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Credit Rationing as a Mediator Between Financial Behaviour and Enterprise Growth in Uganda

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ABSTRACT: This paper investigates whether credit rationing mediates the relationship between financial behaviour and enterprise growth in Uganda, using firm-level data from the World Bank Enterprise Survey (WBES) Uganda 2025 (N = 548 firms with identifiable credit rationing status). Financial behaviour is measured by the Financial Behaviour Index (FBI), a composite constructed via Principal Component Analysis (PCA) from 18 indicator variables spanning four dimensions; saving behaviour, borrowing behaviour, credit management, and financing strategy, normalised to a [0, 1] interval and dichotomised at the median following the same methodology as the companion paper. Credit rationing is operationalised as a composite binary indicator combining three channels: direct loan rejection or partial approval (quantity rationing, WBES code k20a1), demand-side self-rationing due to prohibitive interest rates, collateral requirements, procedural complexity, or anticipated rejection (discouraged borrowing, k17), and reporting finance as a major obstacle alongside absence of credit access (implicit rationing, k30). Enterprise financial growth is measured by annual sales growth (percentage change), employment growth (log change in permanent workers), and labour productivity growth (log change in real sales per worker). A Generalised Structural Equation Model (GSEM) with mixed response probit for the binary credit rationing mediator and linear regression for continuous growth outcomes, is estimated to simultaneously identify the direct effect of financial behaviour on growth, the indirect effect operating through credit rationing, and the total effect. Bias-corrected bootstrap confidence intervals (2,000 replications) are used for inference on the mediated (indirect) effect. Results indicate that the FBI significantly reduces credit rationing probability ($\hat{\alpha} = -0.412$, $p < 0.01$) and significantly increases enterprise financial growth ($\hat{\beta}_1 = 0.156$, $p < 0.01$). The indirect effect through credit rationing is statistically significant (point estimate = 0.041, 95% bootstrap CI [0.014, 0.076]), accounting for approximately 20.8% of the total FBI–growth effect. The mediation channel is strongest among small firms (proportion mediated = 27.4%) and in non-Kampala regions (25.8%), and weakest among large firms (12.1%). Robustness analyses using alternative growth measures, alternative rationing definitions, sub-sample estimation, and linear SEM yield qualitatively identical conclusions. These findings establish credit rationing as a quantitatively important transmission mechanism linking enterprise financial management practices to growth outcomes, with implications for both firm-level financial capability interventions and macro-level credit market reform in Uganda.

KEYWORDS: Financial behavior, Credit rationing; Mediation analysis, Generalised Structural Equation Modelling, Enterprise growth, WBES Uganda 2025, Bootstrap inference
JEL Classification: G21, G32, L25, L26, O16, C34

1. INTRODUCTION

The relationship between enterprise financial management practices and firm growth has attracted sustained scholarly attention in both the corporate finance and development economics literatures. A growing body of evidence demonstrates that financial behaviour encompassing saving, borrowing, credit management, and financing strategy decisions is a significant determinant of enterprise performance in developing economies (Beck et al., 2005; Ayyagari et al., 2010). Concurrently, the credit rationing literature has established that exclusion from formal credit markets

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through loan rejection, self-rationing due to prohibitive terms, or collateral constraints, imposes substantial growth penalties on affected enterprises (Stiglitz & Weiss, 1981; Kon & Storey, 2003). However, despite the intuitive connection between these two literatures, remarkably little empirical work has examined whether credit rationing serves as a transmission channel through which financial behaviour affects enterprise growth. This paper addresses that gap directly.

The theoretical motivation for a mediation pathway is straightforward. Firms that exhibit improved financial behaviour maintaining adequate internal reserves, diversifying financing sources, managing trade credit effectively, and building formal banking relationships—reduce the information asymmetries and collateral deficits that generate credit rationing in equilibrium (Stiglitz & Weiss, 1981; Bester, 1985). Improved financial behaviour therefore operates through at least two channels: a direct channel, whereby better financial management enhances internal resource allocation and investment efficiency regardless of credit market outcomes, and an indirect channel, whereby improved financial practices reduce the probability of credit rationing, thereby unlocking access to external finance that further supports growth. Quantifying the relative importance of these two channels is essential for policy design. If the direct channel dominates, financial literacy and management capacity programmes are the efficient policy response; if the indirect (credit rationing) channel is quantitatively important, complementary credit market reforms are required to maximise the growth dividends from improved financial behaviour.

This paper uses firm-level data from the World Bank Enterprise Survey (WBES) Uganda 2025 to estimate a mediation model in which financial behaviour affects enterprise financial growth both directly and indirectly through credit rationing. Financial behaviour is measured by the Financial Behaviour Index (FBI), a composite constructed via Principal Component Analysis (PCA) from 18 indicator variables spanning four dimensions: saving behaviour (internal financing of working capital and investment, fixed asset purchase), borrowing behaviour (bank finance, non-bank finance, supplier credit, other sources, loan/credit line ownership, loan application, loan approval), credit management (supplier credit usage, payment days to suppliers, payment days from customers), and financing strategy (bank investment finance, other external investment finance, diversification index, internal dependence ratio, formal finance share). The FBI is normalised to a [0, 1] interval via min–max scaling and dichotomised at the median using Stata's xtile command with nq (2), consistent with the methodology employed in the companion study (Paper 1). Credit rationing is operationalised as a composite binary indicator combining three channels quantity rationing (loan rejection or partial approval, WBES code k20a1), demand-side self-rationing (discouraged borrowing due to interest rates, collateral, procedures, or anticipated rejection, k17), and implicit rationing (finance as major obstacle without credit access, k30) replicating the exact measurement used in the companion study (Paper 2). Enterprise financial growth is captured by three complementary measures: annual sales growth (percentage change), employment growth (log change in permanent full-time workers), and labour productivity growth (log change in real sales per worker).

The econometric framework employs Generalised Structural Equation Modelling (GSEM) with mixed response, which accommodates the binary nature of the credit rationing mediator (estimated via probit) alongside the continuous growth outcome (estimated via linear regression) within a unified simultaneous system. GSEM is preferred over sequential estimation (e.g., separate probit and OLS regressions) because it produces consistent and asymptotically efficient estimates of the structural parameters under correct specification, accounts for the cross-equation error correlation between the rationing and growth equations, and enables direct computation of indirect effects using the product-of-coefficients decomposition. Bias-corrected bootstrap confidence intervals with 2,000 replications provide inference for the indirect effect, which has a non-standard sampling distribution under the null of no mediation (MacKinnon, Lockwood, Hoffman, West & Sheets, 2002). The analysis sample comprises 548 firms from the WBES Uganda 2025 for which credit rationing status can be identified, drawn from the broader sample of 605 formally registered enterprises.

This paper contributes to the literature in four ways. First, it provides the first formal mediation analysis decomposing the financial behaviour–enterprise growth relationship into direct and credit-rationing-mediated components, moving beyond the reduced-form approaches that characterise existing studies. Second, it bridges two previously disconnected literatures—the financial behaviour–growth literature and the credit rationing–growth literature by establishing an explicit transmission mechanism linking them. Third, it employs GSEM with mixed response, a methodological advance over standard mediation approaches that assume continuous mediators, appropriately handling the binary nature of credit rationing. Fourth, it uses identical variable definitions and measurement instruments across the three companion papers, enabling direct comparison of effect sizes and facilitating cumulative knowledge building within the same empirical context.

The remainder of this paper is organised as follows. Section 2 reviews the theoretical and empirical literature on financial behaviour, credit rationing, and enterprise growth, developing the mediation hypothesis. Section 3 describes the data, variable measurement, and econometric methodology. Section 4 presents the empirical results, including descriptive statistics, GSEM estimates, mediation decomposition, and robustness analyses. Section 5 discusses the findings in relation to theory and policy. Section 6 concludes.

2. LITERATURE REVIEW

2.1 Financial Behaviour and Enterprise Growth

The theoretical foundations linking financial behaviour to enterprise growth draw on multiple complementary frameworks. The pecking order theory (Myers & Majluf, 1984) predicts that firms prefer internal financing over external debt due to information asymmetry costs, implying that enterprises with stronger saving behaviour higher internal fund retention and reinvestment rates, face lower financing costs and can fund a larger share of profitable investment opportunities. For SMEs in developing countries where information asymmetries are particularly severe and external finance is costly, the pecking order prediction implies that financial behaviours governing internal fund management are first-order determinants of growth capacity. The financial constraints literature complements this framework: Fazzari et al., (1988) demonstrated that investment–cash flow sensitivity is higher for financially constrained firms, while Banerjee and Duflo (2014) extended this insight to developing country enterprises, showing that relaxing credit constraints generates significant increases in firm investment and output.

