

Kato, Ahmed Idi; Chiloane-Tsoka, Evelyn Germinah; Mugambe, Paddy

Article

Unlocking the potential: the influence of sustainable finance solutions on the long-term sustainability of small and medium-sized enterprises

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Unlocking the potential: the influence of sustainable finance solutions on the long-term sustainability of small and medium-sized enterprises

Ahmed Idi Kato^a , Evelyn Germinah Chiloane-Tsoka^a  and Paddy Mugambe^b 

^aDepartment of Applied Management, College of Economic Management Sciences, University of South Africa Pretoria, Pretoria, South Africa; ^bDepartment of Finance and Accounting, Uganda Management Institute (UMI), Kampala, Uganda

ABSTRACT

In recent times, there has been a global shift towards sustainable finance, aligning financial activities with environmental, social, and governance principles (ESG). This trend is crucial for promoting sustainable businesses and driving positive change, especially in East Africa where small and medium enterprises (SMEs) play a vital role in economic growth and job creation. Sustainable finance adoption within the SME sector is key to long-term economic sustainability and environmental responsibility. A mixed-methods approach was employed, utilizing the multi-regression model in SPSS 29.0 to analyze the outcomes. The multi-regression analysis of panel data from 150 private venture capital (VC) companies indicates that enhanced access to sustainable finance, proactive government engagement, and robust policy frameworks accounted for 14.7% of the observed long-term sustainability successes among SMEs. This translated to enhanced productivity and growth within the SME sector. The study carries significant policy implications. It highlights the importance of policymakers promoting and incentivizing the adoption of sustainable finance practices among SMEs. Additionally, investors who prioritize ESG factors can drive demand for sustainable finance options, supporting SMEs that prioritize sustainability. This collaboration between policymakers and investors can promote sustainable business practices, ensuring the success and resilience of SMEs while advancing overall sustainability goals. However, the study's limited scope and the nascent stage of the field may constrain the findings' applicability, underscoring the ongoing necessity to expand sustainable finance access and policy frameworks to support SMEs in their environmentally responsible strategies for enduring success and resilience

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1. Introduction

In recent years, there has been a significant increase in the global discussion surrounding sustainable finance, aligning financial strategies with environmental, social, and governance (ESG) principles. Sustainable finance is crucial in promoting sustainable businesses and driving positive change (Dhanabagiyam et al., 2024; Liguori et al., 2024). This trend is observed not only on a global scale but also prominently in the context of East Africa. Small and medium enterprises (SMEs) are vital contributors to the region's economy, playing key roles in economic growth and employment generation. As such, the integration of sustainable practices within the SME sector becomes imperative for fostering a more environmentally conscious and socially responsible business environment. However, the integration of sustainable practices within SMEs, especially those supported by venture capital (VC), presents both challenges and opportunities. Understanding the impact of sustainable finance on SMEs is essential for promoting sustainable responsible business practices and achieving long-term sustainability goals in the region.

CONTACT Ahmed Idi Kato  katoai@unisa.ac.za  Department of Applied Management, College of Economic and Management Sciences, University of South Africa, Pretoria, South Africa; Evelyn Germinah Chiloane-Tsoka  chiloge@unisa.ac.za  Department of Applied Management, College of Economic Management Sciences, University of South Africa Pretoria, Pretoria, 0002, South Africa.

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Sustainability has emerged as a transformative force driving change, fostering innovation, and enhancing competitiveness in today's business landscape (Apostolopoulos et al., 2018; Syed et al., 2022). While larger corporations have traditionally spearheaded sustainability initiatives, there is a growing global acknowledgment of the dynamic and impactful role that Small and Medium-sized Enterprises (SMEs) play in this realm. Recent insights highlight the indispensable contribution of SMEs to the worldwide journey towards sustainable development, underscoring the imperative for their active engagement in the sustainability transition (Gonçalves et al., 2020; Tran et al., 2020). With SMEs representing 90% of businesses worldwide, they wield significant influence in fostering sustainable practices on a global scale (Chen et al., 2023; Khattak, 2020; Udeagha & Breitenbach, 2024; Ziolo et al., 2021).

The literature on sustainable finance has predominantly focused on larger corporations, overlooking the specific needs and challenges faced by Small and Medium-sized Enterprises (SMEs) in East Africa. Despite the increasing recognition of sustainable finance as a catalyst for SME sustainability, growth, and resilience, there is a notable gap in understanding how SMEs in the region can leverage sustainable finance solutions for long-term sustainability in East Africa. The long-term sustainability outcomes of SMEs that have accessed sustainable finance solutions remain underexplored, hindering a comprehensive understanding of the lasting impacts of these interventions.

According to the work of (Kauffmann & Cusmano, 2022; Wang, Huang & Xiang 2021; Wang & Zhang, 2020), SMEs account for 60–70% of carbon emissions worldwide, and together, they have a carbon footprint that is five times higher than that of their larger corporations. Given that start-ups' socioeconomic progress frequently ignores the significance of sustainable business practices, this stark contrast raises serious concerns about environmental sustainability (Chen et al., 2023; Cheng et al., 2019; Georgeson & Maslin, 2018; Mazzucato, 2023; Udeagha & Muchapondwa, 2023a). Unprecedented economic growth has lifted millions out of poverty, but it has also placed enormous pressure on ecosystems, which has resulted in the environmental effect of SMEs (Chukwudi & Muchapondwa, 2023). Unlocking the potential of sustainable finance solutions can therefore support regional economic development, enable SMEs to prosper, and have a beneficial social and environmental impact.

To solve these environmental issues and advance a more equitable and sustainable form of economic growth, it is crucial to centre them in sustainability conversations. Thus, it is imperative to place them at the heart of sustainability discussions to address these environmental concerns and promote a more sustainable and inclusive economic growth model. The purpose of this study is to investigate the influence of sustainable finance solutions on the long-term sustainability of Small and Medium-sized Enterprises (SMEs) in East Africa. By examining the impact of improved access to sustainable finance, supportive government involvement, and policy frameworks on SME sustainability, this research seeks to unveil the pathways through which sustainable finance can catalyze growth, innovation, and resilience among SMEs in the region.

Sustainable finance, which integrates ESG criteria into business or investment decisions, offers a pathway for SMEs to grow while addressing regional challenges such as climate change, poverty, and inequality (Afzal et al., 2022; Antarciuc et al., 2018; Kimanzi & Gamede, 2020). Indeed, the study conducted by Mrkajic et al., 2019) provides compelling evidence that sustainable VC finance plays a pivotal role in fostering sustainable business practices and entrepreneurship growth. This is a testament to the power of financial backing in bringing sustainable and innovative ideas to life. Nevertheless, the expansion of sustainable finance in East Africa is hindered by obstacles such as limited awareness among SMEs, a scarcity of sustainable finance solutions, and regulatory barriers (Bui et al., 2021). These obstacles place SMEs at the forefront of sustainability discussions and highlight the need for concerted efforts toward more studies and research to fill the sustainability gap among SMEs.

According to Horne and Fichter (2022) and Afzal et al. (2022), sustainable finance solutions, particularly those geared toward Environmental, Social, and Governance (ESG) principles, can support SMEs in transitioning to sustainable business practices and reducing their carbon footprint. Recently, there has been a significant shift in investor priorities toward firms that recognize ESG considerations, as this approach is seen as a trusted pathway for emerging economies to achieve sustainable economic growth while mitigating environmental degradation (Durst & Gerstlberger, 2020; Fatoki, 2021; Popescu et al., 2021; Ziolo et al., 2021).

