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Editorial

Journal of Economics and Behavioral Studies (JEBS) provides distinct avenue for quality research in the everchanging fields of economics & behavioral studies and related disciplines. Research work submitted for publication consideration should not merely limited to conceptualization of economics and behavioral developments but comprise interdisciplinary and multi-facet approaches to economics and behavioral theories and practices as well as general transformations in the fields. Scope of the JEBS includes: subjects of managerial economics, financial economics, development economics, finance, economics, financial psychology, strategic management, organizational behavior, human behavior, marketing, human resource management and behavioral finance. Author(s) should declare that work submitted to the journal is original, not under consideration for publication by another journal and that all listed authors approve its submission to JEBS. Author (s) can submit: Research Paper, Conceptual Paper, Case Studies and Book Review. Journal received research submissions related to all aspects of major themes and tracks. All submitted papers were first assessed by the editorial team for relevance and originality of the work and blindly peer-reviewed by the external reviewers depending on the subject matter of the paper. After the rigorous peer-review process, the submitted papers were selected based on originality, significance and clarity of the purpose. The current issue of JEBS comprises papers of scholars from Uganda, USA, South Africa, Ethiopia and Cyprus. Increasing access to business incubation services for cottage start-ups, Consumption with Imperfect Income Expectations, The Impact of Value Chain Financing on Profitability of Edible Oil Manufacturing Companies, Financial Literacy, Access to Digital Finance and Performance of SMEs, Factor Input Prices and Unemployment, Does Investment in Human Capital Offset Oil Dependence, Role of Artificial Intelligence on Market Performance, Human Capital Development and Unemployment, Stakeholder Involvement and Team Capacity on the Performance of Rural Electrification Projects, Elements of Stakeholder Involvement and Performance of Rural Electrification Projects, Necessity of the Digital Economy for Sustainable Economic Growth and Mediating Role of Access to Digital Finance on the Relationship between Financial Literacy and Performance were some of the major practices and concepts examined in these studies. The current issue will therefore be a unique offer where scholars will be able to appreciate the latest results in their field of expertise and to acquire additional knowledge in other relevant fields.

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PAPERS

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Increasing access to business incubation services for cottage start-ups to promote inclusive entrepreneurship in Southwest Uganda

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Abstract: In the last 30 years, Uganda has grappled with rising unemployment, notably impacting small businesses, with 85% failing within the first five years. This trend is pronounced in the cottage industry, where 46% of businesses couldn't sustain operations in 2017. In Mbarara district, 65% of cottages established in 2015 had closed or relocated by 2019. This study explores the impact of business incubation support services on reducing cottage start-up failures and promoting inclusive entrepreneurship in Mbarara City. Examining 800 start-ups in handicrafts, soap making, pottery, tailoring, and shoe making, the study employed a correlational research design. The data, collected through a Likert scale questionnaire, revealed that access to finance, capacity building, and information technology (ICT) adoption accounted for 13.2% of the variation in cottage enterprise growth potential. Notably, increased finance positively correlated with growth, while capacity building showed no significant association. ICT adoption, however, had a negative correlation. The study emphasizes the need for cottage entrepreneurs to receive more training on product improvement, additional capital, equipment, and partnerships. In conclusion, access to capacity building, funding, and ICT adoption is pivotal for cottage enterprise expansion, advocating for incubation support services to enhance collaboration, funding, equipment, and product improvement training for cottage entrepreneurs.

Keywords: *Incubation, Cottage startup, Capacity building, Finance support, ICT uptake*

1. Introduction

According to Satalkina & Steiner (2020), combining innovation and inclusive entrepreneurship is essential for the continued growth of a nation. The Resource-Based approach (Fabrizio et al., 2022; Cuthbertson & Furseth, 2022) highlights the critical role that small enterprises' adaptation and creativity play in this era of technological advancements. Uganda has prioritized cottage companies because of their capacity to raise incomes, generate employment, and enhance values (Mhlanga, 2021). Nonetheless, obstacles like untapped potential and a strong reliance on the entrepreneur's knowledge prevent them from progressing (Endris & Kassegn, 2022). To bridge the capacity gap, business incubation hubs have welcomed initiatives to increase Uganda's cottage start-ups (Tutuba & Tundui, 2022). Letão et al. (2022) assert that business incubation is an effective means of reducing startup costs, boosting entrepreneurs' self-assurance, and giving them access to vital networks and resources for their company's expansion. The effectiveness of an incubator is determined by the makeup of the participating cottage entrepreneurs and the resources available for incubation (Mian, 2021). Considering the significance of cottage enterprises, it's imperative to look into factors that can stimulate their growth in this context.

In light of Uganda's rising unemployment rate, this study explored the obstacles faced by urban entrepreneurs in the cottage sector, where a surprising 85% of firms fail within the first five years (Mbarara district annual report, 2021). Fabrizio et al., 2022; Cuthbertson & Furseth, 2022) recognized the critical role that small enterprises play in industrial development, and this study intended to identify ways to support cottage start-ups. With these constraints and potential in mind, the research findings will shed light on the strategic role of

business incubation services in fostering inclusive entrepreneurship development among cottage start-ups in the context of urban settings of southwest Uganda.

2. Literature Review

Business incubation and cottage industry development: Business incubators serve as comprehensive support systems, offering a conducive environment and an array of services to nurture entrepreneurial skills and guide idea development (Leitão et al., 2022). Their crucial role in mitigating risks and enhancing the capacity of entrepreneurs to establish innovative and competitive enterprises is emphasized, with success hinging on a combination of infrastructure, supportive policies, financing, a culture of risk-taking, and quality education (Manning & Vavilov, 2023). Addressing challenges in small business development, such as high information costs, low service levels, and capital shortages, incubators play a pivotal role in fostering successful ventures (Tibaingana, 2020). Integrating entrepreneurial finance models, venture capital, and incubator functions is posited as a strategy for success, facilitating the development of valuable enterprises and contributing to local economic growth (Leitão et al., 2022). Studies on business incubation in developing countries, including the GCC member states and Kuwait, underscore their significance in supporting the survival and growth of young firms, contributing to economic development, technology transfer, new enterprise creation, and job generation (Manning & Vavilov, 2023). Ten case studies of business incubation in developing countries affirm their effectiveness and innovation in supporting start-ups (Leitão et al., 2022).

Shifting the focus to cottage industry development, this sector involves family members crafting goods without machinery, fostering a traditional and familial work environment (Santos & Qin, 2019). Cottage and small-scale industries play a pivotal role in a country's development by generating employment, increasing income levels, and improving living standards (Wang & Li, 2021). In rural areas, where tradition and family ties prevail, the household-based approach in the cottage industry proves more suited, providing craftsmen with a happier existence within their own homes (Tibaingana, 2020). Studies highlight the socio-economic improvement brought about by wood-related household-based industries and their contribution to livelihoods (Tryphone & Mkenda, 2023). Pottery, stone-carving, and bark-cloth-making in household-based industries around Lake Victoria demonstrate their significance as sources of livelihood (Wanniarachchi et al., 2022). Recognizing the pivotal role of household-based industries in balanced regional development and export earnings, Kumar & Shukla (2022), underscore their importance. The Kenya Vision 2030 identifies household-based industries as foundational for entrepreneurial development in the country. Additionally, research on community-based family enterprises in rural Sri Lanka emphasizes the crucial link between such enterprises and sustainable development (Wanniarachchi et al., 2022). Studies on Malaysian Chinese family businesses in food manufacturing shed light on the trans-generational nature of innovation and resilience in these family enterprises (Yew, 2023).

Access to finance and growth of cottage industry: Access to finance is pivotal in the growth of cottage industries, a fact underscored by the life cycle concept in small businesses (Islam et al., 2022). Despite their critical need for maximum capital during the initial stages, cottage industries often face a lack of access to cash and financial markets, hindering expansion (Shoma, 2019). The challenge lies in obtaining finance during the growth phase to reach maturity, where government intervention in providing unfettered access to the financial market could alleviate this issue (Nag, 2022). Cottage industries, known for impromptu funding, heavily rely on owner savings rather than alternative methods, impacting profitability, as demonstrated by Mmadabuchi (2021). Notably, small cottage industries exhibit longer life spans compared to medium or large organizations (Madan, 2020). Financing obstacles disproportionately affect small businesses, reducing growth by six percentage points for large firms and 10 percentage points for small firms on average (Mohd Raof et al., 2020). Lack of access to specific forms of financing further constrains small firms, particularly in export, leasing, and long-term finance, significantly impacting their dynamism and, consequently, the overall growth trajectory of a country (Islam et al., 2022). Financial limitations emerge as a major growth obstacle for small and medium entrepreneurial firms in Sub-Saharan African countries, emphasizing the widespread impact of these challenges on cottage industries (Eton & Nkamusiima, 2023). Additionally, a lack of collateral is identified as a significant impediment to firms' growth, further highlighting the multifaceted financial challenges faced by cottage industries (Nag, 2022).

Capacity Building and Growth in the Cottage Industry: In the realm of cottage industry development, human resource management and skill development emerge as pivotal but often overlooked elements (Tambunan, 2019). Despite evidence emphasizing the positive impact of investing in human resources on production, cottage industry owners tend to neglect staff training, driven by perceptions of it being an expense rather than an investment, coupled with concerns about potential wage increases or labor turnover (Hanaysha, 2023). Financial constraints further exacerbate this situation, with larger enterprises exhibiting more effective staff coordination compared to their cottage industry counterparts (Saunila, 2020). Business education, often deemed crucial, is challenged by research findings suggesting that factors like age, migration, and education level do not necessarily correlate with entrepreneurial success in cottage industries (Akpan, Effiom & Akpanobong, 2023). Post-incubator performance is a critical but understudied aspect, with graduation from incubators not guaranteeing post-graduation survival (Hanlin & Okemwa, 2021). Financial dependence is highlighted by Rajagopaul et al. (2022) and Beck, Demirgüç-Kunt & Merrouche, 2013). as a driver of faster growth in financially developed countries, while new small firms in developing countries often face credit and equity rationing due to underdeveloped financial markets (Njanike, 2019). Lack of financial access disproportionately affects small firms, especially in countries with weak institutional environments, yet evidence suggests that they benefit as financial systems develop (Rajagopaul et al., 2022). Training interventions show varying impacts on survival rates, with Maksum, Rahayu, & Kusumawardhani (2020) revealing a 9 percent increase in survival likelihood 12 months post-training, while Lazaro-Mojica and Fernandez (2021) suggest training may marginally reduce the likelihood of survival for female firm owners, attributing it to the training teaching owners to close down losing firms. These nuanced insights underscore the multifaceted dynamics of capacity building and its implications for the growth of cottage industries.

UpTake of Information Technology and Growth in the Cottage Industry: Studies focusing on the role of information technology (IT) adoption tailored for initiating new businesses reveal significant impacts. Chege, Wang, and Suntu (2020) emphasize the impact of information technology innovation on firm performance in Kenya, shedding light on the transformative effects of IT on business outcomes. Similarly, Bandara et al. (2019) provide a systemic review of technological challenges and SME performance, underlining the sustainability of SMEs in the competitive landscape. The study by Hasanah, Shino, and Kosasih (2022) explores the role of information technology in improving the competitiveness of small and SME enterprises, emphasizing the crucial link between IT adoption and business competitiveness. Nindhita et al (2022) analyzed the effect of information technology development and absorptive capacity on MSME business performance, providing insights into the intricate relationship between technology, capacity, and business outcomes.

Furthermore, Hernandez et al (2022) investigate the green information technology readiness of small and medium enterprises in the Philippines, highlighting the growing importance of environmentally conscious IT practices. Shi et al (2023) explore the digital transformation effect in trade credit uptake from the buyer's perspective, revealing the intricate dynamics of digital transformation in business transactions. In Uganda, Kyakulumbye and Pather (2022) delve into understanding ICT adoption amongst SMEs, contributing to the development of a participatory design model for enhancing technology diffusion. Ouimette, Chowdhury, & Kickul (2021) propose a design model for improving information security adoption for SMEs in Uganda, addressing critical concerns in the realm of cybersecurity. Social media's impact on micro and small enterprises is explored by Sendawula et al (2022) and Kikawa et al. (2022), offering insights into the perceptions, readiness, and usage of social media in fostering sustainable growth and marketing performance. Lastly, Mbowa et al. (2023) investigate the influence of social capital on small and medium enterprises' performance in Wakiso District, Uganda, highlighting the interconnectedness of social networks and business outcomes. These diverse studies collectively underscore the multifaceted implications of IT adoption and related factors on the growth and sustainability of businesses, aligning with the evolving landscape of technology in the business domain.

3. Methodology

Design, Population, Sampling, and Data Collection

To gather extensive data on cottage industries in Mbarara city, this study employed a cross-sectional survey design, utilizing a quantitative approach. The study focused on diverse cottage categories, including handcraft, tailoring, soap making, pottery, shoe making, and herbal medicine extraction, collectively representing 800 enterprises as per UBOS data (2021).

To ensure a representative sample, a combination of purposive, stratified, and simple random sampling techniques was employed. Stratified sampling was used to divide the sample into the North and South divisions of Mbarara city, with 80 participants in each. Further, equal representation was ensured among the six cottage categories. Purposive sampling targeted district officials and counselors overseeing these entrepreneur start-ups, selected based on their perceived expertise in providing relevant information.
Primary data was collected through a self-administered questionnaire, categorized into sections covering background information, trade facilitation, business incubation, and cottage industry development. Descriptive and inferential statistics were used to analyze the quantitative data.

To ensure ethical adherence, before data collection, we sought and obtained approval from the Mbarara University of Science and Technology Institution Review Committee (MUST-2023-811). We then obtained permission from the Mbarara city commercial officer to conduct the study among the cottage start-ups operating in the two city divisions. Before each interview commenced, participants were required to read and sign an informed consent form, outlining the study's purpose, confidentiality measures, and their right to participate voluntarily or decline participation at any time.

4. Study Results

The main focus of this study was on cottage start-ups established between 2018 and 2023, with the owner/manager of each enterprise serving as the unit of inquiry. Table 1 below presents a comprehensive breakdown of the study participants by characteristics.

Table 1: Descriptive Statistics of the Unit of Inquiry and Analysis

Category	Item	Frequency	Percent
Gender	Male	77	47.8
	Female	84	52.2
Age	Below 25	72	44.7
	25- 29 years	60	37.3
	30- 34 years	17	10.6
	35-39 years	7	4.3
	40-44 years	3	1.9
	45 and above	2	1.2
Marital status	Single	102	63.4
	Married	57	35.4
	Divorced	2	1.2
Highest level of education	No education	51	31.7
	Certificate	69	42.9
	Diploma	17	10.6
	Bachelors	24	14.9
Position in cottage	Owner	110	68.3
	Worker	51	31.7
Time period spent in the cottage	1-2	95	59.0
	2-3	54	33.5
	Less than one year	12	7.5
	Total	161	100.0

Source: Field data, 2023

The data in Table 1 reveals that a majority (52.2%) of cottage owners are female, while only 47.8% are male. This indicates a slight preference for female participation in the cottage startups included in the study. However, the difference in representation between men and women is relatively small (2.2%). The study found that a vast majority (68.3%) of the participants were the owners of their cottage enterprises, while only 31.7% were workers. This suggests that cottage owners are primarily managing their businesses, likely due to the limited cash flow and profitability of these startups. To further empower women-led cottage start-ups, promoting incubation services in urban settings is recommended.

