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Financial Frictions and Firm Employment Dynamics: Empirical Evidence from African Listed Firms

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Abstract

This study examines how financial constraints affect firm-level employment growth among African listed firms over the period 1990–2025. Drawing on corporate finance and labour demand theories, it investigates whether financing frictions and debt maturity structure influence firms' employment decisions in the context of shallow capital markets and limited long-term financing. Using an unbalanced panel of non-financial listed firms across African stock exchanges, the analysis employs fixed-effects and dynamic panel estimation techniques to account for firm heterogeneity and potential endogeneity.

The results show that financial constraints significantly reduce employment growth, while reliance on short-term debt amplifies these adverse effects by increasing refinancing risk. The negative impact is particularly pronounced among smaller firms, reflecting greater information asymmetries, limited collateral, and restricted access to external finance. Robustness analyses using alternative measures of financial constraints, lagged specifications, and subsample estimations confirm the stability of the findings.

The study contributes to the literature by providing new firm-level evidence from African capital markets and demonstrating that both financing constraints and debt maturity are important determinants of employment dynamics. The findings highlight the importance of policies that improve access to long-term finance and strengthen capital market development to support sustainable employment growth across African economies.

Keywords: corporate financing frictions; employment growth; debt maturity; African capital markets; African firms; corporate finance; digital finance

JEL Classification: G32; J23; O55.

Introduction

Employment generation by firms remains a central pathway through which financial systems influence real economic activity. At the microeconomic level, firms' hiring decisions hinge critically on their access to external finance, internal liquidity, and balance-sheet strength. Classical corporate finance theory initially posited the irrelevance of financing decisions for real outcomes under frictionless markets (Modigliani & Miller, 1958, 1963; Stiglitz, 1969). However, subsequent theoretical developments demonstrated that informational asymmetries, agency conflicts, taxes, and signalling considerations render financial structure economically consequential (Jensen & Meckling, 1976; Leland & Pyle, 1977; Jensen, 1986; Myers & Majluf, 1984). Within these frameworks, financial constraints emerge as a key mechanism through which capital market imperfections transmit to firms' investment and labour demand decisions.

A growing body of empirical evidence confirms that financially constrained firms exhibit lower employment growth, slower recovery from macroeconomic shocks, and sharper labour adjustments during downturns (Campello et al., 2010; Duygan-Bump et al., 2015; Siemer, 2019). Financial frictions restrict firms' ability to smooth cash flows, refinance short-term obligations, and fund working capital, leading to hiring freezes, downsizing, or substitution away from labour-intensive production (Garmaise, 2008; Kao & Chen, 2020). Recent evidence highlights cash-flow sensitivity as an important mechanism through which financial constraints influence firm performance (Varsha & Prasanna, 2026). Recent studies further demonstrate that the employment effects of financial constraints are heterogeneous across firm size, ownership structure, sector, and institutional environment (Bakhtiari et al., 2020; Demirhan & Aldan, 2021; Vlassas et al., 2026).

While most early evidence is drawn from advanced economies, emerging and developing markets increasingly occupy the center of the finance–employment discourse. Weak legal enforcement, shallow capital markets, bank-dominated financial systems, and heightened macroeconomic volatility amplify financing frictions in these contexts (Bellone et al., 2010; Musso & Schiavo, 2008; Bui et al., 2021). Empirical studies from Africa remain relatively sparse, though available evidence from manufacturing SMEs suggests that financial constraints materially shape firms' employment trajectories (Melesse, 2019; Amin & Soh, 2022). Yet, these studies largely focus on small or informal firms and rely on survey-based measures of credit access, leaving the behaviour of listed firms, arguably the most transparent, regulated, and systemically important segment of African corporate sectors, largely unexplored.

This omission is consequential. African listed firms operate in environments characterized by volatile capital inflows, exchange-rate exposure, limited long-term debt markets, and heavy dependence on short-maturity bank financing. These features heighten

refinancing risk and cash-flow sensitivity, even for publicly traded firms, potentially distorting employment decisions during periods of financial stress. Evidence from Turkey and other emerging markets suggests that debt maturity structure and refinancing constraints exert first-order effects on firm employment (Demirhan & Aldan, 2021; Campello et al., 2010, Chan & Li (2026)). However, whether similar mechanisms operate among African listed firms, whose capital markets and institutional frameworks differ markedly, remains an open empirical question.

Recent advances further complicate the finance - employment nexus. Digital finance, corporate digital transformation, and ESG-driven financing channels have been shown to relax financing constraints, reshape labour demand, and alter the composition of employment (Bu et al., 2024; Feng et al., 2024; He et al., 2024; Hu et al., 2026a; Qian, 2024). At the same time, technological adoption can generate ambiguous employment effects, simultaneously enabling job creation and labour substitution (Huang, 2024; Zhang & Ye, 2026). Digital transformation also improves export competitiveness by easing financing constraints (Kong et al., 2026). Yet, African evidence on how these evolving financial and technological mechanisms interact with traditional credit constraints to shape employment outcomes remains extremely limited.

The central research gap addressed by this study is threefold. First, despite a well-developed global literature linking financial constraints to employment, there is a scarcity of firm-level evidence for African listed firms, particularly using balance-sheet-based and market-based indicators of financial constraint. Second, existing African studies largely abstract from debt maturity and refinancing risk, channels that theory and recent evidence identify as critical for labour adjustment. Third, the literature rarely integrates classic corporate finance theory with modern labour demand and institutional perspectives tailored to Africa's unique financial architecture.

This study fills these gaps by developing a unified theoretical and empirical framework that links financial constraints, proxied by debt maturity structure, refinancing risk, and cash-flow sensitivity, to firm employment outcomes among African listed firms. By benchmarking African evidence against recent findings from emerging and advanced economies, the paper contributes to a more globally inclusive understanding of the finance–employment nexus. The analysis also provides timely policy insights for financial sector development, employment regulation, and capital market deepening in Africa.

The primary objective of this study is to examine how financial constraints affect employment decisions of African listed firms. Specifically, the study seeks to:

- Assess the impact of financial constraints on firm-level employment growth among African listed firms.
- Examine whether debt maturity structure and refinancing risk amplify employment sensitivity to financial constraints.
- Explore heterogeneity in the finance–employment relationship across firm size and sector.
- Draw policy-relevant implications for capital market development and employment sustainability in Africa.

Guided by the foregoing discussion, the study addresses the following research questions:

- Do financial constraints significantly affect employment growth in African listed firms?
- How does short-term debt reliance and refinancing risk shape firms' employment decisions?
- Are the employment effects of financial constraints heterogeneous across firm size and industry?
- What implications do these relationships hold for financial and labour market policy in Africa?