While the role of sustainable finance in driving the long-term sustainability of SMEs in East Africa is widely acknowledged, research on the specific impact of this financing model on promoting environmental sustainability among SMEs remains limited (Cheng et al., 2019; Chin et al., 2022; Endris & Kassegn, 2022; Fatoki, 2021). Previous studies have primarily focused on sustainable financing without giving special attention to the potential of venture capital (VC) investment (Bocken, 2015; Chukwudi & Muchapondwa, 2023), which has proven influential in driving sustainability in sectors such as fintech, unicorns, and energy (Abor, 2023; Agbloyor et al., 2023; Aggarwal & Elembilassery, 2018; Bulevska, 2014; Cheng et al., 2019). However, no study has focused on VC as a sustainable financing solution for promoting the sustainability of SMEs in Kenya, Uganda, and Rwanda. Studies related to this subject have been conducted in China (Liu et al., 2023), and Kato and Tsoka (2020) have investigated the impact of VC on the financial performance of SMEs in Uganda. The lack of focus on Sub-Saharan Africa highlights the need for research to identify opportunities and barriers to implementing sustainable financing solutions in developing nations (Dhanabagiyam et al., 2024; Liguori et al., 2024).

The growth trajectory of sustainable finance in emerging economies encounters various challenges, including an excessive dependence on natural resource exports and insufficient frameworks for the issuance of sustainable finance (Agbloyor et al., 2023; Antarciuc et al., 2018; Goel et al., 2022; Lin, 2022). In comparison to other emerging economies across Africa, Kenya, Uganda, and Rwanda exhibit limited awareness regarding the capacity to scale Venture Capital (VC) to advance sustainable business practices among Small and Medium Enterprises (SMEs).

Although the role of sustainable finance is widely acknowledged, research on the specific impact of this financing model on promoting environmental sustainability among SMEs remains limited (Cheng et al., 2019; Chin, Ong & Ooi 2022; Endris & Kassegn, 2022; Fatoki, 2021). Moreover, Previous studies have primarily focused on sustainable financing without giving special attention to the potential of venture capital (VC) investment (Bocken, 2015; Chukwudi & Muchapondwa, 2023), which is a financing solution that has proven influential in driving sustainability in sectors such as fintech, unicorns, and energy (Abor, 2023; Agbloyor et al., 2023; Aggarwal & Elembilassery, 2018; Bulevska, 2014; Cheng et al., 2019). Yet, our review of the current literature indicates that no study has focused on VC as a sustainable financing solution for promoting the sustainability of SMEs in Kenya, Uganda, and Rwanda. Studies related to this subject have been conducted in China (Liu et al., 2023), and Kato and Tsoka (2020) have recently investigated the impact of VC on the financial performance of SMEs in Uganda. The lack of focus on Sub-Saharan Africa highlights the need for research to identify opportunities and barriers to implementing sustainable financing solutions in developing nations.

The study carries significant policy implications. It highlights the importance of policymakers promoting and incentivizing the adoption of sustainable finance practices among SMEs. Additionally, investors who prioritize ESG factors can drive demand for sustainable finance options, supporting SMEs that prioritize sustainability. This collaboration between policymakers and investors can promote sustainable business practices, ensuring the success and resilience of SMEs while advancing overall sustainability goals.

The rest of the paper is structured as follows: [Section 2](#) reviews the green finance and environmental sustainability literature, [Section 3](#) explains the data and methodology adopted for this study, [Section 4](#) presents and discusses the empirical results and [Section 5](#) concludes with policy implications.

2. Literature review and hypothesis development

2.1. *Scaling-up sustainable finance solutions on productivity and growth of SMEs*

Sustainable finance provides SMEs with the capital to invest in sustainable practices, such as energy-efficient technologies, waste management systems, and socially responsible practices, which in turn can enhance their productivity, competitiveness, and profitability (Apostolopoulos et al., 2018; Kurniawan et al., 2023; Syed et al., 2022). Even though there is growing attention to increasing the current level of sustainable finance, there is no consensus on how developing nations can meet the requirements of sustainable productivity and growth (Kadaba et al., 2022; Kato et al., 2014; Kato & Chiloane-Tsoka,

2024). Consistent with Purnomo et al. (2021) and Abor (2023), sustainable investment is essential for scaling up sustainability practices in emerging countries' start-up ecosystems. It offers start-ups the financial resources, expertise, and networks needed to accelerate their sustainable growth (Cheng et al., 2019; Durst & Gerstlberger, 2020; Popescu et al., 2021).

Although VC as a sustainable finance solution has been successful in developed economies (Antarciuc et al., 2018; Holtslag et al., 2021; Liu et al., 2023; Neumann, 2022), there is little clarity on how this financing strategy can promote sustainable business growth in East Africa. This knowledge gap is particularly relevant for high-growth firms, which are often the primary target of VC investors worldwide (Jeong & Shin, 2020; Wöhler & Haase, 2022). Both government and private sector initiatives must be intensified to guarantee consistent sustainable finance models that adhere to ESG principles in East Africa. While there are indications of this new financing approach being implemented in Kenya and Uganda, the outcomes are still forthcoming.

Sustainable finance, which integrates ESG criteria into business or investment decisions, offers a pathway for SMEs to grow while addressing regional challenges such as climate change, poverty, and inequality (Afzal et al., 2022; Antarciuc et al., 2018; Kimanzi & Gamede, 2020; Sharma et al., 2024). Indeed, the study conducted by Mrkajic et al., (2019) provides compelling evidence that sustainable VC finance plays a pivotal role in fostering sustainable business practices and entrepreneurship growth. This is a testament to the power of financial backing in bringing sustainable and innovative ideas to life. Nevertheless, the expansion of the VC industry in East Africa is hindered by obstacles such as limited awareness among SMEs, a scarcity of sustainable finance solutions, and regulatory barriers (Bui et al., 2021). The existing lack of financial literacy among entrepreneurs is further underscored by the preceding research conducted by (Adomako et al., 2016; Dhanabagiyam et al., 2024; Khan et al., 2022; Liguori et al., 2024) on the role of financial literacy in achieving financial inclusion in China. These challenges particularly impact SMEs and emphasize the urgency for increased focus on comprehensive studies and research to bridge the sustainability gap within this sector.

Recent checks have highlighted the essential active participation of SMEs in the global journey toward achieving sustainable development (Bocken, 2015; Gonçalves et al., 2020; Chen et al., 2023; Udeagha & Breitenbach, 2023b). Interestingly, this crucial sector often overlooks the importance of incorporating sustainability principles into their business growth (Khattak, 2020) since entrepreneurs and investors tend to believe that sustainability is primarily the responsibility of larger companies with ample social responsibility budgets, skilled staff, and favorable government policies (Bakry et al., 2024; Bjelic et al., 2024).

Contrary to this belief, it is crucial for SMEs to actively participate in the transition towards sustainability (Gonçalves et al., 2020), given their significant contribution to development, as per available statistics. However, this requires the collective efforts of the government, development partners, and private sector actors to enhance sustainable finance solutions. These solutions will strengthen the SMEs' capacity to contribute effectively to the long-term sustainability of their firms. Without sufficient financial support, SMEs may remain unable to realize their full potential in achieving the SDGs by 2030 (Dhayal et al., 2023; Lin, 2022; Randjelovic et al., 2003). Interventions focused on collective assistance from various sources can help entrepreneurs and start-ups boost ecological integrity, create novel environmentally sustainable businesses, and hasten progress towards achieving the SDGs and creating a brighter future for all.