The age distribution of the participants reveals that a significant majority (44.7%) are below 25 years old, followed by those between 25-29 years (37.3%). The least represented age group is above 45 years (1.2%). This indicates that the youth play a dominant role in owning and managing cottage industries. Their willingness to take on higher start-up risks and their dedication to growing their businesses make them a driving force in the industry. The study further supports the notion that promoting incubation services for start-up cottage enterprises will foster youth participation and contribute to inclusive entrepreneurship in urban settings of southwest Uganda.

The marital status distribution of the participants revealed that a significant majority (63.4%) were single, followed by those who were married (35.4%). The least represented group were divorced individuals (1.2%). This indicates that unmarried youth are more likely to dedicate themselves to running start-up cottages. Based on the growth in income generation from their businesses, these youth may consider marriage as a higher-priority need. While the study does not provide definitive conclusions, it suggests that promoting incubation services among youth-owned cottage start-ups in the age bracket of 18-30 years could be beneficial.

The study revealed that a significant majority (42.9%) of cottage owners held certificates, while 31.7% had no formal education, and only 10.6% held diplomas. This suggests that a lack of education among cottage owners could be a major impediment to their ability to sustain their businesses. These findings should encourage providers of incubation services to prioritize expanding their outreach to less formal communities, where many of these startups originate, to increase the uptake of their services.

Tables 2 and 3 show the inferential results for the correlation and regression analyses respectively. The analysis examined the relationship between three basic incubation services: access to capital, capacity building, and ICT adoption, and participants' perceptions of the growth of their cottage businesses. The goal of this study was to quantify the perceived relationship between participants' perceptions of the need for finances, capacity building, and ICT with cottage growth.

Table 2: Correlation results – Access to finance, Capacity building, ICT & Firm growth

Variables	1	2	3	4
Access to Finance (1)	1			
Capacity Building (2)	.178*	1		
Uptake of Information Technology (3)	-.192*	0.118	1	
Firm Growth (4)	.315**	0.149	-.239**	1

*. Correlation is significant at the 0.05 level (2-tailed).

**. Correlation is significant at the 0.01 level (2-tailed).

Source: Field data, 2023

Access to finance and firm growth of cottages

Table 2 shows a perceived positive relationship between access to finance and firm growth in cottage industries ($r = .315$, $p < .01$). The results suggest that cottage startup participants recognize a moderately positive association between access to funding and their potential to expand their operations. The results further impute that Business incubators ought to explore connecting cottage companies with funding angels and investigating alternative microfinance programs to boost entrepreneurial inclusion.

Capacity building and firm growth of cottages

A correlation analysis revealed a positive but weak and insignificant relationship between capacity building and firm growth among cottage startups, as indicated in Table 2 ($r = 0.149$, $p>0.05$). This implies that while capacity building holds some potential to contribute to firm growth, its impact is relatively small and statistically non-significant. This finding underscores the need for further inquiry into the effectiveness of capacity-building programs for cottage startups, particularly given the majority of participants operating in the informal sector with limited educational backgrounds.

Uptake of information technology and firm growth of cottage industries

Our study revealed a surprising and counterintuitive relationship between cottage startups' perceived need for ICT uptake and their actual firm growth. While participants overwhelmingly recognized the importance of ICT adoption for business expansion, a statistically significant negative correlation emerged between these perceived needs and firm growth ($r = -0.239$, $p<0.01$). This inverse relationship suggests that the current level of ICT adoption among cottage start-ups in southwest Uganda is hindering their growth potential.

To address this critical gap, we strongly advocate for the integration of ICT skilling into incubator capacity-building programs. Such training has the potential to bridge the ICT adoption divide and equip cottage startups with the necessary skills to harness the transformative power of technology.

Given the youthful age bracket of most cottage owners/managers (18-30 years), there exists a receptive audience for ICT skilling programs. By empowering these young entrepreneurs with ICT proficiency, we can foster a ripple effect of rural digital transformation, promote efficient record-keeping, and cultivate the adoption of low-cost digital marketing strategies that enhance firm competitiveness. Only through this comprehensive approach, encompassing ICT skills training, adoption, and strategic utilization, can we truly unlock the growth potential of cottage start-ups in southwest Uganda.

Table 3 Regression results - Access to finance, Capacity building, ICT & Firm growth

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	1.379	0.471		2.925	0.004
	Access to Finance	0.26	0.079	0.253	3.296	0.001
	Capacity Building	0.174	0.103	0.128	1.692	0.093
	Uptake of Information Technology	-2.82E-06	0	-0.206	-2.706	0.008
R	.385[a]					
R Square	0.148					
Adjusted R Square	0.132					
F	9.086					
Sig.	.000[b]					

a. Dependent Variable: Firm Growth

Source: Field data, 2023

Table 3 summarizes the findings of a regression analysis that examined the effect of information technology (IT) adoption, capacity building, and access to finance on firm growth in cottage start-ups. According to the findings, the three factors account for 13.2% of the difference in business growth. As a result, other factors not

included in the analysis, such as location, kind of cottage, and management quality, have a substantial impact (86.8%) in understanding cottage start-up growth.

The analysis of variance (ANOVA) table provides a statistical test of whether the overall model is significant. The F-statistic (9.086) indicates that the model is statistically significant, meaning that there is a statistically significant relationship between the uptake of information technology, capacity building, access to finance and firm growth. The p-value (0.000) is less than 0.05, which is the standard level of significance, indicating that the relationship is statistically significant. To find further strategies for fostering business expansion among cottage start-ups, more research may look into these other variables.

The results in Table 3 highlight the significant positive impact of access to finance on firm growth. For every unit increase in access to finance, there is a corresponding 0.253 unit increase in firm growth. This finding suggests that providing cottage industries with access to suitable financial resources can significantly boost their growth prospects. On the contrary, the results in Table 3 indicate that capacity building has no statistically significant relationship with firm growth among cottage industries. This means that increasing investment in capacity-building initiatives may not directly translate into improved firm growth for these businesses. Moreover, the results in Table 3 reveal a negative relationship between information technology adoption and firm growth. For every unit increase in information technology adoption, there is a corresponding 0.206 units reduction in firm growth. This finding could suggest that the adoption of inappropriate or ineffective information technology solutions among cottage industries may hinder their growth rather than enhance it.
The results in Table 3 provide valuable insights into the factors that influence firm growth among cottage industries. It emphasizes the positive impact of access to finance and highlights the need for cautious implementation of capacity-building and information technology strategies

Discussion of Results

According to Leitão et al. (2022), business incubators function as multifaceted networks of support that provide a nurturing environment and a wide range of services to encourage entrepreneurial abilities and steer the development of ideas. By easing the major obstacles to small business development such as high costs for information acquisition, skill development, and capital scarcity incubators can be extremely helpful in promoting the growth of start-ups, especially in western Uganda (Tibaingana, 2020). This study indicates that business incubators can collaborate with angel and venture investors to promote cottage start-ups and aggressively lead creative microfinance programs to expedite startup growth.

Business incubation and cottage industry development

Cottage start-ups, operating from modest homes with limited infrastructure and relying on traditional craftsmanship, defy expectations by serving as a driving force for economic development (Santos & Qin, 2019). Their household-based structure aligns seamlessly with the values and traditions of rural communities, providing a fulfilling and meaningful work environment for craftsmen (Tibaingana, 2020). Studies have documented the transformative socio-economic impact of wood-based household industries, particularly in rural areas, and their role in enhancing livelihoods (Tryphone & Mkenda, 2023). Moreover, cottage industries involved in pottery, stone carving, and bark cloth making around Lake Victoria have proven to be crucial sources of income and sustenance (Wanniarachchi et al., 2022). Research on community-based family enterprises in rural Sri Lanka and Malaysian Chinese family businesses underscores the enduring nature of innovation and resilience within these cottage start-ups, demonstrating their ability to adapt and thrive across generations (Wanniarachchi et al., 2022; Yew, 2023).

Access to finance and growth of the cottage industry

The life cycle concept in small enterprises emphasizes that access to finance is a vital pillar for the growth of cottage industries (Wahab et al., 2022). Cottage industries frequently face obstacles in gaining access to finance and financial markets, which hinders their progress despite their crucial need for money during their early phases (Shoma, 2019). The difficulty increases throughout the growth stage when getting funding to mature becomes essential. This problem might be greatly mitigated by government action to allow open access to the financial market (Nag, 2022). However, beyond discussing the study results, the government's efforts to facilitate cottages' access to financial mechanisms in Uganda are impractical for a variety of reasons. As a result,

the necessity for private initiatives to provide incubation services connected to access to finance can help to fill the gap.

Cottage start-ups, which are known for their reliance on ad hoc finance sources, rely significantly on owner savings rather than alternate financing choices (Mmadabuchi, 2021). Lack of access to specialized types of funding further hinders small business growth, thereby impacting their dynamism and, adversely affecting the overall national economic trajectory (Wahab et al., 2022). Furthermore, a lack of collateral is cited as a serious hindrance to cottage expansion, emphasizing the multiple financial issues that cottage enterprises face (Nag, 2022). This study demonstrates that business incubator services provided to cottage start-ups have the ability to push their growth by easing access to funding, improving their skills, and integrating information technology, all of which contribute to national development.

Capacity Building and Growth in Cottage Industry

In the dynamic world of cottage start-ups, talent development emerges as a critical although frequently underestimated aspect of fostering growth and sustainability (Tambunan, 2019). Despite convincing evidence indicating the positive impact of investing in skill development, many cottage enterprise owners disregard staff training, considering it an unnecessary expense rather than a strategic investment. This view is frequently reinforced by concerns about likely salary hikes or staff turnover (Hanaysha et al., 2022). Cottage start-ups' financing limits compound the situation (Saunila, 2020). The study's results are not final, despite the widespread belief that business education is essential for entrepreneurship success. This suggests that skill development and educational attainment may not be reliable indicators of entrepreneurial success in the context of cottage enterprises. To draw firm conclusions, more in-depth study on the subject with larger participant sample sizes (> 160) will be required in the future.

Rationality dictates that without matching support for skill development throughout cottage growth, access to financial resources cannot be attained. Even though this assumption seems obvious, more research is needed to substantiate it outside of the current study. Regarding their effect on survival rates, earlier training approaches have produced a variety of results. While Lazaro-Mojica and Fernandez (2021) suggested that training may modestly reduce the likelihood of survival for female firm owners, Maksum et al. (2020) reported that training interventions led to a 9% increase in the likelihood of survival 12 months after the intervention. These varied results emphasize the complex relationship between capacity building and capital use (beyond access) as well as the growth of cottage start-ups.

Uptake of Information Technology and Growth in Cottages

Information technology (IT) use has been shown to have a major impact on cottage start-up growth. According to Chege, Wang, and Suntu (2020), in a Kenyan study setting IT innovation can improve startup performance. The performance of small businesses and technological problems was further analyzed by Islam et al. (2019). Hasanah, Shino, and Kosasih (2022) also looked at how IT might help small firms become more competitive. The impact of IT development and absorptive capacity on the success of small businesses was examined by Nindhita et al. (2022). These studies offer insightful information about the elaborate relationship that exists between technology, capability, and business results.

Our analysis revealed an unfavorable association between ICT usage and cottage start-up growth, contrary to other research that suggested a positive correlation between IT adoption and business growth. The study's overall results across the various cottages show a negative and significant impact of ICT use on enterprise growth, while specific results may differ depending on the type of cottage. This research supports earlier studies that show how IT adoption has a complicated and multidimensional effect on company outcomes.

For instance, Kyakulumbye and Pather (2022) explore ICT adoption in SMEs and contribute to the creation of a methodology for participatory design that promotes technology spread. Ouimette, M., Chowdhury, I., & Kicku (2022) addresses important cybersecurity issues and suggests a design paradigm for SMEs in Uganda to embrace information security more easily. Sendawula et al (2022) and Kikawa et al. (2022) examine the effects of social media, providing information on attitudes, preparedness, and use of social media in promoting long-term development and effective marketing. The study conducted in Uganda's Wakiso District by Mbowa et al. (2023) emphasizes the connection between social networks and economic results.

These several studies highlight the numerous consequences for business incubation services of seeing ICT adoption as a cross-cutting issue. ICT skilling needs to be integrated into associated issues such as financing use/access, market access, cost minimization, and so on that influence the growth of cottage enterprises for acceptability. Further ICT services need to be matched with the developing technological landscape within the cottage business domain.

5. Conclusion and Recommendations

Our research has provided critical insights into the elements that drive cottage start-up growth in urban settings in southwest Uganda. The positive relationship between access to financing and business growth emphasizes the critical role of financial support in developing entrepreneurial initiatives. However, the non-significant relationship between capacity building and cottage growth emphasizes the multidimensional character of capacity-building initiatives, necessitating a more sophisticated approach. Furthermore, the unanticipated negative relationship between information technology adoption and business growth defies conventional wisdom and needs a rethinking of technology implementation in the context of cottage start-ups. These findings highlight the relevance of context-specific assessments in guiding customized incubation service packages that encourage sustainable cottage start-up growth.

Recommendations: Based on the study's findings, policymakers, business incubators, and stakeholders need to tailor their support services to the specific needs of cottage start-ups. Prioritizing actions to improve access to finance is critical, given the favorable impact on business growth. Capacity-building programs need to be revised to better correspond with the varied demands of cottage start-ups, while also respecting the different skill sets required for success. Furthermore, an in-depth study of the dynamics of ICT adoption is required. The empirical findings will pave the way for the development of inclusive capacity packages that successfully apply ICT while not impeding cottage growth.

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Competing interests
The authors declare that they have no competing interests.

Authors' contributions
MT and BM wrote the first and subsequent drafts of this manuscript, with comments from the remaining authors. MT, BM and GK conceptualized and designed the study. BM and MT conducted data analysis and interpretation, with additional input to data interpretation from the remaining authors. All authors read and approved the final manuscript.

Availability of data and materials
The datasets used and/or analyzed during the current study are available from the corresponding author upon reasonable request.