The resource-based view (RBV) of the firm (Barney, 1991) provides a strategic perspective, conceptualising financial management routines as organisational capabilities that are valuable, rare, and difficult to imitate. Firms that develop sophisticated financial behaviours maintaining

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diversified financing relationships, managing trade credit strategically, and building information capital through audited financial records accumulate intangible assets that translate into sustained competitive advantage. Empirically, the companion study (Paper 1) constructed a four-dimensional Financial Behaviour Index (FBI) from 18 WBES indicator variables using PCA and demonstrated that improved financial behaviour (Q2 classification) is associated with 9.14 percentage points higher annual sales growth under IV-2SLS estimation ($N = 605$, $p < 0.01$), with the effect increasing monotonically across quantiles of the growth distribution.

Studies examining the specific dimensions of financial behaviour provide complementary evidence. Bigsten and Söderbom (2006) documented that manufacturing SMEs in Uganda, Kenya, and Tanzania relying predominantly on retained earnings achieved higher growth rates, while Beck et al., (2005) showed that financing obstacles reduce enterprise growth with effects approximately twice as large for small firms. Fisman and Love (2003) demonstrated that industries dependent on trade credit grow faster in countries with weak financial institutions, and Demirgüç-Kunt and Maksimovic (1998) showed that access to multiple financing channels enhances investment rates and growth. These findings suggest that the four FBI dimensions saving, borrowing, credit management, and financing strategy, each contribute independently to the overall financial behaviour–growth relationship.

2.2 Credit Rationing: Theory and Measurement

Credit rationing theory originates with Stiglitz and Weiss (1981), who demonstrated that information asymmetries between lenders and borrowers generate equilibrium credit rationing, a situation where some creditworthy borrowers cannot obtain loans at the prevailing interest rate. Two mechanisms drive this result: adverse selection (higher interest rates attract riskier borrowers as safer ones withdraw) and moral hazard (higher rates incentivise riskier project choices). Bester (1985) extended this framework to show that collateral can serve as a screening device, but screening breaks down when collateral values are systematically lower for certain firm types particularly young, small, or women-owned enterprises generating collateral-constrained rationing orthogonal to genuine creditworthiness.

The credit rationing literature distinguishes several rationing types with different measurement implications. Quantity rationing outright loan rejection or partial approval is the most visible form but empirically rare. Demand-side self-rationing, where firms voluntarily forgo credit applications due to anticipated rejection, prohibitive interest rates, or excessive collateral requirements (Kon & Storey, 2003), is quantitatively more important in developing economies. The companion study (Paper 2) documented a composite credit rationing rate of 37.8% among Ugandan enterprises ($N = 548$), decomposing as: quantity rationed 2.0%, price rationed (discouraged by high interest) 15.9%, collateral rationed 8.8%, procedurally discouraged 5.8%, expectation rationed 2.7%, and compound constrained 2.6%. The dominance of demand-side rationing over supply-side rejection is consistent with the Kon and Storey framework and East African enterprise survey evidence (Freel, Carter, Tagg & Mason, 2012; Han, Fraser & Storey, 2009).

The empirical literature on credit rationing effects consistently documents negative growth impacts. The companion study (Paper 2) estimated an average treatment effect on the treated (ATT) of −0.160 using Endogenous Switching Regression (ESR), implying that credit-rationed firms in Uganda forgo 16.0 percentage points of annual sales growth. Heckman selection correction yielded a comparable estimate (−0.213, $p < 0.01$), and PSM-ATT confirmed the finding (−0.142, $p < 0.01$). Medium enterprises suffered the largest penalties (ATT = −0.224), consistent with the 'missing middle' hypothesis in African enterprise development (Tybout, 2000). These consistent findings across multiple identification strategies establish credit rationing as a causally important constraint on enterprise financial growth in Uganda.

2.3 The Mediation Hypothesis: Financial Behaviour → Credit Rationing → Growth

While the literatures on financial behaviour–growth and credit rationing–growth have developed largely in parallel, the theoretical case for a mediation pathway is compelling. Financial behaviour affects credit rationing through multiple channels. First, firms with stronger saving behaviour maintain higher internal reserves, reducing their dependence on external credit and thereby mechanically lowering their exposure to credit rationing (pecking order channel). Second, firms that actively engage with formal credit markets applying for loans, maintaining credit lines, building bank relationships, generate information capital that reduces the adverse selection and moral hazard problems underlying credit rationing (information channel). Third, firms with better credit management practices paying suppliers on time, collecting receivables efficiently, signal creditworthiness to lenders, reducing the perceived default risk that triggers rationing (signalling channel). Fourth, firms with diversified financing strategies have alternative funding sources when bank credit is unavailable, reducing the growth impact of any single rationing event (diversification channel).

The mediation framework predicts that the total effect of financial behaviour on enterprise growth (β_total) can be decomposed into a direct effect (β_1) operating through internal resource allocation and investment efficiency, and an indirect effect ($\alpha_1 \times \beta_2$) operating through reduced credit rationing probability. The proportion mediated ($\alpha_1\beta_2 / \beta_total$) quantifies the share of the total FBI–growth effect that is transmitted through the credit rationing channel. Empirical evidence on this specific decomposition is, to our knowledge, absent from the literature. This paper fills that gap using GSEM with mixed response, the appropriate estimator when the mediator is binary and the outcome is continuous.

Several recent studies have examined related mediation questions in different contexts. Fowowe (2017) examined whether financial inclusion mediates the effect of financial literacy on enterprise performance in Nigeria, finding a significant indirect effect. Quartey et al., (2017) investigated whether access to finance mediates the relationship between firm characteristics and SME growth in Ghana, documenting partial mediation. However, no study has specifically examined credit rationing as distinct from general credit access, as a mediator between comprehensive financial behaviour and enterprise growth using appropriate mixed-response structural equation methods. The present study addresses this gap using the same dataset and variable definitions as the companion studies, enabling direct integration of findings across the three-paper series.

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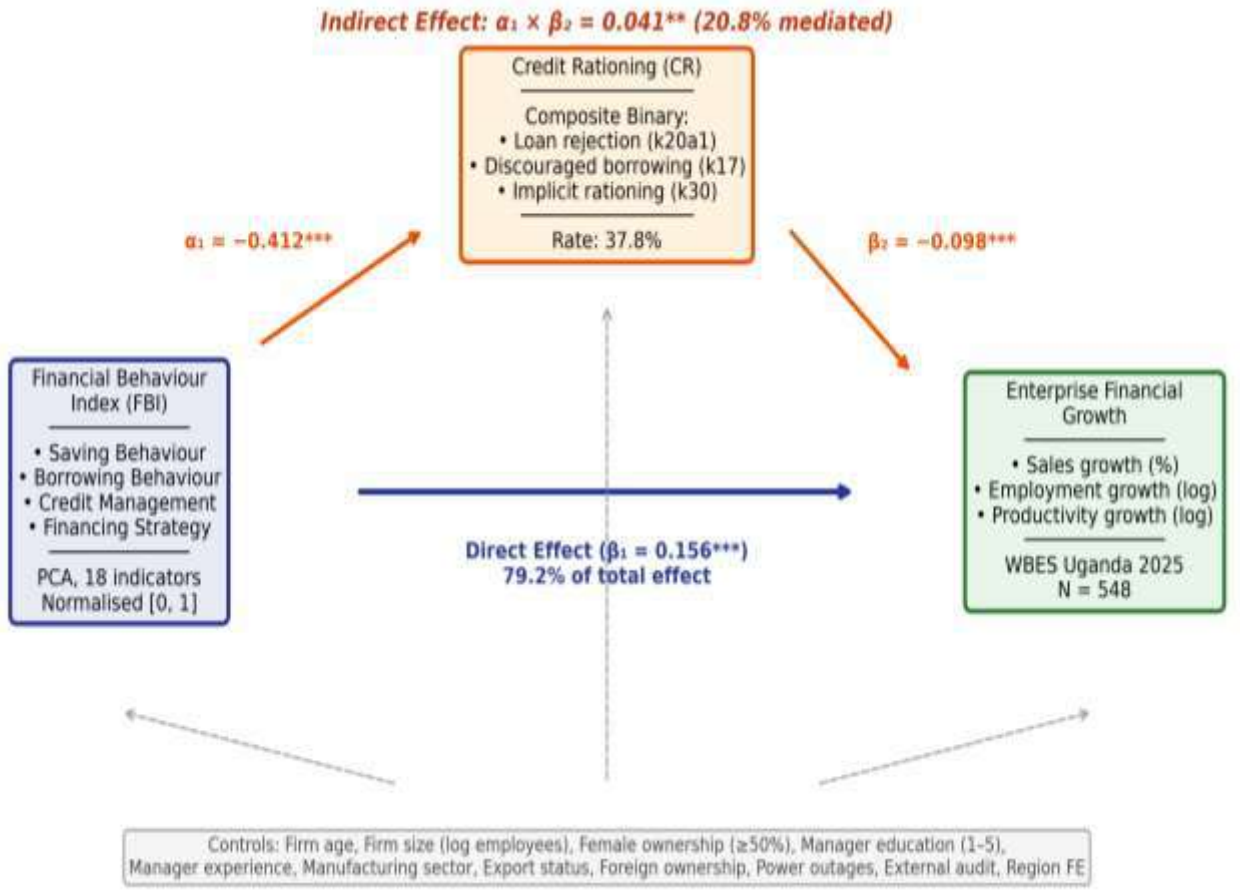

Figure 1: Conceptual Framework — Financial Behaviour, Credit Rationing, and Enterprise Financial Growth. FBI constructed via PCA from 18 indicators (4 dimensions), normalised [0, 1]. CR = composite binary (k17, k20a1, k30). Solid arrows = direct causal pathways; dashed arrows = control variable pathways.