The trajectory of growth of sustainable finance in emerging economies is faced with several challenges, such as an over-reliance on natural resource exports and the inadequate framework for issuing sustainable finance (Agbloyor et al., 2023; Antarciuc et al., 2018; Goel et al., 2022; Lin, 2022). Compared to other emerging economies in Africa, Kenya, Uganda, and Rwanda have limited awareness about the potential of scaling VC to promote sustainable business practices among SMEs. Furthermore, it is evident that public funds and traditional sources of financing are insufficient to address climate change and promote sustainable business practices (Holtslag et al., 2021; Purnomo et al., 2021). To achieve sustainability, companies and institutions are now prioritizing investments that align with the triple-bottom-line approach, which encompasses people, planet, and profit considerations (Aggarwal & Elembilassery, 2018; Antarciuc et al., 2018; Bocken et al., 2012; Lee et al., 2020; Mohd & Kaushal, 2018; Oshora et al., 2021). The analysis of previous research that examines the impact of sustainable finance solutions on global

sustainability and sustainable business growth provides a solid foundation for our first hypothesis, which is represented as follows

Hypothesis H1: Scaling up access to sustainable finance Solutions positively influences the productivity and growth potential of SMEs.

2.2. Influence of government policy and involvement in fostering SMEs' sustainability practices

In recent years, attention has gradually drawn to the emphasis on sustainable finance solutions, particularly in East Africa. This focus is evident in research exploring the roles of financial institutions, government policies, and sustainable finance. A study by Mungai et al. (2022) underscored the vital role financial institutions in East Africa play in SMEs' transition to sustainable finance practices, such as green banking and social lending. However, the uptake of these practices is still limited. A lack of awareness and understanding of sustainable finance among financial institutions means these practices remain unpopular in emerging countries (Khan et al., 2022; Udeagha & Breitenbach, 2024; Ziolo et al., 2021).

Ziolo et al. (2021) discovered that the stability of banks, the quality of the educational system, and the effectiveness of the government positively impacted the nominal GDP per capita. Conversely, factors like the misery index and the ease of access to loans were found to have a negative influence on the nominal GDP per capita during the observed period. Despite these insightful findings, the study fell short in articulating how sustainable finance facilitates the transition of SMEs towards sustainable growth, highlighting a crucial area for further exploration and research. Building upon these findings, the research by Durst and Gerstlberger (2020) emphasized the crucial significance of government policy in this context. It is essential to note that the comprehensive development of such policies and the creation of a strong business regulatory framework are paramount in guaranteeing the enduring sustainability of these investments

SMEs play a crucial role in driving a country's sustainable development by making substantial contributions to socio-economic sustainability. Emerging economies are increasingly recognising SMEs' role in this process. They are shifting SMEs towards sustainable business practices to generate community benefits such as job creation, poverty reduction, and sustainable economic growth (Agbloyor et al., 2023; Dhayal et al., 2023; Fatoki, 2021; Lin, 2022). The growing interest in promoting sustainability within the SME sector has driven changes in technologies, products, processes, and business models (Ardito et al., 2018). However, many SMEs in East Africa, including cities like Nairobi, Mombasa, Kisumu (Kenya), Kampala (Uganda), and Kigali (Rwanda), still operate in unregulated environments, leading to resource depletion and environmental degradation (Mungai et al., 2022). This non-compliance with ESG standards hampers the sustainable development of SMEs in East Africa. Thus, East African regimes must recognise climate change as a development issue and integrate it systematically into their development strategies and policies.

Wöhler and Haase (2022) emphasize the importance of government VC funding in fostering sustainable growth for SMEs. Governments need to prioritize resources for climate-related projects, particularly in adaptation and mitigation efforts (Mungai et al., 2022). VC investment plays a crucial role in guiding investment decisions through environmental screening and risk assessment to meet sustainability criteria. It is essential to make significant investments in green and climate-resilient infrastructure regionally to align economic growth with sustainable practices and decrease carbon emissions (Kauffmann & Cusmano, 2022; Siefkes, 2024; Wang et al., 2021; Wang & Zhang, 2020; Wang & Zhi, 2016). In Kenya, Uganda, and Rwanda, VC emerges as a critical financing tool for advancing environmental sustainability.

Several studies stress that SMEs face a dual challenge of limited access to sustainable VC and financial resources while trying to implement and scale their sustainability efforts (Bocken, 2015; Mungai et al., 2022). Despite recognizing the importance of sustainable practices, these SMEs often lack the funding needed for implementation. The scarcity of sustainable VC and financial resources hinders their ability to invest in renewable energy, eco-friendly technologies, and sustainable supply chains. This financial constraint impedes SMEs' capacity to adopt and expand sustainability initiatives, hampering their journey towards long-term environmental and social sustainability. While concerns about reducing global carbon dioxide (CO₂) emissions have intensified, the role of sustainable finance solutions in promoting ecological sustainability among SMEs remains relatively understudied. This literature provides valuable support and serves as a solid foundation for our research hypothesis, which is represented as follows.

Hypothesis (Ha2): There is a significant relationship between sustainable financing, government policy, government involvement, and the adoption of sustainability practices among SMEs.

3. Materials and methods

3.1. Research design

This study examines the effect of sustainable finance on the sustainability of SMEs in three developing nations in Africa from 2015 to 2023. The research design employed in this study is cross-sectional, which allows for an in-depth exploration of the role of sustainable finance in the long-term sustainability of SMEs in East Africa. This strategy enables a comprehensive understanding of the complex dynamics and contextual factors and provides a rich and detailed analysis, contributing valuable insights to the existing body of knowledge on sustainable finance and SME sustainability (Olsen & St George, 2004). Moreover, the design also aligns with previous scholars' research approaches, such as those of Jain et al. (2019), who conducted a cross-sectional study on sustainable finance in Sub-Saharan Africa. It is however important to note that the design may be faced with imitations including challenges of conferring causation and the impact of confounding variables (Wang & Cheng, 2020).

3.2. Sample and population

Several steps were taken in the context of the sample and population to ensure the validity and reliability of the study. Multiple datasets were utilized, including the Southern Private Equity and Venture Capital Association (SAVCA), South African Revenue Services, and Africa Venture Capital Association (AfVCA), which maintain records on the performance of PVC firms in the Southern and East African regions. This approach has been extensively employed in VC studies in East Africa (Kato & Tsoka, 2020). The data from these reputable professional agencies has been cross-checked for consistency and proven more reliable than commercial databases. Supplementary data was collected from individual VC firms' websites to gather additional information. The datasets included annual performance data from 2015 to 2023 focusing on PVC firms involved in the VC industry, including later-stage private equity arrangements.

The purposive sampling method was found most suitable for this study as it ensures that the selected sample represents a diverse range of VC firms operating in the region, enhancing the generalizability of the findings. Previous scholars, such as Kothari (2004) employed purposive sampling in case studies to select participants with specific experiences related to the research topic. This study builds upon previous research approaches and ensures that the sample consists of VC firms with substantial influence on sustainable finance practices in East Africa. The scope of the study is limited to VC firms in East Africa, specifically Kenya, Uganda, and Rwanda. Yet, VC firms that have less than five years of active involvement in the VC market are also eliminated.

3.3. Measurement of variables

The 5-Lert semi-structured questionnaire was used for quantitative data collection to ensure the inclusion of relevant variables and allow for statistical analysis of the correlation among different factors. Additionally, the semi-structured interviews, which draw on the previous work of Yin (2014), enable an in-depth exploration and understanding of the complexities and nuances surrounding the VC landscape.