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Consumption with Imperfect Income Expectations

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Abstract: Using survey forecast data, this paper documents several stylized facts about forecasters' beliefs on income and consumption and aggregate consumption growth: (1) survey-based income forecast at consensus level is highly correlated with consumption growth; (2) consensus income and consumption growth forecast errors under-react to macro news shocks and (3) consensus income forecast error and consumption growth under-react initially and overreact subsequently in response to main business cycle shocks. Motivated by this evidence, we propose a model of equilibrium consumption determination where agents learn the exogenous latent permanent income process and extrapolate the past income realizations. Our model can generate the behavior of consumption that the rational-expectation Permanent Income Hypothesis fails to predict excess smoothness and excess sensitivity of aggregate consumption, and negatively correlated consumption growth and past income change in the medium run. This study contributes to the literature on economic belief formation and empirical consumption by showing how survey-motivated evidence can jointly explain a range of important anomalies.

Keywords: *Consumption, Income, growth, business cycle shocks*

1. Introduction

The rational-expectation Permanent Income Hypothesis (PIH - hereafter) predicts that consumers with a concave utility function spread out income shocks to smooth consumption and that lifetime consumption, instead of current income, determines consumers' optimal consumption level.[1] Moreover, when there is uncertainty about future income, the consumption Euler equation reduces to a certainty equivalence condition when the marginal utility is a linear function in consumption. It can also be shown that the optimal consumption level is a martingale and that consumption growth is only a function of the prediction error for permanent income, which is orthogonal to any past information. However, empirical studies of consumption have found some patterns in aggregate consumption that are not consistent with predictions from PIH. For example, the seminal papers by Flavin (1981), Deaton (1986) and Campbell & Deaton (1989) use U.S. data to show that aggregate consumption is excessively smooth in that it responds too little to unpredictable changes (innovations) in income and is excessively sensitive in that it responds too much to predictable changes (realized changes) in income.

Campbell & Deaton (1989) argue that these two observations are intrinsically related and conclude that consumption underreacts to permanent income shocks and thus adjusts with a delay. Furthermore, Beeler & Campbell (2012) show that consumption growth and past income change are negatively correlated in the medium term, which also contradicts the prediction from the PIH. In addition to the empirical observations regarding the relation between income changes and aggregate consumption growth, consumers' lifecycle consumption profile in the data seems inconsistent with a standard consumption-saving theory based on PIH. Specifically, consumption initially grows during the lifecycle and drops toward the end of life (Fernandez-Villaverde & Krueger, 2007 and Gourinchas & Parker, 2003), which both use the Consumer Expenditure Survey data and document a hump-shaped lifecycle consumption profile). This paper aims to bring new evidence from survey data to elucidate the aforementioned consumption anomalies. Specifically, we combine the Survey of Professional Forecasters data with business cycle news shocks to study biases in the quarterly income (proxied by Gross Domestic Product) forecast panel by estimating the impulse response function of the forecast errors in response to news shocks.[2]

[1] The reason is that consumers want to smooth their consumption flow under the assumption of concave utility. The optimal consumption mainly depends on the average level of lifetime income because it is much smoother than the income in any particular period.

[2] As suggested by (Kucinskas & Peters, 2022), these biases can be inferred from the response of forecast errors to past news by flexibly estimating the impulse response function of forecast errors without precise knowledge of the true data-generating process.

We show that annual consumption growth is predictable from the average forecast errors reported by the panel of forecasters and consumption growth's impulse response function has a similar shape to that of the consensus forecast errors. We find that income forecast errors underreact or overreact to different pieces of news at multiple horizons, resulting in forecast errors being predicted by news innovations. This is further reflected in the observed consumption growth path which itself is predictable from past information about income. Using survey data, we document several interesting empirical facts about income forecasts, consumption forecasts and observed consumption growth. The first piece of evidence we show is that we cannot reject the certainty equivalence condition by using survey-based expectations. Although testing the validity of an Euler equation is much more challenging and is beyond the scope of this paper, we see from this result that survey-based expectations can be useful. The fact that market participants report forecasts of income that are much closer to the PIH is important. First, it may suggest that incorrect or non-rational beliefs may play an important role in explaining the failure of the PIH, which may help explain some consumption anomalies. This, in fact, is the main story we want to convey in this paper: Survey-based beliefs capture some systematic expectational errors, which makes consumption growth predictable. Furthermore, positing that the PIH Euler equation holds if we incorporate survey-based beliefs provides a useful benchmark as a stylized observation to support the starting point of our theory.

The second empirical observation we document is that the consensus income forecast errors are highly and positively correlated with contemporaneous consumption growth with a 1-, 2-, 3- and 4-quarter looking-back window. The rational PIH framework predicts that the forecast error of the permanent income component is a sufficient statistic for aggregate consumption growth. The second empirical observation is consistent with this prediction. However, we do not argue that the income forecast error is the only predictor of the consumption growth process. Instead, we see, again, that survey-based forecasts can be quite useful and may play an important role in explaining variation in the aggregate consumption path. These two empirical facts imply that survey-based expectations of income may help explain certain deviations from the random walk assumption of consumption growth. Therefore, we carefully study the income belief formation process and especially the biases implied in the survey forecast data. The third empirical observation replicates the results by (Bordalo, Gennaioli, Ma, & Shleifer, 2020) using an updated data sample and suggests that individuals consistently overreact to new pieces of information when they forecast income and consumption. For both nominal and real income, the consensus-level forecasts underreact to news such that forecasters do not fully adjust their forecasts when receiving new information about the data. The evidence that forecasters underreact to the news at the average level is important and a key piece of evidence we use to explain the excess smoothness puzzle. Forecasters are sluggish in incorporating new information about income into aggregate consumption forecasts, which causes consumption forecasts to under-respond to income innovations.

We rely on a local projection regression method and determine the impulse response function of the consensus level forecast errors of income. This exercise shows that after the arrival of a shock, the consensus forecasts of real or nominal income are persistently lower than the realized values, indicating an underreaction to the news. However, after this initial response, forecasted income exceeds realized income, indicating a subsequent overreaction of the forecasts. These patterns are captured by initial positive forecast errors, followed by negative forecast errors. Similar behaviors have been documented for inflation/unemployment forecasts (Angeletos, Huo, & Sastry, 2020) and for U.S. interest rate/interest rate differential forecasts (Vasudevan, Valente, & Wu, 2022). Using realized annual consumption growth data and plotting its impulse response function, we observe a similar pattern of initial underreaction and delayed overreaction to news shocks. To explain the consumption puzzles in a manner consistent with the survey-based evidence, we construct a simple lifecycle consumption model with frictions. The agents in the model face an exogenously defined and identical income process that we call a fundamental or permanent income process, which statistically is represented by a simple AR (1) process. Agents do not directly observe this underlying latent variable; however, they are endowed with a noisy signal which adds additional transitory shocks to the fundamental variable.[3] We interpret this noisy signal as individual income in each period; we will use the terms" signal" and" individual income" interchangeably in this paper.

[3] We call it "permanent" because the realized income in each period will not die out and spans the course of the lifecycle. In other words, the shocks in this process are permanent instead of transitory.

This is one key friction in our model: Consumers have to learn the underlying data-generating process and forecast future income since they are forward-looking. The other important ingredient our theory uses to generate the observed under-reaction and overreaction pattern is extrapolative beliefs. Agents in our setting do not know the true structural parameter of the permanent income process; rather, they use a subjective persistence coefficient when making forecasts. Our characterization shows that when agents over-extrapolate, the individual-level forecast error overreacts and equilibrium consumption growth at the aggregate level is negatively correlated with past income change in the medium term.[4] The proposed model is able to generate an impulse response function of income expectation that is consistent with the survey-based IRF.

2. Related Literature

Our paper is related to several streams of literature and builds on prior studies of consumption behavior and its relation to income changes. An early seminal paper (Caballero, 1990)reconciles three different features of consumption: excess growth, excess smoothness, and excess sensitivity in a framework with precautionary savings. A number of recent papers have proposed several explanations for the puzzling consumption behavior: information costs (Reis, 2006), memory constraints (da Silveira & Woodford, 2019), sticky beliefs (Carroll, Crawley, Slacalek, Tokuoka, & White), self-attribution bias (Zinn, 2013), the spirit of capitalist (Huang & Caliendo, 2011), moral hazard (Attanasio & Pavoni, 2011), habit formation (Chetty & Szeidl, 2016) and loss aversion and reference-dependent preferences (Pagel, 2017). Our paper differs from these prior studies in several ways. First, while most of the aforementioned studies rely on a non-standard preference approach, such as habit formation and costly information processing, the current paper focuses on a belief-based explanation. We complement the existing literature by providing an alternative way to look at the behavior of consumption. Second, we directly use survey-based evidence to inform a possible model of consumption. Similarly, (Vasudevan, Valente, & Wu, 2022) developed a theory of exchange rate determination by studying the behavior of exchange rates using short-term interest rates and interest rate differential forecasts.

Other related evidence, especially about how consensus-level and individual-level expectations react to news shocks, includes (Angeletos, Huo, & Sastry, 2020) which studies inflation and unemployment forecasts from the same data source as this paper, and (Bordalo, Gennaioli, Ma, & Shleifer, 2020) which reports the predictability of forecast errors for a range of macroeconomic and financial aggregate variables. The key finding, that expectations and observed prices on average initially under-react and subsequently overreact to news, has been extensively studied in stock market settings (see, for example, (Bondt & Thaler, 1985 and Cutler, Poterba & Summers, 1991), among others). Our paper complements the existing literature by providing direct evidence concerning income forecasts and aggregate consumption growth. The simple theoretical model we propose in this paper relies on two key ingredients to explain consumption behavior: informational frictions and extrapolation. Prior studies of informational frictions, such as high-order uncertainty, rational inattention and incomplete information, include Sims (2003), Sims (2010), Matejka (2016), Nimark (2008), Berrada (2006) and Timmermann (2001). Our approach to modeling informational friction is straightforward; agents in our model rely on Bayesian learning to extract fundamental information.

Extrapolation plays another central role in our theory. In the literature, extrapolative beliefs have been extensively studied both theoretically (Barberis, Greenwood & Shleifer, 2015) and empirically (Liao, Peng, & Zhu, 2021). Our model of extrapolation is intuitive and inspired by the work of (Angeletos, Huo, & Sastry, 2020). Finally, this paper is broadly connected to the literature on how beliefs, especially incorrect beliefs, affect equilibrium prices. Related papers include, for example, (Gourinchas & Tornell, 2004), who explain time-series variation in spot exchange rates by incorporating a specific form of interest rate belief distortion, and (Barberis, Greenwood, Jin, & Shleifer, 2018), who develop a model with extrapolative beliefs to explain price bubbles and trading volume. Our paper similarly focuses on certain deviations from rational expectations and delivers theoretical predictions that are consistent with the observed consumption growth data. The rest of the paper is organized as follows. The next section discusses the existing empirical evidence on consumption behavior. Section 3 presents the data used in this paper and documents several stylized facts from the survey data. Section 4 and Section 5 propose and characterize a model of consumption under incomplete information and extrapolative beliefs. Finally, Section 6 concludes and suggests some future research directions.

[4] Here over-extrapolation means that agents perceive an even more persistent process when updating their beliefs.

Puzzling Facts about Consumption: In this section, we first review the standard PIH theory and its predictions about consumption growth. The core PIH prediction is that the Euler equation from an optimal consumption-savings problem is consistent with a certainty equivalence condition and that consumption change is only a function of the forecast error of lifetime permanent income, i.e. a random walk process. This property makes the consumption growth process a pure innovation that cannot be predicted from any realized past information. However, this conclusion is not supported by the data and there is strong evidence in the literature showing deviations from the PIH, which argues against the unpredictability of consumption growth. Specifically, in contrast to predictions from the PIH theory, aggregate consumption responds too much to past income change and too little to contemporaneous income news. In addition, the PIH also fails to predict the empirical findings that the consumption growth is negatively autocorrelated in the medium term and that the consumption profile over the lifecycle is hump shaped. We will review these findings later in this section. Consider a simple problem in which an agent makes an optimal consumption-saving plan subject to an intertemporal budget constraint.

If we assume that the constant interest rate and the intertemporal discount rate are identical, we can derive the following well-known Euler equation,
$u'(c_t) = \mathrm{E}t(u'(c_{t+1}))$,
where *it* represents the consumption level at time *t*. Furthermore, under quadratic utility, we can show that certain equivalence holds:
$c_t = \mathrm{E}t(c_{t+1})$.
Alternatively, under these assumptions, the Euler equation can also be written as
$ct = ct{-}1 + \varepsilon t$
where $\mathrm{E}t(\varepsilon_t) = 0$ and ε_t i.i.d. across time. The economic interpretation of ε_t is that it represents a consumption innovation that is revealed at time *t*, for example, shocks to personal income at time *t*. An implication of this refined Euler equation is that: consumption growth Δc_t is only correlated with the innovation at time *t* and is orthogonal to any information set before time *t*, and thus Δc_t cannot be predicted by past consumption or labor income change. In other words, consumption growth over time should be a random walk. However, numerous studies have rejected this random walk conclusion and have documented the following well-known puzzling empirical facts.[5]

- *Excess sensitivity of consumption growth*. Aggregate consumption responds too much to lagged income changes or to predictable changes in income,
- *Excess smoothness of consumption growth*. Aggregate consumption responds too little to contemporaneous income news or to unpredictable changes in income,
- *Negatively correlated consumption growth over the medium term*. Consumption growth exhibits mean reversion and the autocorrelation of consumption growth is negative,
- *Hump-shaped consumption profile over the lifecycle*. Consumption grows initially and then decreases over the course of the lifecycle, even after controlling for many factors including family size and time.

The PIH is inconsistent with the above empirical findings because the PIH says that consumption growth only responds one-to-one to a current income innovation but not to any past realized income innovations. Furthermore, the PIH does not predict a particular shape of the consumption profile. These pieces of evidence challenge the PIH theory. This paper proposes an alternative theory based on a behavioral mechanism to both explain these puzzling facts and generate new testable hypotheses.

Evidence from Survey Data: We begin by presenting several stylized facts using the survey data on income and consumption forecasts both at the aggregate and at the individual level. Some of the evidence has previously been documented in, for example, (Bordalo, Gennaioli, Ma, & Shleifer, 2020). All of the observations exhibit some deviations from the rational PIH model, and they motivate our model assumptions which we present in the next section.

Data: The two main datasets we use are the Survey of Professional Forecasters (SPF, hereafter) and the main business cycle shock derived from (Angeletos, Huo, & Sastry, 2020). The SPF data dates back to 1968 and was originally collected by the American Statistical Association and the National Bureau of Economic Research.

[5] See (Jappelli & Pistaferri, 2010) for a more comprehensive survey.

