIF = 1.54	VIF < 10	No serious multicollinearity detected
Augmented Dickey–Fuller test	Test for unit roots/stationarity	ADF statistics range from −7.83 to −12.83 across model variables	$p < 0.001$	Variables are stationary

Notes: The diagnostic tests relate to the main spare debt capacity specification. The Hausman test supports the use of the random-effects estimator. The Breusch–Pagan test indicates heteroscedasticity, justifying the use of robust standard errors. The Durbin–Watson statistic suggests possible positive autocorrelation; therefore, robust inference is retained. The VIF results are below conventional thresholds, indicating that multicollinearity is not a major concern. The ADF results reject the unit-root null, supporting the stationarity of the model variables.

Table A2. Robustness Test: SDC model excluding leverage.

Variable	Coefficient	Robust Std. Error	z-Statistic	p-Value	Interpretation
Dividend payout	−0.46345	0.33763	−1.37	0.170	Not significant
Tobin's Q	−0.05655 **	0.02220	−2.55	0.011	Significant
Profitability	0.07350	0.10015	0.73	0.463	Not significant
Cash holdings	0.21429	0.14553	1.47	0.141	Not significant
Retained earnings	−0.05725	0.04681	−1.22	0.221	Not significant using robust SE
Asset tangibility	0.06912	0.06221	1.11	0.267	Not significant
Finance cost	−5.59358 ***	1.04964	−5.33	0.000	Significant
Constant	0.68308 ***	0.06879	9.93	0.000	Significant

Model statistics: Number of observations = 1469, Number of firms = 74, $\sigma_u = 0.26387$, $\sigma_e = 0.40546$, $\rho = 0.29752$, Wald $\chi^2(7) = 41.29$, $\text{Prob} > \chi^2 = 0.0000$. The dependent variable is financial flexibility measured using the spare debt capacity proxy. Leverage is excluded from this robustness specification because actual leverage forms part of the spare debt capacity classification rule. Robust standard errors clustered at the firm level are reported. Significance levels: ** $p < 0.05$; *** $p < 0.01$. Appendix A Table A2 reports the robustness results for the SDC model after excluding leverage. This test was conducted because actual leverage forms part of the spare debt capacity classification rule. The results show that Tobin's Q remains negative and statistically significant, while finance cost also remains negative and statistically significant. These findings support the main SDC interpretation that growth opportunities and financing costs are important determinants of borrowing-capacity-based financial flexibility. However, retained earnings becomes statistically insignificant after leverage is excluded, indicating that its effect is less stable than those of Tobin's Q and finance cost. Overall, the robustness test supports the conclusion that the SDC results are not solely driven by the mechanical relationship between leverage and the SDC proxy.

Table A3. Same-Sample Robustness Test for the Low-Leverage-High-Cash Proxy.

Variable	B	S.E.	Wald	Sig.	Exp(B)	95% CI for Exp(B)
Tangibility	0.953	0.499	3.642	0.056	2.594	0.975–6.902
Retained earnings	0.600	0.178	11.340	0.001	1.823	1.285–2.586
Profitability	2.449	0.569	18.488	0.000	11.572	3.790–35.331
Firm size	−0.146	0.031	21.796	0.000	0.864	0.813–0.919
Firm age	0.008	0.003	8.553	0.003	1.008	1.003–1.013
Tobin's Q	0.333	0.103	10.387	0.001	1.395	1.139–1.708
Dividend payout	−0.120	1.398	0.007	0.931	0.887	0.057–13.736
Returns	0.372	0.151	6.097	0.014	1.451	1.080–1.950
Constant	−0.743	0.653	1.295	0.255	0.476	0.132–1.711

Model diagnostics: Omnibus $\chi^2(8) = 143.427$, $p < 0.001$; $-2 \text{ Log Likelihood} = 1568.932$; Cox & Snell $R^2 = 0.093$; Nagelkerke $R^2 = 0.135$; $N = 1469$. Notes: The dependent variable is financial flexibility measured using the low-leverage-high-cash proxy. The model is estimated using only the same 1469 firm-year observations used in the SDC specification. Exp(B) represents the odds ratio. Significance levels: $p < 0.10$, $p < 0.05$, $p < 0.01$.

Appendix A Table A3 reports the same-sample robustness test for the LLHC model using only the 1469 observations included in the SDC specification. The results show that retained earnings, profitability, firm size, firm age, Tobin's Q, and returns remain statistically significant, while tangibility is weakly significant at the 10% level. Dividend payout becomes statistically insignificant in the same-sample specification. Overall, the results indicate that several LLHC determinants remain robust when the sample is restricted to the SDC estimation sample, suggesting that the main measurement sensitivity findings are not driven solely by differences in sample size.

Table A4. Heterogeneity Validation by Financing-Access Characteristics.

