Exploiting a non–mainstream financial scheme to innovate: SMEs in the developing world

Abstract

Purpose: The study aims to explore the role of non–mainstream financial schemes in supporting innovation within SMEs in developing countries, particularly in sub–Saharan Africa. It investigates how informal credit, business group affiliation, and foreign and state ownership arrangements influence SMEs' innovative activities in environments with limited access to formal financial resources.

Design/methodology/approach: The research utilizes data from the World Bank's Enterprise Surveys, focusing on 8,466 firms across 11 sub-Saharan African countries from 2011 to 2020. A logistic regression analysis was conducted to assess the impact of various financial sources on SMEs' innovation outputs, particularly incremental innovations, due to data constraints on radical innovations.

Findings: The findings reveal that informal credit significantly supports SME innovation, while business group resources can hinder innovative activities by restricting firms to routine tasks. State ownership positively influences innovation, whereas the impact of foreign ownership is inconclusive. These results highlight the critical role of alternative financial mechanisms in the innovation activities of SMEs in resource-limited settings.

Originality: This study contributes to the literature by providing empirical evidence on the effects of non-mainstream financial schemes on SME innovation in developing countries. It offers new theoretical insights into how SMEs navigate financial constraints to foster innovation and suggests policy implications for improving financial support systems for SMEs in such contexts. The research underscores the importance of contextualizing entrepreneurship studies to better understand the unique challenges and opportunities faced by SMEs in developing regions.

Plain Language Summary: This study examines how small businesses in developing countries use alternative financial resources, such as informal credit and state support, to drive innovation. The findings emphasize the significance of these non–mainstream financial schemes in assisting SMEs to overcome financial barriers and succeed in their innovative activities.

Keywords: informal credit, business groups, state and foreign ownership, SME innovation.

Introduction

Research recognizes that SMEs are an indispensable component of many regions of the developing world (Wu *et al*., 2016; Saka–Helmhout *et al.,* 2020), including poor neighborhoods in sub–Saharan Africa. For example, in most sub–Saharan African countries, SMEs are pivotal to job creation. In Zambia, SMEs account for 88% of employment; in Ghana, they contribute 80% to employment creation; and in South Africa, they provide up to 60% employment. Additionally, these enterprises contribute to innovation efforts, which are essential for the economic and social transformations of their citizens who are often trapped in poverty (Kuk *et al.*, 2022; Thai *et al*., 2022). However, their innovations are carried out using limited financial resource–bases (Simba et al., 2021). For example, compared to their peers from advanced economies and other developing countries, SMEs in sub–Saharan African countries face more significant challenges in accessing the financial resources required for innovation activities (Simba *et al.,* 2024). Despite these financial difficulties, these enterprises engage in solving social problems by bringing much–needed technology–enabled services to the poor neighborhoods (see Diniz *et al.,* 2019). Research suggests that they bring innovative services like digital currency systems that enable people in such neighborhoods to acquire basic human needs like clean water, food, and access to medical assistance (Kuk *et al*., 2022; Simba *et al.,* 2021). Given the role of innovative SMEs in these neighborhoods, estimated to have over a billion inhabitants (UN, 2019), understanding the sources of financial resources these SMEs draw upon to innovate, operate, and survive is essential for fostering their continued development and long–term success.

Many scholars recognize that financial resources are a key driver of innovation for firms (see Demirkan, 2018; Radas and Bozic, 2012). They especially perceive mainstream financing provisions like formal credit to be a facility that enables firms to carry out a full innovation cycle (from designing and testing to product implementation; Eisenhardt and Tabrizi, 1995).

Even though this view may represent the context of stable financial markets in advanced economies, in developing countries where informality remains a common feature in economic and social interactions, mainstream research continues to overlook the relevance of non–mainstream financial systems to innovation in SMEs. Despite the fragmented and oftentimes inconsistent research on SMEs in developing countries, existing literature indicates that these businesses often struggle in the absence of well–developed financial markets (Mol-Gómez-Vázquez *et al*., 2019; Berger and Udell, 2003). Alternative financial mechanisms, such as informal credit (Simba *et al.,* 2023; Wellalage and Locke, 2020), business group resources (Carney *et al.*, 2011; Tajeddin and Carney, 2019), and state or foreign ownership structures (Leuz *et al*., 2010), collectively form a financial ecosystem that SMEs in developing economies rely upon for various business activities, including innovation. In this study, we introduce the concept of a 'non–mainstream financial scheme' to describe the range of financial resources that are available within the SME ecosystem in these developing countries.

To understand how resource–limited SMEs leverage this non–mainstream financial scheme, we develop a comprehensive SME–innovation–finance analysis. This theoretically–derived analysis is crucial for research as it sheds light on alternative financial arrangements available to innovative SMEs in developing countries. Such an understanding enhances the scholarly literature by revealing the social mechanisms that shape both SME financing and innovation in these economies while also shedding light on the strategies and decisions made by SME owner-managers who are responsible for generating innovations that benefit large populations across various regions in developing countries. To understand this SME–innovation–finance phenomenon, we address this question: *How does a non–mainstream financial scheme impact SME innovation in developing countries?*

Research outcomes generated from addressing this question have the potential to significantly contribute to the fields of SME and entrepreneurship financing in multiple

dimensions. Firstly, these findings enrich contextual knowledge by illustrating the varying impacts of non–mainstream financial schemes—such as informal credit, business group resources, and foreign or state ownership—on SME innovation in developing countries. In some ways, they offer new perspectives to underscore how local context shapes alternative financial sources for SMEs in these regions, challenging the traditional reliance on formal financial mechanisms. By emphasizing the importance of context, this study fosters a more nuanced scholarly dialogue that moves away from imposing universal theories often less sensitive to local variations. In doing so, it highlights the need for tailored financial approaches in developing countries, offering a deeper understanding of how unique financial structures support or hinder innovation. These insights contribute to the ongoing academic discourse on entrepreneurship financing, encouraging a shift toward context–specific models and solutions that better reflect the realities of SMEs in developing economies (Bruton *et al*., 2022; Simba, 2024). Thus, our study contributes to research by introducing indigenous theorizations that contextualize SME, innovation, and entrepreneurship studies, especially in the context of developing countries (e.g., Filatotchev *et al*., 2022; Welter, 2011).

Second, the study offers an in-depth analysis of the intersection between SME innovation and finance, positing fresh insights into how resource-constrained SMEs utilize a non–mainstream financial scheme of informal credit, business group resources, and state and foreign ownership arrangements as a key support mechanism for innovation activity. These findings both enrich the existing literature on SMEs and expand our understanding by outlining a financial ecosystem based on alternative financial resources. The study establishes a new paradigm in SME innovation–finance, grounded in empirical data and an interdisciplinary approach that merges research from SMEs, innovation, and entrepreneurial financing.

Third, the theorizations and contextual perspectives advanced in this research have research, policy, and practical implications. For research, they provide alternative arguments

about the effect of informal credit, business group resources, state and foreign ownership arrangements on SME innovation in weak institutional environments. Moreover, they provide scholars with an instructive paradigm that requires further research to examine its relevance and applicability in other parts of the developing regions (e.g., Polit and Beck, 2010). Policy institutions (e.g. Khatami *et al.,* 2024) are challenged to find ways of supporting innovative SMEs to access crucial financial resources through entrepreneurship policy initiatives, financial market reforms, and infrastructure development. Finally, managers can benefit from this research by gaining insights into the available financing sources for supporting innovative activities in developing countries.

Literature Review and Hypotheses Development

Formal credit and innovation in developing countries

Research from developed economies suggests that formal credit is essential for product innovation and business growth in SMEs (Hernández–Cánovas and Martínez–Solano, 2006; Molina-García *et al*., 2023). Yet in developing countries, acquiring formal credit remains challenging for SMEs due to stringent lending criteria (Brito *et al.*, 2022; Beck *et al*., 2009; Simba *et al.,* 2023). Other studies highlight that SMEs in these countries not only face the typical challenges associated with being new but also lack sufficient collateral, have lower credit scores, and often lack a credit history (Van Caneghem and Van Campenhout, 2012). Brancati (2015) further notes that SMEs, due to their innovative nature, are particularly prone to financial difficulties. The stringent lending standards they face significantly impede their ability to secure essential funding for innovation, even though they rely on creative strategies to compete with larger, established companies. Financing innovation becomes even more challenging when there is limited information about borrowers, worsened by gaps in the financial infrastructure (Uzuegbunam and Uzuegbunam, 2018; Angilella and Mazzù, 2015).