Since 1990, it has been conducted by The Federal Reserve Bank of Philadelphia. The survey is conducted every quarter and contains point forecasts of major macroeconomic and financial variables in the United States. The forecasters in the survey are identified anonymously by forecaster IDs and we observe the forecaster-level data from which we can also construct different forecast moments such as consensus-level (mean or median) forecasts. In each quarter t, before the release of the current quarter's realized value, forecasters are asked to provide their estimates for the current quarter and each of the next four quarters. Therefore, in each given quarter t, we observe five forecasts for each following quarter. This paper mainly uses three forecast series from the SPF data: Nominal GDP (NGDP), Real GDP (RGDP) and Real Personal Consumption (RCONSUM).[6] The data cleaning procedure follows (Bordalo, Gennaioli, Ma, & Shleifer, 2020).[7] The forecasted variables are in levels and we transform them into implied growth rate forecasts.

Specifically, in a given quarter t, we define individual i's annual growth rate forecast as $F_{i,t-1}(x_{t+3})/x_{t-1} - 1$ where x is the macro series of interest. The realized growth rate is constructed in the same fashion, $x_{t+3}/x_{t-1} - 1$. We also define the forecast revision as the revision of the implied growth rate from the last quarter (quarter $t-1$ to quarter t), which reflects the change in the forecaster's information set. Finally, the forecast error is defined as the discrepancy between the actual realized value and the forecast. From the individual-level forecasts, we calculate the consensus-level forecast as the mean forecast for each quarter.[8] The second dataset we use is the business cycle shocks. We mainly use these shocks to construct the IRFs of the forecast and forecast errors. These shocks are derived by estimating a joint VaR model and maximizing the contributions to the business cycle variations of several major business cycle variables including unemployment, hours worked, output, consumption, investment and inflation. A more comprehensive description can be found in (Angeletos, Huo, & Sastry, 2020). These business cycle shocks are utilized to construct the IRFs in the same fashion as in (Angeletos, Huo, & Sastry, 2020) and (Vasudevan, Valente, & Wu, 2022).

Empirical Facts: In this section, we present several observations from the SPF data. We begin our analysis by testing the certainty equivalence condition in the survey data. In a standard PIH model, the Euler equation reduces to the certainty equivalence equation such that the expected future consumption level is equal to the current period's consumption. It is indeed this property that makes the consumption growth process a random walk without any predictability. A natural question is whether the certainty equivalence holds in the survey expectation data, which is examined in our first test. The rest of the tests in this section show how the forecast error, at both the consensus level and individual level, reacts to different pieces of news including the income news implied in the forecast revisions and the identified business cycle innovations. We also present the dynamics of the forecast reactions such as the IRFs at different lags. Studying the IRFs is crucial; if consumption growth does not follow a random walk, it may contain past information regarding realized income. The IRFs of the forecast errors can inform us whether there are systematic errors when people form beliefs about the future income process and thus make a sub-optimal consumption-saving plan, which then leads to deviations from the PIH's predictions. In the final part of this section, we summarize all the empirical findings from the survey forecast data and some motivations for an alternative behavioral model.

Fact 1 Certainty Equivalence Holds in the Survey Forecast: We run the certainty equivalence regression in the following form,

$$Ft(ct+j) = \alpha + \beta ct + \varepsilon t+j,$$

where the LHS is the consensus forecast of aggregate consumption at different horizons and the RHS predictor is the realized actual consumption level. For the individual-level regression, we replace the predicted variable by $Fit(c_{t+j})$ which represents different individuals' forecasts. Specifically, we regress the forecast of 1-, 2-, 3- and 4- 4-quarters ahead conditional on the time-t information set on the consumption level at time t. The PIH's Euler equation predicts that $\alpha = 0$ and $\beta = 1$. The regression results are summarized in Table 1 and Table 2. The regression results suggest that the slope is very close to one and is highly significant at conventional levels. In addition, we are not able to reject the hypothesis that the true intercept is different from zero. This holds both

[6] GDP forecasts are used as proxies for forecasters' income expectations.

[7] Namely, only forecasters with at least ten observations are kept. For each quarter-forecast horizon, forecasts that are more than five interquartile ranges away from the median are identified as outliers and are winsorized.

[8] The consensus-level forecast error is the realized value minus the consensus-forecast and the consensus-level forecast revision is the consensus-level forecast change from the last quarter.

for consensus forecast regressions and individual-level forecast regressions. It suggests that incorrect or non-rational beliefs may play an important role in explaining the failure of the PIH and thus the consumption puzzles laid out in the last section. It may be that the survey-based beliefs capture some systematic expectational errors that make consumption growth predictable. Furthermore, the finding provides a useful benchmark as a stylized fact that supports the starting point of our theory, i.e., that the PIH Euler equation holds if we incorporate survey-based beliefs.

Fact 2 Consumption Growth is Highly Correlated with Income Forecast Error: If consumption growth is not a random walk, can the survey-based forecast error predict it? Our second fact from the SPF data answers this question. We run the following consumption growth prediction regression,

$\Delta c_{t+j} = \alpha + \beta FE_{t,t+j} + controls + \varepsilon_t$

where j corresponds to a quarter, consumption growth is defined as $\Delta c_{t+j} = c_{t+j} - c_t$ and the consensus forecast error of real income $FE_{t,t+j}$ is defined as $x_{t+j} - \bar{E}_t(x_{t+j})$, for j from 1 to 4. For control variables, we use both past consumption growth and past forecast error at the consensus level. The regression results can be found in Table 3 in the Appendix. We can see that real consumption growth defined at all horizons is highly correlated with the average forecast error of real income. However, this result does not contradict the PIH. In the rational-PIH model, the forecast error of the permanent income component is a sufficient statistic for aggregate consumption growth. Our regression results are consistent with this prediction. However, it is interesting to see that the survey-based forecast or forecast error can generate the predictability of the consumption growth process. This fact should be viewed jointly with Fact 3 presented in the next section. Our second observation mainly shows that consumption growth can be predicted by income forecast errors and the next fact suggests that the forecast error itself can be predicted by the forecast revision or news about future income. Rational consumers fully incorporate any news into their optimal consumption-saving plan. Behavioral consumers may not fully react to the news which therefore makes their consumption predictable by past information. In other words, consumption adjusts with a delay.[9]

Fact 3 Underreaction and Overreaction in Income and Consumption Forecasts: Our third piece of motivating evidence tests information rigidity in the SPF forecasts. Specifically, we regress forecast errors on forecast revisions, using both consensus-level observations (as in (Coibion & Gorodnichenko, 2015)) and individual forecaster-level observations (as in (Bordalo, Gennaioli, Ma, & Shleifer, 2020))

In particular, regressions are of the form,

$FE_t = \alpha + \beta_{CG} FR_t + \varepsilon_t$

$FEit = \alpha + \beta BGMSFRit + \varepsilon it$

where we define

$FEt = xt{+}k - \bar{E}t(xt{+}k)$

$FRt = \bar{E}t(xt{+}k) - \bar{E}t{-}k(xt{+}k)$

$FEit = xt{+}k - Eit(xt{+}k)$ $FRit = Eit(xt{+}k) - Eit{-}k(xt{+}k)$.

where x_{t+k} is the variable of interest, such as nominal GDP, $\bar{E}_t(x_{t+k})$ is the consensus forecast for k quarters ahead conditional on the time t information set and $Eit(x_{t+k})$ is forecaster i's forecast in period t. We are interested in the sign of β_{CG} and β_{BGMS}. As mentioned in Coibion and Gorodnichenko (2015), $\beta > 0$ corresponds to forecasters under-reacting to information that arrives between period $t{-}k$ and period t, and $\beta < 0$ corresponds to forecasters overreacting to information that arrives between $t{-}k$ and t, with larger magnitude coefficients indicating more under-reaction or overreaction.

A positive coefficient indicates that the forecast error is positively correlated with changes in forecasters' expectations from $t - k$ to t. This reflects that forecasters' beliefs did not move sufficiently to capture the information they observed, consistent with under-reaction. Conversely, a negative coefficient indicates that forecasters' beliefs moved too much, consistent with overreaction. The regression results can be found in Table 4 and Table 5. Similar results are also reported in (Bordalo, Gennaioli, Ma, & Shleifer, 2020) and we include them in this paper using an updated data sample. The regression results suggest that individuals consistently overreact to new information when they forecast all three variables. For consensus-level forecasts of real consumption, we do not obtain statistically significant results. However, for both nominal and real GDP, we can see that the CG regression coefficients are positive and statistically significant except for one-quarter ahead

[9] See (Campbell & Deaton, 1989) for a more detailed discussion.

forecasts. We interpret the positive signs as indicating under-reaction to news such that forecasters do not fully adjust their forecasts when receiving new information about the data. These results are consistent with (Bordalo, Gennaioli, Ma, & Shleifer, 2020).

Fact 4 Initial Under-reaction and Delayed Overreaction in Consensus Income Expectations: To study how forecasters respond to the arrival of news, we borrow two types of news (Angeletos, Huo, & Sastry, 2020).[10] The shocks are constructed by running a VAR of ten US macroeconomic variables and extracting the linear combination of residuals in the VAR that explains the most quarterly variation of a given macroeconomic variable for 6 to 32 quarters ahead. The first shock, which is called the "main business cycle shock", is constructed by maximizing its contribution to the business cycle variation in unemployment. The authors argue that it is one of the main drivers of the bulk of the business cycle in the data. The second shock we consider is the TFP shock constructed by targeting the TFP series, which is shown to be unrelated to the main business cycle shock at all frequencies. Figure 1 plots the impulse response functions of the consensus forecast error of real and nominal income from the SPF at the quarterly frequency. The impulse response functions are estimated from regressions of the form $yt+h = \alpha h + \beta h\varepsilon t + \gamma hCt + ut+h$

Where y_{t+h} is the variable of interest (forecast error in our case), C_t is the lagged values of forecasts and outcomes used as controls, and ε_t is the main business cycle shock or the TFP shock. The forecast error is defined as $y_{t+h} = x_{t+h}$-$E_{t+h-j}x_{t+h}$ (the consensus forecast error of the income). We specify h = 1,2,...,20 which corresponds to up to 20 quarters ahead. The sample for the analysis runs from 1968 to 2017.[11] The figure also plots plus and minus one standard error band for the impulse response functions. The impulse response functions reveal that for around five quarters after the arrival of a main business cycle shock and around ten quarters after the arrival of a TFP shock, the consensus forecast of real or nominal income is persistently lower than the realized values, indicating under-reaction to news. However, after that, the forecasted income exceeds the realized income, indicating the subsequent overreaction of the forecasts. These patterns are captured by initial positive forecast errors, followed by negative forecast errors. Similar behaviors are documented for inflation/unemployment forecasts (Angeletos, Huo, & Sastry, 2020) and U.S. interest rate/interest rate differential forecasts (Vasudevan et al. (2022)). ial under-reaction and delayed overreaction of survey-based consensus expectations to news shocks.

Fact 5 Initial Under-reaction and Delayed Overreaction in Consumption Growth: From our empirical fact 2, we see that forecast errors of income at the consensus level predict consumption at multiple horizons; we also showed that consensus income forecast errors under-react and then overreact to news. A natural question to ask is whether realized consumption growth itself exhibits a similar pattern of underreaction followed by overreaction. We follow the local projection regression method described in the last section and plot the IRFs of annual consumption growth to the news shocks in Figure 2.[12] We see that consumption growth at an annual frequency also displays the pattern of initial underreaction and subsequent overreaction after the realization of the news. That is, when receiving a positive (negative) main business cycle shock or a TFP shock, consumption growth increases (decreases) in the short term. However, after several quarters, consumption growth becomes negative (positive). We interpret the predictability of aggregate consumption growth, jointly from all the facts we documented, from the belief updating property of the forecasters: they do not fully adjust their forecasts or over-respond in their forecasts, which is reflected in their reported consumption forecasts and realized consumption profiles.

[10] We downloaded the data on shocks from George-Marios Angeletos' website.

[11] The sample from (Angeletos, Huo, & Sastry, 2020) ends in 2017Q4.

[12] Specifically we estimate the following equation

$$y_{t+h} = \alpha_h + \beta_h\varepsilon_t + \gamma_h C_t + u_{t+h}$$

where y_{t+h} is the annual consumption growth at time $t + h$, C_t are lagged values of forecasts and outcomes used as controls at time t, and ε_t are the main business cycle shock or the TFP shock in the period of t.

3. A Life-Cycle Consumption Model

We present a theory of consumption in this section. Our goal is to explain consumption behavior in a manner consistent with the motivating empirical evidence and the puzzling observations regarding consumption. The theory we introduce is a standard consumption-saving optimization model with an exogenous income process and incomplete information. Consumers choose their consumption in each period over their lifecycle but are uncertain about the permanent income component. They are endowed with a noisy signal from which they make inferences about the unobserved latent income. In the model, the consumers are also not informed about the structural parameters when updating their beliefs in each period of time. Therefore, they use some subjective parameters when making inferences. We first introduce the model environment and solve the Full Information Rational Benchmark (PIH) in which there is no uncertainty in the market. We then show that the PIH predicts that the consumption change over time cannot be predicted by past information. Finally, we present the full model solution and study how consumption changes react to income news in both the short term and medium term.

Preliminaries: Time is discrete and indexed by $t = 0,1,2,...T$. There are an infinite number of ex-ante identical households who are indexed by i; we normalize the mass of households to one. In each period t, household i earns exogenous income y_{it} and makes consumption and saving plans by maximizing the following lifetime utility,

$$\mathbb{E}_{it}\left(\sum_{j=t}^{T}\beta^{j-t}u(c_{ij})\right)$$

subject to the budget constraint

$$c_{it}+s_{it}=y_{it}+\frac{1}{1+r}s_{it+1}$$

where we denote consumption and saving by c_{it} and s_{it}, respectively. The discount factor is denoted by β and r is the net return on savings, which is exogenous to all the households. In the rest of the paper, we assume the household's utility function is quadratic and has the following functional form,

$u(c) = -(c-\gamma)^2$,

where γ is a fixed and exogenous parameter. Under this assumption, it is easy to show that the optimal consumption profile satisfies the following Euler equation,

$cit = \mathrm{E}it(cit+1)$

where we assume that the discount factor satisfies $\beta(1 + r) = 1$. Combining this equation with the budget constraint, we can write the optimal consumption and consumption growth as

$$c_{it}=-\frac{1-\beta}{1-\beta^{T-t+1}}s_t+\frac{1-\beta}{1-\beta^{T-t+1}}\sum_{j=0}^{T-t}\beta^j\mathbb{E}_{it}(y_{it+j})$$

$$c_{it}-c_{it-1}=\left(\frac{1-\beta}{1-\beta^{T-t+1}}\right)\sum_{j=0}^{T-t}\beta^j(\mathbb{E}_{it}(y_{it+j})-\mathbb{E}_{it-1}(y_{it+j}))$$

Income Process and Information: Throughout the paper, we assume that households earn permanent income with idiosyncratic risk in each period. Specifically, we assume that y_{it} is generated by the following process

$y_{it} = y_t + \sigma_v v_{it}$, v_{it} *i.i.d.* $\sim$N(0,1)

where σ_v is the standard deviation. The permanent income component follows an $AR(1)$ process

$y_t = \rho y_{t-1} + \varepsilon_t$, ε_t *i.i.d.* $\sim$N(0,1)

where $\rho \leq 1$ and we normalize the permanent shock to have unit variance. We suppose that households do not directly observe y_t but only observe y_{it}. In addition, they do not observe other households' income. We denote the information set for household i at time t by $\mathrm{I}_{it} = \{y_{i0}, y_{i1}, ..., y_{it}\}$.