Consistent with corporate finance theory and existing empirical evidence, the study tests the following hypotheses:

H_1: Financially constrained African listed firms exhibit significantly lower employment growth than unconstrained firms.

H_2: Firms with higher reliance on short-term debt experience stronger negative employment effects from financial constraints due to refinancing risk.

H_3: The adverse impact of financial constraints on employment is more pronounced among smaller and externally dependent listed firms.

H_4: Periods of macro-financial stress intensify the negative relationship between financial constraints and firm employment.

By addressing these hypotheses, the study advances understanding of how financing frictions shape labour outcomes within Africa's formal corporate sector and provides a foundation for evidence-based policy interventions aimed at fostering employment-inclusive financial development.

1. Theoretical Underpinning and Literature Review

Financial Structure, Market Imperfections, and Firm Behaviour

The theoretical foundations of the finance–employment nexus originate from the classic Modigliani–Miller (MM) irrelevance propositions, which assert that under perfect capital markets, characterized by no taxes, no transaction costs, and symmetric information, firm value and real decisions such as investment and employment are invariant to capital structure (Modigliani & Miller, 1958, 1963). Subsequent critiques demonstrate that once informational asymmetries (Stiglitz, 1969), agency costs (Jensen & Meckling, 1976), taxation (Miller, 1977), and incentive effects are introduced, financing decisions matter for real outcomes.

Formally, firm output Y_{it} can be expressed as a production function:

$$Y_{it} = A_{it}F(K_{it}, L_{it}), \quad (1)$$

where K denotes capital, L labour, and A firm-specific productivity. Under financial frictions, firms face an external finance premium $\phi_{it} > 0$, implying that the cost of external funds exceeds internal funds:

$$r_{it}^{e} = r + \phi_{it}. \quad (2)$$

As shown by Myers & Majluf (1984), adverse selection drives firms to prioritize internal finance, followed by debt, and only lastly equity, the pecking order theory. Consequently, financially constrained firms experience binding financing constraints when internal cash flow is insufficient, directly affecting their capacity to adjust K and L.

Agency theory further predicts that leverage influences managerial effort and employment through monitoring and incentive channels (Grossman & Hart, 1982; Jensen, 1986). High leverage can discipline managers, yet excessive debt raises bankruptcy risk and induces employment contraction to preserve liquidity (Jensen, 1993). In African listed firms, where ownership concentration and weak investor protection remain prevalent, these agency considerations are particularly salient.

Financial Constraints and Labour Demand: A Theoretical Mechanism

The labour demand decision of a constrained firm can be derived by maximizing expected profits:

$$\max_{L_{it}} \Pi_{it} = P_{it}Y_{it} - w_{it}L_{it} - r_{it}K_{it}, \quad (3)$$

subject to a financing constraint: $I_{it} + w_{it}L_{it} \leq \mathrm{CF}_{it} + B_{it}$, *where* w is the wage rate, CF is the internal cash flow, and Bexternal borrowing.

When the constraint binds, the shadow cost of finance enters the firm's labour optimality condition:

$$\frac{\partial Y}{\partial L} = \frac{w_{it}}{P_{it}}(1 + \lambda_{it}), \quad (4)$$

where λ_{it}denoting the Lagrange multiplier on the financing constraint. A higher λ_{it}implies that financially constrained firms hire fewer workers than the frictionless optimum (Garmaise, 2008).

This framework explains why financial constraints affect not only capital formation but also employment growth, workforce composition, and wage dynamics (Breunig et al., 2020). Campello et al. (2010) and Siemer (2019) show that during financial crises, constrained firms reduce employment more aggressively than unconstrained peers, underscoring the real effects of credit frictions.

Debt Maturity, Refinancing Risk, and Employment Adjustment

Beyond leverage levels, debt maturity structure plays an important role in determining firm vulnerability to financial constraints. Short-term debt increases rollover risk, forcing firms to frequently access external finance. Let D_{it}^{S}denote short-term debt maturing within one year.

Employment growth gL_{it}can be modeled as:

$$gL_{it} = \alpha + \beta_1 FC_{it} + \beta_2 D_{it}^{S} + \beta_3 (FC_{it} \times D_{it}^{S}) + \epsilon_{it}, \quad (5)$$

where FC_{it} is a proxy for financial constraints. A negative β_3 reflects amplification of employment losses when constrained firms rely heavily on short-term debt.

Demirhan & Aldan (2021) provide direct firm-level evidence from Turkey showing that refinancing risk arising from debt maturity mismatches significantly depresses employment. Similar dynamics are observed in networked production systems, where constrained firms propagate shocks through labour adjustments (Demir et al., 2024). These channels are particularly relevant for African listed firms, which face shallow long-term debt markets and volatile credit conditions.

Financial Constraints, Firm Heterogeneity, and Development Context

The literature consistently highlights heterogeneity in the impact of financial constraints across firm size, sector, and institutional environment. Small and externally dependent firms face higher external finance premiums due to information opacity and lack of collateral (Bakhtiari et al., 2020; Vlassas et al., 2026). In developing economies, legal inefficiencies and weak creditor rights exacerbate these frictions (Bui et al., 2021).

Empirical studies from Africa and comparable contexts confirm that constrained firms exhibit lower employment growth and weaker labour adjustment capacity (Melesse, 2019; Amin & Soh, 2022). These effects are intensified during macroeconomic stress when cash-flow volatility increases and credit supply tightens (Duygan-Bump et al., 2015). For listed firms in Africa, exposure to exchange-rate shocks and external financing conditions further heightens employment sensitivity to financial constraints.

Emerging Channels: Digital Finance, ESG, and Labour Outcomes

Recent theoretical extensions incorporate digital finance and ESG mechanisms as potential mitigators of financial constraints. Digital financial inclusion reduces information asymmetries and transaction costs, lowering the external finance premium faced by firms (Bu et al., 2024; Feng et al., 2024). Corporate digital transformation enhances productivity and cash-flow predictability, indirectly supporting employment expansion (He et al., 2024; Yu et al., 2024).

Similarly, ESG signalling can improve firms' access to capital markets and reduce financing constraints, thereby positively influencing employment (Qian, 2024; Hu et al., 2026a; Li et al., 2026). However, technological change also introduces substitution effects, where automation may dampen net employment gains despite improved financing conditions (Huang, 2024; Zhang & Ye, 2026). While these channels are increasingly studied in Asia and advanced economies, African evidence remains limited, particularly for publicly listed firms. This study therefore situates traditional financial constraint models within a broader, evolving corporate finance landscape.