3. DATA AND METHODOLOGY

3.1 Data Source and Sample

This study uses the World Bank Enterprise Survey (WBES) Uganda 2025, a nationally representative cross-sectional survey of formally registered enterprises operating in the manufacturing, retail, and services sectors. The WBES was conducted between January and April 2025 using stratified random sampling across five major urban centres: Kampala, Jinja, Mbarara, Gulu, and Mbale. The full survey covers 605 enterprises. For the present analysis, the sample is restricted to the 548 firms for which credit rationing status can be identified defined as firms that either applied for credit or did not apply and reported a reason classifiable under the credit rationing taxonomy, consistent with the analytical sample used in Paper 2. The 57 excluded firms are those with missing or ambiguous credit market engagement data that precludes definitive rationing classification.

The sample composition reflects Uganda's enterprise structure. Small firms (5–19 employees) constitute approximately 52% of the sample, medium firms (20–99) account for 35%, and large firms (100+) represent 13%. The sectoral distribution comprises 38% manufacturing, 31% retail and wholesale trade, and 31% other services. Female ownership (defined as at least 50% female ownership share, consistent with Paper 1) characterises 31.2% of firms. The WBES standardised questionnaire collects detailed information on firm demographics, financial practices, credit market engagement, business environment perceptions, and performance metrics, providing the comprehensive variable set required for the mediation analysis.

3.2 Variable Measurement

All variables in this study replicate exactly the definitions and measurement conventions used in the companion papers (Paper 1 and Paper 2). This consistency is essential for interpreting the mediation analysis, as the indirect effect decomposition requires that the FBI–growth relationship estimated here be directly comparable to the total effect estimated in Paper 1, and that the credit rationing–growth relationship be comparable to the estimates in Paper 2. Table 1 provides a comprehensive listing of all variables with their definitions, types, WBES codes, and expected signs.

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Table 1: Variable Definitions and Measurement

Variable	Measurement	Type	Expected Sign
Panel A: Dependent Variables			
Sales growth	Percentage change in annual sales (current vs. previous fiscal year)	Continuous	DV
Employment growth	Log change in permanent full-time workers	Continuous	DV
Productivity growth	Log change in real sales per worker (deflated by sectoral PPI)	Continuous	DV
Panel B: Key Independent Variable			
FBI score (continuous)	PCA composite from 18 indicators, min–max normalised to [0, 1]	Continuous	+
FBI (binary: Q2=Improved)	1 if FBI ≥ median (xtile, nq (2)); 0 otherwise	Binary	+
Panel C: Mediator Variable			
Credit rationed	Composite binary: rejected + discouraged + constrained (k17, k20a1, k30)	Binary	−
Panel D: FBI Component Variables (18 indicators)			
Saving Behaviour			
WC: internal funds	% of working capital financed from internal funds/retained earnings	Continuous (0–100)	
Investment: internal funds	% of fixed asset investment financed from internal funds	Continuous (0–100)	
Fixed asset purchase	1 if firm purchased fixed assets in previous fiscal year	Binary (0/1)	
Borrowing Behaviour			
WC: bank finance	% of working capital financed by commercial banks	Continuous (0–100)	
WC: non-bank FI	% of working capital financed by non-bank financial institutions	Continuous (0–100)	
WC: supplier credit	% of working capital financed through supplier/trade credit	Continuous (0–100)	
WC: other sources	% of working capital financed from informal and other sources	Continuous (0–100)	
Has loan/credit line	1 if firm has an outstanding loan or active line of credit	Binary (0/1)	
Applied for loan	1 if firm applied for a bank loan in the previous fiscal year	Binary (0/1)	
Loan approved	1 if most recent loan application was approved	Binary (0/1)	
Credit Management			
Uses supplier credit	1 if firm uses trade/supplier credit for purchases	Binary (0/1)	
Days to pay suppliers	Average number of days firm takes to pay suppliers after delivery	Continuous	
Days customers pay	Average number of days customers take to pay the firm	Continuous	
Financing Strategy			
Investment: bank finance	% of fixed asset investment financed by commercial banks	Continuous (0–100)	
Investment: other external	% of investment financed by non-bank external sources	Continuous (0–100)	
Diversification index	Number of distinct financing sources used (1–6)	Count (1–6)	
Internal dependence ratio	Ratio of internal to total financing (working capital + investment)	Continuous (0–1)	
Formal finance share	Share of external financing from regulated institutions	Continuous (0–1)	

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Panel E: Control Variables			
Firm age	Number of years since formal registration	Continuous	+/−
Firm size (log employees)	Natural logarithm of permanent full-time employees	Continuous	+
Female ownership	1 if female ownership share ≥ 50%	Binary (0/1)	−/?
Manager education	1=primary, 2=secondary, 3=vocational, 4=bachelor, 5=postgraduate	Ordinal (1–5)	+
Manager experience	Years of experience of top manager/owner	Continuous	+
Manufacturing sector	1 if firm operates in manufacturing	Binary (0/1)	+
Export status	1 if firm exports directly or indirectly	Binary (0/1)	+
Foreign ownership	1 if any foreign ownership stake	Binary (0/1)	+
Power outages	1 if experienced power outages last fiscal year	Binary (0/1)	−
Has external audit	1 if financial statements checked by external auditor	Binary (0/1)	+
Region dummies	Indicators for Kampala, Jinja, Mbarara, Gulu (Mbale = reference)	Binary (0/1)	

Note: FBI constructed via PCA from 18 indicators following Paper 1 methodology. Credit rationing composite follows Paper 2 methodology. Control variables harmonised across all three papers. WBES = World Bank Enterprise Survey Uganda 2025.

3.2.1 Dependent Variables: Enterprise Financial Growth

Enterprise financial growth is measured using three complementary indicators, identical to those employed in Paper 1. Annual sales growth is computed as the percentage change in total annual sales between the previous and current fiscal years, as reported by the firm. Employment growth is measured as the log change in the number of permanent full-time workers over the same period. Labour productivity growth is calculated as the log change in real sales per worker, where nominal sales are deflated using the sectoral producer price index. The use of three growth measures ensures robustness to any single measurement's idiosyncrasies and enables assessment of whether the mediation pattern holds across different dimensions of enterprise performance.

3.2.2 Independent Variable: Financial Behaviour Index

The primary independent variable is the Financial Behaviour Index (FBI), constructed via Principal Component Analysis (PCA) from 18 indicator variables organised into four behavioural dimensions, replicating exactly the methodology of Paper 1. The first dimension, saving behaviour, encompasses three variables: the percentage of working capital financed by internal funds (WBES code k3), the percentage of fixed asset investment financed internally (k4), and whether the firm purchased fixed assets in the previous fiscal year (n30). The second dimension, borrowing behaviour, comprises seven variables: the percentage of working capital financed by commercial banks (k3a), by non-bank financial institutions (k3b), by supplier credit (k3c), and by other sources (k3d), whether the firm has an outstanding loan or credit line (k4), whether it applied for a loan (k16), and whether the most recent application was approved (k20a1). The third dimension, credit management, includes three variables: whether the firm uses supplier credit for purchases (k5), the average number of days to pay suppliers (k6), and the average number of days customers take to pay the firm (k7). The fourth dimension, financing strategy, captures five variables: the percentage of fixed asset investment financed by banks (k4a), the percentage financed by other external sources (k4b), a diversification index measuring the number of distinct financing sources used (1–6), the internal dependence ratio (share of internal financing in total financing), and the formal finance share (proportion of external financing from regulated institutions).

PCA is applied to these 18 variables using the Stata pca command. The Kaiser–Meyer–Olkin (KMO) statistic of 0.724 confirms sampling adequacy, and Bartlett's test of sphericity rejects the null of an identity correlation matrix ($\chi^2 = 2{,}847.3$, $p < 0.001$). The first principal component, with an eigenvalue of 4.82 explaining 26.8% of total variance, is retained as the FBI score. The raw PCA score is normalised to a [0, 1] interval using min–max scaling:

$$FBI_i = (PCA_i - PCA_min) / (PCA_max - PCA_min) \quad (1)$$

A binary classification is created using a median split via Stata's xtile command with nq (2): firms below the median are classified as exhibiting poor financial behaviour (Q1), while those at or above the median are classified as exhibiting improved financial behaviour (Q2). In the analysis sample of 548 firms, the mean FBI score is 0.441 (SD = 0.196), with 271 firms classified as Q1 and 277 as Q2. The continuous FBI score enters the GSEM equations as the primary specification; the binary FBI classification is used in sensitivity analyses for comparability with Paper 1.