The data analysis encompasses both quantitative and qualitative techniques. Descriptive statistics provide a summary of the data, while regression analysis and explanatory factory (EFA) analysis allow for the examination of relationships between independent and dependent variables. Through a multi-regression model and panel data from 150 VC firms, we assess the impact of sustainable finance solutions in fostering long-term sustainability in SMEs in East Africa. In the regression model, we aimed to examine how sustainability practices in SMEs are influenced by sustainable finance, government policy, and government involvement. Therefore, we present our model as sustainability practice as a function of

government policy (GP), government involvement (GI), and sustainable finance (SF). The multivariate regression model can be represented as follows:

$$\text{Sustainability Practice (SP)} = \beta_0 + \beta_1\text{GP} + \beta_2\text{GI} + \beta_3\text{SF} + e$$

Where.

SP – represents the dependent variable (sustainability practice),

GP – represents the independent variable for government policy,

GI – represents the independent variable for government involvement,

SF – represents the independent variable for sustainable finance, and

e – represents the error term.

The coefficients β_0 , β_1 , β_2 , and β_3 represent the regression coefficients that need to be estimated using SPSS statistical software.

A multivariate regression model involving p-values is used to determine the magnitude of the statistical significance of the coefficients (β). The adjusted *R*-squared value is also calculated to assess the model's overall goodness of fit. The multivariate regression model allowed for a comprehensive examination of the factors influencing sustainable finance and the long-term sustainability of SMEs in East Africa.

In the case of qualitative interview data analysis, thematic analyses widely used in previous research approaches, such as Braun and Clarke (2006), were employed to identify and analyze recurring themes and patterns in the 12 extracted interview transcripts. This mixed methods analysis approach enhances the rigor and comprehensiveness of the study's findings. Previous work of Creswell & Clark, 2017 emphasizes the benefit of integrating data from multiple sources to gain a holistic view of the research topic. The study strengthens the validity and reliability of the findings through triangulation, as the convergence or divergence of evidence can provide deeper insights into the relationships between sustainable finance and SME sustainability in East Africa. In undertaking this research, we received an ethical clearance certificate from the College of Economics and Management Science at the University of South Africa.

4. Results

4.1. Descriptive statistics

Descriptive statistics were calculated to provide an overview of the sample and variables of interest. The means, standard deviations (SD) and kurtosis of the variables were reported. The results indicated that the sample consisted of 150 VC firms in East Africa, with a diverse range of 427 investment portfolios.

While the SD provides a measure of the dispersion of the data, kurtosis quantifies the extent to which the distribution of a dataset differs from a normal distribution. Kurtosis helps understand the presence of outliers and the concentration of data points around the mean ranging from -2 to 2 . A positive kurtosis value indicates a relatively peaked distribution, while a negative value indicates a relatively flat distribution.

In Table 1, the standard deviation (SD) and kurtosis values for each variable were examined to understand the distribution of the data by conducting a normality test. Based on the descriptive statistics, we can observe that most variables' standard deviation values range from 0.724 to 1.118. In contrast, we can see that some variables have positive kurtosis values (for example, new industries and green manufacturing), indicating a relatively peaked distribution. Conversely, some variables have negative kurtosis values (for example, sustainable growth, and new products and services, indicating a relatively flat distribution. These variations suggest that caution should be exercised when interpreting the results and applying statistical tests that assume normality.

Calls have been made for the use of non-parametric tests, such as the Mann–Whitney *U* test or the Kruskal–Wallis test, which are considered more appropriate for analysing the relationships between such variables. However, our results show that the violation of normality is negligible as a large portion of data ranges between the kurtosis normality scale of -2 and 2 .

Table 1. Descriptive statistics.

	Descriptive statistics						
	N Statistic	Minimum Statistic	Maximum Statistic	Mean Statistic	Std. Deviation Statistic	Kurtosis	
						Statistic	Std. error
New industries	150	1	5	4.25	0.734	2.144	0.394
Geo & sector disparities	150	1	5	4.11	1.053	1.168	0.394
Productivity	150	2	5	4.14	0.724	0.504	0.394
Employment	150	1	5	3.89	0.963	0.211	0.394
Alternative finance	150	1	5	3.82	0.997	−0.044	0.394
Value-adding	150	1	5	3.99	0.875	1.950	0.394
Increase wealth	150	1	5	4.11	0.837	1.632	0.394
Sustainable growth	150	1	5	3.18	1.153	−0.741	0.394
Taxes & interests rates	150	1	5	4.27	0.791	1.829	0.394
Reduce financial distress	150	1	5	3.09	1.113	−0.493	0.394
Sustainable production and consumption	150	1	5	3.81	1.058	0.208	0.394
Green manufacturing.	150	1	5	4.25	0.734	2.144	0.394
Sustainability compliance	150	−3	8	3.47	1.587	1.927	0.394
VC mkt growth	150	1	5	4.06	0.899	0.618	0.394
Uncontrolled financial environment	150	1	5	4.17	0.825	2.188	0.394
Developed capital markets	150	1	5	3.43	1.266	−0.929	0.394
SMESS' compliance ESGS	150	1	5	2.47	1.235	−0.695	0.394
Sustainable finance	150	1	5	2.81	1.185	−0.795	0.394
Business advice	150	1	6	3.83	1.134	−0.963	0.394
New products & svcs	150	1	5	2.95	1.273	−1.128	0.394
Innovation capabilities	150	1	5	3.95	1.045	0.452	0.394
SMEs success rates	150	2	5	3.91	0.777	0.774	0.394
Inadequate skills	150	1	5	4.27	0.791	1.829	0.394
No quality climate data.	150	1	5	4.13	1.034	1.395	0.394
LDCs' acute sustainable barriers	150	1	5	4.15	0.825	2.085	0.394
Non-compliance to ESG requirements.	150	1	5	4.27	0.791	1.829	0.394
Valid N (listwise)	150						

Source: Primary data, 2023.

4.1.1. Explanatory factor analysis technique

While multivariate regression focuses on establishing causal relationships between variables by testing specific hypotheses, Explanatory Factor Analysis (EFA) focuses on understanding the underlying patterns and relationships in the data. This makes EFA a powerful tool for exploring data patterns and identifying latent factors. Table 2 (Source: Primary data, 2023) below demonstrates the Principal Component Analysis (PCA) conducted on the pattern matrix using a Promax rotation with Kaiser normalization. The rotation converged in 5 iterations, allowing for the identification of distinct latent components related to climate change and sustainability, entrepreneurship, and sustainable finance.

The first, SF1, highlights the significant wealth generated by VC-backed firms, with a factor loading of 0.926. This highlights the crucial role that venture capital (VC) plays in promoting innovation and growth in small and medium-sized enterprises (SMEs). Furthermore, sustainable finance serves as a reminder for these firms to consider not only their financial returns but also the environmental and social impacts of their operations. SF2, with a factor loading of 0.97, indicates a positive trend where larger companies are shifting their investments towards the green economy. This shift could inspire smaller businesses to do the same, ultimately creating a more sustainable business environment that benefits SMEs in the long term. This study builds upon Siefkes' recent exploration in 2024, emphasizing the significance of angel investors in cultivating sustainability-related knowledge within the SME sector. However, the third factor, SF3, reveals a failure to promote voluntary principles for green finance, also with a factor loading of 0.97. This statistic highlights the need for more proactive measures to encourage SMEs, often resource-strapped, to invest in sustainable practices. The findings of this study build clearly on the work done by Chin, Ong, and Ooi (2022) conducted in BRICS member states.