Additionally, recent research (e.g., Brown *et al*., 2022; Simba *et al*., 2023) shows that innovative SMEs can be discouraged from borrowing to invest in innovation–related activities due to fear of rejection, negative perceptions towards the process of applying for credit, and a belief that the economic conditions are unfavorable. There is recognition, in the literature, that for various reasons (e.g., market imperfections, and dysfunctional formal institutions among others) small businesses that are innovative tend to have their credit applications turned down more than other types of firms (Lee *et al*., 2015). This is particularly evident for innovative SMEs in developing countries, where business environments are characterized by weak financial markets and limited capital investment options (Wellalege and Fernandez, 2019). Under this condition, SMEs are pushed to use other non–mainstream financing means such as informal finance to realize their innovation activities (Buyinza and Bbaale, 2013). To achieve this goal, we suggest the following:

H1: *Formal credit has a negative association with SME innovations in developing countries.*

Informal credit and innovation in developing countries

Arguably, the fact that small businesses are unable to access finance from formal credit markets in developing countries forces them to resort to non–mainstream informal financial means (Beck and Cull, 2014). As a result, small businesses tend to depend on informal credit for start–up and working capital, as well as for product and process innovation purposes (Kislat, 2015; Passas et al., 2012). Recent scholarly works identify the absence of functional institutions such as banking and financial services (Saka–Helmhout *et al.*, 2020) as the main factor that not only drives SMEs toward non–mainstream financing schemes in developing countries (Beck and Cull, 2014), but also a greater part of the region's adult inhabitants (Klapper & Singer, 2015). Research elsewhere suggests that bank loans are not a common thing for entrepreneurs and SMEs in developing economies (Zhang, 2014). Particularly, because money lenders in many

regions of developing countries consider small businesses a high-risk investment due to the extreme economic conditions and institutional instabilities that often define these regions (Passas *et al.*, 2012), informal financing has taken center stage as a viable alternative to support their activities (Beck and Cull, 2014; Nguyen and Cahn, 2021; Saka–Helmhout *et al.*, 2020; Ullah, 2019).

Research suggests that non–mainstream financing schemes provide innovative SMEs with greater flexibility (Wu *et al.*, 2016), quick access (Nguyen and Canh, 2021) and faster processing times (Armendariz and Morduch, 2005) which are important in terms of innovation lead cycles and time to market new innovations. Arguably, the prompt and relatively accessible informal credit for innovative SMEs greatly increases their chances of obtaining funds to finance their innovative activities (Wellalege and Fernandez, 2019; Wellalege and Locke, 2020). Moreover, the quickness with which it can be authorized significantly reduces the time delay associated with obtaining capital in developing economies (Simba *et al.*, 2023; Wu *et al.*, 2016). Indeed, informal credit, as opposed to formal credit, provides SMEs, in developing countries with immediate and timely financial resources needed to innovate with low or no initial transaction costs, including freedom from collateral security-related issues. From that perspective, we contend that:

H2: *Informal credit is positively associated with SME innovations in developing countries.*

Business Groups Affiliation and Innovation

Research shows that formal institutions (e.g. Khatami *et al.*, 2024) within a country can have an impact on the behavior of entrepreneurs and their businesses. This implies that the way entrepreneurs operate and the decisions they make can be influenced by the effectiveness and relevance of these formal institutions. For example, the decisions to enter or exit a market are influenced by the legal and bankruptcy frameworks, while the firm's development is regulated

by contracts (Welter and Smallbone, 2011). On the other hand, informal institutions through culture and kinship ties can increase transaction costs and, in so doing, reduce the efficiency of market–based exchanges (Puffer *et al.,* 2010). This is most evident in developing countries, where weak enforcement and informality have created profound implications for business exchange. Developing country SMEs adapt to this condition by forming networks based on strategic relationships known as business groups (Carney *et al.*, 2011). The firms involved in such alliances are often family-controlled or share common ownership while being typically diverse (Mahmood and Mitchell 2004).

Arguably, business groups play a crucial role in the economic advancement of many developing countries, particularly in the realm of SME innovation (Khanna and Palepu, 1997). Research indicates that being part of a business group can have a positive influence on SME innovation by enabling access to resources within the group, such as human talent, capital, complementary services, and products (Mahmood and Mitchell, 2004). Studies demonstrate that the scope of business groups often extends beyond individual firms, and thus, the cooperative capacity to innovate can be favorably impacted (Deltour *et al.*, 2021). Indeed, SMEs affiliated with a business group can access essential innovation resources not only from their own network, and groups such as competitors, suppliers, customers, etc. (Carney *et al.*, 2011). Therefore, we argue that a business group's internal capital market, especially in developing countries, serves as a reservoir for SMEs as it provides the necessary capital required to finance innovation. In this context, we anticipate that business group affiliation provides a bridge for SMEs' access to vital resources needed for their innovations. Thus, we hypothesize that:

H3: *Business group affiliation is positively correlated with SME innovation in developing countries.*

Foreign ownership arrangements and innovation.

Theoretically, foreign ownership structures such as external equity have the potential to boost the inclination to innovate among SMEs (Baumol, 2010). For example, studies indicate that foreign ownership improves the allocation of resources for knowledge creation, which, in turn, enhances the SMEs' capacity to introduce new processes and launch new products into markets (Seo *et al.,* 2015). Notwithstanding such theoretical frameworks, the role of foreign ownership in innovation is not always clear-cut because it varies in relation to firm and country–specific factors (Dachs and Peters, 2014).

For SMEs in developing countries, there are reasons to expect that foreign ownership arrangements can have a negative impact on innovation performance. First, there is a significant amount of information asymmetry in many parts of developing economies (Beck and Demirguc–Kunt, 2006), making it difficult for foreign investors to evaluate and observe the innovation activities of domestic firms. Under these circumstances, foreign investors often have the propensity to underinvest in domestic firms or shy away from engaging in long–term investments in those firms (Leuz *et al.,* 2010). Within the external capital markets, the information advantage of the domestic firms can lead to non–optimal decisions (Jensen and Meckling, 1976). In other words, owners of SMEs in developing countries may prioritize their private profit interests, thus not meeting the demands of foreign investors. In this context, the likelihood of moral hazard is high, where owners may decide to use the funds collected for purposes other than innovation activities (Sahut *et al.,* 2021).

In a related study, Edeh and Acedo (2021) emphasize that the negative impact of external financial support on SME innovation activities in developing countries could be attributed to a mismatch between the funder's objectives and the immediate incentives or needs of firms. Besides, recent evidence from sub–Sahara Africa shows that companies under foreign ownership arrangements are unlikely to implement innovations (Adu–Danso and Abbey, 2022). On this, we hypothesize that:

H4: *Foreign ownership is negatively correlated with SME innovations in developing countries.*

State Ownership arrangements and innovation.

SMEs strive to introduce innovations as a means to contend with bigger and well-established companies (Spithoven *et al.,* 2013). Particularly, for those in developing nations, their efforts are often limited by their inadequate access to internal and external financial, human, as well as capital resources (Goedhuys and Sleuwaegen, 2016). Furthermore, the situation is further worsened by a notable absence of efficient financial markets (Nguyen and Canh, 2021). As previously explained, in many parts of developing nations where mainstream financial lenders are partially functional, SMEs are largely perceived as high risk as they do not possess collateral (Simba *et al.,* 2023) and face extensive information asymmetries (Ngalawa and Viegi, 2013). Despite these obstacles, research recognizes that SMEs with some form of state ownership tend to benefit from such arrangements in various ways (Lin *et al.* 2021).

For example, Edeh and Acedo (2021) show that financial support from the state government contributes to the product and process innovation efforts of SMEs in Nigeria. Prior research reveals that firms with state government connections have access to a large pool of resources the government makes available to them (Gu *et al.,* 2008). Additionally, their entitlement to resources also comes with some level of government protection (Li and Zhang, 2007). With such protection, these firms tend to experience an increasing availability of scarce resources (Tan *et al.,* 2007) essential for innovation (Teece, 1986). In other words, enterprises owned by the government tend to receive greater policy assistance, including government R&D support, than their counterparts without government affiliations. Based on this, we argue that state ownership is crucial for fostering SME innovation, particularly in developing countries. Thus, we hypothesize that:

H5: *State–ownership is positively associated with SME innovations in developing countries.*

–Insert figure 1 here–

Methodology

To test the hypotheses of this study, we utilized the Enterprise Surveys developed by the World Bank (WBES). More precisely, we focused on data from sub–Saharan African nations (WBES, 2016). Institutional development in African countries is significantly impeded, with financial constraints having the most significant impact on firms' innovation activities. Since WBES gathers direct innovation measures, we do not need to rely on indirect proxies for the main variables. WBES, which was established by the World Bank around 2005, assesses the world's investment climate and enhances a greater understanding of firm behavior in different regions of developing countries. There are 174,000 firms from 151 countries participating in the WBES, which provides a wide range of survey data. This data contains the answers to the questionnaire by 8,466 firms in 11 sub–Saharan African countries from 2011–2020.

The details of the countries considered in this study as well as the sample numbers are shown in Table 1. A WBES is usually administered by local staff who conduct individual interviews with representatives of the firm who possess the knowledge of the overall operations of the company (Tajeddin and Carney, 2019). Since local staff conduct the surveys, the interviewer is expected to be familiar with the local culture and language. WBES data is extensively utilized in various disciplines, such as economics and strategic management, because of its rigorous approach and resulting reliability (e.g., Mitton, 2016; Tajeddin and Carney, 2019).