Financing-Access Group	SDC Sample N	SDC Flexible N	SDC Flexible %	LLHC Sample N	LLHC Flexible N	LLHC Flexible %
High financing-access firms	736	444	60.3%	1054	431	40.9%
Low financing-access firms	733	327	44.6%	1046	227	21.7%

Notes: SDC = spare debt capacity proxy; LLHC = low-leverage-high-cash proxy. The financing-access index was constructed using firm size, asset tangibility, profitability, and finance cost. Higher firm size, higher tangibility, stronger profitability, and lower finance cost indicate stronger financing-access characteristics. Firms above the yearly median of the financing-access index were classified as high financing-access firms, while those below the yearly median were classified as low financing-access firms. The test is used as a heterogeneity validation exercise and does not directly observe credit rationing, loan rejections, credit ratings, or bank lending access.

Table A5. Sub-period Robustness: Measurement Sensitivity across Macro-shock Periods.

Period	Years	SDC Sample N	SDC Flexible %	LLHC Sample N	LLHC Flexible %	Classification Overlap %
Pre-crisis	2000–2006	509	48.3%	728	32.0%	14.7%
Crisis	2007–2009	221	55.7%	315	34.0%	18.6%
Post-crisis	2010–2019	739	54.4%	1057	30.1%	18.9%

Notes: SDC = spare debt capacity proxy; LLHC = low-leverage-high-cash proxy. The SDC sample reflects the observations available for the spare debt capacity specification, while the LLHC sample reflects the full observations available for the low-leverage-high-cash classification. Classification overlap refers to the percentage of common SDC-sample observations classified as financially flexible under both proxies. The crisis period is defined as 2007–2009.

Table A6. Comparison of Retained and Excluded Observations for the SDC Estimation Sample.

Variable	Retained SDC Sample Mean, N = 1469	Excluded Observations Mean, N = 631	Difference	Welch <i>t</i> -Test <i>p</i> -Value
Firm size	15.6889	13.5169	2.1721	0.0000
Leverage	0.2368	0.1705	0.0663	0.0000
Industry leverage	0.2342	0.1838	0.0504	0.0000
Tangibility	0.9282	0.8700	0.0582	0.0000
Profitability	0.0965	0.1142	−0.0176	0.0262
Finance cost	0.0188	0.0194	−0.0006	0.6194
Cash holdings	0.1159	0.1570	−0.0411	0.0000
Tobin's Q	1.1361	1.2568	−0.1207	0.0072

Notes: The retained SDC sample refers to the 1469 observations used in the spare debt capacity estimation. The excluded observations refer to the 631 observations from the full 2100 firm-year sample that were not retained in the SDC estimation sample. Industry leverage is used as the available industry-level characteristic because the estimation dataset contains industry leverage rather than a separate categorical industry code. Welch *t*-tests compare the retained and excluded observations.

Table A7. Industry Composition of the Sample.

Industry	Number of Firms	Percentage of Firms
Industrials	28	26.4%
Consumer services	26	24.5%
Basic materials	24	22.6%
Technology	12	11.3%
Consumer goods	11	10.4%
Telecommunications	2	1.9%
Healthcare	2	1.9%
Oil and gas	1	0.9%
Total	106	100.0%

Notes: Industry classification is based on the JSE sector classification reported in the original sample structure. The table reports the number and percentage of firms in each industry group. Financial firms were excluded because their capital structures, regulatory requirements, and balance sheet characteristics differ from those of non-financial firms. Industry-level financing conditions are also considered in the predicted leverage model through the inclusion of industry leverage.

Table A8. Robustness of SDC Classifications under Alternative Classification Rules.

SDC Classification Rule	SDC Flexible N	SDC Flexible %	Overlap with LLHC N	Overlap with LLHC %	Interpretation
One-year negative deviation	856	58.3%	277	18.9%	Relaxed SDC definition
Two consecutive years of negative deviation	771	52.5%	256	17.4%	Main persistence-based validation
Three consecutive years of negative deviation	721	49.1%	247	16.8%	Stricter persistence-based validation
Standardised residual: lowest tercile	464	31.6%	146	9.9%	Stronger unused-debt-capacity definition
Standardised residual: lowest quartile	348	23.7%	105	7.1%	Strictest SDC definition

Notes: SDC = spare debt capacity; LLHC = low-leverage-high-cash. The one-year rule classifies a firm-year as financially flexible when the deviation between actual and predicted leverage is negative. The two- and three-year rules classify firm-year observations as flexible when they form part of a negative-deviation spell lasting at least two or three consecutive years, respectively. The standardised residual rules classify observations as financially flexible when the standardised deviation falls in the lowest tercile or quartile of the SDC-sample distribution. Overlap with LLHC refers to the number and percentage of the 1469 SDC-sample observations classified as financially flexible under both the relevant SDC rule and the LLHC median-threshold proxy.

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