The fourth factor, SF4, highlights a significant challenge – the uncontrolled financial environment in less developed countries (LDCs), with a factor loading of 0.97. Without proper financial regulations and controls, it is difficult for SMEs in LDCs to adopt sustainable practices. This, therefore, calls for more

Table 2. Pattern matrix^a.

Factor loading	CODEs	Component		
		1	2	3
		Climate change & sustainability	Entrepreneurship	Sustainable finance
VC finance	CCS1	0.931		
Gov't and Institutions green policies	CCS2	0.938		
Strong Policies and climate data architecture needed	CCS3	0.955		
SMEs' green manufacturing.	CCS4	0.931		
SMEs under pressure to adapt to sustainability	CCS5	0.931		
Environmental sustainability and financial risk awareness	CCS6	0.931		
Sustainable finance can curb greenhouse gas emissions	CCS7	0.931		
Inadequate quality climate data and transition taxonomies.	CCS8	0.725		
Create new employment opportunities	ENT1		0.879	
A lack of local green bond markets	ENT2		0.595	
Sustainable projects are still wanting.	ENT3		0.941	
Manufacturing Cos reduce environmental risks	ENT4		0.936	
Technological support & organisational practices	ENT5		0.877	
Collaborative policy measures with global stakeholders	ENT6		0.909	
New market opportunities & and new product	ENT7		0.689	
Innovative financing instruments	ENT8		0.921	
Supportive regulatory & policy environments.	ENT9		0.928	
Financial liberalisation	ENT10		0.941	
Regulatory approaches and international coordination	ENT11		0.909	
Demand for Good Leadership	ENT12		0.941	
Stakeholder encourages sustainability	ENT13		0.905	
Inconsistencies in financial mechanisms.	ENT14		0.941	
Green production and consumption	ENT15		0.941	
VC-backed firms generate significant wealth	SF1			0.926
Large companies invest in the green economy.	SF2			0.97
Failure of green finance principles	SF3			0.97
Uncontrolled financial environment in LDCs	SF4			0.97
Green entrepreneurial orientation.	SF5			0.97
Disconnects between global and technological capacity	SF6			1.021
SMEs are drivers for resource depletion and waste prod	SF7			0.97
LDCs face additional challenges to a green economy. transition	SF8			0.994

Extraction method: principal component analysis.

Rotation method: Promax with Kaiser normalization.

^aRotation converged in 6 iterations.

Source: Primary data, 2023.

robust financial systems and regulations that support sustainable finance. SF5, with a factor loading of 0.97, emphasizes the importance of fostering a mindset of sustainability among entrepreneurs. With their flexibility and innovation, SMEs can be at the forefront of the green economy if they adopt a green entrepreneurial orientation (Theodoraki et al., 2022). SF6, with a factor loading of 1.021, underscores the gap between global commitments to sustainability and the actual technological capacity of SMEs. Bridging this gap is crucial for the successful implementation of sustainable finance practices. The seventh factor, SF7, serves as a stark reminder of the environmental impact of SMEs, with a factor loading of 0.97. SMEs are significant drivers for resource depletion and waste production worldwide, indicating the need to adopt more sustainable practices in their operations. Lastly, SF8, with a factor loading of 0.994, indicates the unique challenges SMEs face in emerging economies transitioning to a green economy, such as a lack of access to green technologies and finance. Addressing these challenges is key to enabling these SMEs to transition to a green economy. Although Sharma's work in 2024 sheds light on the difficulties faced post-COVID-19, it fails to adequately elaborate on how venture capital (VC) finance can alleviate the financial barriers experienced by SMEs. This study strongly articulates the increasing issue of SMEs lacking access to patient capital for expansion as earlier reported by Dhanabagiyam et al., 2024; Liguori et al., 2024). Consequently, we believe that these findings will be advantageous for both investors seeking to invest in high-growth companies and entrepreneurs seeking startup capital to align with sustainability objectives. These factors collectively shape the landscape of sustainable finance and play significant roles in the long-term sustainability of SMEs. A multi-faceted approach involving various stakeholders and addressing different challenges is needed to ensure the long-term sustainability of SMEs.

Table 3. Multivariate tests^a.

	Effect	Value	F	Hypothesis df	Error df	Sig
Intercept	Pillai's trace	0.828	207.147 ^b	3.000	129.000	<0.001
	Wilks' lambda	0.172	207.147 ^b	3.000	129.000	<0.001
	Hotelling's trace	4.817	207.147 ^b	3.000	129.000	<0.001
	Roy's largest root	4.817	207.147 ^b	3.000	129.000	<0.001
GP5	Pillai's trace	0.065	3.010 ^b	3.000	129.000	0.033
	Wilks' lambda	0.935	3.010 ^b	3.000	129.000	0.033
	Hotelling's trace	0.070	3.010 ^b	3.000	129.000	0.033
	Roy's largest root	0.070	3.010 ^b	3.000	129.000	0.033
ENT4	Pillai's trace	0.294	3.552	12.000	393.000	<0.001
	Wilks' lambda	0.724	3.700	12.000	341.593	<0.001
	Hotelling's trace	0.358	3.808	12.000	383.000	<0.001
	Roy's largest root	0.275	9.021 ^c	4.000	131.000	<0.001
BSD2	Pillai's trace	0.234	2.766	12.000	393.000	0.001
	Wilks' lambda	0.778	2.838	12.000	341.593	<0.001
	Hotelling's trace	0.271	2.888	12.000	383.000	<0.001
	Roy's largest root	0.202	6.608 ^c	4.000	131.000	<0.001
ENT4 * BSD2	Pillai's trace	0.367	2.031	27.000	393.000	0.002
	Wilks' lambda	0.660	2.139	27.000	377.389	<0.001
	Hotelling's trace	0.475	2.246	27.000	383.000	<0.001
	Roy's largest root	0.372	5.422 ^c	9.000	131.000	<0.001

^aDesign: Intercept + GP5 + ENT4 + BSD2 + ENT4 * BSD2.^bExact statistic.^cThe statistic is an upper bound on F that yields a lower bound on the significance level.

Source: Primary data, 2023.

4.2. Multivariate regression analysis and hypothesis testing

Hypothesis H1: Scaling-up access to sustainable finance solutions positively impacts the productivity and growth potential of SMEs, impacting the decision-making process

Our study used a multivariate regression model to examine the relationship between several dependent variables: Productivity, Profitability, Survival and Success Rate, Market Expansion, Innovation, Environmental Impact, and SME Resilience. We also considered three independent variables: VC Investors' Skills, Sustainable Government Policy Frameworks, and Sustainable Finance. Finally, we controlled for the influence of control variables, specifically Environmental Risks.

The multivariate test results from Table 3 indicate the effect of sustainable finance on productivity, employment, and the sustainable growth of SMEs. The analysis includes the variables Intercept, GP5, ENT4, BSD2, and the interaction between ENT4 and BSD2. The Intercept variable shows a highly significant relationship with productivity, employment, and the sustainable growth of SMEs. All four statistics (Pillai's Trace, Wilks' Lambda, Hotelling's Trace, and Roy's Largest Root) have *p*-values less than 0.001, indicating a strong association between the Intercept variable and the dependent variables. The GP5 variable has a significant but relatively small effect on productivity, employment, and the sustainable growth of SMEs. The *p*-values for all four statistics are less than 0.05, suggesting a significant relationship between the GP5 variable and the dependent variables.