–Insert Table 1 here–

Dependent variables

We examine the firm's capacity to innovate based on innovation output indicators. A firm that implemented a novel or significantly improved process in the three preceding years, as well as a firm that introduced a novel or significantly improved product in the past three years. Since both indicators are based on a firm's assessment of its innovative activities, they are subjective. WBES allows us to apply both innovation indicators (see Table 2). The dataset also provides two categories of innovation, including incremental and radical. However, since there was much missing data associated with the measurement of radical innovation, we measured incremental innovation in this study for the setting of sub–Sahara Africa.

The use of firm self–assessments to measure incremental innovation is consistent with existing innovation literature (Ayalew *et al.,* 2020; Jayaram *et al.,* 2014; Benner and Tushman, 2002; Evangelista *et al.,* 1998). To gauge innovation, we rely on two specific questions from the WBES: (1) "Have new services or products been introduced over the last three years?" and (2) "Has the establishment launched new or significantly improved processes in the last three years?" In our logistic regression analysis, the dependent variable "innovation" is coded as 0 for non-innovative firms and 1 for innovative firms.

Independent variables

This study examined five financial sources of innovation, including formal credit, informal credit, business group affiliation, foreign, and state ownership arrangements. Firms may benefit from formal and informal financial sources provided in the domestic market, and/or affiliation with business groups as a primary form of governance in developing countries (Carney *et al.,* 2011).

Formal credit: The WBES measures the proportion of working capital financed by external sources, such as banking and non-banking financial institutions. Credit was measured by combining financial proportions from private banking (cf., QK3bc in WBES) and non-banking financial establishments (QK3e). It is evident from a descriptive statistic of the sources of working capital that the average amount of financing is relatively high, at around 82%. Small businesses are mostly financed through formal sources, as indicated by these relatively high mean values.

Informal credit: To measure informal credit, we aggregate the financing proportions derived from credit-based transactions with suppliers and customer advances (QK3f), as well as loans from alternative money lenders such as acquaintances, family members, etc. (QK3hd). The descriptive analysis of informal credit sources for working funds reveals that the average financing is relatively low, that is, at about 14%.

BGA: Business affiliation is a dummy variable indicating whether a firm is a part of the business group or not. As Carney *et al.* (2011) pinpointed, affiliations typically take the form of publicly traded firms, listed on the national stock exchange, which are partly owned by another firm. Research in the field of BG frequently concentrates on big corporations, which results in the exclusion of small businesses and creates challenges for cross-national comparisons, especially when varying ownership criteria are employed across nations. Due to its definition of group affiliation across different areas, the WBES survey proves to be highly useful in this context. BG data from WBES also fulfill the requirements suggested in the literature, including groupings of legally independent companies, stable affiliations with larger organizations, and coordination with them (Castellacci, 2015). Based on the World Bank's survey, independent firms must meet the following criteria: (a) being legally registered for tax purposes, (b) being financially independent and having their own financial statements, (c) being

managed and controlled by private domestic entities, and (d) being owned by private domestic entities. Affiliated SMEs do not identify themselves as "firms in their own right" but are instead linked to a larger firm (Q7). According to Kennedy (1988), Africa's BGs comply with this definition. Hence, affiliation signifies an SME's legal independence but stable affiliation with a larger organization. As a result, 18% of privately owned SSA SMEs indicate they are affiliated with a group.

Foreign ownership arrangements: The ownership type will provide a channel to knowledge, human resources, and funds; potentially, it may influence the innovation performance (Gonzalez *et al.*, 2016). We measured foreign ownership variables as the proportion of firms under foreign ownership. WBES provides this information by determining whether a company is owned by private foreign individuals or organizations (b.2b.).

State ownership arrangements: State–owned financial institutions are more inclined to lend to state–owned firms in developing countries. Consequently, these firms are less likely to encounter financial constraints and more likely to participate in innovation activities (Ayalew and Xianzhi, 2018). To operationalize state ownership, we consider the question of what percentage of this company is owned by the government or state (WBES, b.2c.).

Control variables

Consistent with common practices in the broader innovation literature, our analysis includes eight variables at the firm level, one of which is firm size. Larger firms are generally expected to demonstrate greater innovation compared to smaller ones. This expectation is based on several factors, such as capital market failures causing smaller firms to lack the internal resources needed for innovation (Schumpeter, 1942), or the increased production capacity of larger firms enabling them to generate more output (Cohen and Klepper, 1996). To measure the influence of firm size, this study uses the number of full-time employees as an indicator. These numbers are then categorized into three nominal groups: micro companies (fewer than 10 workers), small companies (fewer than 50 workers), and medium companies (fewer than 200

workers). These categories are commonly employed in the context of African countries (Abor and Quartey, 2010; Eniola and Ektebang, 2014).

Firm age: As an important source of new and technologically superior products and processes, young enterprises assume a crucial function in the innovation process (Schumpeter, 1934). We control for the effect of firm age, using the number of years from the company's foundation to the year the interview was conducted.

Firm ownership arrangements: Ownership status may influence the firm's core competencies and capabilities which are decisive in pursuing innovative efforts. The type of ownership serves as a significant conduit for acquiring resources such as knowledge and human capital (Gonzalez *et al.,* 2016). To account for the influence of ownership, we included locally-owned firms in our analysis. Firms with private domestic ownership often face limitations in accessing either financial or innovative resources and are usually considered less innovative (Beck, 2007). To measure this type of ownership, we use the following question: *What proportion of this enterprise is owned by domestic organizations or individuals? (Q.b2a).* Employees and their knowledge and know–how help to build up an innovation culture in the firm and subsequently influence the firm's innovative outputs. Thus, providing formal training will produce more knowledgeable employees who influence the firm's innovation activities. The WBES has a relevant question on this matter for measuring the formal training status in firms, and this question is stated as follows: "*Did this organization provide formal training programs for its full–time employees?"* (L.10.).

Despite the previously mentioned variables being identified as effective antecedents to innovation, there are obstacles that firms may encounter in their operations that can impact their performance, and more specifically, their innovation performance. In line with argued antecedents, we emphasize financial access (QK.30) and an inadequately educated workforce

(QL.30) as two obstacles that may influence innovation performance. Finally, we also consider the industry and country as nominal variables.

(Insert Table 2 here)

Empirical analysis

To empirically evaluate the impacts of the five (5) factors on product and process innovation as indicators of technology–related innovation, we use the logit model for its estimation given that the dependent variables are not continuous. Since the dependent variables are not continuous, the standard efficient ordinary least square (OLS) method will produce biased results. The logit model can be used to generate efficient estimates for both continuous and discrete variables (Wooldridge, 2010). The indicator for technology-related innovation is proxied by variables measuring both product innovation and process innovation (Jayaram *et al.*, 2014; Evangelista *et al.*, 1998). The models are described in the following equations, with α as constant, β as the coefficient vector, and ε representing the error term. Finally, we included a number of fixed effects: industry, country, and year in the model.

(1a) Product Innovation = α + βFormal Credit + βControl Variables +fixed effects+Ɛ
(1b) Process Innovation = α + β Formal Credit + βControl Variables +fixed effects+Ɛ

(2a) Product Innovation = α + βInformal Credit + βControl Variables +fixed effects+Ɛ
(2b) Process Innovation = α + βInformal Credit + βControl Variables +fixed effects+Ɛ

(3a) Product Innovation = α + βBGA + βControl Variables +fixed effects+Ɛ
(3b) Process Innovation = α + βBGA + βControl Variables +fixed effects+Ɛ

(4a) Product Innovation = α + βForeign Ownership + βControl Variables +fixed effects+Ɛ
(4b) Process Innovation = α + βForeign Ownership + βControl Variables +fixed effects+Ɛ

(5a) Product Innovation = α + βState Ownership + βControl Variables +fixed effects+Ɛ
(5b) Process Innovation = α + βState Ownership + βControl Variables +fixed effects+Ɛ

Results

Table 2 displays the descriptive statistics, emphasizing the variables we utilized in our baseline regression. Our dataset suggests that SMEs tend to contribute to innovation as reflected in their product or process. Specifically, the descriptive analysis (Table 3) indicates that 42%

and 30% of the SMEs are involved in product innovation and process innovation, respectively. This is supported by the low percentage (average 35%) of SMEs implementing any type of innovation. This was captured in our dataset confirming that about 80% of these SMEs, used some form of a credit facility. Also, we considered some firm characteristics (e.g., firm age, state ownership, etc.) deemed important for an SME to have, as they may significantly increase the chances of SMEs to introduce innovative outcomes, particularly in the developing countries where firms suffer from obstacles such as lack of access to formal financial services, or availability of adequately educated/skilled employees.