Full Information Rational Benchmark: We first derive the full information benchmark where agents perfectly observe y_t. When all households have the same information set, we can effectively suppose there is only a representative agent and aggregate-level consumption coincides with individual-level consumption. It is easy to prove the following proposition.

Proposition 1: *If households perfectly observe the process of permanent income, consumption growth satisfies the following equation,*

$$\Delta c_t^* = c_t^* - c_{t-1}^* = \left(\frac{1-\beta}{1-\beta^{T-t+1}}\right)\left(\frac{1-(\rho\beta)^{T-t+1}}{1-\rho\beta}\right)\varepsilon_t.$$

The covariance between consumption growth and income change is

$$cov(\Delta c_t^*, \Delta y_t) = \left(\frac{1-\beta}{1-\beta^{T-t+1}}\right)\left(\frac{1-(\rho\beta)^{T-t+1}}{1-\rho\beta}\right).$$

From Proposition 1, it is clear that consumption growth is pure noise and is not predicted by any past information. The intuition is that households want to smooth their consumption flow and consumption mainly depends on expected lifetime income, which is much smoother than income in a particular period. Therefore, consumption growth is mainly the forecast error of lifetime income, which is orthogonal to past variables such as past income or past income change.

Full Model Solution: We now present the main result of the paper. In the model where households do not directly observe permanent income, they rely on the income realizations y_{it} to learn so that y_{it} is effectively a noisy signal of y_t. We also assume that households' subjective persistence of permanent income may be different from the true parameter. Specifically, we allow households to perceive the autocorrelation of y_t to be $\tilde{\rho}$. We regard $\tilde{\rho}$ as a parameter summarizing extrapolative expectations and will assume $1 \geq \tilde{\rho} \geq \rho$ in the rest of the paper, which we call over-extrapolation of realized income. The following proposition summarizes households' forecast rule of future income and consumption growth.

Proposition 2: *If households do not perfectly observe the process of permanent income, their prediction of permanent income satisfies*

$$\tilde{\mathbb{E}}_{it}(y_t) = \left(1-\frac{\lambda}{\tilde{\rho}}\right)\frac{1}{1-\lambda\mathbb{L}}y_{it}$$

Where

$$\lambda = \frac{1}{2}\left(\tilde{\rho} + \frac{1+\tau_\nu}{\tilde{\rho}} - \sqrt{(\tilde{\rho} + \frac{1+\tau_\nu}{\tilde{\rho}})^2 - 4}\right) \text{ and } \tau_\nu = \sigma_\nu^{-2}.$$

Consumption growth satisfies the following equation

$$\Delta c_{it} = c_{it} - c_{it-1} = \left(\frac{1-\beta}{1-\beta^{T-t+1}}\right)\left(\frac{1-(\tilde{\rho}\beta)^{T-t+1}}{1-\tilde{\rho}\beta}\right)\left(1-\frac{\lambda}{\tilde{\rho}}\right)\frac{1-\tilde{\rho}\mathbb{L}}{1-\lambda\mathbb{L}}y_{it}.$$

The proof can be found in the Appendix. From the above result, we can see that all the information contained in y_{it}, not just the current realization of innovation, enters into the computation of consumption growth. To see more clearly how households forecast permanent income, we can rewrite the forecast rule as

$$\tilde{\mathbb{E}}_{it}(y_t) = \frac{\lambda}{\tilde{\rho}}\tilde{\mathbb{E}}_{it-1}(y_t) + \left(1-\frac{\lambda}{\tilde{\rho}}\right)y_{it}.$$

From the above equation, we can see that households' prediction of the fundamental variable is a weighted average of their past forecasts and the new information received. The weight $\left(1-\frac{\lambda}{\tilde{\rho}}\right)$ is the Kalman gain and the forecast itself is an $AR(1)$ process. We can view the parameter λ as the informational friction that induces sticky updating of households' beliefs. When households have full information about permanent income, λ goes to zero and the current prediction reflects only the new observation y_{it} but no longer depends on the past prediction. In the next section, we formally derive the covariance between forecast error and income news, which will shed light on how households react to income innovations.

Theoretical Predictions: In this section, we present a set of predictions from the model developed in the last section. We will mainly focus on the full model with dispersed information and extrapolation since the FIRE benchmark is rather clear and intuitive. We first derive how households' expectation error of future income reacts to income news and show how the model is related to the consumption anomalies we study in this paper.

The Impulse Response of Forecast Errors: From the individual household's forecast rule, we define the consensus forecast as the average forecast across households,

$$\bar{\mathbb{E}}_t(y_{t+1}) = (\tilde{\rho} - \lambda)\frac{1}{1-\lambda\mathbb{L}}y_t.$$

We define the consensus- and individual-level news in each period as follows.

Definition 1. In period *t*, the consensus-level news is the innovation in the permanent income process such that

$news_t = \varepsilon_t$,

and the idiosyncratic-level news is the private noise in y_{it} weighted by its standard deviation

$newsit = \sigma\nu vit.$

The following proposition summarizes the Impulse Response Functions (IRFs) of forecast errors with respect to both current news and past news at both the consensus level and individual level. **Proposition 3.** *The one-period ahead forecast errors at the consensus level and individual level are*

$$FE_{t,t+1} = \frac{1-\tilde{\rho}\mathbb{L}}{(1-\rho\mathbb{L})(1-\lambda\mathbb{L})}\varepsilon_{t+1}$$

and

$$FE_{it,t+1} = \frac{1-\tilde{\rho}\mathbb{L}}{(1-\rho\mathbb{L})(1-\lambda\mathbb{L})}\varepsilon_{t+1} - \frac{\tilde{\rho}-\lambda}{1-\lambda\mathbb{L}}\sigma_\nu\nu_{it}.$$

The IRFs of the consensus-level forecast error w.r.t. $news_{t-j}$ *are*

$$IRF_t^j = \frac{\partial FE_{t,t+1}}{news_{t-j}} = \frac{\lambda^{j+1}(\tilde{\rho}-\lambda) - \rho^{j+1}(\tilde{\rho}-\rho)}{\rho-\lambda},\ \forall j \geq 0.$$

The IRFs of the individual-level forecast error w.r.t. $news_{it-j}$ *are*

$$\frac{\partial FE_{it,t+1}}{news_{it-j}} = -\lambda^j(\tilde{\rho}-\lambda),\ \forall j \geq 0.$$

We view the total response of the individual-level forecast errors to news as the aggregate effect of $news_{t-j}$ *and* $news_{it-j}$ *such that*

$$IRF_{it}^j = \frac{\partial FE_{it,t+1}}{news_{t-j}} + \frac{\partial FE_{it,t+1}}{news_{it-j}} = \frac{\lambda^{j+1}(\tilde{\rho}-\lambda) - \rho^{j+1}(\tilde{\rho}-\rho)}{\rho-\lambda} - \lambda^j(\tilde{\rho}-\lambda).$$

The proof can be found in the Appendix. Our first observation is that IRF^j_{it} will always be more negative compared to IRF^j_t given that $\lambda < \tilde{\rho}$, which is easy to prove. This implies that good news at the individual level will result in a more negative forecast error, so households underreact less or overreact more to news at the individual level compared to an average household. Economically, it is due to independent idiosyncratic shocks across periods. When there is some good idiosyncratic news (ν_{it}) realized in the current period, household *i* updates its forecast of future income upwards. However, the good news is only temporary and does not affect the next period's income, which on average disappoints those households and results in a smaller forecast error. Our second observation is that whether households under or overreact to current news depends on the trade-off between extrapolation degree and informational friction. The consensus and individual level forecast error to current news (taking $j = 0$) is $\lambda - (\tilde{\rho} - \rho)$ and $2\lambda - (\tilde{\rho} - \rho) - \tilde{\rho}$ where λ arises due to noise in the realized income y_{it}. Ceteris paribus, a higher level of extrapolation reduces the reaction of forecast errors to current news and induces more overreaction to news. Noisy information, on the other hand, increases the IRF coefficients and produces more underreaction to news. Which effect dominates depends on the relative strength of noisy learning and extrapolative beliefs. Furthermore, the more auto-correlated the permanent income process is, the more a household forecast underreacts and the less it overreacts. It is also intuitive because a larger value of ρ implies a relatively smaller level of extrapolation ($\tilde{\rho}$ closer to ρ) and noisy information plays a more important role.

Relation to Consumption Anomalies: Recall that the MPC in the rational-expectation PIH is a function of both the discount factor and the auto-correlation coefficient such that,

$$MPC^* = \left(\frac{1-\beta}{1-\beta^{T-t+1}}\right)\left(\frac{1-(\rho\beta)^{T-t+1}}{1-\rho\beta}\right).$$

One can prove that this MPC is always less than one and increases when households approach the end of the lifecycle. This is because households mainly care about the average lifetime income and when an income shock occurs its average impact will be more pronounced when there are fewer periods left. When the income process

is a martingale process, the PIH predicts that the MPC is one. We define consumption as excessively smooth and excessively sensitive relative to the PIH as follows:

Definition 2. Aggregate consumption is excessively smooth if $MPC = \frac{\partial \Delta c_t}{\partial \varepsilon_t}$ is smaller than $MPC^* = \left(\frac{1-\beta}{1-\beta^{T-t+1}}\right)\left(\frac{1-(\rho\beta)^{T-t+1}}{1-\rho\beta}\right)$ for all *t*. Consumption is excessively sensitive if $\frac{\partial \Delta c_t}{\partial \varepsilon_{t-1}} > 0$ for all *t*.
We can prove that the full model predicts excessively smooth and excessively sensitive consumption growth.

Proposition 4. *Aggregate consumption is excessively smooth if the following condition holds*
$$\lambda > \tilde{\rho}\frac{\sum_{j=0}^{T}(\tilde{\rho}^j - \rho^j)\beta^j}{\sum_{j=0}^{T}(\tilde{\rho}\beta)^j}.$$
When $\tilde{\rho} = \rho$ and $\tau_v < +\infty$, aggregate consumption is always excessively smooth.
Aggregate consumption is excessively sensitive if the following condition holds
$\tau_v < +\infty$ and $\lambda > \tilde{\rho} - \rho$.

Note that the condition to generate excess sensitivity corresponds to the condition under which the forecast error under-reacts to a current income shock. The intuition is that if households under-react to current shocks when updating their beliefs concerning average lifetime income, the incorporation of news into their consumption profile is slowed. As a result, good news realized in the current period predicts positive consumption growth in the next period. This causes consumption growth to be correlated with predicted income growth. The PIH fails to predict excessively sensitive consumption growth because income innovations are fully incorporated into consumption in each period and future consumption growth is therefore not predicted by past income news. For consumption to be excessively smooth, however, under-reaction to current income news is not sufficient. To see this, we can decompose the consumption growth as follows,

$$\begin{aligned}\Delta c_t &= \left(\frac{1-\beta}{1-\beta^{T-t+1}}\right)(y_t - \bar{\mathbb{E}}_{t-1}(y_t) + \sum_{j=1}^{T-t}\beta^j(\bar{\mathbb{E}}_t(y_{t+j}) - \bar{\mathbb{E}}_{t-1}(y_{t+j})))\\ &= \left(\frac{1-\beta}{1-\beta^{T-t+1}}\right)(\underbrace{y_t - \bar{\mathbb{E}}_{t-1}(y_t)}_{\text{Forecast Error}} + \beta\frac{1-(\beta\tilde{\rho})^{T-t}}{1-\beta\tilde{\rho}}(\underbrace{\bar{\mathbb{E}}_t(y_{t+1} - (\bar{\mathbb{E}}_{t-1}(y_{t+1}))}_{\text{Forecast Revision}}))\end{aligned}$$

Where the current income news enters both the forecast error and the forecast revision and $\frac{\partial \bar{\mathbb{E}}_t(y_{t+1} - (\bar{\mathbb{E}}_{t-1}(y_{t+1})}{\partial \varepsilon_t} = \tilde{\rho} - \lambda$ compared to ρ in PIH. Under-reacting to news will make the forecast revision a positive function of income innovations ε_t and a less precise signal (larger λ) induces a somewhat smaller effect of income news in the second term. However, extrapolation mitigates the sluggishness as summarized in the coefficient that increases with $\tilde{\rho}$. Excess smoothness in aggregate consumption relative to the PIH arises when the average effect of noise is stronger than that of extrapolation. When $\rho = \tilde{\rho}$, our model always predicts a smaller MPC purely due to imperfect observation of the permanent income component. In fact, our model predicts not only excess sensitivity of consumption to recent news but also implies that all past income news affects the consumption growth path. This is because the forecast error in our model is not pure noise and is predictable by past realized news. It is this feature that produces predictable consumption growth when the PIH fails to replicate. Under some values of the parameters, our model also implies negatively autocorrelated consumption growth in the medium term,

Definition 5.3. Aggregate consumption growth is negatively autocorrelated in the medium term if $cov(\Delta c_t, \Delta c_{t-j}) < 0$ for some $j > 1$.
We can prove the following proposition regarding the consumption growth covariance between periods *t* and *t − j*.

Proposition 5. *When $\rho > \tilde{\rho}$ and $\tau_v < +\infty$, aggregate consumption growth is negatively autocorrelated in the medium term such that $cov(\Delta c_t, \Delta c_{t-j}) < 0$ for some $j > 1$.*
This implication is mainly due to our agents' over-extrapolating income shocks, which leads to subsequent overreaction. The intuition is as follows. Regardless of how noisy the private income process is, households

always positively react to the current shocks (although they may do so in an under-reacting fashion). This means ε_{t-j} enters the consumption growth from period $t-j-1$ to period $t-j$ positively. It is also not surprising that the impact of ε_{t-j} has the largest magnitude among all realized shocks. However, when we have $\rho < \tilde{\rho}$, we know that households ultimately overreact to historical income shocks. For example, ε_{t-j} negatively predicts consumption growth from $t-1$ to t, thus resulting in a negative correlation between Δc_t and Δc_{t-j}.

4. Conclusion

In this paper, we propose an explanation for several major macro consumption anomalies. These consumption anomalies are deviations from the rational PIH model in which consumption growth is essentially a random walk and is unpredictable. Specifically, the empirical literature documents that aggregate consumption is too smooth in response to unpredictable income changes and too sensitive in response to predicted income changes. Furthermore, in contrast to the prediction from PIH that past income change and consumption growth are uncorrelated in the medium term, the data show that consumption growth is negatively correlated with past income growth. A hump-shaped consumption profile over the lifecycle in the data also contradicts the random walk assumption. Our theoretical explanation of these puzzling facts relies heavily on an unconventional belief formation process of consumers, guided by survey-based evidence. Our focus on survey-based forecasts of aggregate income as a proxy for market participants' beliefs is motivated by the strong relationship between survey-based forecast errors of income and consumption growth. Focusing on income forecasts, we document that consensus forecasts of nominal and real income initially underreact, and subsequently overreact to news shocks.