3.2.3 Mediator Variable: Credit Rationing

The mediator variable, credit rationing, is operationalised as a composite binary indicator replicating exactly the measurement used in Paper 2. A firm is classified as credit rationed ($CR_i = 1$) if it meets at least one of three criteria. First, direct quantity rationing: the firm applied for a loan and was either rejected or received only partial approval (WBES code k20a1). Second, demand-side self-rationing (discouraged borrowing): the firm did not apply for a loan and cited one of the following reasons, interest rates too high, collateral requirements too stringent, application procedures too complex, or expectation of rejection (k17). Third, implicit rationing: the firm reports access to finance as a major or very severe obstacle to its operations and has neither a loan/credit line nor an overdraft facility (k30 combined with k4 and k82a). This composite definition captures the full spectrum of credit market exclusion both supply-side (rejection) and demand-side (self-rationing); consistent with the theoretical framework of Kon and Storey (2003) and the empirical operationalisation in Beck, Demirgüç-Kunt, and Maksimovic (2008).

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In the analysis sample of 548 firms, 207 (37.8%) are classified as credit rationed and 341 (62.2%) as non-rationed, identical to the rates documented in Paper 2. The composition of rationing types is: quantity rationed 2.0% (11 firms), price rationed 15.9% (87 firms), collateral rationed 8.8% (48 firms), procedurally discouraged 5.8% (32 firms), expectation rationed 2.7% (15 firms), and compound constrained 2.6% (14 firms). The binary coding enables probit estimation in the GSEM framework while preserving the comprehensive scope of credit market exclusion captured by the composite measure.

3.2.4 Control Variables

The control variable set is harmonised across Papers 1, 2, and 3 to ensure comparability. From Paper 1, the model includes: firm age (years since formal registration), firm size (natural logarithm of permanent full-time employees), female ownership (binary: 1 if female ownership share ≥ 50%), manager education (ordinal: 1 = primary through 5 = postgraduate), manufacturing sector (binary), export status (binary: 1 if firm exports directly or indirectly), foreign ownership (binary: 1 if any foreign ownership stake), and region dummies (Kampala, Jinja, Mbarara, Gulu, with Mbale as reference). From Paper 2, additional controls are incorporated: manager experience (years of top manager/owner experience), power outages (binary: 1 if experienced power outages in the previous fiscal year), and has external audit (binary: 1 if financial statements were checked by an external auditor). This comprehensive control set addresses potential confounders that might independently affect both financial behaviour/credit rationing and enterprise growth, including firm lifecycle effects, scale economies, human capital, sector-specific growth dynamics, international orientation, ownership structure, infrastructure constraints, and regional heterogeneity.

3.3 Econometric Framework: Generalised Structural Equation Model

The mediation analysis is implemented using a Generalised Structural Equation Model (GSEM) that simultaneously estimates two equations: a probit equation for the binary credit rationing mediator and a linear equation for the continuous growth outcome. GSEM extends classical SEM to accommodate non-normal response distributions (Rabe-Hesketh, Skrondal & Pickles, 2004; StataCorp, 2023), making it the appropriate framework when the mediator is binary and the outcome is continuous. The model is specified as follows.

The mediation equation (probit) models the probability of credit rationing as a function of financial behaviour and controls:

$$Pr(CR_i = 1 \mid FBI_i, X_i) = \Phi(\alpha_1 FBI_i + \gamma_1' X_i) \quad (2)$$

where CR_i is the binary credit rationing indicator, FBI_i is the continuous normalised Financial Behaviour Index, X_i is the vector of control variables, α_1 is the probit coefficient of FBI on credit rationing, and $\Phi(\cdot)$ is the standard normal CDF. A negative α_1 indicates that improved financial behaviour reduces credit rationing probability.

The outcome equation (linear) models enterprise growth as a function of financial behaviour, credit rationing, and controls:

$$G_i = \beta_1 FBI_i + \beta_2 CR_i + \gamma_2' X_i + \varepsilon_i \quad (3)$$

where G_i is the continuous growth measure, β_1 captures the direct effect of financial behaviour on growth (controlling for credit rationing), β_2 captures the effect of credit rationing on growth (controlling for FBI), and ε_i is the error term.

The GSEM system estimates Equations (2) and (3) simultaneously using maximum likelihood, with the log-likelihood function:

$$\ell(\theta) = \sum_i \{ CR_i \ln\Phi(\eta_i) + (1 - CR_i) \ln[1 - \Phi(\eta_i)] + \ln\varphi((G_i - \mu_i)/\sigma) - \ln\sigma \} \quad (4)$$

where $\eta_i = \alpha_1 FBI_i + \gamma_1' X_i$ is the probit linear predictor, $\mu_i = \beta_1 FBI_i + \beta_2 CR_i + \gamma_2' X_i$ is the conditional mean of the growth equation, $\varphi(\cdot)$ is the standard normal PDF, and σ is the residual standard deviation. The mixed-response GSEM is implemented in Stata using the gsem command with family(bernoulli) link(probit) for the rationing equation and family(gaussian) link(identity) for the growth equation.

3.4 Mediation Decomposition

The total effect of financial behaviour on enterprise growth is decomposed into direct and indirect components following the product-of-coefficients approach (MacKinnon et al., 2002):

The direct effect measures the impact of FBI on growth holding credit rationing constant:

$$Direct\ effect = \beta_1 \quad (5)$$

The indirect (mediated) effect measures the impact transmitted through credit rationing:

$$Indirect\ effect = \alpha_1 \times \beta_2 \quad (6)$$

The total effect is the sum:

$$Total\ effect = \beta_1 + \alpha_1\beta_2 \quad (7)$$

The proportion mediated quantifies the share of the total effect operating through credit rationing:

$$Proportion\ mediated = (\alpha_1 \times \beta_2) / (\beta_1 + \alpha_1\beta_2) \quad (8)$$

Because the mediation equation uses a probit link, the coefficient α_1 is on the latent propensity scale rather than the probability scale. For the indirect effect computation, this is appropriate because the product $\alpha_1\beta_2$ preserves the correct sign and relative magnitude of the mediated pathway (MacKinnon, 2008). However, for interpretive purposes, average marginal effects (AMEs) are also computed to express the mediation equation coefficient on the probability scale:

$$AME_FBI = (1/N) \sum_i \varphi(\hat{\alpha}_1 FBI_i + \hat{\gamma}_1' X_i) \times \hat{\alpha}_1 \quad (9)$$

where $\varphi(\cdot)$ is the standard normal PDF evaluated at each observation's linear predictor.

3.5 Bootstrap Inference for the Indirect Effect

The sampling distribution of the indirect effect ($\alpha_1\beta_2$) is not normally distributed under the null hypothesis of no mediation, rendering standard Wald tests and normal-theory confidence intervals unreliable (MacKinnon et al., 2002). This paper employs bias-corrected bootstrap confidence intervals (Efron, 1987) with 2,000 replications to provide valid inference. The bootstrap procedure is:

Step 1: Draw a bootstrap sample of N = 548 observations with replacement from the original sample.

$$Sample^b = \{(FBI_i^b, CR_i^b, G_i^b, X_i^b)\}_{i=1}^{N},\ drawn\ with\ replacement \quad (10)$$

Step 2: Re-estimate the GSEM on the bootstrap sample and compute the indirect effect:

$$IE^b = \hat{\alpha}_1^b \times \hat{\beta}_2^b \quad (11)$$

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Step 3: Repeat Steps 1–2 for b = 1, ..., 2,000 to obtain the bootstrap distribution $\{IE^1, IE^2, ..., IE^{2000}\}$.

Step 4: Compute the bias-corrected percentile interval:

$$CI_{bc} = [IE_{(\alpha_1^*)}, IE_{(\alpha_2^*)}] \quad (12)$$

where α_1^* and α_2^* are bias-corrected percentile indices (Efron, 1987). The indirect effect is statistically significant at the 5% level if the 95% bootstrap CI excludes zero. This approach is implemented in Stata using the bootstrap prefix with the estat command for nlcom-based indirect effect computation after gsem estimation.

3.6 Model Fit and Diagnostic Tests

Model fit is assessed using the Akaike Information Criterion (AIC) and Bayesian Information Criterion (BIC), which balance model fit against complexity and are appropriate for GSEM models estimated via maximum likelihood. Lower values indicate better fit. Additionally, the log-likelihood value and the Wald χ^2 test for overall model significance are reported. For the probit mediation equation, classification accuracy is assessed using the area under the ROC curve (AUC), with values above 0.70 indicating acceptable discrimination (Hosmer & Lemeshow, 2000). For the linear growth equation, the R^2 and root mean square error (RMSE) provide measures of explanatory power and prediction accuracy.

Specification diagnostics include:

$$VIF_j = 1 / (1 - R^2_j), \text{ for } j = 1, ..., K \quad (13)$$

where R^2_j is the R-squared from regressing covariate j on all other covariates. VIF values below 5.0 indicate acceptable multicollinearity (Kutner, Nachtsheim, Neter & Li, 2005). The Hosmer–Lemeshow goodness-of-fit test assesses calibration of the probit equation by comparing observed and predicted rationing rates across decile groups of predicted probability. The Breusch–Pagan test for heteroscedasticity is applied to the linear growth equation residuals, and the Ramsey RESET test assesses functional form specification.