Regarding firm size, we observed that the majority of these SMEs are micro and small in size. A 15–year experience average was observed among those who managed SMEs in the sub–Saharan African manufacturing sector. Formal training was provided to employees by 28% of SMEs. Likewise, we identified firm characteristics as one of the key determinants of innovation. Notably, 84% of the SMEs in our dataset have private domestic ownership but only less than 1% have state–ownership. In our dataset, SMEs were, on average, 20 years old. SMEs in developing countries face more challenges related to accessing finance than to acquiring adequately skilled employees (Table 3).

To determine the degree of association between our variables, we carried out a correlation analysis as illustrated in Table 4. As expected, firms' informal credit has positive correlations with firms' innovation though non–significant, except for formal credit which is negative. As expected, the correlation matrix also reveals a negative correlation between BGA and firms' innovations. However, as expected, the connection between foreign and state ownership arrangements and firms' innovation is positive. Here, the logistic regression will provide a more precise outcome to validate the inputs obtained from the correlation matrix as a preliminary analysis. The coefficients are of moderate size in most cases. Thus, multicollinearity between variables is unlikely. Multicollinearity may impact both estimation

outcomes and result interpretation. In addition, when multicollinearity is absent, endogeneity problems are alleviated (Mela and Kopalle, 2002).

–Insert Tables 3 & 4 here–

Table 5 illustrates the results of the logit model testing our hypotheses. By utilizing the primary explanatory variables from the analysis of innovation and SME financing literature, we estimate the likelihood of an SME being innovative. The first two columns in Table 5 show that SMEs that have better access to financial resources through banks or financial institutions are less likely to engage in innovative practices/innovations in either products or processes [$\beta = -0.004$, $p < 0.001$, Model (1a); $\beta = -0.004$, $p < 0.001$, Model (1b)]. However, SMEs with increased access to informal credit for their operations introduce more innovations [$\beta = 0.005$, $p < 0.001$, Model (2a); $\beta = 0.005$, $p < 0.001$, Model (2b)]. Therefore, hypothesis 1 (H1) was validated, emphasizing that mere access to formal financing is insufficient to motivate SMEs to pursue innovative projects (and may even restrict their fund utilization). Conversely, informal loans offer SME owners more flexibility in fund allocation, thus endorsing Hypothesis 2 (H2). These findings hold significance in developing countries, where the business environment is frequently influenced by unstable financial systems, inadequate governance, and deficient legal institutions, resulting in varied credit source outcomes (Menkhoff *et al.*, 2012). As seen in Model 3a and 3b in Table 5, the BGA's effect on SME innovation in developing countries is negative and significant [ß = -0.122; $p < 0.01$, Model (3a); ß = -0.227; $p < 0.001$, Model (3b)], thereby providing no support for Hypothesis 3.

The results highlight the downsides of being part of a business group and larger companies. Business groups may restrict their affiliates to some routine tasks, or their affiliates may receive sufficient security/market share from their business groups, reducing the affiliates'

willingness to innovate. To determine whether foreign ownership is negatively associated with SME innovation in developing countries, we test Models 4a and 4b, as shown in Table 5. The results show that the –negative impact of foreign ownership on innovation is not significant [ß = - 0.002; p > 0.1, Model (4a); ß = -0.002; p > 0.1, Model (4b)], which means that Hypothesis 4 was not supported. In the context of sub–Saharan Africa, foreign ownership structures tend to disadvantage local partners. This is primarily because foreign investors partner with sub–Saharan African firms to benefit from local advantages such as low labor costs and abundant raw materials. Finally, the results of Models (5a) and (5b) show that state ownership has positive effects on SME innovation in developing countries. Thus, the results support Hypothesis 5 [$\beta = 0.011$, $p < 0.01$, Model (5a); $\beta = 0.015$, $p < 0.001$, Model (5b)].

(Insert Table 5 here)

Discussion

The innovation efforts of SMEs in developing countries are very important to many individuals who live in impoverished neighborhoods (Kuk *et al.,* 2022). Considering their importance to over a billion individuals who inhabit such neighborhoods (UN, 2019), it is essential that research develops some understanding of where SMEs, in such contexts, obtain financial resources necessary for their innovations. Research generally acknowledges that such contexts lack functional formal financial institutions (see Wellalage and Fernandez, 2019; Wellalage and Locke, 2020; Wu *et al.,* 2016)—a situation that severely reduces the options available to SMEs to acquire much–needed financial resources to enable their innovations.

To address the critical question concerning the types of financial sources SMEs utilize for supporting their innovative activities, this study drew upon theoretical insights at the intersection of SME, innovation, and entrepreneurial finance literature forming the basis of its analysis. Its comprehensive analysis yielded new insights into how SMEs in developing countries secure essential financial resources for innovation. Empirical evidence suggests that

SMEs in sub–Saharan Africa rely on a variety of non–mainstream financing mechanisms: in other words, informal credit channels (Wellalage and Locke, 2020). They utilize business groups (cf., Carney *et al.,* 2011; Tajeddin and Carney, 2019), and state ownership agreements (Leuz *et al.,* 2010) as avenues for obtaining innovation investments. Contrary to our initial expectations, financial resources from business groups had a negative impact on SME innovation. This can be explained by the dual nature of business groups. While they can offer necessary capital for financing innovation, they can also act as constraints, limiting SMEs to resources available within the group (cf., Carney *et al.,* 2011; Shapiro *et al.,* 2023; Tajeddin and Carney, 2019). Despite foreign ownership showing aspects of having a negative impact on SME innovation in developing countries, it gives reasons to suspect that our findings are inconclusive on its impact on innovation. This demonstrates the complex relationship among different financing and ownership structures and their impact on SME innovation in developing countries.

Notwithstanding evidence showing the complexities surrounding financing SME innovations in developing countries, the present research contributes to SME, innovation management, and entrepreneurial financing research in various ways. Specifically, the study unveils a novel aspect of SME innovation—financing, and highlights the critical role of alternative financial mechanisms in the innovation activities of SMEs in developing countries. Within the financial landscape these enterprises navigate, informal credit emerges as a crucial enabler for SME–led innovations that are essential for impoverished neighborhoods in these countries. Crucially, innovation funding through non–mainstream means is quick to obtain without the need to complete cumbersome credit application forms or go through collateral and project approval procedures (cf., Simba *et al.,* 2023). Its flexibility (Wellalege and Fernandez, 2019; Wu *et al.,* 2016), and short turnaround time (Armendariz and Morduch, 2007) improve innovation lead cycles and the time to market new innovations. Undoubtedly, this is essential

for SMEs that are in business contexts known to have high financial institutional voids (cf., Goedhuys and Sleuwaegen, 2016; Oriaifo *et al.,* 2020) and have the responsibilities of serving large poor neighborhoods.

Theoretical contributions

The cross–fertilisation between SME research, innovation, and finance engendered in this research advances new theorizations that help to understand how contextual factors dictate the source of finance SME owners in developing countries utilize in the absence of formal financing mechanisms. The findings of this study address, in some way, the misconception of the place of non–mainstream financial systems in innovative SMEs. They statistically illustrate the varying degrees of the impact of informal credit, business group resources, firms, and state ownership arrangements on SME innovation in developing countries. Arguably, the study facilitates scholarly conversations with context and it generates indigenous theorizations that are sensitive to contextual variations (cf., Filatotchev *et al.,* 2022; Bruton *et al.,* 2022). In some ways, it addresses research calls by Welter (2011) and Zahra (2007) advocating for contextualizing entrepreneurship research. In keeping with that, the study presents academic researchers with an instructive SME innovation–financing framework, encouraging further studies to establish its applicability in research studies that focus on various contexts.

Research implications

The findings and new theoretical explanations of this research have the following research implications. They can be useful for guiding both SME and innovation policy development to highlight the push factors forcing innovative SMEs to resort to non–mainstream financing means, especially in the developing world where formal sources of finances are a preserve for the elite. These findings and theorizations stimulate debate about the need for

policy reforms to integrate unconventional financing schemes into the financial markets of the developing world. Reforming the financial markets to make them inclusive is crucial for SMEs across many parts of the developing world. Indeed, recognizing informal sources of finance, including informal credit, business groups, foreign and state ownership arrangements, as alternative pathways for SMEs to secure funding is essential in terms of enabling their innovations. These seemingly essential sources of finance must be seen as a continuum of formal financial services (see Simba *et al.,* 2024) as opposed to an old-fashioned and unregulated mechanism that will fade with modernization. In some ways, enhancing financial access for SMEs, often viewed as essential economic agents by both academics and economic commentators, is crucial for regional economics. This also expands their understanding of the financial resources accessible for them to utilize within their financial ecosystems. This crucially provides information that contributes to their innovation management, survival, and growth strategies. This is crucial for social and economic sustainability, particularly for communities in the developing world characterized by high unemployment.