Moreover, similar patterns of reaction can also be seen in aggregate consumption growth. We propose a model similar to (Angeletos, Huo, & Sastry, 2020) and, (Vasudevan, Valente, & Wu, 2022). Two key frictions play an important role in the model. The first is that consumers do not directly observe the latent fundamental income variable that governs the realized income in each period, so they need to learn the data-generating process to make inferences. Second, we allow consumers to use a subjective persistence parameter, which can be different from the true parameter, in updating their beliefs. Combining these two assumptions, we are able to generate forecast errors of income and equilibrium consumption growth consistent with the evidence. We also carefully characterize the model solution and show its relation to each of the consumption anomalies. There are also some policy implications from this paper. First of all, consumption equilibrium is determined by a wide range of personal expectations of future macroeconomic variables such as inflation rate and interest rate, which in turn affects the equilibrium aggregate production. Therefore, it will be useful to design belief management tools such as forward guidance, considering distorted beliefs, to reach more efficient market outcomes. Second, consumption is ultimately related to investments such as fixed income, real estate and stock market decisions.

This study can be used and extended to develop policies to reduce information frictions in financial markets to further help consumers and investors to make optimal consumption, investment and saving portfolio choices. We conclude with some thoughts on further directions for work suggested by our analysis. First, the agents in our model are ex-post heterogeneous in the sense that their realized personal income (signals) can be different. However, we do not specify the source of this heterogeneity. It could derive from income sources, working location and matching frictions. Due to the heterogeneity in their received signals, consumers disagree about the same fundamental data-generating process. Understanding this heterogeneity, and especially how individual consumption is related to the source of heterogeneity, is an interesting future direction. It may also help to explain the cross-sectional variations in consumption. Second, we do not make quantitative predictions in the paper. An important next step is to use detailed personal consumption expenditure and income data, jointly with survey-based data, to calibrate the model. This will allow us to make more precise predictions such as the timing of underreaction and overreaction, how much excess sensitivity in consumption is due to overreaction and possibly also suggest some welfare implications. Finally, our theoretical framework is a partial equilibrium model. Endogenizing the income process in the model, for example by introducing a firm sector, can be useful. Such a model can be applied to study other macroeconomic implications such as general equilibrium effects and redistribution policy.[13] We leave these directions for future research.

[13] For example, how consumers form income beliefs regulates the slope of the Keynesian cross and how the aggregate demand responds to monetary policy.

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Appendices

A. Tables and Figures

Table 1: Regression of Consumption Level Forecast on Realized Consumption (Individual Level)

	(1) $E_{it}(c_{t+1})$	(2) $E_{it}(c_{t+2})$	(3) $E_{it}(c_{t+3})$	(4) $E_{it}(c_{t+4})$
c_t	1.004***	1.013***	1.020***	1.027***
	(0.00450)	(0.00387)	(0.00370)	(0.00369)
Constant	8.437	-3.311	-9.404	-11.03
	(21.92)	(18.81)	(17.96)	(17.92)
N	5475	5476	5477	5452

Standard errors in parentheses
$^{*}p < 0.1$, $^{**}p < 0.05$, $^{***}p < 0.01$
This table summarizes the results from regressing individual-level consumption forecast on realized consumption level in the following form
$Fit(c_{t+j}) = \alpha + \beta c_t + \varepsilon_{t+1}$.
The standard errors are clustered at the year-quarter level.

Table 2: Regression of Consumption Level Forecast on Realized Consumption (Consensus Level)

	(1) $E_t(c_{t+1})$	(2) $E_t(c_{t+2})$	(3) $E_t(c_{t+3})$	(4) $E_t(c_{t+4})$
c_t	1.005***	1.013***	1.021***	1.028***
	(0.00108)	(0.00163)	(0.00225)	(0.00262)
Constant	4.111	-5.919	-11.59	-13.55
	(8.027)	(12.35)	(17.08)	(19.87)
N	163	163	163	163

Standard errors in parentheses
$^{*}p < 0.1$, $^{**}p < 0.05$, $^{***}p < 0.01$
This table summarizes the results from regressing consensus-level consumption forecast on realized consumption level in the following form
$F^{-}t(ct+j) = \alpha + \beta ct + \varepsilon t+1$.
We report the HAC-standard errors in the table.

Table 3: Regression of Consumption Growth on Real Income Forecast Error

	Real Income Forecast Errors							
	(1) 1Q	(2) 2Q	(3) 3Q	(4) 4Q	(5) 1Q	(6) 2Q	(7) 3Q	(8) 4Q
Coefficient	0.711***	0.672***	0.665***	0.692***	0.731***	0.604***	0.543***	0.477***
	(0.0873)	(0.0821)	(0.0892)	(0.0931)	(0.0854)	(0.0687)	(0.0577)	(0.0490)
Controls	N	N	N	N	Y	Y	Y	Y

N	194	194	195	196	192	193	194	195

Standard errors in parentheses
$^{*}p < 0.1$, $^{**}p < 0.05$, $^{***}p < 0.01$
This table reports the regression coefficients from the following equation
$\Delta c_{t+j} = \alpha + \beta FE_{t,t+j} + controls + \varepsilon_t$
where j corresponds to a quarter, the consumption growth is defined as $\Delta c_{t+j} = c_{t+j} - c_t$ and consensus forecast error of the real income $FE_{t,t+j}$ is defined as $x_{t+j} - E_t(x_{t+j})$, for j from 1 to 4. For control variables, we use both the past consumption growth and the past forecast error at the consensus level. We report the HAC standard errors in the above table.

Table 4: Regression of Forecast Errors on Forecast Revisions (Individual Level)

	Real Income					
	(1) 1Q	(2) 2Q	(3) 3Q			(4) 4Q
Coefficient	-0.332***	-0.165***	-0.172***			-0.149***
		(0.0283)	(0.0384)	(0.0468)	(0.0379)	
N		5648	5657	5625	4815	
R^2		0.083	0.014	0.012	0.007	
	Nominal Income					
	(1) 1Q	(2) 2Q	(3) 3Q			(4) 4Q
Coefficient	-0.369***	-0.217***	-0.181***			-0.217***
		(0.0247)	(0.0305)	(0.0326)	(0.0345)	
N		5719	5721	5688	4938	
R^2		0.112	0.027	0.015	0.019	
	Real Consumption					
	(1) 1Q	(2) 2Q	(3) 3Q			(4) 4Q
Coefficient	-0.361***	-0.354***	-0.241***	-0.243***		
	(0.0318)	(0.0365)	(0.0380)	(0.0405)		
N	3878	3884	3867	3396		
R^2	0.072	0.059	0.025	0.019		

Standard errors in parentheses
$^{*}p < 0.1$, $^{**}p < 0.05$, $^{***}p < 0.01$
This table summarizes the results from regressing individual-level forecast error on forecast revision in the following form
$FEit = \alpha + \beta BGMSFRit + \varepsilon t$
The standard errors are double clustered at year-quarter and forecaster ID levels. Columns (1) - (4) represent 1-, 2-, 3and 4-quarter ahead of forecast.

Table 5: Regression of Forecast Errors on Forecast Revisions (Consensus Level)

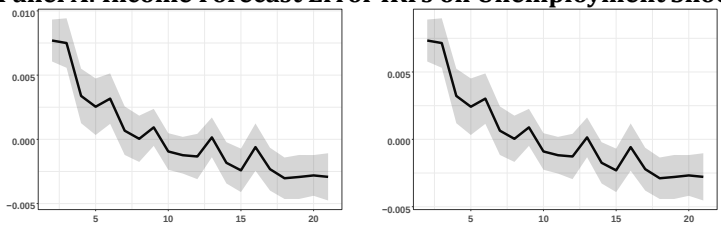
	Real Income						
	(1) 1Q	(2) 2Q				(3) 3Q	(4) 4Q
Coefficient	0.00767	0.349**				0.482***	0.450*
			(0.0986)	(0.140)	(0.181)	(0.231)	
N			196	196	196	191	
R^2			0.000	0.034	0.048	0.027	
	Nomi	nal Income					
	(1)	(2)				(3)	(4)

	1Q	2Q					3Q	4Q
Coefficient	-0.0448	0.319**					0.512***	0.559***
		(0.0901)	(0.126)	(0.164)	(0.208)			
N		199	199	199	194			
R^2		0.001	0.034	0.060	0.054			

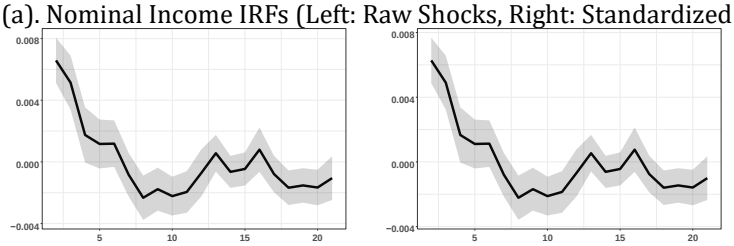
	Real Consumption							
	(1)	(2)					(3)	(4)
	1Q	2Q					3Q	4Q
		Coefficient	-0.0475	-0.0413	0.156	0.237		
	(0.149)	(0.153)	(0.182)	(0.243)				
N	145	145	145	145				
R^2	0.001	0.001	0.006	0.009				

Standard errors in parentheses
$^{*}p < 0.1$, $^{**}p < 0.05$, $^{***}p < 0.01$
This table summarizes the results from regressing consensus-level forecast error on forecast revision in the following form
$FE_t = \alpha + \beta_{CG}FR_t + \varepsilon_t$
We report the HAC standard errors. Columns (1) - (4) represent 1-, 2-, 3- and 4-quarter ahead forecast.

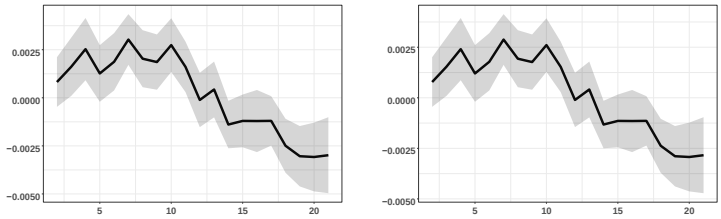
Figure 1: Under-reaction and Overreaction in Income Expectation to News Shocks
Panel A: Income Forecast Error IRFs on Unemployment Shock



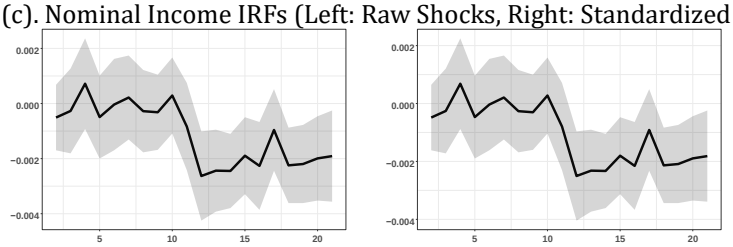
(a). Nominal Income IRFs (Left: Raw Shocks, Right: Standardized Shocks)



(b). Real Income IRFs (Left: Raw Shocks, Right: Standardized Shocks)
Panel B: Income Forecast Error IRFs on TFP Shock



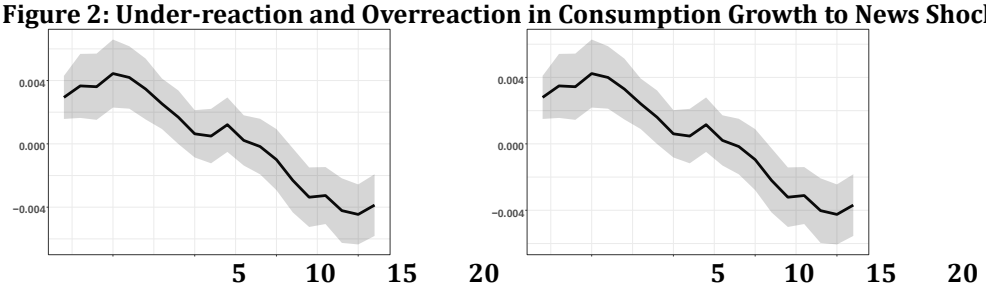
(c). Nominal Income IRFs (Left: Raw Shocks, Right: Standardized Shocks)



(d). Real Income IRFs (Left: Raw Shocks, Right: Standardized Shocks)

The figure plots impulse response functions (IRFs) of US income consensus forecast errors in response to news shocks. The IRFs are estimated from regressions of the form $y_{t+h} = \alpha_h + \beta_h\varepsilon_t + \gamma_h C_t + u_{t+h}$ where y_{t+h} is forecast error, C_t are lagged values of forecasts and outcomes used as controls, and ε_t are the main business cycle shock or the TFP shock. The forecast error is defined as $y_{t+h} = x_{t+h} - E_{t+h-j}x_{t+h}$ (the consensus forecast error of the income). The sample for the analysis runs from 1968 to 2017. The left column in the figure plots the raw shock and the right column plots the standardized shocks which transform the raw shocks by subtracting the mean and dividing by the standard deviations over the sample.

Figure 2: Under-reaction and Overreaction in Consumption Growth to News Shocks



(a). Consumption Growth IRFs on Unemployment Shock (Left: Raw Shocks, Right: Standardized Shocks)

(b). Consumption Growth IRFs on TFP Shock (Left: Raw Shocks, Right: Standardized Shocks)

The figure plots impulse response functions (IRFs) of consumption growth in response to news shocks. The IRFs are estimated from regressions of the form $y_{t+h} = \alpha_h + \beta_h\varepsilon_t + \gamma_h C_t + u_{t+h}$ where x_{t+h} is the annual consumption change, C_t are lagged values of forecasts and outcomes used as controls, and ε_t are the main business cycle shock or the TFP shock. The sample for the analysis runs from 1968 to 2017. The left column in the figure plots the raw shock and the right column plots the standardized shocks which transform the raw shocks by subtracting the mean and dividing by the standard deviations over the sample.