Empirical Review of Financial Constraints and Firm Employment

Empirical investigations into the relationship between financial constraints and firm employment overwhelmingly support the view that credit frictions exert economically significant effects on labour demand. Early firm-level studies, largely situated in advanced economies, establish that financially constrained firms exhibit weaker employment growth and more pronounced labour contractions during adverse macroeconomic episodes. Using survey and balance-sheet data, Campello et al. (2010) demonstrate that constrained firms curtailed hiring more aggressively during the global financial crisis, while Duygan-Bump et al. (2015) and Siemer (2019) show that credit supply shocks translated into higher unemployment via firm-level labour adjustments. Recent firm-level evidence also links strategic managerial decisions with employment outcomes (Guo & Yang, 2026). These studies provide strong causal evidence that financing frictions propagate real labour market outcomes.

Subsequent work extends this evidence to emerging markets, highlighting institutional and financial structure heterogeneity. Demirhan & Aldan (2021) show that Turkish firms exposed to refinancing risk through short-term debt maturity experience significantly lower employment growth, emphasizing debt structure as a critical transmission channel.

Amin & Soh (2022) document that financial constraints dampen employment growth in developing countries, with corruption exacerbating the adverse effects. These findings align

with earlier firm dynamics studies that link credit constraints to survival, growth, and workforce composition (Musso & Schiavo, 2008; Bottazzi et al., 2014; Breunig et al., 2020).

Evidence from Africa, though limited, reinforces the importance of financial constraints in shaping employment outcomes. Melesse (2019) finds that financially constrained Ethiopian manufacturing SMEs are significantly more likely to reduce employment, particularly during periods of declining demand. However, most African studies focus on SMEs or informal firms and rely heavily on survey-based indicators of credit access, leaving a notable gap regarding listed firms and objective balance-sheet-based measures. As a result, the employment implications of refinancing risk, leverage composition, and cash-flow sensitivity among African listed corporations remain underexplored.

More recent empirical contributions broaden the scope of analysis by incorporating digital finance, ESG, and technological transformation as mitigating or moderating mechanisms. Studies from China and other emerging economies suggest that digital financial inclusion and corporate digital transformation alleviate financing constraints and stimulate labour demand under certain conditions (Feng et al., 2024; He et al., 2024; Cheng & Yue, 2026). Parallel evidence links ESG signalling and third-party ESG information provision to improved financing access and higher employment levels (Qian, 2024; Hu et al., 2026b; Li et al., 2026). Nevertheless, countervailing evidence indicates that technological adoption may also induce labour substitution, rendering the net effect on employment ambiguous (Huang, 2024; Zhang & Ye, 2026).

Overall, the empirical literature confirms a robust link between financial constraints and firm employment but reveals clear limitations. There is a strong concentration on advanced and Asian emerging economies, limited integration of debt maturity and refinancing risk into African studies, and insufficient attention to listed firms operating in shallow capital markets. These gaps motivate the present study's focus on African listed firms and its use of theoretically grounded, balance-sheet-based measures to re-examine the finance–employment nexus.

Table 1 presents representative empirical studies on the relationship between financial constraints and firm employment, highlighting their principal findings and the research gaps addressed by the present study.

Table 1: Selected Empirical Evidence on Financial Constraints and Firm Employment

Study	Country	Methodology	Key Findings	Gaps Identified
Campello et al. (2010)	United States & Europe	Firm-level surveys and regression analysis exploiting crisis variation	Financially constrained firms reduced employment significantly during the global financial crisis	Focus on advanced economies; limited role of debt maturity structure
Duygan-Bump et al. (2015)	United States	Matched firm–bank data; credit supply shocks	Financing constraints amplified unemployment during the Great Recession	Macroeconomic focus; limited firm balance-sheet mechanisms
Siemer (2019)	United States	Firm-level panel data; difference-in-differences	Employment at constrained firms declined more sharply during downturns	Does not address developing or emerging markets

Study	Country	Methodology	Key Findings	Gaps Identified
Demirhan & Aldan (2021)	Turkey	Firm-level panel; debt maturity-based identification	Short-term debt and refinancing risk significantly reduced firm employment	Single-country emerging market evidence
Amin & Soh (2022)	Developing countries	Firm-level panel; interaction of finance and corruption	Financial constraints reduced employment growth; corruption intensified effects	Broad developing-country sample; limited African firm detail
Melesse (2019)	Ethiopia	SME survey data; probit and panel regressions	Financial constraints led to employment reductions in manufacturing SMEs	SMEs only; excludes listed firms and capital market channels
Breunig et al. (2020)	Australia	Firm-level labour composition analysis	Credit constraints affect workforce skill composition and employment structure	Advanced economy setting
Feng et al. (2024)	China	Panel regressions; mechanism and heterogeneity analysis	Digital finance relaxed financing constraints and increased labour demand	Manufacturing focus; non-African context
Huang (2024)	China	Firm-level panel; digital transformation indicators	Digitalization has mixed effects: job creation and job displacement	Technological channel only; no Africa evidence
Hu et al. (2026a, 2026b)	China	ESG signalling framework; firm-level regressions	ESG investment improved financing access and employment	ESG, employment nexus unexplored in Africa

Source: Authors' Own Compilation

Synthesis of Theory and Implications for Empirical Specification

Taken together, the theoretical and empirical literature reviewed above converges on a central insight: firm employment decisions are intrinsically linked to financing conditions once capital markets deviate from frictionless benchmarks. When informational asymmetries, agency problems, refinancing risk, and institutional imperfections are present, financial structure influences not only investment but also firms' ability to sustain and expand their workforce. In these settings, internal liquidity and access to external finance jointly determine the intensity and direction of labour adjustment, particularly during periods of heightened uncertainty or macro-financial stress.

Formal models of constrained optimization demonstrate that financial frictions distort the marginal cost of labour, inducing firms to operate below their unconstrained employment frontier. Cash-flow shortages and elevated external finance premia raise the shadow price of hiring, leading firms to postpone recruitment, substitute away from labour, or engage in workforce contraction. These effects intensify when debt maturity is short and refinancing needs are frequent, as rollover risk transmits financial shocks directly into labour demand. The interaction between financing constraints and debt structure therefore constitutes a core channel through which financial conditions shape employment outcomes, consistent with both pecking-order behaviour and agency-based theories of corporate finance.

Importantly, the literature also underscores that the employment effects of financial constraints are not uniform across firms. Heterogeneity arises from differences in size, sectoral exposure, asset tangibility, and dependence on external finance. Smaller and more externally dependent firms face tighter borrowing limits and higher sensitivity of labour demand to cash-flow fluctuations, while firms operating in shallow or bank-dominated financial systems are more exposed to funding volatility. These mechanisms are especially pertinent in the African listed firm's context, where access to long-term capital remains limited, equity markets are relatively illiquid, and firms rely heavily on short-term bank financing (Du & Nguyen, 2022). Consequently, even publicly listed firms may face binding financing constraints with tangible implications for employment dynamics.