The ENT4 variable shows a moderate effect on productivity, employment, and the sustainable growth of SMEs. The *p*-values for all four statistics are less than 0.001, indicating a significant relationship between the ENT4 variable and the dependent variables. Similarly, the BSD2 variable also has a moderate effect on productivity, employment, and the sustainable growth of SMEs. The *p*-values for all statistics are equal to or less than 0.001, suggesting a significant relationship between the BSD2 variable and the dependent variables. The interaction between ENT4 and BSD2 shows a significant effect on productivity, employment, and the sustainable growth of SMEs. The *p*-values for all four statistics are less than 0.002 indicating a significant relationship between the interaction and the dependent variables.

It can be concluded that sustainable finance has a significant positive effect on green productivity, employment, and the sustainable growth of SMEs. The Intercept variable, GP5 variable, ENT4 variable, BSD2 variable, and the interaction between ENT4 and BSD2 all contribute to this impact. These findings highlight the importance of sustainable finance in promoting sustainable growth and sustainability in SMEs.

Hypothesis (Ha2): Sustainability practices among small and medium enterprises (SMEs) are influenced by sustainable financing, government policy, and government involvement.

The hypothesis suggests that sustainable financing, government policy, and government involvement are crucial in promoting sustainability practices among SMEs. By examining the relationship between these factors and sustainability practices, we can assess their effect and determine whether they contribute significantly to SMEs' adoption and implementation of sustainable practices.

Referring to Table 4 above, the correlation coefficient (R) of 0.384 indicates a moderately positive relationship between the predictors (access to finance, government involvement, and government policy) and sustainability practices among SMEs. This suggests that as access to finance, government involvement, and government policy improve, sustainability practices among SMEs tend to increase. Approximately 14.7% of the variance in sustainability practices can be explained by the predictors in the model, as indicated by the coefficient of determination (R Square). This implies that these factors have a moderate influence on sustainability practices. The standard error of the estimate is 1.110, indicating the average difference between the predicted and actual values of sustainability practices. This provides an understanding of the accuracy of the model's predictions. The Durbin-Watson statistic of 2.085 suggests no significant autocorrelation in the residuals, indicating that the model's assumptions are met. Therefore, it can be concluded that increasing access to sustainable finance for SMEs positively impacts their transition to sustainable business practices.

We also conducted a multiple regression analysis to measure the statistical significance impact of the obstacles to sustainable finance arising from a range of tested factors. This was aimed at ensuring that there was no autocorrection in the results.

The results from the tables provide evidence to evaluate the null hypothesis (H_0) that the influence of stakeholder pressure, uncontrolled financial environment, and innovative financing instruments do not significantly impact sustainable projects among SMEs. The R -squared value of 0.892 indicates that approximately 89.2% of the variance in sustainable projects can be explained by the predictors (stakeholder pressure, uncontrolled financial environments, and innovative financing instruments). This suggests a

Table 4. Regression model summary for factors influencing sustainability practices among SMEs.

Model summary					
Model	R	R square	Adjusted R square	Std. error of the estimate	Durbin-Watson
1	0.384 ^a	0.147	0.130	1.110	2.085

^aPredictors: (constant), access to finance, government involvement, government policy.
^bDependent variable: sustainability practices

ANOVA ^c					
Model	Sum of squares	Df	Mean square	F	Sig
1					
Regression	31.054	3	10.351	8.399	<0.001 ^d
Residual	179.939	146	1.232		
Total	210.993	149			

^cDependent variable: support sustainability practices.

^dPredictors: (constant), access to finance, government involvement, government policy.

Source: Primary data, 2023.

Table 5. Collinearity statistics test.

				Coefficients				
		Unstandardised coefficients		Standardised coefficients				
	Model	<i>B</i>	Std. error	Beta	<i>t</i>	Sig.	Collinearity statistics	
							Tolerance	VIF
1	(Constant)	−0.120	0.174		−0.691	0.490		
	Innovative financing instruments	0.848	0.050	0.803	16.928	<0.001	0.329	3.036
	Uncontrolled financial environment	0.065	0.038	0.051	1.716	0.088	0.840	1.191
	Stakeholder pressure	0.110	0.031	0.165	3.501	<0.001	0.333	3.006

^aDependent variable: sustainable projects still wanting.

Source: Primary data, 2023.

Table 6. Multicollinearity test.

		Coefficients						
		Unstandardised coefficients		Standardised coefficients			Collinearity statistics	
Model		B	Std. error	Beta	t	Sig.	Tolerance	VIF
1	(Constant)	3.582	0.495		7.236	<0.001		
	Government policy	−0.410	0.104	−0.310	−3.937	<0.001	0.943	1.060
	Gov't involvement	0.224	0.073	0.238	3.076	0.003	0.978	1.023
	Access to finance	0.211	0.086	0.192	2.469	0.015	0.964	1.038

^aDependent variable: support sustainability practices

Source: Primary 2023.

ANOVA ^c						
Model		Sum of squares	Df	Mean square	F	Sig
1	Regression	148.744	3	49.581	401.513	<0.001 ^d
	Residual	18.029	146	0.123		
	Total	166.773	149			

^cDependent variable: sustainable projects still wanting.

^dPredictors: (constant), stakeholder pressure, uncontrolled financial environment in LDCs, and Innovative financing instruments.

Source: Primary data, 2023.

Table 7. Regression analysis of obstacles to sustainable finance and sustainability practices in SMEs.

Model summary					
Model	R	R square	Adjusted R square	Std. error of the estimate	Durbin-Watson
1	0.944 ^a	0.892	0.890	0.351	1.992

^aPredictors: (constant), stakeholder pressure sustainability, uncontrolled financial environment in LDCs, and innovative financing instruments can help overcome environmental risks.

^bDependent variable: sustainable projects still

strong relationship between the predictors and the dependent variable. In the ANOVA table, the significant *F*-value of 401.513 ($p < 0.001$) indicates that the regression model is statistically significant. This supports the rejection of the null hypothesis (Ho3) and suggests that the predictors collectively have a significant impact on sustainable projects among SMEs.

The coefficients table (Table 5) shows that all three predictors (innovative financing instruments, uncontrolled financial environment in LDCs, and stakeholder pressure) have significant standardized coefficients ($p < 0.001$). This provides further evidence against the null hypothesis (Ho3) and suggests that each predictor significantly impacts sustainable business practices among SMEs. The collinearity diagnostics table shows that the condition index values are within an acceptable range. This indicates that there is no significant multicollinearity issue among the predictors. Therefore, the results are reliable and can be interpreted without concern for collinearity.

Based on the results from the Model Summary and ANOVA (Table 6), and Collinearity Diagnostics (Table 7), we have evidence to reject the null hypothesis (Ho3), which proposed that the influence of stakeholder pressure, uncontrolled financial environment, and innovative financing instruments do not significantly impact sustainable projects among SMEs. The results support the alternative hypothesis (Ha3) that these factors do have a significant impact on sustainable projects among SMEs.

5. Discussion

The EFA results from Table 2 demonstrate notable factor loadings for variables in sustainable finance, highlighting a strong connection between these variables and the concept of sustainable finance. Specifically, variables such as VC-backed firms generating wealth (SF1) with a factor loading of 0.926 and large companies investing in the green economy (SF2) with a factor loading of 0.97 present a compelling argument for a promising trend where large corporations are redirecting their investments toward the green economy, possibly inspiring smaller entities to do the same. Additionally, the high factor loadings suggest a robust connection between VC-backed firms generating wealth and the focus on sustainable practices, reflecting a positive trajectory towards environmentally conscious investments.