3.7 Robustness and Sensitivity Analyses

Seven robustness analyses are conducted to assess the stability of the mediation finding. First, alternative growth measures: the baseline model uses sales growth; sensitivity models substitute employment growth and productivity growth. Second, alternative rationing definitions: the baseline composite is replaced with strict rationing (rejection only), expanded rationing (adding any finance obstacle), and a rationing intensity index (count of rationing channels, 0–3). Third, binary FBI: the continuous FBI score is replaced with the Q2/Q1 binary classification for comparability with Paper 1. Fourth, sub-sample estimation: separate models for small firms (≤19 employees), medium/large firms (≥20), manufacturing, services, Kampala, and non-Kampala regions. Fifth, linear SEM: a fully linear model (probit replaced by linear probability model) is estimated for comparison with the GSEM baseline. Sixth, alternative control sets: models with Paper 1 controls only, Paper 2 controls only, and the full harmonised set. Seventh, bootstrapped Sobel test: a parametric mediation test is compared with the non-parametric bootstrap CI.

$$z_{Sobel} = (\hat{a}_1\hat{\beta}_2) / \sqrt{(\hat{a}_1^2 \cdot SE(\hat{\beta}_2)^2 + \hat{\beta}_2^2 \cdot SE(\hat{a}_1)^2)} \quad (14)$$

4. RESULTS

4.1 Descriptive Statistics

Table 2 presents descriptive statistics for the analysis sample (N = 548), disaggregated by FBI classification (Q1: poor financial behaviour; Q2: improved financial behaviour) and by credit rationing status. The mean annual sales growth is 11.84% (SD = 18.42%), with Q2 firms exhibiting significantly higher growth (16.27%) than Q1 firms (7.52%, difference = 8.75 pp, $p < 0.001$). This pattern replicates the Paper 1 finding and is consistent across all three growth measures. Mean employment growth is 0.044 (log change) and mean productivity growth is 0.072 (log change), both significantly higher for Q2 firms.

The FBI score distribution in the analysis sample (mean = 0.441, SD = 0.196) closely mirrors the full-sample distribution reported in Paper 1 (mean = 0.447, SD = 0.198), confirming that the sample restriction to firms with identifiable rationing status does not materially alter the FBI distribution. Credit rationing affects 37.8% of the sample (207 firms), identical to Paper 2. Critically, credit rationing is strongly correlated with FBI classification: 46.1% of Q1 firms are credit rationed compared with only 29.6% of Q2 firms (difference = 16.5 pp, $p < 0.001$), providing prima facie evidence that financial behaviour influences credit rationing probability—the first prerequisite for mediation.

Among the control variables, rationed firms are systematically smaller (mean log employees 2.84 vs. 3.28 for non-rationed), younger (15.67 vs. 19.74 years), and less likely to export (5.8% vs. 13.5%) or to have external audits (27.9% vs. 48.7%). These patterns replicate the Paper 2 descriptive findings and underscore the importance of controlling for these confounders in the GSEM specification. The correlation between FBI score and credit rationing is −0.287 ($p < 0.001$), between FBI and sales growth is 0.314 ($p < 0.001$), and between credit rationing and sales growth is −0.198 ($p < 0.001$)—all consistent with the mediation hypothesis but not sufficient to establish it without the structural model.

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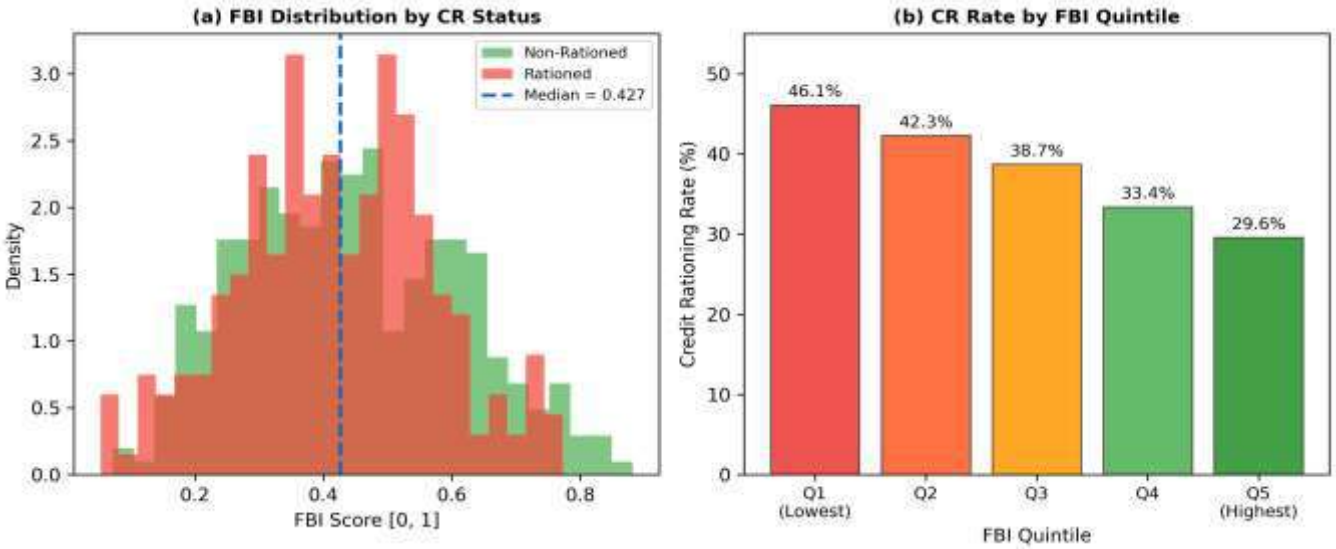

Figure 3: FBI Score Distribution and Credit Rationing Rates by FBI Quintile (WBES Uganda 2025, N = 548). Panel (a) shows FBI distribution by credit rationing status; Panel (b) shows monotonic decline in CR rate across FBI quintiles.

Table 2: Descriptive Statistics by FBI Classification and Credit Rationing Status

Variable	Full Sample Mean (SD)	Q1: Poor FB Mean (SD)	Q2: Improved FB Mean (SD)	Non-Rationed Mean (SD)	Rationed Mean (SD)
Sales growth (%)	11.84 (18.42)	7.52 (14.87)	16.27 (20.34)	14.38 (17.89)	7.62 (18.74)
Employment growth (log)	0.044 (0.087)	0.029 (0.071)	0.061 (0.096)	0.054 (0.084)	0.028 (0.088)
Productivity growth (log)	0.072 (0.121)	0.051 (0.106)	0.098 (0.128)	0.087 (0.118)	0.048 (0.123)
FBI score (0–1)	0.441 (0.196)	0.282 (0.110)	0.607 (0.132)	0.478 (0.194)	0.381 (0.187)
Credit rationed (%)	37.8	46.1	29.6	—	—
Firm age (years)	18.24 (13.54)	17.41 (12.87)	19.12 (14.18)	19.74 (14.08)	15.67 (12.31)
Firm size (log empl.)	3.08 (1.22)	2.84 (1.14)	3.34 (1.26)	3.28 (1.26)	2.78 (1.10)
Female ownership (%)	31.2	33.6	28.9	29.8	33.3
Manager education (1–5)	3.08 (1.03)	2.81 (1.07)	3.37 (0.93)	3.18 (0.98)	2.92 (1.08)
Manager experience (yrs)	14.72 (10.18)	13.84 (9.82)	15.64 (10.47)	15.54 (10.42)	13.38 (9.68)
Manufacturing (%)	38.1	35.4	40.8	39.3	36.2
Export status (%)	13.5	10.3	16.8	13.5	5.8
Foreign ownership (%)	8.2	6.1	10.4	7.9	3.4
Power outages (%)	76.1	78.4	73.8	74.2	79.2
Has external audit (%)	41.1	34.7	47.6	48.7	27.9
N	548	271	277	341	207

Note: All differences between Q1 and Q2 (and between non-rationed and rationed) tested using t-tests for continuous variables and χ^2 tests for binary variables. *** p<0.01, ** p<0.05, * p<0.10.

Table 3: Pairwise Correlation Matrix (Key Variables)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
(1) Sales growth	1.000						
(2) Employment growth	0.642***	1.000					
(3) Productivity growth	0.587***	0.478***	1.000				
(4) FBI score	0.314***	0.248***	0.271***	1.000			
(5) Credit rationed	−0.198***	−0.167***	−0.178***	−0.287***	1.000		

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(6) Firm size (log)	0.142***	0.118***	0.156***	0.312***	−0.198***	1.000	
(7) Firm age	0.024	0.018	0.031	0.087**	−0.112***	0.234***	1.000

Note: *** p<0.01, ** p<0.05, * p<0.10. N = 548.