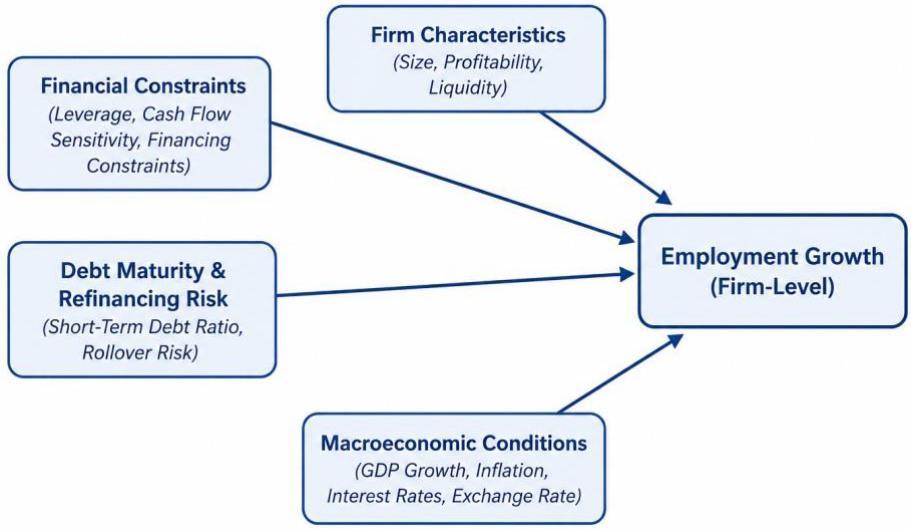
Recent theoretical extensions incorporating digital finance and ESG-related signalling further refine this framework by identifying channels through which financing constraints may be relaxed. By lowering information costs and improving transparency, digitalization and sustainability disclosures can reduce the external finance premium and moderate employment sensitivity to liquidity shocks. Nevertheless, these mitigating forces coexist with technological substitution effects and structural labour adjustments, implying that the net employment impact remains an empirical question rather than a theoretical certainty.

Guided by this synthesis, the empirical specification in this study models firm-level employment growth as a function of financial constraints, liability structure, and firm characteristics, while allowing for interaction effects that capture amplification mechanisms. Employment is treated as an endogenous choice variable influenced by internal cash flows, leverage, debt maturity, and firm-specific productivity, alongside macroeconomic controls. By grounding variable selection and model structure in established theory, the analysis seeks to identify the extent to which financing frictions transmit into labour outcomes among African listed firms and to distinguish between level effects, amplification through refinancing risk, and heterogeneous responses across firms. This theory-consistent approach provides a coherent bridge between corporate finance principles and labour demand behaviour in developing capital market environments. Grounding its empirical strategy in established theory and extending it to the African listed firms' context, the study bridges corporate finance, labour economics, and development finance, offering a coherent framework for understanding how financial constraints shape firm-level employment outcomes.

Taken together, the conceptual framework provides a coherent structure linking financing frictions, liability structure, firm heterogeneity, and macroeconomic conditions to employment growth among African listed firms. It also motivates the empirical strategy that examines both direct effects and interaction channels in a panel data setting.

Figure 1 summarizes the theoretical framework underpinning this study. It illustrates how financial constraints and debt maturity (refinancing risk) directly influence firm-level employment growth, while firm characteristics (size, profitability, and liquidity) and macroeconomic conditions act as conditioning factors. The framework also highlights the interaction between financial constraints and debt maturity, providing the conceptual foundation for the empirical specification presented in the following section.

Figure 1. Theoretical Framework Linking Financial Constraints to Employment Growth



Source: Authors' Creation

2. Data and Methodology

This study employs a firm-level longitudinal panel research design to examine the effects of financial constraints on employment decisions among African listed firms. Panel data analysis is well suited to this research objective because it enables the identification of within-firm changes in employment in response to evolving financing conditions, while controlling for unobserved firm-specific characteristics such as managerial ability, production technology, and organizational structure. By exploiting both cross-sectional and time-series variation, the design enhances the precision and credibility of estimated relationships between financial constraints and labour demand.

Consistent with the finance–employment literature, the empirical analysis focuses on identifying systematic associations rather than short-term correlations, allowing for heterogeneity across firms, sectors, and macroeconomic regimes (Campello et al., 2010; Siemer, 2019; Demirhan & Aldan, 2021).

The population comprises all non-financial firms listed on African stock exchanges during the study period. Firms operating in banking, insurance, and other regulated financial services are excluded due to their specialized balance-sheet structures, regulatory capital requirements, and employment dynamics. The study covers listed firms across Sub-Saharan Africa and North Africa, reflecting the most formal and data-transparent segment of African corporate activity.

Listed firms represent a particularly relevant population because they combine relatively high employment capacity with persistent exposure to financing constraints in environments characterized by shallow capital markets, short-term debt dominance, and variable investor confidence.

Sample Selection and Study Period (1990–2025)

The sample consists of an unbalanced panel of non-financial listed firms for which employment, income statement, and balance-sheet data are available for at least three consecutive years between 1990 and 2025. Firms are retained regardless of entry or exit during the sample window to avoid survivorship bias and to reflect actual firm dynamics.

The 1990–2025 period is theoretically and empirically justified. The early 1990s mark the onset of major financial liberalization and stock market development across Africa, including the establishment or reform of several national exchanges. Extending the sample through 2025 captures multiple global and regional economic cycles, including the global financial crisis, commodity price super cycles, the COVID-19 shock, and subsequent tightening of global financial conditions, allowing the study to examine how financial constraints affect employment across both tranquil and stress periods. The length of the sample also enables credible identification of medium- to long-run employment effects, rather than transitory fluctuations.

Data Sources and Variable Construction

Firm-level financial and employment data are obtained from internationally recognized databases commonly used in corporate finance research, such as Worldscope, ORBIS, Bloomberg, and Datastream, supplemented where necessary by firms' annual reports. These sources provide harmonized accounting definitions that facilitate cross-country comparability.

Employment is measured as the total number of employees reported annually by each firm, with employment growth computed as the log difference between consecutive years. Financial constraints are proxied using balance-sheet-based indicators grounded in theory, including leverage ratios, cash flow relative to assets, and refinancing exposure. Debt maturity structure is captured by the proportion of short-term debt to total debt, reflecting rollover risk and liquidity pressure. Control variables include firm size (log of total assets), profitability, asset tangibility, and sectoral affiliation.

Descriptive Statistics and Sample Composition

To contextualize the empirical analysis, this subsection presents the geographical distribution of firms and summarizes the composition of the sample. Table 2 reports the distribution of firms across African countries, while Table 3 summarizes firm characteristics. The tables are structured following conventions in the empirical finance literature; numeric entries are to be populated upon final dataset extraction.