B. Proofs

Proof of Proposition 2

The income process can be written as

$$s_{it} = M(\mathbb{L}) \begin{bmatrix} \varepsilon_t \\ \tilde{\nu}_{it} \end{bmatrix}$$

where $M(\mathbb{L}) = \begin{bmatrix} \frac{1}{1-\tilde{\rho}\mathbb{L}} & \tau_\nu^{-1/2} \end{bmatrix}$ and $\tilde{\nu}_{it}$ has a variance of one. The fundamental representation is

$$B(\mathbb{L}) = \tau_\nu^{-1/2} \sqrt{\frac{\tilde{\rho}}{\lambda}} \frac{1-\lambda\mathbb{L}}{1-\tilde{\rho}\mathbb{L}}$$

where

$$\lambda = \frac{1}{2}\left(\tilde{\rho} + \frac{1+\tau_\nu}{\tilde{\rho}} - \sqrt{(\tilde{\rho} + \frac{1+\tau_\nu}{\tilde{\rho}})^2 - 4}\right).$$

By the Wiener-Hopf prediction formula, the individual forecast formula is

$$\tilde{\mathbb{E}}_{it}(y_t) = \left[\frac{1}{1-\tilde{\rho}\mathbb{L}} M^T(\mathbb{L}^{-1}) B(\mathbb{L}^{-1})^{-1}\right]_+ B(\mathbb{L})^{-1} y_{it} = \left(1 - \frac{\lambda}{\tilde{\rho}}\right) \frac{1}{1-\lambda\mathbb{L}} y_{it}.$$

And

$\tilde{E}_{it}(y_{t+j}) = \tilde{E}_{it}(y_{it+j}) = \tilde{\rho}^j \tilde{E}_{it}(y_t)$

when $j \geq 1$.

Proof of Proposition 3

The forecast error at the consensus level can be written as

$$FE_{t,t+1} = y_{t+1} - \bar{\mathbb{E}}_t(y_{t+1}) = \frac{1}{1-\rho\mathbb{L}}\varepsilon_{t+1} - \frac{(\tilde{\rho}-\lambda)}{1-\lambda\mathbb{L}} \frac{1}{1-\rho\mathbb{L}}\varepsilon_t = \frac{1-\tilde{\rho}\mathbb{L}}{(1-\rho\mathbb{L})(1-\lambda\mathbb{L})}\varepsilon_{t+1},$$

Similarly, the forecast error at the individual level is

$$FE_{it,t+1} = y_{t+1} - \tilde{\mathbb{E}}_{it}(y_{t+1}) = \frac{1-\tilde{\rho}\mathbb{L}}{(1-\rho\mathbb{L})(1-\lambda\mathbb{L})}\varepsilon_{t+1} - \frac{\tilde{\rho}-\lambda}{1-\lambda\mathbb{L}}\sigma_\nu \nu_{it}.$$

The response of consensus level forecast error to news is

$$\frac{\partial FE_{t,t+1}}{news_{t-j}} = (\rho^{j+1} + \rho^j\lambda + \ldots + \lambda^{j+1}) - \tilde{\rho}(\rho^j + \rho^{j-1}\lambda + \ldots + \lambda^j) = \frac{\lambda^{j+1}(\tilde{\rho}-\lambda) - \rho^{j+1}(\tilde{\rho}-\rho)}{\rho-\lambda}$$

for all $j \geq 0$. The response of individual-level forecast errors to private news is

$$\frac{\partial FE_{it,t+1}}{news_{it-j}} = -\lambda^j(\tilde{\rho}-\lambda)$$

for all $j \geq 0$.

Proof of Proposition 4

To have excessively sensitive aggregate consumption, we need to show that

$$\frac{\partial \Delta c_t}{\partial \varepsilon_{t-1}} = \left(\frac{1-\beta}{1-\beta^{T-t+1}}\right)\left(\frac{1-(\tilde{\rho}\beta)^{T-t+1}}{1-\tilde{\rho}\beta}\right)\left(1-\frac{\lambda}{\tilde{\rho}}\right)(\rho+\lambda-\tilde{\rho}) \propto (\rho+\lambda-\tilde{\rho})$$

which is positive if $\lambda > \tilde{\rho} - \rho$. To have excessively smooth, we need to show

$$MPC = \left(\frac{1-\beta}{1-\beta^{T-t+1}}\right)\left(\frac{1-(\tilde{\rho}\beta)^{T-t+1}}{1-\tilde{\rho}\beta}\right)\left(1-\frac{\lambda}{\tilde{\rho}}\right)$$

or

$$(1-\frac{\lambda}{\tilde{\rho}}) > \frac{\left(\frac{1-\beta}{1-\beta^{T-t+1}}\right)\left(\frac{1-(\rho\beta)^{T-t+1}}{1-\rho\beta}\right)}{\left(\frac{1-\beta}{1-\beta^{T-t+1}}\right)\left(\frac{1-(\tilde{\rho}\beta)^{T-t+1}}{1-\tilde{\rho}\beta}\right)}$$

which is equivalent to

$$\lambda > \tilde{\rho}\frac{\sum_{j=0}^{T}(\tilde{\rho}^j - \rho^j)\beta^j}{\sum_{j=0}^{T}(\tilde{\rho}\beta)^j}.$$

Proof of Proposition 5

We can derive the following covariance term between Δc_t and Δc_{t-j} for an arbitrary j

$$cov(\Delta c_t, \Delta c_{t-j}) \propto \sum_{k=j}^{+\infty} \frac{(\tilde{\rho}-\rho)\rho^k + (\lambda-\tilde{\rho})\lambda^k}{\lambda-\rho} \frac{(\tilde{\rho}-\rho)\rho^{k-j} + (\lambda-\tilde{\rho})\lambda^{k-j}}{\lambda-\rho}$$

$$\propto (\tilde{\rho}-\rho)\frac{(\lambda-\rho)(1-\tilde{\rho}\rho)}{1-\rho^2}\rho^j + (\lambda-\tilde{\rho})\frac{(\lambda-\rho)(1-\tilde{\rho}\lambda)}{1-\lambda^2}\lambda^j.$$

This means that

$$(\lambda-\rho)cov(\Delta c_t, \Delta c_{t-j}) \propto (\tilde{\rho}-\rho)\frac{(1-\tilde{\rho}\rho)}{1-\rho^2}\rho^j + (\lambda-\tilde{\rho})\frac{(1-\tilde{\rho}\lambda)}{1-\lambda^2}\lambda^j.$$

Suppose $\tilde{\rho} > \rho$ and $\lambda > 0$ (or $\tau_v < +\infty$) and we can consider two different cases. Suppose $\lambda \geq \rho$, then $(\rho/\lambda)^j$ goes to zero when j goes to infinite. So the RHS must be negative for some j which implies $cov(\Delta c_t, \Delta c_{t-j}) < 0$ for some j. The same argument can be made when $\lambda < \rho$. This completes our proof.

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The Impact of Value Chain Financing on Profitability for South Africa's Edible Oil Manufacturing Companies: Raw Materials and Working Capital Approaches

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Abstract: Edible oil manufacturing companies in South Africa generate significant amounts of revenue, which they do not capitalize on. South Africa has no shortage of consumer demand for commodities. The edible oil sector is hampered by poor raw material output in the nation, insufficient financing by value-chain participants, and a shortage of specific effort and understanding in growing the value chain. The research aim was to evaluate the impact of value chain financing on profitability for South Africa's edible oil manufacturing companies via raw materials and working capital approaches. Utilizing secondary data collected from the financial statements of edible oil manufacturing companies from 2012 to 2022. Throughout the research, a positivism paradigm was applied using a descriptive retrospective panel data approach. Multiple regression analysis was used to determine the connection between the value chain financing variables (raw materials as well as working capital) and the profitability of edible oil manufacturing companies in South Africa. On financing in raw material there was a negative correlation among the two variables, but it is not statistically significant ($r = -0.030$, $p = .424$). On financing in working capital, there was a positive correlation ($r = .201$, $p = .012$), the connection between financing in creditors management and profitability in the edible oil company has a positive correlation ($r = .162$, $p = 0.09$) but is not statistically significant. The research found that raw material financing and working capital financing had no statistically significant connection to the profitability of edible oil manufacturing companies in South Africa.

Keywords: *Value chain financing, profitability, raw material and working capital.*

1. Introduction

Several studies have shown that the profitability of any business raises its market value and contributes to the expansion of the entire industry, which ultimately produces success in the economy (Abuzayed, 2012). There are 27 edible oil companies, which make up 95% of the industry's manufacturing base, and provide most domestic oil refining in South Africa (Ahn et al., 2022). In addition, approximately 53% of the capacity for producing edible oil is being used. The quantity and quality of oil seeds are thus a constraint on the sector's efficiency (Abah, 2020). The edible oil sub-capacity sector's utilization rate is significantly lower than that of the other industries in the food manufacturing sector and has fallen below the national average in recent years(Gan and Li, 2014). However, value chain financing is a highly effective strategy for focusing on methods to raise the intensity and impact of finance (Fernández-López et al., 2020). It covers agricultural producers' finances and local and international shareholders' finances. A value chain involves a series of processes, from conception to production and ultimately to consummation. This contains all stages of production which include dispatch to end users and disposal after use. The primary goal of a value chain is to guarantee that its value supplied is distributed equitably across value chain participants (Gan and Li, 2014).

Furthermore, the value chain analysis describes how the organization operates. This also relates actions to the company's competitive position, analysis and outline of the firm's value chain activities. This includes an assessment of the firm's productivity competitiveness. Hence, profitability is determined by capacity utilization and raw material supply, both of which are critical to effective capacity utilization in the farming sector. Building a value chain but also ameliorating funding amongst the purchaser's value chain is one of the most important steps in acquiring raw materials (Gan and Li, 2014). The management of working capital (WC) and the value chain helps edible oil manufacturing companies improve their profitability. Moreover, it measures an organization's operating liquidity, and its requirement rises or falls in proportion to the company's output volume (Ndumbe et al., 2019). Larsson (2018) asserts that factors including a firm's size, growth rate, goods sold, firm specialization, company guidelines, and value chain plans and procedures all have an impact on the amount of cash a company requires. Increase profitability depending on firm size and production needs to ensure consistent raw material supply and timely distribution of finished products to

clients. Muflikh et al. (2021) mentioned the most significant factors that led to greater reliability by sunflower purchasers.

Customers mostly in the value chain help in increased quality improvements in the industry, relating to core capabilities, capital warehousing, and technology. Firm infrastructure, human capital management, technical progress, services, and commodities purchasing are support activities that create competitive advantages in business. According to Singh and Chatterjee (2022) the management of trade rivalry and company guidelines implemented throughout the value chain influenced the firm's profitability in the seafood processing sector. The study will prove quite useful in demonstrating the importance of strategic review and its impact on profitability. Firm characteristics, size, and capital structure all have an impact on the firm's profitability, which may explain the huge variances. Every corporation has certain qualities that distinguish one entity from another. A company's capital structure is determined by its size. Continuously increasing the company's financial requirements reflects the company's ambition to boost earnings (Ndumbe et al., 2019). The level of leverage and liquidity of a company indicates its financial strategy. Debt management is particularly critical since the company must determine how and when to repay loans, based on cash flow and interest rates (Purwanti, 2019).

2. Literature Review

This section addresses the literature review on value chain financing and firm characteristics in the edible oil industry in South Africa. Profitability in the edible oil production industry remained unchanged from 2012 to 2022. The South African economy is expected to weaken in 2012, with a real GDP growth of 2.7%, down from an estimated 3.1% in 2011 (Mazenda et al., 2022). The most important price-making variables in 2011 were the edible oil production cycle, the greatest yearly increase in Crude Edible oil (CEO) production, and a shortfall in South American soybean oil supplies due to persistent drought conditions (Ndumbe et al., 2019). Hence, the lack of supply of sunflowers on the world market because of the ongoing conflict in Russia and Ukraine (in 2022) is one of the factors influencing prices. Further analysis revealed that finance is insufficient in the edible oil industry's value chain, resulting in stagnating profitability (Mazenda et al., 2022). To participate in an increasingly competitive globalized economy, firms must utilize their resources effectively and productively (Prokop et al., 2019, Acar et al., 2022). Edible oil manufacturing companies must effectively increase profitability and understand how much finance is required for good value chain management (Schmidthuber et al., 2022). In the previous five years from 2017 to 2022, edible oil manufacturing companies in South Africa have flourished, with production and demand rising year after year (Mazenda et al., 2022).

The COVID-19 pandemic had little effect on the industry in the 2020/2021 marketing year, with soybean oil output predicted to climb by over 40% to a historical high of 1.7 million tonnes due to record planted areas and ideal meteorological conditions (Hidayati et al., 2021). In 2021/2022, South Africa was crushing a record 2.2 million tonnes of oilseeds, creating 1.5 million tonnes of oilseed (Muller, 2022, Juan et al., 2022). The edible oil industry in South Africa is of great importance as the market demand exceeds R54 billion. It is growing regularly and the country's need for edible oil is recognized by all (Dossou et al., 2022). The annual production is 464,000 tonnes, with a foreign exchange loss of R54 billion. Currently, approximately 53% of the built capacity in this industry is being used, relative to South African nourishment and an affiliated market average of 80% (Mazenda et al., 2022). In South Africa, resource underutilization is related to insufficient financing in the value chain by firms in this sector. According to Schmidthuber et al. (2022), the edible oil value chain is divided into activities such as raw materials, working capital, primary activities and support activities. Muller (2022) claimed that the profitability of the edible oil manufacturing industry has contributed to South Africa losing significant revenue, job opportunities, foreign exchange outflows, and GDP.

Profitability in edible oil manufacturing companies in South Africa is suffering because of capacity underutilization. Other researchers, such as Botes et al. (2018) believe that the unawareness of financing inside a suitable value chain influences profitability. The study reveals that resource underutilization is related to insufficient financing in the value chain by firms, which stagnates profitability. In addition, other researchers will gain knowledge from the results of this study by using it as a source of information to conduct similar analyses and by completing a few of the gaps that have recently been identified in previous relevant research. A competitive advantage is required to please clients by satisfying their requests (Mazenda et al., 2022).

According to the Competitive advantage theory, companies ought to pursue regulations that result in excellent goods offered at substantial costs (Mazenda et al., 2022). Considering Value Chain Finance, suggested by Muller (2022), may increase the general efficiency of corporations supplying as well as demanding farming funding within the value chain. The most common supplier of raw materials is purchasing it using a manufacturer's agreement and investors, or raw material importation.

Coordinating is accomplished by reviewing the contract's precise terms, which outline the criteria that apply to the farming and company, as well as the selling range (Mazenda et al., 2022). Botes et al. (2018) experimentally discovered that there had been an enormous boost in income produced by producers, as well as an improvement in efficiency in decreasing expenses by adopting new Value Chain techniques on the profitability of small-scale businesses agricultural businesses. The report did not completely clarify the way the overall profitability was affected. Based on Kans (), inventory management Value Chain financings influenced profitability, however, the results did not give an in-depth examination of inventory management's impact on profitability. Muller (2022) discovered that inventory volatility is impacted by the preparation, procurement, manufacturing, and delivery of products and has an impact on profitability. Further research conducted by Muflikh et al. (2021) discovered that physical inventory activity, the creation of goods processes, inventory management, delay in delivery, innovation, and technological advances all had a major impact on the success of South African food production enterprises. The empirical research investigates how profitability factors including leverage and size affect business profitability and growth. In organizational research, one of the most significant features is the company's size. Singh and Chatterjee (2022) have demonstrated experimentally that firm size is positively connected to the profitability of life insurance firms in the United States. The research aim was to evaluate value chain financing on profitability for South Africa's Edible oil manufacturing companies via raw materials and working capital approaches.