Research limitations and suggestions for future studies

Like any other research project, our study has its limitations. The empirical tests presented in Model 4a suggest that the negative impact of foreign ownership on innovation is not significant (ß = - 0.002; $p > 0.1$). This inconclusive result provides opportunities for future research. Using a qualitative approach, future studies should explore whether there is a tendency among foreign owners to neglect international ventures. Could their decisions be influenced by government subsidies? Focusing on this issue can enhance the understanding of the factors that impact innovation in SMEs in developing regions. Furthermore, quantitative research can focus on investigating the reasons why foreign investors sometimes neglect to invest in the innovation capabilities of their ventures abroad.

Additionally, it is noteworthy that while the focus and the results of this study reflect the important role non–mainstream financial schemes play in facilitating innovation among SMEs, the heterogeneity in business financing systems across many parts of the developing countries means that our findings may not be universally applicable. While this presents a limitation of this research, it offers opportunities for future studies to explore the mechanisms behind financing systems in other developing country contexts.

Conclusion

This study contributes to the intersection of SME, innovation, and entrepreneurship research by developing new theories that explain how innovative SMEs in developing countries navigate financial gaps. The findings indicate that the local context dictates the financial resources SMEs rely on, particularly for innovation. Specifically, informal credit, business group resources, and varying ownership structures form an alternative financial landscape impacting these firms. Like all studies, this one is not without limitations. The data used were derived from 9 sub–Saharan African regions comprising 46 countries, which, while in some ways it enhances the generalizability of the findings within the region, also limit that generalizability beyond the region.

References

Abor, J. and Quartey, P. (2010), "Issues in SME development in Ghana and South Africa", *International Research Journal of Finance and Economics,* Vol. 39 No.6, pp. 215-228.

Adu-Danso, E. and Abbey, E. (2022), "Does foreign ownership enhance technological innovation among manufacturing firms in Sub-Saharan Africa?", *Journal of Small Business and Entrepreneurship*, Vol.34 No.2, pp. 195-221. https://doi: 10.1080/08276331.2020.1771813

Angilella, S. and Mazzù, S. (2015), "The financing of innovative SMEs: A multicriteria credit rating model", *European Journal of Operational Research,* Vol.244 No.2, pp. 540-554. https://doi.org/10.1016/j.ejor.2015.01.033

Armendáriz, B. and Morduch, J. (2010), *The Economics of Microfinance.* MIT Press.

Armendariz de Aghion, B. and Morduch, J. (2005), *The Economics of Microfinance.* MIT Press, Cambridge.

Ayalew, M. M., and Xianzhi, Z. (2019), "Bank competition and access to finance: evidence from African countries", *Journal of Industry, Competition and Trade*, Vol.19 No.1, pp. 155-184. https://doi.org/10.1007/s10842-018-0283-6

Ayalew, M. M., Xianzhi, Z. and Hailu, D. H. (2020), "The finance of innovation in Africa", *European Journal of Innovation Management*, Vol.3,No.23, pp. 348-382. https://doi.org/10.1108/EJIM-11-2018-0242

Baumol, W.J. (2010), *The Microtheory of Innovative Entrepreneurship*. Princeton University Press.

Beck, T., Demirgüç-Kunt, A. and Maksimovic, V. (2008), "Financing patterns around the world: Are small firms different?", *Journal of Financial Economics*, Vol.89 No.3, pp. 467-487. https://doi.org/10.1016/j.jfineco.2007.10.005

Beck, T. (2007), *Financing constraints of SMEs in developing countries: Evidence, determinants, and solutions*. Washington DC: The World Bank.

Beck, T. and Demirguc-Kunt, A. (2006), "Small and medium-sized enterprises: Access to finance as a growth constraint", *Journal of Banking and Finance*, Vol.30 No.11, pp. 2931-2943. https://doi.org/10.1016/j.jbankfin.2006.05.009

Beck, T., Demirgüç-Kunt, A. and Honohan, P. (2009), "Access to financial services: Measurement, impact, and policies", *The World Bank Research Observer*, Vol.24 No.1, pp. 119-145. https://doi.org/10.1093/wbro/lkn008

Benner, M.J. and Tushman, M. (2002), "Process management and technological innovation: a longitudinal study of the photography and paint industries", *Adm. Sci. Q.*, Vol.47 No.4, pp. 676-707. https://doi.org/10.2307/3094913

Berger, A.N. and Udell, G.F. (1998),"Lines of credit and relationship lending in small firm finance", *Social Science Electronic Publishing*, Vol.63 No.2, pp. 47–48. http://dx.doi.org/10.2139/ssrn.124708

Brancati, E. (2015), "Innovation financing and the role of relationship lending for SMEs". *Small Business Economics*, Vol.44 No.2, pp. 449-473. https://doi.org/10.1007/s11187-014-9603-3.

Brito, R. P. D., Lenz, A. K. and Pacheco, M. G. M. (2022), "Resilience building among small businesses in low-income neighborhoods", *Journal of Small Business Management*, Vol.60 No.5, pp. 1166-1201.

Brown, R., Liñares-Zegarra, J. M. and Wilson, J. O. (2022), "Innovation and borrower discouragement in SMEs", *Small Business Economics,* Vol. 59 No.4, pp. 1489-1517. https://doi.org/10.1007/s11187-021-00587-1

Bruton, G. D., Nuhu, N. and Qian, J. J. (2021), "Informal finance in settings of poverty: Establishing an agenda for future entrepreneurship research", *Journal of Developmental Entrepreneurship,* Vol.26 No.02, pp. 2150011. https://doi.org/10.1142/S1084946721500114

Bruton, G. D., Zahra, S. A., Van de Ven, A. H. and Hitt, M. A. (2022), "Indigenous theory uses, abuses, and future", *Journal of Management Studies*, Vol.59 No.4, pp. 1057-1073. https://doi.org/10.1111/joms.12755

Buyinza, F., and Bbaale, E. (2013), "Access to credit and the effect of credit constraints on the performance of manufacturing firms in the East African region: Micro analysis", *International Journal of Economics and Finance,* Vol.5 No.10, pp. 85-99. https://doi:10.5539/ijef.v5n10p85

Carney, M., Gedajlovic, E. R., Heugens, P. P., Van Essen, M. and Van Oosterhout, J. (2011), "Business group affiliation, performance, context, and strategy: A meta-analysis". *Academy of Management Journal,* Vol.54 No.3, pp. 437-460. https://doi.org/10.5465/amj.2011.61967812

Castellacci, F. (2015), "Institutional voids or organizational resilience? Business groups, innovation, and market development in Latin America", *World Development,* Vol.70 No.2015, pp. 43–58. https://doi.org/10.1016/j.worlddev.2014.12.014

Chang, S. J., Chung, C. N. and Mahmood, I. P. (2006), "When and how does business group affiliation promote firm innovation?", A tale of two emerging economies", *Organization Science,* Vol.17 No.5, pp. 637-656. https://doi.org/10.1287/orsc.1060.0202

Dachs, B. and Peters, B. (2014), "Innovation, employment growth, and foreign ownership of firms: A European perspective", *Research Policy,* Vol.43 No.1, pp. 214-232. https://doi.org/10.1016/j.respol.2013.08.001

Deltour, F., Le Gall, S. and Lethiais, V. (2021), "Partners and Geographical Scale of SMEs' Open Innovation: Does Business Group Affiliation Matter?", *International Journal of Innovation Management,* Vol.25 No.06, pp. 2150064. https://doi.org/10.1142/S136391962150064X

Demirkan, I. (2018), "The impact of firm resources on innovation", *European Journal of Innovation Management,* Vol.21 No.4, pp. 672-694. https://doi.org/10.1108/EJIM-12-2017-0196

Diniz, E. H., Siqueira, E. S. and Van Heck, E. (2019), "Taxonomy of digital community currency platforms", *Information Technology for Development,* Vol.25 No.1, pp. 69-91. https://doi.org/10.1080/02681102.2018.1485005

Edeh, J. N. and Acedo, F.J. (2021), "External supports, innovation efforts, and productivity: Estimation of a CDM model for small firms in developing countries", *Technological Forecasting and Social Change,* Vol.173 No.2021, pp. 121189 https://doi.org/10.1016/j.techfore.2021.121189.

Eisenhardt, K. M. and Tabrizi, B. N. (1995), "Accelerating adaptive processes: Product innovation in the global computer industry", *Administrative Science Quarterly,* pp. 84-110. https://doi.org/10.2307/2393701

Eniola, A. A. and Ektebang, H. (2014), "SME firms' performance in Nigeria: Competitive advantage and its impact." *International Journal of Research Studies in Management,* Vol.3 No.2, pp. 75-86. https://doi.org/10.1016/j.sbspro.2015.06.361

Evangelista, R., Sandven, T., Sirilli, G. and Smith, K. (1998), "Measuring innovation in European industry", *International Journal of the Economics of Business,* Vol.5 No.3, pp. 311-333. https://doi.org/10.1080/13571519884413

Filatotchev, I., Ireland, R. D. and Stahl, G. K. (2022), "Contextualizing management research: An open systems perspective", *Journal of Management Studies,* Vol.59 No.4, pp. 1036-1056. https://doi.org/10.1111/joms.12754

Goedhuys, M. and Sleuwaegen, L. (2013), "The Impact of International Standards Certification on the Performance of Firms in Less Developed Countries", *World Development*, Vol.47 No.2013, pp. 87-101. https://doi.org/10.1016/j.worlddev.2013.02.014

Goedhuys, M. and Sleuwaegen, L. (2016), "International standards certification, institutional voids, and exports from developing country firms", *International Business Review*, Vol.25 No.6, pp. 1344-1355. https://doi.org/10.1016/j.ibusrev.2016.04.006

Gonzalez, A., Qiang, C.Z. and Kusek, P. (2017), "Foreign investment is a major contributor to development", *Book chapter Global Investment Competitiveness Report* 2017/2018, doi: 10.1596/ 978-1-4648-1175-3.