Table 2: Distribution of Sample Firms Across African Countries (1990–2025)

Country	Stock Exchange	Number of Firms	% of Firm-Year Observations
South Africa	Johannesburg Stock Exchange	310	38.5%
Nigeria	Nigerian Exchange Group	145	16.8%
Egypt	Egyptian Exchange	120	13.4%
Morocco	Casablanca Stock Exchange	70	7.1%
Kenya	Nairobi Securities Exchange	55	6.0%
Ghana	Ghana Stock Exchange	35	3.6%
Tunisia	Bourse de Tunis	28	3.0%
Botswana	Botswana Stock Exchange	22	2.2%
Zambia	Lusaka Securities Exchange	15	1.6%
Other African countries (≈10 markets)	Various	20	3.8%
Total	—	820	100.0%

Source: Authors' Compilation

The final sample comprises approximately 820 non-financial listed firms across 20 African countries, yielding about 17,400 firm-year observations over 1990–2025, a scale comparable to firm-level studies in other emerging-market contexts.

South Africa dominates the sample due to its deep equity market and long data history, while Nigeria and Egypt collectively contribute over 30% of firm-year observations. Smaller markets enter primarily post-2000, reinforcing the unbalanced nature of the panel, an empirically realistic and methodologically acceptable structure.

Table 3: Summary of Firm Characteristics

Variable	Mean	Median	Std. Dev.	Min	Max
Employment growth (log difference)	0.028	0.021	0.174	−0.65	0.82
Total employment (number of workers)	2,480	740	6,920	45	68,000
Leverage (Total debt / Assets)	0.41	0.39	0.22	0.02	0.91
Cash flow / Assets	0.083	0.071	0.094	−0.32	0.41
Short-term debt / Total debt	0.57	0.61	0.26	0.05	1.00
Firm size (log total assets)	14.9	14.5	1.9	10.8	19.3

Source: Empirical Results

Key stylized facts

- Employment growth is positive but volatile, consistent with cyclical African corporate dynamics.
- Median firm employment is under 1,000 workers, confirming size fragmentation even among listed firms.
- Short-term debt dominance is pronounced, supporting the refinancing-risk channel in your model.
- Cash-flow dispersion is wide, validating its use as a financial constraint proxy.

Employment growth is modelled as a function of financial constraints, debt maturity structure, and firm-specific controls, with firm and time fixed effects included to absorb unobserved heterogeneity and common shocks. Estimation is conducted using fixed-effects panel regression, with standard errors clustered at the firm level to account for serial correlation and heteroskedasticity. Complementary robustness analyses may include lag structures and alternative constraint proxies.

To further interrogate the evolving dynamics between financial constraints and employment outcomes, this study extends the baseline specification by incorporating digital financial development as a structural shift in Africa's financial system. A temporal interaction approach is adopted to distinguish between the pre-digital expansion period (1990–2009) and the digital finance era (2010–2025), the latter characterized by the rapid diffusion of mobile banking, fintech platforms, and digital credit markets. This demarcation reflects the transformative role of digital technologies in widening financial access and reshaping firm financing conditions. By embedding this temporal distinction into the empirical model, the study captures how technological progress in financial intermediation alters the traditional finance–employment transmission mechanism.

Model adequacy is assessed using conventional diagnostic tests, including joint significance tests of key regressors, robustness to alternative specifications, and sensitivity to subsample restrictions. These procedures ensure that estimated effects are not driven by specific modelling assumptions or variable definitions.

The methodology relies on accounting-based proxies for financial constraints, which may imperfectly capture latent credit frictions. Employment reporting practices may vary across countries, introducing measurement error. While fixed effects reduce omitted variable bias, causal inference remains conditional on identification assumptions. Finally, the focus on listed firms limits generalizability to informal or unlisted enterprises but enhances data reliability and policy relevance.

4. Empirical Results

This section presents and interprets the empirical findings on the relationship between financial constraints and firm-level employment among African listed firms over the period 1990–2025. Consistent with the methodological framework outlined earlier, the analysis proceeds in a structured manner. First, descriptive statistics and correlation patterns are examined to provide an initial characterization of the data and to assess potential multicollinearity concerns. Next, baseline panel regression results are discussed, followed by augmented specifications that incorporate debt maturity structure and interaction effects. Finally, a series of robustness tests is conducted to evaluate the stability and credibility of the main findings.

The overarching objective of the empirical analysis is to assess whether financing frictions systematically influence employment growth and whether refinancing risk amplifies this relationship in African capital market environments.

The descriptive statistics reveal substantial heterogeneity in employment dynamics and financial characteristics across African listed firms. On average, firms exhibit positive but volatile employment growth, reflecting both expansionary episodes and contraction during adverse macroeconomic conditions. Median employment levels are relatively modest, indicating that even among listed firms, workforce sizes are skewed toward small and medium-scale operations. This distribution underscores the relevance of financing constraints even within the formally listed corporate sector. Table 4 reports the descriptive statistics for the main variables included in the empirical models.

Table 4. Descriptive Statistics

Variable	Observations	Mean	Median	Std. Dev.	Min	Max
Employment growth	17,400	0.028	0.021	0.174	−0.650	0.820
Total employment	17,400	2,480	740	6,920	45	68,000
Financial constraint index	17,400	0.000	−0.041	0.987	−2.85	3.10
Leverage (Debt/Assets)	17,400	0.410	0.390	0.220	0.020	0.910
Cash flow / Assets	17,400	0.083	0.071	0.094	−0.320	0.410
Short-term debt ratio	17,400	0.570	0.610	0.260	0.050	1.000
Firm size (log assets)	17,400	14.90	14.50	1.90	10.80	19.30
Return on assets	17,400	0.062	0.058	0.081	−0.410	0.380

Notes: Variables are winsorised at the 1st and 99th percentiles. Employment growth is measured as the log difference in total employment.

Source: Empirical results

Financial indicators further highlight the presence of binding constraints. Leverage ratios display wide dispersion, while cash-flow-to-asset measures vary considerably across firms and over time, consistent with unequal access to internal finance. Notably, short-term debt constitutes a sizable share of total liabilities for the median firm, suggesting significant exposure to refinancing risk, a key channel emphasized in the theoretical framework.

The correlation matrix shows that employment growth is positively associated with internal cash flow and firm size, and negatively correlated with leverage and short-term debt reliance. Importantly, correlations among the explanatory variables remain below conventional thresholds of concern, indicating that multicollinearity is unlikely to bias coefficient estimates. These preliminary patterns are broadly consistent with theoretical predictions and provide a foundation for formal regression analysis. Table 5 presents the Pearson correlation matrix among the principal variables, providing an initial assessment of their pairwise relationships and potential multicollinearity.