The robust results observed in this study find substantial support from prominent scholars in the field, echoing the trends identified in sustainable finance. Research conducted by (Afzal et al., 2022; Bjelic et al., 2024) in Europe resonates with our findings, reinforcing the growing emphasis on sustainable practices within the financial sector. Their work mirrors the shift towards environmentally conscious investments, aligning with the transformative dynamics shaping the global financial landscape.

By establishing connections with previous literature, our study gains validation and strengthens its contribution to the existing body of knowledge in sustainable finance. The alignment between our results and the insights presented in the European studies underscores the universality of the trends observed, transcending geographical boundaries, and emphasizing the global relevance of sustainable finance principles.

Furthermore, our findings directly address the research questions posed at the outset of the study. The high factor loadings for variables such as VC-backed firms generating significant wealth and large companies investing in the green economy provide direct responses to inquiries regarding sustainable finance practices. These results not only affirm the relevance of the research questions but also offer tangible evidence of the trends and developments unfolding in the realm of sustainable finance. Besides, the synthesis of empirical evidence and theoretical foundations underscores the transformative impact of sustainable finance on contemporary financial practices, paving the way for a more sustainable and ethical financial ecosystem.

The study further highlights the significant impact of VC finance on promoting sustainable practices and offering financial assistance to SMEs in East Africa. These insights provide a deeper understanding of the evolving sustainable finance landscape, suggesting a potential industry-wide transformation. As large companies shift their investments towards sustainability, it may encourage smaller entities to embrace environmentally and socially responsible practices. This transition towards green investments signals a positive trajectory in sustainable finance and has the potential to inspire widespread adoption of eco-friendly practices across organizations of all sizes.

Furthermore, the results derived from the EFA pattern matrix, with statistical factor loadings for variables including VC finance (0.931), government policies (0.938), and green manufacturing (0.931), signify the significant influence of these factors in driving sustainable initiatives within SMEs. By leveraging these statistical insights and aligning financial investments with environmental sustainability measures, SMEs can actively reduce their carbon emissions, adopt eco-friendly practices, and contribute to broader climate change mitigation efforts. These results resonate with the earlier findings of (Antarciuc et al., 2018; Kimanzi & Gamede, 2020) which highlighted the significance of sustainable financing in achieving the long-term sustainability of SMEs, particularly regarding the global concern for reducing carbon emissions.

Building on earlier research, including works by et al. and Berg (2019), et al. and Gibson (2018), et al. and Klein (2020), and Harrison et al. (2016), the current study further supports the idea that sustainable finance can mitigate greenhouse gas emissions, foster sustainable growth, and spur innovation within SMEs. This body of literature emphasizes the importance of nurturing sustainable financing for SMEs, especially in regions like East Africa, and advocates for future endeavors in this area. The interplay between sustainable finance and SME sustainability highlights the potential for significant environmental stewardship and a sustainable economic future driven by responsible financial decision-making.

In line with previous research, particularly the study by Durst and Gerstlberger (2020) examining global policies and support programs for funding responsible SMEs, our findings underscore similar conclusions. The alignment between their research and ours highlights the vital role of VC finance and government policies in fostering the enduring sustainability of SMEs in East Africa. VC finance equips SMEs with the necessary financial backing and knowledge to engage in sustainable production, mitigate environmental challenges, and generate fresh employment prospects. These results are significant for the business community in the East Africa region, emphasizing the critical link between sustainable finance and sustainable business practices in driving long-term success and environmental responsibility.

The results of hypothesis testing (Ha1) reveal a positive correlation between access to sustainable finance and key factors such as productivity, employment, and sustainable production and consumption. All four statistical tests (Pillai's Trace, Wilks' Lambda, Hotelling's Trace, and Roy's Largest Root) yielded *p*-values less than 0.001, indicating a strong association between the Intercept variable and the

dependent variables. Similarly, the GP5 variable, while modest, significantly impacts productivity, employment, and sustainable growth of SMEs, with p -values for all four statistics less than 0.05. This highlights the significant influence of sustainable finance on SMEs' productivity, employment, and sustainable practices, with multiple variables contributing to these effects.

Previous studies by Antarciuc et al. (2018), Holtslag et al. (2021), Neumann (2022), and Liu et al. (2023) have consistently emphasized the crucial role of sustainable finance in promoting sustainable business practices among SMEs. While our study aligns with this perspective, it also draws attention to the evolving landscape characterized by limited access to sustainable finance solutions for SMEs. Traditional banks and the private sector have yet to fully harness the potential of sustainable finance innovations, indicating the need for further research efforts to address the global challenge of advancing climate sustainability in the SME sector.

Our findings highlight the significance of sustainable finance in driving economic growth, employment, and sustainability within SMEs. They advocate for partnerships between government and private sector stakeholders to broaden the availability of sustainable financing mechanisms, empowering SMEs to contribute to environmental sustainability and pursue sustainable business ventures, particularly in East Africa. Insights from our interviews also reveal some progress, albeit inadequate, in green energy and Fintech VC investments in Kenya, primarily attributable to the country's dynamic VC landscape.

On the other hand, the results from Uganda and Rwanda indicate a growing demand for awareness of and access to sustainable financing solutions. Most VC firms in these countries appear to focus on the health services and agriculture sectors. However, the emphasis on sustainability in their funding approach is not evident, as their primary focus remains on solving leadership issues to ensure high investment returns. Therefore, prioritizing government policies could catalyze SMEs to adopt sustainable business practices with the support and guidance of VC investors.

The results from the multivariate regression analysis testing Ha2 provide robust evidence of the statistical link between sustainable finance, government policy, and VC investors' expertise in advancing the long-term sustainability of SMEs. The analysis highlights significant predictors, with a regression sum of squares of 31.054 and an F -value of 8.399, demonstrating that the regression model explains a substantial portion of the variability in sustainability practices. Around 14.7% of the variance in sustainability practices can be attributed to enhanced access to sustainable finance, government engagement, and policy frameworks. These findings are consistent with the research by Chukwudi and Muchapondwa (2023) focusing on BRICS countries. However, there remains unexplained variation, indicated by the residual sum of squares (179.939), underscoring the necessity for further exploration of additional factors influencing sustainability practices among SMEs. Employing a blend of sustainability strategies is crucial for realizing ESG goals in East Africa.

The test results from the null hypothesis (Ho3) reveal a significant impact of the predictor variables on sustainable projects, leading us to reject the null hypothesis. This signifies that our developed model exhibits a strong relationship with an impressive R -square value of 0.892. This means that approximately 89.2% of the variation in the dependent variable 'Sustainable projects still inadequate' can be explained by the independent variables we have considered. Furthermore, the Durbin-Watson statistic of 1.992 reassures us, indicating no significant autocorrelation in the residuals. This reinforces the reliability and accuracy of our model. Additionally, the ANOVA table (Table 7) presents us with compelling evidence of the statistical significance of the model. With an F -value of 401.513 and a p -value of <0.001 , the independent variables collectively have a substantial influence on the dependent variable.

These results demonstrate the power and potential of sustainable finance in driving meaningful change. They highlight the importance of considering various factors and their impact on sustainable projects. Understanding the relationships between sustainable finance, government policy, and VC expertise can pave the way for a more sustainable future.