Gu, F.F., Hung, K. and Tse, D.K. (2008), "When does guanxi matter?", Issues of capitalization and its dark sides", *Journal of Marketing*, Vol.72 No.4, pp. 12–28. http://dx.doi.org/10.1509/jmkg.72.4.12

Hernández-Cánovas, G. and Martínez-Solano, P. (2006), "Banking relationships: effects on debt terms for small Spanish firms", *Journal of Small Business Management*, Vol.44 No.3, pp. 315-333. https://doi.org/10.1111/j.1540-627X.2006.00174.x

Jayaram, J., Oke, A. and Prajogo, D. (2014), "The antecedents and consequences of product and process innovation strategy implementation in Australian manufacturing firms", *International Journal of Production Research*, Vol.52 No.15, pp. 4424-4439. https://doi.org/10.1080/00207543.2013.849363

Jensen, M.C. and Meckling, W. H. (1976), "Theory of the firm: Managerial behaviour, agency costs, and ownership structure", *Journal of Financial Economics*, Vol.3 No.4, pp. 305-360. https://doi.org/10.1007/978-94-009-9257-3_8

Kennedy, P. T. (1988), *African capitalism: The struggle for ascendancy*. New York, Cambridge University Press.

Khanna, T. and Palepu, K. (1997), "Why focused strategies." *Harvard Business Review*, Vol.75 No.4, pp.41-51.

Khanna, T. and Rivkin, J. W. (2001), "Estimating the performance effects of business groups in emerging markets", *Strategic Management Journal*, Vol.22 No.1, pp. 45-74. https://doi.org/10.1002/1097-0266(200101)22:1<45:AID-SMJ147>3.0.CO;2-F

Khanna, T. and Yafeh, Y. (2007), "Business groups in emerging markets: Paragons or parasites?". *Journal of Economic Literature*, Vol.45 No.2, pp. 331-372. doi: 10.1257/jel.45.2.331

Khatami, F., De Bernardi, P., Vilamová, Š., Cagno, E. and Ricciardi, F. (2024), "Innovation ecosystem for smart products: empirical quantification of its key dimensions in SMEs of 21 European countries", *Review of Managerial Science*, pp. 1-26. https://doi.org/10.1007/s11846-024-00763-z

Kislat, C. (2015), "Why are informal loans still a big deal?", Evidence from North-East Thailand", *Journal of Development Studies*, Vol.51 No.5, pp. 569–585. https://doi.org/10.1080/00220388.2014.983907

Klapper, L. and Singer, D. (2015), "The role of informal financial services in Africa." *Journal of African Economies*, Vol. 24 Suppl. 1, i12-i31. https://doi.org/10.1093/jae/eju027

Kuk, G., Simba, A. and Giamporcaro, S. (2022), "How Paying–it–Forward Expands Entrepreneurial Functioning in Kenya's Informal Settlements", In *Academy of Management Proceedings* (Vol. 2022, No. 1, p. 12412). Briarcliff Manor, NY 10510: Academy of Management.

Lee, B. K. (2006), *Dividend Policy and RandD Investment Decisions of Korean Firms: A Dynamic Panel Data Analysis.* Seoul: Korea Economic Research Institute.

Lee, N., Sameen, H. and Cowling, M. (2015), "Access to finance for innovative SMEs since the financial crisis", *Research Policy*, Vol.44 No.2, pp. 370-380. https://doi.org/10.1016/j.respol.2014.09.008

Leuz, C., Lins, K. V. and Warnock, F. E. (2010), "Do Foreigners Invest Less in Poorly Governed Firms?", *The Review of Financial Studies*, Vol.23 No.3, pp. 3245–3285. https://doi.org/10.1093/rfs/hhn089

Li, H. and Zhang, Y., (2007), "The role of managers" political networking and functional experience in new venture performance: evidence from Chinas transition economy", *Strategic Management Journal*, 28(8), 791–804. https://doi.org/10.1002/smj.605

Mahmood, I. P. and Mitchell, W. (2004), "Two faces: Effects of business groups on innovation in emerging economies", *Management Science*, Vol.50 No.10, pp. 1348-1365. https://doi.org/10.1287/mnsc.1040.0259

Mela, C. F. and Kopalle, P. K. (2002), "The impact of collinearity on regression analysis: the asymmetric effect of negative and positive correlations", *Applied Economics*, Vol.34 No.6, pp. 667-677. https://doi.org/10.1080/00036840110058482

Menkhoff, L., Neuberger, D. and Rungruxsirivorn, O. (2012), "Collateral and its substitutes in emerging markets' lending." *Journal of Banking and Finance*, No.36 No.3, pp. 817-834. https://doi.org/10.1016/j.jbankfin.2011.09.010

Mitton, T. (2016), "The wealth of subnations: Geography, institutions, and within-country development", *Journal of Development Economics*, Vol.118, pp. 88–111. https://doi.org/10.1016/j.jdeveco.2015.09.002.

Molina-García, A., Dieguez-Soto, J., Galache-Laza, M. T. and Campos-Valenzuela, M. (2023), Financial literacy in SMEs: a bibliometric analysis and a systematic literature review of an emerging research field. *Review of Managerial Science*, Vol.17 No.3, pp. 787-826. https://doi.org/10.1007/s11846-022-00556-2

Ngalawa, H. and Viegi, N. (2013), "Interaction of formal and informal financial markets in quasi-emerging market economies", *Economic Modelling*, Vol.31 No.2013, pp. 614–624. https://doi.org/10.1016/j.econmod.2013.01.005

Nguyen, B. and Canh, N. P. (2021), "Formal and informal financing decisions of small businesses", *Small Business Economics*, Vol.57 No.3, pp. 1545-1567. https://doi.org/10.1007/s11187-020-00361-9

Oriaifo, J., Torres de Oliveira, R. and Ellis, K. M. (2020), "Going above and beyond: How intermediaries enhance change in emerging economy institutions to facilitate small to medium enterprise development", *Strategic Entrepreneurship Journal*, Vol.14 No.3, pp. 501-531. https://doi.org/10.1002/sej.1349

Passas, N., Hsu, S. and Li, J. (2012), "Development and legitimacy of Chinese informal finance." *The Pacific Review*, Vol.25 No.4, pp. 495-511. https://doi.org/10.1080/09512748.2012.685091

Polit, D. F. and Beck, C. T. (2010), "Generalization in quantitative and qualitative research: Myths and strategies", *International Journal of Nursing Studies*, Vol.47 No.11, pp. 1451-1458. https://doi.org/10.1016/j.ijnurstu.2010.06.004

Puffer, S. M., McCarthy, D. J. and Boisot, M. (2010), "Entrepreneurship in Russia and China: The impact of formal institutional voids", *Entrepreneurship Theory and Practice*, Vol.34 No.3, pp. 441-467. DOI: 10.1111/j.1540-6520.2009.00353.x

Radas, S. and Bozic, L. (2012), "Overcoming failure: Abandonments and delays of innovation projects in SMEs", *Industry and Innovation*, Vol.19 No.8, pp. 649-669. https://doi.org/10.1080/13662716.2012.739769

Sahut, J-M., Dana, L-P. and Teulon, F. (2021), "Corporate governance and financing of young technological firms: A review and introduction", *Technological Forecasting and Social Change*,Vol.163 No.2021, pp.120425. https://doi.org/10.1016/j.techfore.2020.120425.

Saka-Helmhout, A., Chappin, M. and Vermeulen, P. (2020), "Multiple paths to firm innovation in sub-Saharan Africa: How informal institutions matter", *Organization Studies*, Vol.41 No.11, pp. 1551-1575. https://doi.org/10.1177/017084061988297

Seo, J. H., J. O. Kim and W. S. Choi. (2015), "The Effects of Commercialization Capability in Small and Medium-Sized Businesses on Business Performances: Focused on Moderating Effects of Open Innovation", *Journal of Management and Strategy*, Vol.6 No.2, pp. 70–82. DOI: 10.5430/jms.v6n2p70

Shapiro, D., Estrin, S., Carney, M., and Liang, Z. (2023),"Business Groups and Export Performance: The Role of Coordination Failures and Institutional Configurations", *Journal of Management Studies*, Vol.61, pp. 2303-2337https://doi.org/10.1111/joms.12973

Simba, A., Ojong, N. and Kuk, G. (2021), "Bricolage and MSEs in emerging economies", *The International Journal of Entrepreneurship and Innovation*, Vol.22 No.2, pp. 112-123. https://doi.org/10.1177/1465750320969621

Simba, A., Ogundana, O. M., Braune, E., and Dana, L. P. (2023),"Community financing in entrepreneurship: A focus on women entrepreneurs in the developing world", *Journal of Business Research*, Vol.163, pp. 113962.