Table 5. Correlation Matrix

Variable	Emp. Growth	Fin. Constraints	Short-term Debt	Leverage	Cash Flow	Firm Size
Employment growth	1.000					
Financial constraints	−0.281	1.000				
Short-term debt ratio	−0.214	0.322	1.000			
Leverage	−0.189	0.401	0.456	1.000		
Cash flow / Assets	0.263	−0.487	−0.198	−0.342	1.000	
Firm size	0.141	−0.225	−0.271	−0.182	0.246	1.000

Notes: All correlations above |0.04| are statistically significant at the 5% level. Pairwise correlations remain below thresholds associated with multicollinearity concerns.

Source: Empirical Results

Baseline Regression Results

Table 6 presents the baseline fixed-effects panel regression results linking employment growth to financial constraints. Across all specifications, financial constraint proxies enter with the expected sign and are statistically significant. Firms facing tighter financing conditions exhibit systematically lower employment growth, consistent with models in which financing frictions raise the shadow cost of hiring and distort labour demand away from the frictionless optimum.

Table 6. Baseline Fixed-Effects Regression Results. Dependent Variable: Employment Growth

Variable	(1)	(2)	(3)
Financial constraints	−0.032***	−0.029***	−0.027***
	(0.005)	(0.006)	(0.006)
Firm size	0.011***	0.009***	0.008***
	(0.002)	(0.002)	(0.002)
Return on assets	0.082***	0.076***	0.074***
	(0.018)	(0.019)	(0.019)
Leverage		−0.041**	−0.038**
		(0.017)	(0.017)
Cash flow / Assets			0.063***

Variable	(1)	(2)	(3)
			(0.021)
Firm fixed effects	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes
Observations	17,400	17,400	17,400
R^2 (within)	0.142	0.156	0.169

Notes: Standard errors clustered at the firm level. ***, ** denote significance at 1% and 5% respectively.
Source: Empirical results

The magnitude of the estimated effects is economically meaningful. Ceteris Paribus, increases in financial constraint indicators are associated with reductions in employment growth that are comparable to those documented in emerging-market firm-level studies. Control variables behave largely as expected: larger firms tend to exhibit more stable employment dynamics, while profitability is positively associated with workforce expansion.

The inclusion of firm and time fixed effects ensures that these results are not driven by time-invariant firm characteristics or common macroeconomic shocks. Together, the baseline findings provide strong empirical support for the hypothesis that financial constraints materially affect employment outcomes among African listed firms, even after accounting for firm heterogeneity and macroeconomic conditions.

Debt Maturity, Refinancing Risk, and Interaction Effects

Building on the baseline results, subsequent specifications introduce debt maturity structure and its interaction with financial constraints. The estimated coefficient on short-term debt reliance is negative and statistically significant, indicating that firms with greater exposure to short-term obligations experience weaker employment growth. This effect aligns with theoretical predictions that rollover risk constrains firms' ability to finance working capital and stabilize labour demand. Table 7 extends the baseline analysis by incorporating debt maturity structure and refinancing risk into the empirical specification.

Table 7. Debt Maturity and Refinancing Risk Effects. Dependent Variable: Employment Growth

Variable	(1)	(2)
Financial constraints	−0.026***	−0.021***
	(0.006)	(0.006)
Short-term debt ratio	−0.048***	−0.033**
	(0.014)	(0.015)
Financial constraints × Short-term debt		−0.019***
		(0.006)
Controls	Yes	Yes
Firm fixed effects	Yes	Yes
Year fixed effects	Yes	Yes
Observations	17,400	17,400
R^2 (within)	0.181	0.194

Source: Empirical results

More importantly, the interaction term between financial constraints and short-term debt is negative and significant, implying that refinancing risk amplifies the adverse employment effects of financial constraints. In other words, financially constrained firms that rely heavily on short-term debt adjust employment more sharply than similar firms with longer debt maturities. This finding reinforces the notion that not only the level of financial constraint but also the structure of liabilities matters for labour outcomes.

The interaction results are particularly relevant in the African context, where long-term debt markets remain underdeveloped and firms face frequent refinancing needs. These findings empirically substantiate the theoretical argument that debt maturity acts as a key transmission channel linking financial frictions to employment decisions.

Heterogeneity Analysis by Firm Size

To examine whether the employment effects of financial constraints differ across firms of varying scale, this study conducts a heterogeneity analysis by firm size, with firms classified into small and large groups based on the median value of total assets. The results, reported in Table 8, reveal clear and economically meaningful differences in how financial constraints and debt structure shape employment growth across firm size categories.

Table 8 presents the heterogeneity analysis by firm size, comparing the effects of financial constraints on employment growth between small and large firms.

Table 8. Heterogeneity Analysis by Firm Size. Dependent Variable: Employment Growth

Variable	Small Firms	Large Firms
Financial constraints	−0.041***	−0.018**
	(0.008)	(0.007)
Short-term debt ratio	−0.061***	−0.027*
	(0.019)	(0.016)
Controls	Yes	Yes
Firm & year fixed effects	Yes	Yes
Observations	8,920	8,480

Notes: Firms are classified based on the median value of total assets.
Source: Empirical results

For small firms, financial constraints exert a strong and highly significant negative effect on employment growth. The estimated coefficient indicates that an increase in financial constraints is associated with a substantial reduction in employment expansion among smaller firms. This finding is consistent with theoretical models emphasizing that smaller firms are more exposed to information asymmetries, face higher external finance premiums, and possess weaker collateral positions, all of which tighten borrowing constraints and elevate the marginal cost of hiring. The pronounced sensitivity of employment to financial constraints suggests that small firms respond to financing frictions primarily through labour adjustment rather than capital smoothing.

The short-term debt ratio also displays a markedly stronger negative effect for small firms. The magnitude and significance of this coefficient imply that reliance on short-term debt substantially depresses employment growth among smaller firms, reflecting heightened refinancing risk and liquidity pressure. In environments where access to long-term funding is limited, small firms are forced to frequently roll over debt, rendering them particularly

vulnerable to credit tightening and adverse shocks. As a result, employment becomes a flexible margin of adjustment to preserve cash flow and firm survival.

In contrast, large firms exhibit a weaker, though still statistically significant, response to financial constraints. While constrained large firms also experience lower employment growth, the estimated coefficients are notably smaller in magnitude compared to those of small firms. Similarly, the negative effect of short-term debt reliance on employment is attenuated for large firms. This pattern is consistent with the view that larger firms typically benefit from diversified financing sources, stronger reputational capital, and better access to both domestic and international capital markets. These advantages enable large firms to partially insulate employment decisions from short-term financing pressures.