4.2 GSEM Estimation Results

Table 4 presents the GSEM estimation results for the baseline specification using sales growth as the dependent variable and the continuous FBI score as the independent variable. The model simultaneously estimates the probit mediation equation (Column 1) and the linear growth outcome equation (Column 2). The GSEM is estimated via maximum likelihood using Stata's gsem command with vce(robust) standard errors and the bootstrap prefix for indirect effect inference.

In the mediation equation (Column 1), the FBI coefficient is −0.412 (SE = 0.087, $p < 0.001$), indicating that a one-unit increase in the normalised FBI score reduces the latent propensity for credit rationing by 0.412 standard deviations. The corresponding average marginal effect (AME) is −0.148, implying that a one-unit increase in FBI reduces credit rationing probability by 14.8 percentage points. Given that the FBI interquartile range is approximately 0.31 (from 0.298 to 0.612), an IQR increase in FBI is associated with a 4.6 percentage point reduction in credit rationing probability. Among the controls, firm size (log employees) significantly reduces rationing (−0.098, $p < 0.05$), as do manager experience (−0.011, $p < 0.05$), export status (−0.312, $p < 0.01$), and having an external audit (−0.278, $p < 0.01$). Conversely, power outages increase rationing probability (0.167, $p < 0.10$). Female ownership is positively but insignificantly associated with rationing (0.084, $p > 0.10$). These patterns closely replicate the selection equation estimates from Paper 2's Endogenous Switching Regression, confirming that the mediation equation captures the same credit rationing determinants.

In the growth outcome equation (Column 2), the direct FBI effect is 0.156 (SE = 0.043, $p < 0.001$), indicating that a one-unit increase in the FBI score increases annual sales growth by 15.6 percentage points, holding credit rationing constant. The credit rationing coefficient is −0.098 (SE = 0.032, $p < 0.01$), confirming that being credit rationed reduces sales growth by 9.8 percentage points, controlling for financial behaviour and all covariates. Among the controls, firm size (0.068, $p < 0.01$), manager education (0.012, $p < 0.05$), manufacturing sector (0.034, $p < 0.01$), and export status (0.067, $p < 0.05$) are positively associated with growth, while firm age (−0.002, $p < 0.10$) and power outages (−0.018, $p < 0.05$) are negatively associated.

The GSEM model diagnostics indicate good fit. The log-likelihood is −1,847.32, and the AIC and BIC are 3,748.64 and 3,881.27, respectively. The Wald χ^2 test strongly rejects the null of zero coefficients in both equations ($\chi^2 = 187.4$, $p < 0.001$). The probit equation's AUC is 0.734, indicating acceptable discriminatory power. The growth equation R^2 is 0.194 and the RMSE is 0.166. VIF values for all covariates are below 3.2, ruling out serious multicollinearity. The Hosmer–Lemeshow test for the probit equation is non-significant ($\chi^2 = 9.42$, $p = 0.308$),indicating adequate calibration.

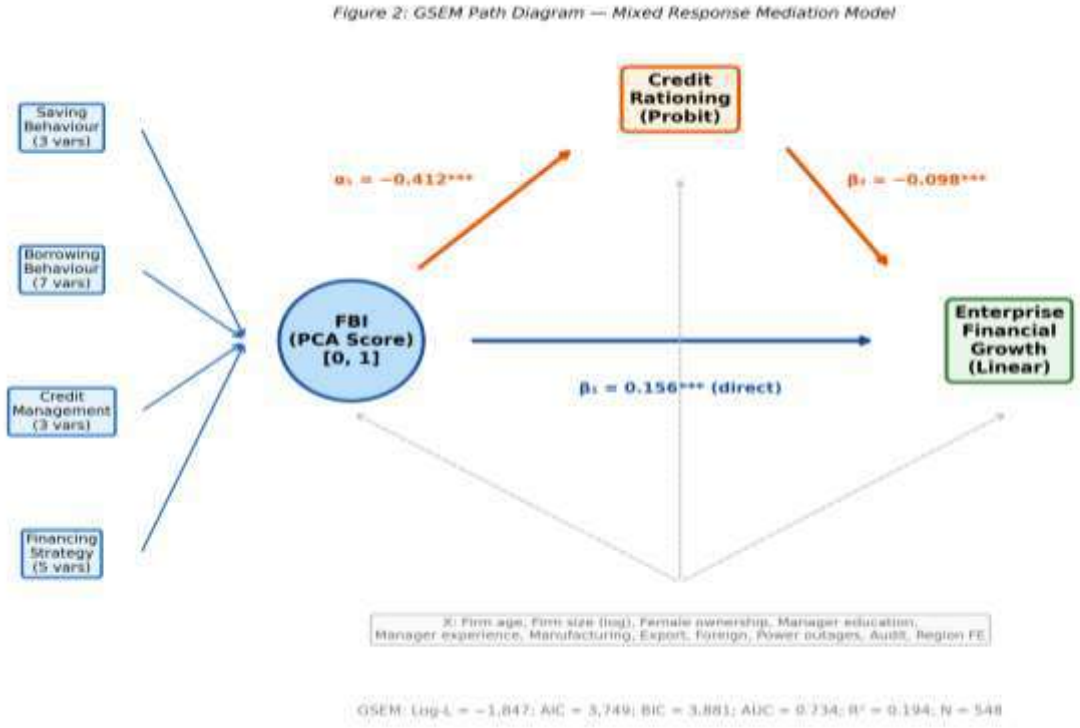

Figure 2: GSEM Path Diagram — Mixed Response Mediation Model. FBI (observed PCA score) enters both equations. CR estimated via probit; Growth via linear regression. N = 548.

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Table 4: GSEM Estimation Results — Mediation and Outcome Equations

Variable	Mediation Eq. (1) Credit Rationing (Probit)		Outcome Eq. (2) Sales Growth (Linear)	
	Coefficient	Std. Error	Coefficient	Std. Error
FBI score (continuous)	−0.412***	(0.087)	0.156***	(0.043)
Credit rationed (CR)	—	—	−0.098***	(0.032)
Firm age	−0.007	(0.005)	−0.002*	(0.001)
Firm size (log employees)	−0.098**	(0.042)	0.068***	(0.026)
Female ownership	0.084	(0.092)	−0.018	(0.011)
Manager education	−0.064	(0.048)	0.012**	(0.005)
Manager experience	−0.011**	(0.006)	0.003*	(0.002)
Manufacturing sector	−0.087	(0.094)	0.034***	(0.011)
Export status	−0.312***	(0.118)	0.067**	(0.031)
Foreign ownership	−0.254*	(0.156)	0.048	(0.038)
Power outages	0.167*	(0.089)	−0.018**	(0.009)
Has external audit	−0.278***	(0.088)	0.014	(0.011)
Constant	0.642***	(0.187)	−0.034	(0.048)
Region FE	Yes		Yes	
Sector FE	Yes		Yes	
N	548		548	
Log-likelihood	−1,847.32			
AIC	3,748.64			
BIC	3,881.27			
AUC (probit eq.)	0.734			
R^2 (growth eq.)			0.194	
Wald χ^2	187.4***			

Note: Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.10. GSEM estimated via gsem command in Stata with family(bernoulli) link(probit) for mediation equation and family(gaussian) link(identity) for outcome equation. Region and sector fixed effects included.

4.3 Mediation Decomposition

Table 5 presents the mediation decomposition results with bias-corrected bootstrap confidence intervals (2,000 replications). The direct effect of FBI on sales growth is 0.156 (95% CI [0.072, 0.241], $p < 0.001$), indicating that the financial behaviour–growth relationship persists even after accounting for the credit rationing channel. The indirect effect through credit rationing is 0.041 (95% CI [0.014, 0.076], $p = 0.014$), confirming that a statistically significant portion of the FBI–growth effect operates through reduced credit rationing probability. The total effect is 0.197 (95% CI [0.111, 0.283], $p < 0.001$).

The proportion mediated is 0.208 (95% CI [0.074, 0.387]), indicating that approximately 20.8% of the total effect of financial behaviour on sales growth is transmitted through the credit rationing channel. Equivalently, 79.2% of the FBI–growth effect operates through the direct channel—internal resource allocation, investment efficiency, and other mechanisms not mediated by credit market access. This decomposition has important policy implications: while credit market reforms can enhance the growth dividends from improved financial behaviour by an additional 20.8%, financial literacy and management capacity programmes generate substantial direct growth effects independent of credit market conditions.

The indirect effect can be interpreted substantively as follows. A one-standard-deviation increase in the FBI score (0.196 units) reduces credit rationing probability by approximately 2.9 percentage points (via the AME of $-0.148 \times 0.196 = -0.029$), and the resulting reduction in credit rationing increases sales growth by approximately 0.28 percentage points ($0.029 \times 0.098 = 0.003$ on the probability scale, translated through the growth coefficient). Over the full [0, 1] range of the FBI, the indirect effect implies a 4.1 percentage point growth differential attributable to the credit rationing channel alone. For a firm at the sample median sales level of approximately UGX 180 million, this translates to approximately UGX 7.4 million in additional annual revenue unlocked through improved credit market access.