Simba, A., Tajeddin, M., Dana, L. P. and Ribeiro Soriano, D. E. (2024), "Deconstructing involuntary financial exclusion: a focus on African SMEs" *Small Business Economics*, Vol.62 No.1, pp. 285-305.

Simba, A. (2024), "Reassessing Western Biases: An African perspective of entrepreneurship and innovation", *In the International Encyclopedia of Business Management*, Elsevier.

Smallbone, D. and Welter, F. (2001), "The role of government in SME development in transition economies", *International Small Business Journal*, Vol.19 No.4, pp. 63-77. https://doi.org/10.1177/0266242601194004

Spithoven, A., Vanhaverbeke, W. and Roijakkers, N. (2013), "Open innovation practices in SMEs and large enterprises", *Small Business Economics*, Vol.41 No.3, pp. 537-562. https://doi.org/10.1007/s11187-012-9453-9

Tajeddin, M. and Carney, M. (2019), "African business groups: how does Group affiliation improve SMEsexport intensity?", *Entrepreneurship Theory and Practice,* Vol.43 No.6, pp. 1194-1222. DOI: 10.1177/1042258718779586

Tan, J., Li, S. and Xia, J. (2007), "When iron fist, visible hand, and invisible hand meet: firm-level effects of varying institutional environments in China", *Journal of Business Research,* Vol.60 No.7, pp. 786–794. https://doi.org/10.1016/j.jbusres.2007.03.003

Teece, D. J. (1986), "Profiting from technological innovation: implications for integration, collaboration, licensing, and public policy", *Research Policy,* Vol.15 No.6, pp. 285–305. https://doi.org/10.1016/0048-7333(86)90027-2

Ullah, B. (2019), "Firm innovation in transition economies: The role of formal versus informal finance", *Journal of Multinational Financial Management,* Vol.50, pp. 58-75. https://doi.org/10.1016/j.mulfin.2019.04.004

UN (2019), *Make cities and human settlements inclusive, safe, resilient, and sustainable.* Available at: https://unstats.un.org/sdgs/report/2019/goal-11/. Accessed on 05/10/2022

Uzuegbunam, A. O. and Uzuegbunam, I. (2018), "Arm"s-length or give-and-take? Gender differences in the relational orientation of new ventures in Sub-Saharan Africa." *Strategic Entrepreneurship Journal,* Vol.12 No.4, pp. 522-541. https://doi.org/10.1002/sej.1301

Van Caneghem, T. and Van Campenhout, G. (2012), "Quantity and quality of information and SME financial structure", *Small Business Economics,* Vol.39 No.2, pp. 341-358. https://doi.org/10.1007/s11187-010-9306-3

Wellalage, N. H., and Fernandez, V. (2019), "Innovation and SME finance: Evidence from developing countries." *International Review of Financial Analysis,* Vol.66, pp. 101370. https://doi.org/10.1016/j.irfa.2019.06.009

Wellalage, N. H., and Locke, S. (2020), "Formal credit and innovation: Is there a uniform relationship across types of innovation?", *International Review of Economics and Finance,* Vol.70, pp. 1-15. https://doi.org/10.1016/j.iref.2020.07.004

Welter, F., and Smallbone, D. (2011), "Institutional perspectives on entrepreneurial behavior in challenging environments", *Journal of Small Business Management,* Vol.49 No.1, pp. 107-125. doi/full/10.1111/j.1540-627X.2010.00317.x

Welter, F. (2011), "Contextualizing entrepreneurship—conceptual challenges and ways forward", *Entrepreneurship Theory and Practice,* Vol.35 No.1, pp. 165–184. DOI: 10.1111/j.1540-6520.2010.00427.x

World Bank Enterprise Survey(2016), Enterprise survey indicator descriptions.

Wooldridge, J. M. (2010), *Econometric Analysis of Cross Section and Panel Data*. MIT Press.

Wu, J., Al-Khateeb, F. B., Teng, J. T. and Cárdenas-Barrón, L. E. (2016), "Inventory models for deteriorating items with maximum lifetime under downstream partial trade credits to credit-risk customers by discounted cash-flow analysis", *International Journal of Production Economics,* Vol.171, pp. 105-115. https://doi.org/10.1016/j.ijpe.2015.10.020

Wu, J., Si, S., and Wu, X. (2016), "Entrepreneurial finance and innovation: Informal debt as an empirical case", *Strategic Entrepreneurship Journal,* Vol.10 No.3, pp. 257-273. https://doi.org/10.1002/sej.1214

Wu, L., Wei, Y. and Wang, C. (2021), "Disentangling the effects of business groups in the innovation-export relationship", *Research Policy, Vol.*50 No.1, pp. 104093 https://doi.org/10.1016/j.respol.2020.104093.

Wu, T-H., Ting, P.J.L., Lin, M-C. and Chang, C-C. (2022), "Corporate ownership and firm performance: a mediating role of innovation efficiency", *Economics of Innovation and New Technology*, Vol.31 No.4, pp. 292-319. https://doi.org/10.1080/10438599.2020.1799140

Zahra, S. A. (2007), "Contextualizing theory building in entrepreneurship research", *Journal of Business Venturing*, Vol.22 No.3), pp. 443–452. https://doi.org/10.1016/j.jbusvent.2006.04.007

Figure 1. Conceptual Framework

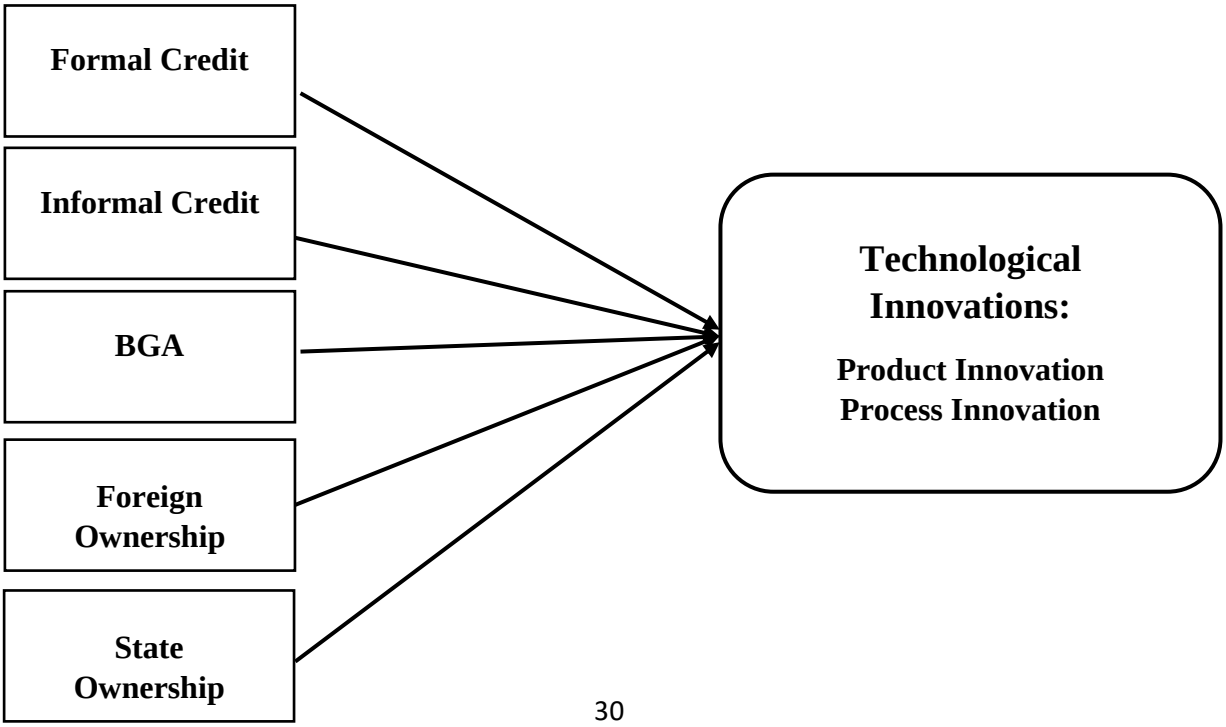

Table 1. Sample's Distribution (Country and Observation Years)