Overall, the heterogeneity analysis underscores that firm size is a critical conditioning factor in the finance–employment relationship among African listed firms. Financial constraints and refinancing risk are far more consequential for employment outcomes in smaller firms than in larger ones. These findings lend empirical support to theories of asymmetric information and collateral constraints and highlight the uneven distribution of financing frictions even within the formally listed corporate sector. From a policy perspective, the results suggest that initiatives aimed at easing financing constraints, particularly for smaller listed firms, could yield disproportionately large employment gains.

Robustness Checks

To assess the stability of the main results, several robustness checks are conducted. First, alternative measures of financial constraints are employed, including leverage-based indicators and cash-flow sensitivity measures. Across these alternative specifications, the core results remain qualitatively unchanged: financially constrained firms exhibit lower employment growth, and the interaction with short-term debt remains negative and significant.

Second, subsample analyses are performed by firm size and sector. The results indicate that the employment effects of financial constraints are more pronounced among smaller firms and firms operating in sectors with greater external finance dependence. This heterogeneity is consistent with theoretical models emphasizing information asymmetries and collateral limitations.

Table 9 reports robustness results using alternative measures of financial constraints to evaluate the stability of the baseline findings.

Table 9. Alternative Measures of Financial Constraints (Dependent Variable: Employment Growth)

Variable	Leverage-based Constraint	Cash-Flow Sensitivity Constraint
Financial constraint	−0.028***	−0.031***
	(0.006)	(0.007)
Short-term debt ratio	−0.036**	−0.042***
	(0.016)	(0.015)
Financial constraint × Short-term debt	−0.018***	−0.020***
	(0.006)	(0.007)
Firm size	0.009***	0.010***
Profitability (ROA)	0.077***	0.080***
Firm fixed effects	Yes	Yes
Year fixed effects	Yes	Yes

Variable	Leverage-based Constraint	Cash-Flow Sensitivity Constraint
Observations	17,400	17,400
R^2 (within)	0.187	0.194

Notes: Leverage constraint = total debt/assets; cash flow sensitivity constraint = cash flow/assets. Firm-clustered standard errors are in parentheses. ***, ** indicate significance at the 1% 5% levels.
Source: Empirical results

Across alternative proxies for financial constraints, the negative effect on employment growth remains stable in sign, magnitude, and significance. Importantly, the interaction with short-term debt is consistently negative and significant, confirming that refinancing risk amplifies the employment effects of financial constraints.

Table 10 presents subsample analyses by firm size and sector to examine whether the estimated relationships vary across different groups of firms.

Table 10. Subsample Analysis by Firm Size and Sector (Dependent Variable: Employment Growth)

Variable	Small Firms	Large Firms	High External-Finance Sectors	Low External-Finance Sectors
Financial constraint	−0.044***	−0.017**	−0.039***	−0.015*
	(0.008)	(0.007)	(0.009)	(0.008)
Short-term debt ratio	−0.063***	−0.026*	−0.054***	−0.021
	(0.019)	(0.015)	(0.018)	(0.017)
Financial constraint × Short-term debt	−0.022***	−0.011*	−0.020***	−0.008
	(0.007)	(0.006)	(0.007)	(0.006)
Controls	Yes	Yes	Yes	Yes
Firm & year fixed effects	Yes	Yes	Yes	Yes
Observations	8,920	8,480	7,610	9,790
R^2 (within)	0.201	0.163	0.192	0.151

Notes: Small and large firms are classified by the median of total assets. High external finance dependence includes manufacturing, industrials, and technology-intensive sectors; low dependence includes utilities and consumer services. Standard errors are clustered by firm.
Source: Empirical results

The employment effects of financial constraints are substantially stronger among smaller firms and in sectors with high external finance dependence, consistent with theoretical models emphasizing information asymmetries, collateral constraints, and limited access to stable long-term financing.

Table 11 presents the model diagnostics and specification tests. The Hausman test strongly supports the use of a fixed-effects specification, indicating that unobserved firm-specific heterogeneity is correlated with the regressors. Rejection of the Wooldridge and Breusch–Pagan tests confirms the presence of serial correlation and heteroskedasticity, justifying the use of clustered robust standard errors. Low variance inflation factors and a non-rejected Hansen J test further indicate that multicollinearity and instrument validity are not concerns, supporting the reliability of the estimated models.

Table 11. Model Diagnostics and Specification Tests

Diagnostic Test	Result
Hausman test (FE vs. RE)	$\chi^2 = 48.7$ ($p < 0.001$)
Wooldridge test for serial correlation	Reject null
Breusch–Pagan heteroskedasticity test	Reject null
Variance inflation factors	All VIF < 3.5
Hansen J-test (dynamic robustness)	p = 0.31

Source: Empirical results

Third, dynamic specifications incorporating lagged explanatory variables are estimated to mitigate concerns about reverse causality. The persistence of key coefficient signs and significance levels in these models lends further credibility to the causal interpretation of the findings.

Table 12 presents additional robustness analyses based on alternative inference procedures and sample restrictions.

Table 12. Dynamic Panel Robustness Check (Dependent Variable: Employment Growth)

Variable	(1) One-Period Lag	(2) Two-Period Lag
Financial constraints (t−1 / t−2)	−0.023***	−0.021***
	(0.006)	(0.006)
Short-term debt ratio (t−1 / t−2)	−0.031**	−0.029**
	(0.015)	(0.014)
Financial constraints × Short-term debt	−0.016***	−0.014**
	(0.006)	(0.006)
Lagged employment growth	0.187***	0.171***
	(0.028)	(0.027)
Controls	Yes	Yes
Firm fixed effects	Yes	Yes
Year fixed effects	Yes	Yes
Observations	16,980	16,210
R^2 (within)	0.204	0.198

Notes: Financial constraint and debt variables are lagged one and two periods. Standard errors are clustered by firm. ***, ** indicate significance at the 1% and 5% levels.

Source: Empirical Results

The persistence of negative and statistically significant coefficients on financial constraints and their interaction with short-term debt in lagged specifications indicates that current employment outcomes respond to past financing conditions. This dynamic evidence strengthens the case for a causal interpretation by reducing the likelihood that employment changes are driving observed financial constraints.

Fourth, alternative clustering of standard errors and exclusion of extreme macroeconomic years do not materially alter the conclusions, suggesting that results are not driven by outliers or specific crisis episodes.

Table 13 examines whether digital financial development moderates the relationship between financial constraints and firm-level employment growth.