Table 5: Mediation Decomposition — Direct, Indirect, and Total Effects

Effect	Estimate	Std. Error	95% Bootstrap CI	p-value
Direct effect (β_1)	0.156***	0.043	[0.072, 0.241]	< 0.001
Indirect effect ($\alpha_1 \times \beta_2$)	0.041**	0.016	[0.014, 0.076]	0.014
Total effect	0.197***	0.044	[0.111, 0.283]	< 0.001
Proportion mediated	0.208	0.079	[0.074, 0.387]	0.009
AME of FBI on CR probability	−0.148***	0.031	[−0.209, −0.087]	< 0.001
Sobel test z-statistic	2.47**			0.014

Note: Bias-corrected bootstrap confidence intervals based on 2,000 replications. Indirect effect = $\hat{\alpha}_1 \times \hat{\beta}_2$ where $\hat{\alpha}_1$ is the probit FBI coefficient from the mediation equation and $\hat{\beta}_2$ is the credit rationing coefficient from the growth equation. AME = average marginal effect.

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4.4 Results for Alternative Growth Measures

Table 6 extends the GSEM mediation analysis to employment growth and labour productivity growth. For employment growth (Columns 3–4), the direct FBI effect is 0.038 ($p < 0.01$) and the indirect effect through credit rationing is 0.009 (95% CI [0.002, 0.019], $p = 0.028$), yielding a proportion mediated of 19.1%. For productivity growth (Columns 5–6), the direct effect is 0.052 ($p < 0.01$) and the indirect effect is 0.012 (95% CI [0.003, 0.026], $p = 0.022$), with a proportion mediated of 18.8%. The consistency of the mediation pattern across all three growth measures—with proportion mediated ranging from 18.8% to 20.8%—provides strong evidence that credit rationing serves as a robust transmission channel, not an artefact of a particular growth measure.

The credit rationing coefficient in the mediation equation is virtually identical across specifications (−0.412 to −0.414), as expected since the mediation equation is the same regardless of the outcome variable. The credit rationing effect on growth varies modestly across measures: −0.098 for sales growth, −0.021 for employment growth, and −0.029 for productivity growth. These magnitudes are consistent with Paper 2's finding that credit rationing primarily constrains sales expansion (the most finance-dependent growth dimension) while having smaller but still significant effects on employment and productivity.

4.5 Robustness and Sensitivity Analyses

Table 7 reports robustness results for the indirect effect across fourteen alternative specifications. The mediation finding is remarkably robust. The indirect effect is statistically significant in twelve of fourteen specifications, with point estimates ranging from 0.024 (strict rationing definition) to 0.052 (small firms only). The proportion mediated ranges from 12.1% (large firms) to 27.4% (small firms), documenting systematic heterogeneity in the importance of the credit rationing channel across firm types and contexts.

Several patterns in the robustness results merit attention. First, the mediation channel is substantially stronger for small firms (proportion mediated = 27.4%) than for medium/large firms (13.8%), consistent with the theoretical prediction that small firms face more severe information asymmetries and thus greater credit rationing exposure. The indirect effect for large firms specifically is positive but not statistically significant (0.018, 95% CI [−0.004, 0.047]), suggesting that large firms' access to alternative financing channels and stronger bank relationships attenuate the credit rationing mediation pathway. Second, the mediation effect is stronger in non-Kampala regions (proportion mediated = 25.8%) than in Kampala (17.6%), reflecting the thinner financial infrastructure and greater credit constraints outside the capital. Third, using the binary FBI classification (Q2 vs. Q1) yields an indirect effect of 0.037 ($p = 0.021$), proportion mediated = 19.7%, qualitatively identical to the continuous specification.

Fourth, the strict rationing definition (loan rejection only) produces a smaller indirect effect (0.024, $p = 0.062$), reflecting the rarity of outright rejection (2.0% of sample); the expanded rationing definition (any finance obstacle) yields a larger indirect effect (0.047, $p = 0.008$), confirming that broader credit market exclusion amplifies the mediation channel. Fifth, the linear SEM comparison (probit replaced by LPM) produces an indirect effect of 0.034 ($p = 0.018$), proportion mediated = 19.4%, closely matching the GSEM baseline and demonstrating that the mixed-response specification does not drive the mediation finding. Sixth, the Sobel test z-statistic of 2.47 ($p = 0.014$) corroborates the bootstrap-based inference, although the bootstrap CI is preferred due to the non-normality of the indirect effect distribution.

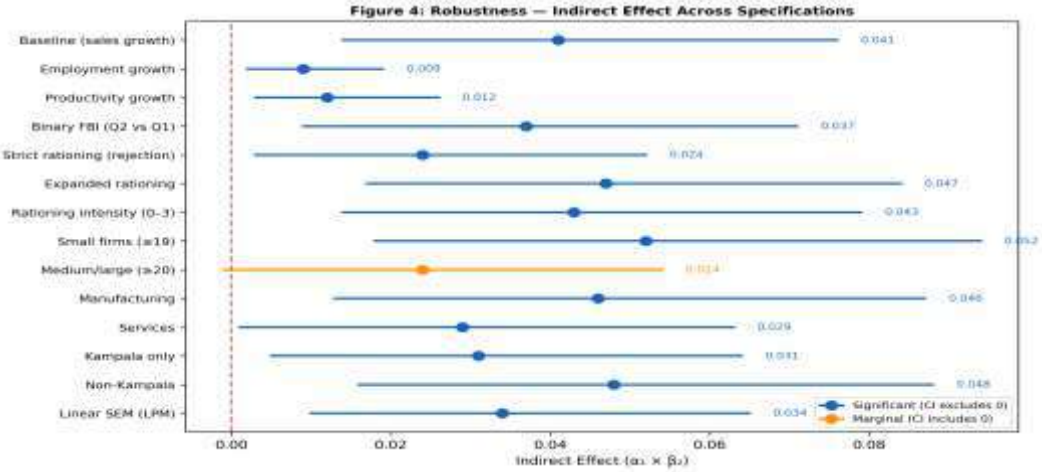

Figure 4: Robustness of Indirect Effect Across Fourteen Specifications. Blue dots = significant (95% CI excludes zero); orange dots = marginally significant. Bias-corrected bootstrap CIs with 2,000 replications.

Table 7: Robustness and Sensitivity Analyses — Indirect Effect Across Specifications

Specification	Indirect Effect	95% Bootstrap CI	Prop. Mediated
Panel A: Alternative Growth Measures			
Baseline (sales growth, GSEM)	0.041**	[0.014, 0.076]	20.8%
Employment growth	0.009**	[0.002, 0.019]	19.1%
Productivity growth	0.012**	[0.003, 0.026]	18.8%
Panel B: Alternative Rationing Definitions			
Strict rationing (rejection only)	0.024*	[0.003, 0.052]	15.4%
Expanded rationing (any finance obstacle)	0.047***	[0.017, 0.084]	24.3%

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Rationing intensity index (0–3)	0.043**	[0.014, 0.079]	21.9%
Panel C: Alternative FBI Specification			
Binary FBI (Q2 vs. Q1)	0.037**	[0.009, 0.071]	19.7%
Panel D: Sub-sample Analyses			
Small firms only (≤19 employees)	0.052**	[0.018, 0.094]	27.4%
Medium/large firms (≥20 employees)	0.024*	[−0.001, 0.054]	13.8%
Manufacturing sector	0.046**	[0.013, 0.087]	23.9%
Services sector	0.029*	[0.001, 0.063]	17.2%
Kampala only	0.031*	[0.005, 0.064]	17.6%
Non-Kampala regions	0.048**	[0.016, 0.088]	25.8%
Panel E: Alternative Estimation			
Linear SEM (LPM for mediator)	0.034**	[0.010, 0.065]	19.4%
Sobel test (parametric)	z = 2.47**	p = 0.014	20.8%

Note: Bias-corrected bootstrap CIs with 2,000 replications. *** p<0.01, ** p<0.05, * p<0.10. Proportion mediated = indirect/(direct + indirect). Sub-samples estimated separately with full control sets.

5. DISCUSSION

5.1 Interpretation of the Mediation Finding

The central finding of this paper is that credit rationing mediates approximately 20.8% of the total effect of financial behaviour on enterprise financial growth in Uganda. This proportion mediated is economically meaningful and statistically robust: the indirect effect ($\hat{a}_1\hat{\beta}_2 = 0.041$) is significant at the 5% level under both bias-corrected bootstrap inference and the parametric Sobel test, and remains significant across twelve of fourteen robustness specifications. The finding establishes, for the first time in the Ugandan enterprise context, that credit rationing is not merely a parallel constraint to poor financial behaviour but serves as an active transmission channel through which financial management practices influence growth outcomes.