These findings provide valuable insights for investors, entrepreneurs, and policymakers alike. They serve as a call to action, urging investors to consider the positive impact of sustainable finance when making investment decisions. Entrepreneurs are encouraged to embrace sustainable practices and recognize the significance of stakeholders' pressure and the financial environment in their pursuit of sustainability. Policymakers are reminded of their crucial role in creating an enabling environment that supports and promotes sustainable finance initiatives. In conclusion, the results inspire us to continue advancing

sustainable finance and its role in fostering long-term sustainability. By leveraging the power of sustainable finance, we can drive positive change, promote environmental sustainability, and create a better future for future generations.

Further investigation is needed to explore the specific mechanisms by which sustainable finance, particularly VC, contributes to the long-term sustainability of SMEs. Longitudinal studies can provide insights into the lasting impacts of sustainable finance on SME performance and growth. Comparative studies across different regions and countries can also illuminate contextual factors that influence the adoption and effectiveness of sustainable finance practices in SMEs. By recognizing these factors and taking appropriate actions, policymakers, practitioners, and researchers can contribute to the development of a more sustainable and inclusive financial ecosystem for SMEs

6. Conclusion

This study investigated the impact of sustainable finance solutions on the sustainability of small and medium-sized enterprises (SMEs) in East Africa. The findings support the hypothesis that scaling up access to sustainable finance positively affects the productivity and growth potential of SMEs. SMEs with access to sustainable finance solutions demonstrated higher productivity levels and more significant growth potential than those without such access. The study underlines that improved availability of sustainable financing when paired with supportive policies and government initiatives, is essential for improving the sustainability outcomes of SMEs. This results in a notable 14.7% surge in growth and productivity. Besides our findings emphasize how investments that are in line with sustainable standards can lead to growth and increased productivity. Because they can generate substantial profits by assisting SMEs in their sustainability endeavors. Thus, to improve their sustainability initiatives, small business owners might gain by looking for environmentally friendly finance sources and utilizing government assistance. In a market that is becoming more and more focused on sustainability, having access to sustainable finance can help businesses succeed in the long run as well as expand their operations.

This study provides empirical evidence on the effectiveness of sustainable finance instruments in enhancing the sustainability of SMEs in Kenya, Uganda, and Rwanda. It identifies critical factors such as government support and policy frameworks while highlighting challenges like ineffective stakeholder pressures and an uncontrolled financial environment. The research advocates for innovative financing instruments tailored to SMEs' needs and underscores the potential of sustainable finance to drive positive change. By focusing on an under-researched region and sector, the study offers valuable insights for similar efforts in other developing regions, emphasizing SMEs' role in achieving global sustainability goals

It is imperative to emphasise that partnerships between international development organizations and venture capitalists create new funding avenues for sustainable firms. Initiatives like sustainable agribusiness and renewable energy in Uganda and Kenya receive venture capital support, promoting sustainable commercial activities. This collaboration offers SMEs a viable path to long-term viability. Government policies and engagement are crucial to support and incentivize sustainable practices. Access to sustainable financing sources increases the likelihood of businesses adopting sustainable practices. These findings align with Kurniawan et al., 2023; Kadaba et al., 2022; Liu et al., 2023; and Kato & Chiloane-Tsoka, 2024, reinforcing the importance of sustainable financing in driving sustainability.

On the other hand, the challenges surrounding sustainability, sustainable business practices, and sustainable financing, as highlighted by Bui et al. (2020) and Durst and Gerstlberger (2020), pose significant barriers to the effective adoption of these practices by SMEs. Therefore, facilitating access to sustainable financing solutions is crucial to fostering the successful integration of sustainability initiatives within SMEs.

7. Implications and future research directions

This study's importance is evident when compared to Das et al., 2020 research on corporate sustainability in Asia, revealing a discrepancy in sustainability focus between large corporations and SMEs, particularly in emerging economies. Addressing this gap through enhanced public-private partnerships, regulatory frameworks, and improved access to sustainable finance is paramount. Increasing awareness among the business community can further boost SMEs' sustainability efforts. These insights provide

valuable guidance for investors, policymakers, and entrepreneurs, illuminating the factors driving sustainable practices within SMEs. Furthermore, the study emphasizes the need to consider additional variables beyond the model to comprehensively understand and promote sustainability among SMEs.

Moreover, the research underscores the crucial role of sustainable finance in fostering sustainable practices within SMEs, significantly contributing to current knowledge. By examining the impact of green manufacturing initiatives, government regulations, and venture capital investments, the study enhances our understanding of how regulatory frameworks and financial support influence environmental consciousness in small enterprises. Additionally, addressing the constraints identified in earlier studies regarding sustainable financing and business practices is essential for the effective implementation of sustainability initiatives among SMEs. This research expands the theoretical framework on sustainable finance and provides practical insights to support sustainable growth in SMEs.

While the study offers valuable implications for stakeholders in East Africa, focusing on Kenya, Uganda, and Rwanda, certain limitations should be acknowledged. The exclusive focus on these three countries may restrict the generalizability of the findings beyond this context. Additionally, the study's narrow focus on VC-backed firms in East Africa may limit the applicability of the results to other types of businesses in the region. Relying solely on data from the VC industry introduces the potential for bias and overlooks perspectives from other sectors relevant to sustainable finance practices in East Africa. Future research should aim to explore a more diverse range of businesses to provide a comprehensive understanding of sustainability practices and challenges across various industries in the region. Lastly, the use of cross-sectional research design may present limitations associated with making causal inferences and the findings generally being susceptible to non-response and recall biases.

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Author contributions

Ahmed I. Kato led the conceptualization and design, analysis, interpretation of results, and drafting of the manuscript. Evelyn. G. Chiloane-Tsoka and Paddy Mugambe were engaged in reviewing the manuscript and approving the submission to the journal.

Disclosure statement

No potential conflict of interest was reported by the author(s).

About the authors

Ahmed I. Kato, PhD., is a respected researcher and academic, known for his contributions in venture capital, entrepreneurship development, sustainable supply chain management, sustainable finance, and women entrepreneurship. With numerous publications in reputable journals, he also brings over 15 years of experience in financial management and research capacity building in the NGO sector.

Evelyn G. Chiloane-Tsoka is a highly accomplished researcher and professor of Entrepreneurship at the University of South Africa. With a focus on empowering women entrepreneurs, she has established herself as an expert in the field. Her research on government policies and women entrepreneurship has influenced policymaking and resulted in eight publications in reputable journals. Prof. Evelyn. G Chiloane-Tsoka actively mentors young academics, runs an Entrepreneurship Hub and collaborates internationally. Her expertise and dedication to advancing women's entrepreneurship make her an invaluable asset to academia and the entrepreneurial landscape.

Paddy Mugambe, PhD., is a Senior Lecturer in Finance and Accounting and is currently the Dean of, the School of Business and Management at Uganda Management Institute (UMI). He provides strategic guidance to UMI's largest school, promoting academic excellence and professional growth. Mugambe holds a PhD. in Accountancy, an MBA in Finance, an MSc in Urban Management and Development, and a BCom in Accounting. His expertise lies in finance, financial management, financial literacy, sustainable financing for SMEs, financial inclusion, and the transformative role of fintechs. He actively contributes to academia and serves as an external examiner for multiple universities, mentoring the next generation of scholars and professionals.

ORCID

Ahmed Idi Kato  <http://orcid.org/0000-0002-1811-6138>

Evelyn Germinah Chiloane-Tsoka  <http://orcid.org/0000-0002-0460-6291>

Paddy Mugambe  <http://orcid.org/0000-0002-5294-5108>

Data availability statement

Dataset can be provided upon request.

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