Countries	**2011**	**2013**	**2014**	**2016**	**2017**	**2018**	**2019**	**2020**	**Total**
Benin				119					**119**
Cameroon				244					**244**
Ghana		641							**641**
Kenya		631				885			**1516**
Mozambique						529			**529**
Niger					107				**107**
Nigeria			1601						**1601**
SouthAfrica								979	**979**
Tanzania		539							**539**
Zambia		628					526		**1154**
Zimbabwe	513			524					**1037**
Total	**513**	**2439**	**1601**	**887**	**107**	**1414**	**526**	**979**	**8466**

Table 2. Questionnaires based on WBES

Variable		Definition	Source
DV	Technological Innovation	Product Innovation: h1_New Products/Services Introduced Over Last 3 Years	WBES
		Process Innovation: h5_During Last 3 Years, Establishment Introduced New/Significantly Improved Process	WBES
INV.	Formal credit	K3bc: Borrowed from banks: private and state-owned	WBES
		K3e: Borrowed from non-bank financial institutions which include microfinance institutions, credit cooperatives, credit unions, or finance companies.	
	Informal Credit	K3f: Purchases on credit from suppliers and advances from customers	WBES
		K3hd: Other, moneylender, friends, relatives, etc.	
	Business Group Affiliation	B2a: What per cent of this firm is owned by each of the following: Private domestic individuals, companies, or organizations? [1] A.7: the establishment is part of a larger firm?	Calculated from WBES
	Foreign Own.	b.2b. Ownership of Private foreign individuals, companies or organizations.	WBES
	State Ownership	Q.b2c: What per cent of this firm is owned by the government/state	WBES
CV.	Firm Size	The Number of a full-time employees (Nominal variable)	WBES
	Firm Age	The number of years between the firm's founding year and the year of its interview	WBES
	Domestic Ownership	Q.b2a. What per cent of this firm is owned by Domestic individuals, companies or organizations:	WBES
	Training	L.10. did this establishment have formal training programs for its permanent, full-time employees?	WBES
	Financial Obstacle	K.30. To what degree is Access to Finance an obstacle to the current operations of this establishment?	WBES
	Educational Obstacle	L.30. To what degree is an Inadequately Educated Workforce an obstacle to the current operations of this establishment?	WBES
	Industry	A4a. Business sector	WBES
	Country	Nominal variable (11 countries): code of each country	WBES
	Year	The year of the interview	WBES

[1] Assuming that a firm is domestically owned if at least 50% of its ownership belongs to private domestic individuals.

Table 3. Descriptive Statistics

Variables	Obs.	Median	Mean	Std Dev	Minimum	Maximum
Product INN.	8466	0	0.42665	0.49462	0	1
Process INN.	8466	0	0.30191	0.45912	0	1
Formal Credit	8466	100	82.2661	29.8184	0	100
Informal Credit	8466	0	14.2748	25.6256	0	100
BG	8466	2	1.79849	0.40115	1	2
Foreign Own.	8466	0	8.76943	25.525	0	100
Firm Size	8466	2	1.78927	0.71339	1	4
Firm Age	8466	15	19.9563	16.97	0	220
Mng. Experience	8466	14	15.6547	10.1948	0	72
Domestic Own.	8466	100	84.0763	33.2902	0	100
State Own.	8466	0	0.83782	5.59998	0	99
Formal Training	8466	0	0.28396	0.45094	0	1
Financial Obst.	8466	2	1.77309	1.35671	0	4
Educational Obst.	8466	1	0.97401	1.10437	0	4
Industry	8466	27	29.5749	18.3881	1	93

Table 4: Correlation matrix

	Product_INN.	Process_INN.	Formal_Credit	Informal_Credit	Firm Size	Firm Age	Mng.Expe.	BGA	Domestic Own.	Foreign Own.	State Own.	Formal training	Financial Obst.	Educational Obst	Industry
Product_INN.	1														
Process_INN.	0.444	1													
Formal_Credit	-0.082	-0.078	1												
Informal_Credit	0.080	0.070	-0.797	1											
Firm Size	0.067	0.075	0.050	-0.045	1										
Firm Age	-0.009	-0.002	0.051	-0.045	0.247	1									
Mng. Experience	0.030***	0.012	0.053	-0.043	0.141	0.388	1								
BGA	-0.04***	-0.064	0.001	-0.017	-0.163	-0.121	0.022**	1							
Domestic Own.	-0.050	-.03***	0.104	-0.138	-0.111	0.023**	0.034***	0.104	1						
Foreign Own.	0.030***	0.021*	-0.003	0.010	0.151	-0.007	-0.01	-0.106	-0.728	1					
State Own.	0.048	0.059	-0.065	0.086	0.040***	0.024**	-0.03***	-0.053	-0.240	0.025**	1				
Formal training	0.222	0.246	-0.04***	0.025**	0.170	0.040***	0.053	-0.092	-0.074	0.077	0.041***	1			
Financial Obst.	0.109	0.077	-0.060	0.052	-0.092	-0.025**	0.015	0.033***	0.059	-0.04***	-0.008	0.063	1		
Educational Obst.	0.166	0.154	-0.137	0.110	-0.009	-0.054	-0.003	0.017	-0.072	0.027**	0.073	0.127	0.229	1	
Industry	0.042***	0.067	0.045	-0.011	0.027**	0.096	0.053	-0.058	0.028***	-0.011	-0.010	0.001	0.105	-0.091	1

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 5: Logit Regression Results

Variables	Formal Credit		Informal Credit		BGA		Foreign Own.		State Own.	
	Product_INN.	Process_INN.	Product_INN.	Process_INN.	Product_INN.	Process_INN.	Product_INN.	Process_INN.	Product_INN.	Process_INN.
	Model (1a)	Model (1b)	Model (2a)	Model (2b)	Model (3a)	Model (3b)	Model (4a)	Model (4b)	Model (5a)	Model (5b)
Formal credit	-0.004***	-0.004***								
	(0.001)	(0.001)								
Informal credit			0.005***	0.005***						
			(0.001)	(0.001)						
BGA					-0.122**	-0.227***				
					(0.059)	(0.062)				
Foreign Ownership							-0.002	-0.002		
							(0.001)	(0.001)		
State Ownership									0.011**	0.015***
									(0.004)	(0.004)
Firm Size	0.144***	0.151***	0.143***	0.150***	0.126***	0.125***	0.139***	0.147***	0.133***	0.140***
	(0.034)	(0.037)	(0.034)	(0.037)	(0.034)	(0.037)	(0.034)	(0.037)	(0.034)	(0.037)
Firm Age	-0.003**	-0.003*	-0.003**	-0.003*	-0.004**	-0.004**	-0.003**	-0.003*	-0.003**	-0.003*
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Mng. Experience	0.005*	0.001	0.005*	0.000	0.005*	0.001	0.004*	0.000	0.005*	0.000
	(0.002)	(0.003)	(0.002)	(0.003)	(0.002)	(0.003)	(0.002)	(0.003)	(0.002)	(0.003)
Domestic Own.	-0.002**	0.000	-0.001**	0.000	-0.002***	-0.001	-0.003***	-0.002*	-0.001**	0.000
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Formal Training	0.859***	1.026***	0.864***	1.032***	0.857***	1.018***	0.866***	1.034***	0.863***	1.030***
	(0.051)	(0.053)	(0.051)	(0.053)	(0.052)	(0.053)	(0.051)	(0.053)	(0.051)	(0.053)
Financial Obst.	0.116***	0.054***	0.115***	0.054***	0.119***	0.058***	0.118***	0.057***	0.118***	0.057***
	(0.018)	(0.019)	(0.018)	(0.019)	(0.018)	(0.019)	(0.018)	(0.019)	(0.018)	(0.019)
Educational Obst.	0.230***	0.238***	0.233***	0.242***	0.243***	0.252***	0.241***	0.249***	0.239***	0.246***
	(0.022)	(0.023)	(0.022)	(0.023)	(0.022)	(0.023)	(0.022)	(0.023)	(0.022)	(0.023)
Country Code	-0.046***	-0.003	-0.043***	0.000	-0.046***	-0.004	-0.045***	-0.002	-0.045***	-0.003
	(0.009)	(0.009)	(0.009)	(0.009)	(0.009)	(0.009)	(0.009)	(0.009)	(0.009)	(0.009)
Constant	-2.078***	-2.837***	-2.471***	-3.239***	-2.096***	-2.658***	-2.239***	-2.976***	-2.345***	-3.108***
	(0.584)	(0.680)	(0.583)	(0.680)	(0.591)	(0.684)	(0.583)	(0.677)	(0.580)	(0.675)
Number	8466	8466	8466	8466	8466	8466	8466	8466	8466	8466
-2 Log likelihood	10820.96	9637.697	10822.365	9640.537	10845.342	9651.394	10847.555	9662.285	10843.024	9652.306
Cox and Snell Rsq.	0.083	0.083	0.083	0.083	0.08	0.081	0.08	0.08	0.08	0.081

Nagelkerke Rsq.	0.111	0.117	0.111	0.117	0.108	0.115	0.107	0.114	0.108	0.115

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$
Industry and Year were controlled.