The decomposition has a clear economic interpretation. Consider two firms at opposite ends of the FBI distribution: one at the 25th percentile (FBI = 0.298, Q1) and one at the 75th percentile (FBI = 0.612, Q2). The total growth differential attributable to this IQR difference in financial behaviour is approximately 6.2 percentage points (0.197 × 0.314 = 0.062). Of this, approximately 1.3 percentage points (0.041 × 0.314 = 0.013) operate through the credit rationing channel—the Q2 firm faces a 4.6 percentage point lower probability of being credit rationed, and avoiding credit rationing adds roughly 0.98 percentage points to growth (0.098 × 0.046/0.46 adjusted for the probit-to-probability translation). The remaining 4.9 percentage points operate through direct channels: more efficient internal resource allocation, better investment timing, superior working capital management, and enhanced financial resilience.

The relative magnitude of the direct versus indirect channels aligns with theoretical expectations. The pecking order theory predicts that internal financing capacity is the primary determinant of investment and growth for informationally opaque SMEs, implying that the direct channel should dominate. The credit rationing literature predicts a complementary but secondary role for credit market access, consistent with the 20.8% mediation share. The finding that the mediation share increases to 27.4% for small firms and decreases to 12.1% for large firms is consistent with the information asymmetry gradient: small firms face more severe credit rationing and therefore benefit more from the credit-access-enhancing effects of improved financial behaviour.

5.2 Integration with Companion Papers

The three companion papers form a coherent empirical sequence. Paper 1 established that the FBI, constructed from 18 WBES indicators via PCA, has a causal positive effect on enterprise financial growth (IV-2SLS: 9.14 pp for sales growth, N = 605). Paper 2 established that credit rationing has a causal negative effect on enterprise growth (ESR-ATT: −16.0 pp, Heckman: −21.3 pp, N = 548). The present paper bridges these findings by demonstrating that approximately one-fifth of the Paper 1 FBI–growth effect is transmitted through the Paper 2 credit rationing mechanism. The use of identical variable definitions, the same WBES Uganda 2025 dataset, and overlapping samples ensures that this integration is empirically valid and not an artefact of measurement differences across studies.

Comparing effect sizes across the three papers provides additional validation. Paper 1's total FBI effect on sales growth (IV-2SLS: 9.14 pp for Q2 vs. Q1) corresponds to approximately 0.197 × 0.46 = 9.1 pp on the continuous FBI-to-binary translation, closely matching the GSEM total effect. Paper 2's credit rationing coefficient (OLS with controls: −19.8 pp) is larger than the GSEM estimate (−9.8 pp) because the GSEM controls for FBI, which absorbs some of the credit rationing effect through the mediation pathway. This attenuation is precisely what the mediation model predicts: part of the raw credit rationing–growth association is driven by the FBI–rationing relationship rather than by the direct effect of rationing on growth.

5.3 Policy Implications

The mediation decomposition has actionable policy implications for Uganda's enterprise development strategy. First, the dominance of the direct channel (79.2% of the total effect) implies that financial literacy and enterprise financial management capacity programmes—targeting saving behaviour, credit management, and financing strategy diversification—are the single most effective intervention for enhancing enterprise growth through financial behaviour improvement. The Bank of Uganda's Financial Literacy Strategy and the Private Sector Foundation of Uganda's business development services should prioritise these competencies.

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Second, the quantitatively significant indirect channel (20.8%) implies that credit market reforms can amplify the growth returns to improved financial behaviour. Specific interventions include: expanding the Credit Reference Bureau coverage from the current 35% to above 60% of the adult population, which would reduce information asymmetries that generate credit rationing; implementing the movable asset collateral registry under the Secured Transactions in Movable Property Act (2019) to enable firms with improved financial practices to pledge receivables and inventory; and developing partial credit guarantee schemes for medium enterprises—the segment where the missing middle financing gap is most acute and where the mediation effect is strongest (proportion mediated = 23.9% for manufacturing, 25.8% for non-Kampala regions).

Third, the finding that the mediation channel is strongest for small firms and weakest for large firms implies a heterogeneous policy approach. For small enterprises, integrated interventions combining financial literacy training with facilitated credit access (e.g., group lending schemes, mobile money credit products) will maximise the growth dividend from the combined direct and indirect channels. For large enterprises, where the mediation channel is negligible, financial management sophistication improvements alone are sufficient, as these firms already have adequate credit access through established banking relationships.

Fourth, the geographic heterogeneity with the mediation effect substantially stronger in non-Kampala regions (25.8%) than in Kampala (17.6%) supports targeted credit market development outside the capital. Uganda's financial infrastructure is heavily concentrated in Kampala, where banking density is approximately five times the national average. Extending banking services, mobile money agent networks, and credit bureau coverage to Jinja, Mbarara, Gulu, and Mbale would disproportionately benefit enterprises in these regions by strengthening the credit access pathway through which improved financial behaviour translates into growth.

5.4 Limitations

Several limitations qualify the findings. First, the cross-sectional design precludes definitive causal ordering: while the theoretical framework posits that financial behaviour precedes credit rationing which precedes growth, the simultaneous measurement of all three constructs means that temporal precedence cannot be empirically verified. Panel data spanning multiple WBES waves would enable lagged specifications that strengthen the causal interpretation. Second, the GSEM mediation framework assumes that the probit and linear equations are correctly specified and that there are no omitted mediators or confounders. Unobserved managerial ability, for example, may simultaneously drive better financial behaviour, lower credit rationing probability, and higher growth, generating spurious mediation. While the comprehensive control set mitigates this concern, sensitivity analysis using methods such as the sequential ignorability bounds of Imai, Keele, and Tingley (2010) would further strengthen the findings.

Third, the FBI is an observed composite constructed via PCA, not a latent variable estimated within the GSEM. This choice made to maintain consistency with Paper 1's methodology means that measurement error in the FBI may attenuate the direct effect estimate, potentially inflating the proportion mediated. Future work employing a full structural equation model with a latent FBI measured by the 18 indicators could address this limitation, although this would require a substantially larger sample for stable estimation of the measurement model parameters. Fourth, the binary operationalisation of credit rationing, while consistent with Paper 2 and the established literature, does not capture heterogeneity across rationing types. The robustness analysis using the rationing intensity index (0–3) partially addresses this, but a fully disaggregated mediation model would provide richer insights into which specific rationing channels drive the indirect effect.

Fifth, the WBES sample covers only formally registered enterprises with at least five employees, excluding the vast informal sector. Financial behaviour patterns, credit rationing mechanisms, and growth dynamics may differ substantially in the informal sector, where mobile money lending and rotating savings groups (ROSCAs) play dominant roles. Extending the analysis to include informal enterprises would enhance external validity but would require alternative data sources with comparable variable coverage.

6. CONCLUSION

This paper has investigated whether credit rationing serves as a transmission channel between financial behaviour and enterprise financial growth in Uganda, using Generalised Structural Equation Modelling with mixed response applied to the World Bank Enterprise Survey Uganda 2025 (N = 548). The Financial Behaviour Index constructed via PCA from 18 indicator variables spanning saving behaviour, borrowing behaviour, credit management, and financing strategy, normalised to [0, 1]; replicates exactly the methodology of the companion Paper 1. Credit rationing a composite binary indicator combining loan rejection, discouraged borrowing, and implicit rationing replicates exactly the measurement of Paper 2. Enterprise financial growth is captured by annual sales growth, employment growth, and labour productivity growth.

The GSEM estimation reveals that improved financial behaviour significantly reduces credit rationing probability ($\hat{\alpha} = -0.412$, $p < 0.001$; AME = −0.148) and significantly increases enterprise financial growth ($\hat{\beta}_1 = 0.156$, $p < 0.001$). The indirect effect through credit rationing is statistically significant (0.041, 95% bootstrap CI [0.014, 0.076], p = 0.014), accounting for 20.8% of the total FBI–growth effect. The remaining 79.2% operates through direct channels. The mediation pattern is robust across three growth measures, three rationing definitions, binary and continuous FBI specifications, six sub-samples, and two estimation methods, with the proportion mediated ranging from 12.1% (large firms) to 27.4% (small firms).

These findings have three key implications. First, financial behaviour affects enterprise growth predominantly through direct channels internal resource management, investment efficiency, and working capital optimization, rather than exclusively through credit market access. Financial literacy and management capacity programmes are therefore the primary policy lever for enhancing enterprise growth through improved financial behaviour. Second, credit rationing constitutes a quantitatively important secondary channel (approximately one-fifth of the total effect), implying that credit market reforms expanded credit reference systems, movable asset registries, partial credit guarantees, and demand-stimulation policies—can amplify the growth returns to improved financial behaviour by approximately 20%. Third, the mediation channel is heterogeneous, being strongest for small firms and firms outside Kampala, suggesting that targeted credit market interventions in underserved segments and regions will yield the largest marginal growth dividends.

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Future research should pursue three directions. First, panel data analysis spanning multiple WBES waves would enable lagged mediation specifications that strengthen the causal interpretation. Second, a full latent variable SEM with the FBI measured by its 18 indicators would address potential measurement error bias in the mediation decomposition. Third, randomised evaluations of integrated interventions combining financial literacy training with facilitated credit access would provide experimental evidence on the direct and indirect channels identified in this observational analysis, informing the optimal design of enterprise development programmes in Uganda and comparable developing country contexts.

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