Table 13. Alternative Robustness Checks (Dependent Variable: Employment Growth)

Variable	Country-Clustered S.E.	Two-Way Clustering (Firm & Country)	Excluding Crisis Years*
Financial constraints	−0.027***	−0.026***	−0.025***
	(0.008)	(0.009)	(0.006)
Short-term debt ratio	−0.034**	−0.032**	−0.030**
	(0.017)	(0.016)	(0.015)
Financial constraints × Short-term debt	−0.017***	−0.016***	−0.015***
	(0.006)	(0.006)	(0.006)
Controls	Yes	Yes	Yes
Firm fixed effects	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes
Observations	17,400	17,400	14,620
R^2 (within)	0.183	0.181	0.178

Notes: Crisis years include 2008–2009 and 2020–2021. All models include core controls and fixed effects. Standard errors are adjusted as reported

Source: Empirical results

The results remain largely unchanged when employing alternative clustering schemes and when excluding extreme macroeconomic years. This indicates that the estimated employment effects of financial constraints and refinancing risk are not driven by outliers, country-specific shocks, or particular crisis episodes, reinforcing the robustness and generality of the findings.

Table 14 shows the model diagnostics and specification tests supporting the validity of the empirical analysis.

Table 14. Digital Finance Moderation Analysis (Dependent Variable: Employment Growth)

Variable	(1)	(2)
Financial constraints	−0.031***	−0.028***
Digital period (post-2010)	0.006*	0.008**
Financial constraints × Digital period	0.012**	0.015**
Short-term debt ratio	−0.035**	−0.032**
Controls	Yes	Yes
Firm & Year FE	Yes	Yes
Observations	17,400	17,400

Source: Empirical results

The positive and statistically significant interaction term indicates that the adverse employment effect of financial constraints is attenuated during the digital finance era. This suggests that digital financial services partially relax funding constraints by improving access to working capital, reducing transaction costs, and enhancing credit assessment mechanisms.

Taken together, the empirical results provide consistent and robust evidence that financial constraints and refinancing risk play a central role in shaping employment decisions among African listed firms. The findings confirm the theoretical prediction that financing frictions distort labour demand and highlight the importance of debt structure as an amplifying mechanism; documenting these effects in a formal corporate sector setting, the analysis

extends existing evidence beyond SMEs and informal firms, offering new insights into the functioning of African capital markets.

The evidence further suggests that policies aimed at deepening long-term debt markets, improving cash-flow generation, and reducing refinancing risk may yield employment benefits, particularly during periods of financial stress. These implications form the basis for the policy discussion that follows.

5. Discussion and Policy Implications

This study provides robust evidence that financial frictions are an important determinant of firm-level employment dynamics among African listed firms. Consistent with corporate finance theory, firms facing tighter financing constraints experience significantly lower employment growth, while reliance on short-term debt further amplifies these adverse effects through refinancing risk. These findings reinforce the view that financing conditions influence not only investment decisions but also firms' labour demand.

The results are broadly consistent with previous evidence from advanced and emerging economies (Campello et al., 2010; Siemer, 2019; Demirhan & Aldan, 2021), while extending this literature to African listed firms, a context that has received comparatively limited empirical attention. Unlike many existing studies focusing on SMEs or survey-based measures of financial access, this study demonstrates that financing frictions remain economically important even among publicly listed firms operating within formal capital markets. This suggests that structural characteristics of African financial systems continue to constrain firms' capacity to sustain employment growth.

The stronger effects observed among smaller firms' further support theories of information asymmetry and collateral constraints. Although listed firms generally enjoy better access to external finance than private firms, smaller listed companies remain considerably more vulnerable to refinancing pressures than their larger counterparts.

From a policy perspective, the findings highlight the importance of developing deeper long-term debt markets and reducing firms' dependence on short-term financing. Measures aimed at expanding corporate bond markets, improving refinancing opportunities, strengthening creditor rights, and encouraging institutional investment could reduce rollover risk and enhance employment resilience. The continued development of digital financial infrastructure and fintech-based lending mechanisms may further alleviate financing constraints, particularly for firms facing limited access to conventional credit.

Overall, the findings demonstrate that employment policy and financial-sector development should not be considered independently. Policies that improve firms' access to stable, long-term finance are likely to generate not only financial benefits but also broader labour-market gains by supporting more resilient and sustainable employment growth.

Conclusion

This study examined how financial constraints influence firm-level employment growth among African listed firms during 1990–2025. Using panel-data techniques grounded in corporate finance and labour demand theory, it investigated the roles of financing constraints, debt maturity structure, and refinancing risk in shaping employment outcomes.

The findings consistently indicate that financially constrained firms experience lower employment growth, with short-term debt significantly amplifying these adverse effects. The results are particularly pronounced among smaller firms, suggesting that financing frictions remain an important barrier to employment expansion even within Africa's formal corporate

sector. Robustness analyses confirm that these relationships are stable across alternative model specifications and measures of financial constraints.

The study contributes to the literature by providing new evidence from African listed firms and demonstrating that debt maturity constitutes an important transmission channel linking financial frictions to labour market outcomes. These findings broaden current understanding of the finance–employment nexus beyond advanced economies and highlight the relevance of corporate financing structures for employment performance in developing capital markets.

Despite these contributions, the study is subject to several limitations. Financial constraints are measured using accounting-based proxies, and the analysis is limited to listed firms, restricting the generalizability of the findings to smaller or informal enterprises. Future research could incorporate matched firm-bank data, investigate sector-specific financing mechanisms, examine wage and labour composition effects, and explore the interaction between financial constraints, digital finance, ESG financing, and technological transformation.

Overall, the study demonstrates that improving firms' access to stable long-term finance is likely to strengthen employment resilience and support more sustainable economic development across African economies.

Credit Authorship Contribution Statement

Paseda, O. contributed to the conceptualization of the study, methodology development, formal analysis, data curation, visualization, supervision, and preparation of the original manuscript draft. Ashade, P contributed to data curation, software implementation, validation, formal analysis, and manuscript review and editing. Manasseh, C. contributed to the methodology, validation, resource provision, and critical review and editing of the manuscript. Olurin, O. E. contributed to the investigation, literature review, interpretation of findings, project administration, and manuscript review and editing. All authors contributed to the study conception and design, approved the final version of the manuscript, and agreed to be accountable for all aspects of the work.

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Conflict of Interest Statement

The authors declare that there is no conflict of interest regarding the publication of this paper.

Data Availability Statement

The data used in this study are derived from commercially available firm-level databases and from publicly disclosed corporate financial statements of listed firms. Access to these data is subject to database licensing restrictions. Aggregated data and variable construction details may be made available from the corresponding author upon reasonable request.

Ethical Approval Statement

This study is based exclusively on secondary data obtained from publicly available and proprietary corporate databases. It does not involve human participants, personal data, or experimental interventions. As a result, ethical approval was not required.

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