3. Research Method

Throughout the research process, the positivist paradigm was applied using a descriptive retrospective panel data technique. Multiple regression analysis was used to determine the link between the financing factors (raw materials as well as working capital) and the profitability of South African edible oil manufacturing firms. The research addressed all 27 edible oil manufacturing enterprises in South Africa, which generate 95% of the edible oil generated in the country. The total number of panel data records was 22 x 11 = 242. The research's unit of analysis was all edible oil manufacturing enterprises in South Africa. The composite indexes were produced employing principal component analysis, and data was analyzed utilizing descriptive statistical analysis, correlation analysis, quantitative analysis, and multiple regressions on panel data. Several pre-estimation tests were carried out to achieve the greatest quality findings. The unit root test was performed on the model's variables to confirm that there is no stationarity impact. The null hypothesis for the Levin-Lin-Chu (LLC) tests stipulates that all of the panels include a unit root. The null hypothesis is rejected, and the test reveals that panels are stationary and do not include the unit root. Variance Inflation Factors (VIF) were calculated for all independent variables and moderating variables within the panel data to evaluate multicollinearity. Independent or moderating factors with VIF values greater than 10 were eliminated. The mean VIF for all variables incorporated into the model is 3.34 (which is suggested to reduce it to lower than 10) and all individuals' VIF for all variables chosen is likewise less than 10. Using the research's panel data, the Hausman test was used to identify the best model among fixed effects along with random effects. The Husman test-based Fixed Effect model was used to run multiple regressions in this research.

4. Results and Discussion

Correlation Analysis

Table 1: Correlation of Financing in Raw Material and Profitability

Variables	Profitability	Purchase of Material	Raw Material
Profitability	1		
Purchase of material	.30 (481)	1	
Raw Material	-.030 (424)	-.025 (765)	1

Note: * Represents a significant relationship at a 5% level.

Pearson coefficient for product-moment correlation was utilized as well in the research to analyze the link among independent variables as well as the composite index of the dependent variable. Each test was carried out at the 5% level of significance. The connection between financing in raw materials along profitability in the edible oil industry has a negative correlation between the two variables, but it is not statistically significant (r = -0.030, p =.424). However, the connection between financing in the purchase of material via agreements with suppliers and profitability in the edible oil industry has a positive correlation between the two variables (r =.30, p =.481). In summary, there was a somewhat negative connection between raw material financing and the South African edible oil industry's profitability. An increase in financing for the purchase of material (r =.30, p =.481) is associated with a reduction in profitability. The financing of the raw material variable was also not significant at the 5% level of significance, as indicated in Table 1. The purchasing of materials, however, is more substantial than the purchase of raw materials via suppliers' agreement at the 5% level of significance. Bijman et al. (2020) examined different research whereby raw material financing using agreements with suppliers was investigated. They evaluated and proved that effectiveness in agreements is achieved by guaranteeing a link between the agricultural activities and the company, therefore it increases the profitability. Inventory management and creditor management, including prepayments, were used to assess the research's second objective, namely the financing of working capital. The findings of Pearson's product-movement correlation coefficient (r) and significant value (P) for working capital financing and profitability are presented in Table 2.

Table 2: Correlation of Financing in Working Capital and Profitability

Variables	Profitability	Inventory Management	Creditors Management	Prepayments
Profitability	1			
Inventory management	.201 (.012)	1		
Creditors management	.162 (0.09)	-.026 (.761)	1	
Prepayments	-018 (386)	.308 (.000) *	-.017 (.840)	1

Note: * Represents a significant relationship at a 5% level

The connection between inventory management along profitability in edible oil manufacturing has a positive correlation (r =.201, p =.012), the connection between financing in creditors management and profitability in the edible oil company has a positive correlation (r =.162, p = 0.09) but is not significant. Furthermore, the connection between financing in prepayment and profitability in the edible oil company has a negative correlation (r =-018, p = (386) which is not significant. In summary, there seemed to be a weak positive connection between working capital financing and profitability in the South African edible oil company. Increased working capital financing (r =.201, p =.012) correlates with increased profitability. Furthermore, as indicated in Table 2, financing in working capital variables was not statistically significant at the 5% level of significance. In addition, inventory management is of greater significance than prepayments and creditor

management at the 5% level of significance. A weak positive correlation indicates that there is no significant link between financing working capital and profitability, but the direction is positive, implying that more financing aids in boosting profitability. This conclusion is comparable to that reported in the research on inventory management by Rai et al. (2023) demonstrating adequate financial aid in material flow optimization and profitability. Further research by Dary and James Jr (2020) carried out experiments and confirmed that enterprises concurrently provide credit, indicating that the gap between prepayments and creditors needs to be appropriately evaluated and funded to maximize profitability.-Moderating variable firm characteristics was assessed using firm size and firm capital structure. Table 3 presents the findings for the moderating variable influencing profitability using Pearson's product-movement correlation coefficient (r) and significant value (P).

Table 3: Correlation of Firm Characteristics and Profitability

Variables	Profitability	Firm Size	Firm Capital Structure
Profitability	1		
Firm size	.146 (.034)*	1	
Firm capital structure	-.082 (.146)	.105 (.214)	1

Note: *Represents a significant relationship at a 5% level.

The connection between firm capital structure with profitability in the edible oil company has a negative correlation between the two variables (r = -.082, p =.146), but it is not significant. Conversely, the connection between firm size with profitability in edible oil manufacturing has a positive correlation among the two variables (r =.146, p =.034). In summary, it found a positive link between profitability and moderating variable firm characteristics in the South African edible oil company. Profitability growth is positively connected to an increase in firm characteristics. In addition, as indicated in Table 3, merely firm size (r=.146 p =.034), one of the moderating variables, proved to be significant at the 5% level of significance, whereas the remaining variable, firm capital structure, was not significant. The influence of firm size on profits was experimentally evaluated by Pattiruhu and Paais (2020) who discovered a positive association between firm size with profitability. An identical connection was observed in the present research, while both studies showed the connection to be highly significant. Other empirical research conducted by Dirman (2020) found a strong correlation between capital structure and profitability in the South African insurance sector. Comparably, our research revealed a positive, substantial correlation between profitability and capital structure.

Panel Data Regression: The explanatory multivariate approach of Panel data regression analysis was utilized in this portion of the research to analyze correlations among variables and demonstrate the validity of the Panel data regression models. The research then compared the independent variables and moderate variables (raw material via purchase material, raw materials, working capital via inventory management, creditors management and moderate variables via firm size with firm capital structure) to the dependent variables' profitability (ROE, Tobin Q and ROI).

Table 4: Regression Results with Profitability (ROE) Model 1

Variables	Fixed Effect Model				Random Effect Model			
Profitability (ROE)	Coefficient (β)	St. Error	t-Statistic	P-value	Coefficient (β)	St. Error	t-Statistic	P-value
Purchase material	of-4.79E-08	2.94E-08	-1.631271	0.1067	4.55E-09	6.27E-09	0.726476	0.4694
Raw material	-7.83E-07	4.82E-07	-1.624010	0.1083	1.54E-07	2.20E-07	0.699864	0.4857
Inventory management	2.23E-08	1.09E-07	0.203542	0.8392	-3.03E-08	1.02E-07	-0.691132	0.7669
Creditors management	1.95E-08	1.40E-08	1.386957	0.1693	-3.84E-09	5.56E-09	-0.691132	0.4912
Prepayments	-4.13E-07	2.66E-07	-1.555190	0.1238	1.45E-07	1.34E-07	1.086418	0.2801

Inbound logistics	-5.96E-07	1.47E-07	-4.039020	0.0001 *	-2.89E-07	1.26E-07	-2.298172	0.0238 *
Outbound logistics	4.13E-07	3.18E-07	1.277023	0.2052	6.64E-08	2.33E-07	0.285134	0.7762
Firm operations	6.41E-07	5.11E-07	1.254356	0.2133	-1.77E-07	2.21E-07	-0.81715	0.4247
Management cost	-3.20E-07	3.08E-07	-1.038886	0.3019	-3.22E-07	2.79E-07	-1.155219	0.2509
Development cost	0.647846	.3700031	1.750001	0.0431 *	-1.69E-07	1.35E-07	-1.256504	0.2120
Marketing and sales	5.87E-08	5.18E-07	0.113279	0.9101	-5.49E-07	4.62E-07	-1.190016	0.2370
Firm size	-4.09E-09	6.34E-09	-0.646075	0.5201	-4.45E-07	6.08E-09	-0.731785	0.4661
Firm capital structure	-4.38E-07	2.01E-07	-2.181393	0.0321*	-4.44E-07	1.90E-07	-2.333504	0.0218*
Constant β_0	9.989031	1.491290	6.698248	0.0000	6.163931	0.879502	7.008431	0.0000

Note: * Implies significant at a 5% level of significance

Table 5: Hausman Test for Selection of Model 1

Correlated Random Effects -Hausman Test
Test cross-section random effects

Test Summary	Chi-square	Chi-sq. D.F	Prob
Cross section	88.980681	12	0.0000

H0: Random effect model is consistent H1: Fixed effect model is consistent.

From the above Table 5, it suggests that the fixed effect model is appropriate, hence; we accept the alternative hypothesis that the fixed effect model is consistent. Therefore, the parameter estimation for model 1 in this study was done using the fixed effect regression model.

Table 4 shows that the coefficients of the model differ significantly from 0 and the P-value 0.000 is less than 5%. There are also analyzed significant tests of individual coefficients for each predictor's variable in the model. The coefficient of determination shows a solid linear model that describes the phenomena that occur in the twenty-two analyzed variables in an amount of 51.2%, corresponding to the explanation variables. The rest of the 48.8%, refers to the impact of unidentified or unconsidered factors on the profitability of South Africa's edible oil company. Holding all other variables constant, each edible oil company is expected to have β0 = 9.98 units of profitability (with respect to return on equity) with a probability value < 0.05. The results further indicate that the firm capital structure (P-value = 0.0321) is very significant and affects profitability at a 5% level of significance. Other predictor variables are not significant at a 5% level of significance. The research conducted by Singh and Chatterjee (2022) analyzed shareholder value as a profitability measurement, and this research additionally evaluated the value chain on ROE as a financial indicator to see which metric of profitability is ideal for this research. The research discovered an r-sqr of 51.2%, which explains 51.2% of the variance.

Table 6: Regression Results with Profitability (Tobin Q) Model 2

Variables	**Fixed Effect Model**				**Random Effect Model**			
Profitability (Tobin Q)	**Coefficient (β)**	**St. Error**	**t-Statistic**	**P-value**	**Coefficient (β)**	**St. Error**	**t-Statistic**	**P-value**
Purchase of material	-6.13E-10	3.2E-09	-0.187191	0.8520	-8.81E-11	6.01E-10	-0.146667	0.8837
Raw material	-2.73E-08	5.38E-08	-0.508058	0.6128	-2.59E-08	1.98E-08	-1.309858	0.0193 *
Inventory management	4.59E-09	1.22E-09	0.227080	0.8209	-2.27E-09	1.03E-08	-0.220108	0.8261
Creditors management	3.56E-10	1.57E-09	0.227080	0.8209	1.56E-10	5.97E-10	0.261048	0.7946
Prepayments	-4.75E-09	2.96E-08	-0.160337	0.8730	-3.96E-09	1.26E-08	-0.315462	0.7531

Inbound logistics	9.03E-09	1.64E-08	-0.550162	0.5837	-1.19E-08	1.22E-08	-0.974689	0.3322
Outbound logistics	2.50E-08	3.55E-08	0.704383	0.4832	2.02E-08	2.41E-08	0.836587	0.4049
Firm operations	1.48E-08	5.70E-08	0.258927	0.7963	6.54E-09	2.38E-08	0.275259	0.7837
Management cost	7.94E-09	3.43E-08	0.231422	0.8176	8.78E-09	3.05E-08	0.287853	0.7741
Development cost	-3.83E-09	1.66E-08	-0.231422	0.8177	3.22E-09	1.31E-08	0.246406	0.8055
Marketing and sales	-4.53-08	5.78E-08	-0.785003	0.4347	-4.08E-08	4.41E-08	-0.924881	0.3574
Firm size	5.22E-11	7.06E-10	0.073945	0.9412	-3.35E-10	6.30E-08	-0.573107	0.5679
Firm capital structure	-2.87E-08	2.24E-08	-1.284506	0.0261 *	-3.35E-08	2.06E-08	-1.630903	0.0163 *
Constant β_0	0.541786	0.166254	3.258786	0.0016*	0.553059	0.060825	9.092554	0.0000*

Note: * Implies significant at a 5% level of significance.

Table 7: Hausman Test for Selection of Model 2

Correlated Random Effects -Hausman Test Test Cross-Section Random Effects			
Test Summary	Chi-square	Chi-sq. d.f	Prob
Cross section	8.312819	12	0.7602

H0: Random effect model is consistent H1: Fixed effect model is consistent.

From the above Table 7, it suggests that the random effect model is appropriate, hence we accept the null hypothesis that the random effect model is consistent. Therefore, our parameter estimation for model 2 in this study was done using the random effect regression model.

Table 6 indicates that the coefficients of the model are significantly different from 0 and the P-value 0.000 is less than 5%. There are also analyzed significant tests of individual coefficients for each predictor's variable in the model. The coefficient of determination demonstrates a bad linear model that describes the phenomena that occur in the twenty-two analyzed variables in an amount of 43.8%, corresponding to the explanation variables. The rest of the 56.2% refers to the impact of unidentified or unconsidered factors on the profitability of South Africa's edible oil Company. Holding all other variables constant, each edible oil company is expected to have β0 = 0.553 units of profitability (with respect to Tobin Q) with a probability value < 0.05. The results also indicate that the firm capital structure (P-value = 0.0163) and raw material (P-value = 0.0193) are very significant and affect profitability at a 5% level of significance. Other predictor variables are not significant at a 5% level of significance. Tobin Q solely as an indicator of profitability reduced the justification of the model to 43.8% and the greatest compared the ROE and ROI as an evaluation of profitability and Tobin Q has just been looked at as intellectual property assessments in the estimation and profitability research on Tawan semi-Transformer company by Albab and Azis (2021) with utilizing Tobin Q by itself will not be a good representation to the profitability of the company.

Table 8: Regression Results with Profitability (ROI) Model 3

Variables	**Random Effect Model**				**Random Effect Model**			
Profitability (ROI)	**Coefficient (β)**	**St. Error**	**t-Statistic**	**P-value**	**Coefficient (β)**	**St. Error**	**t-Statistic**	**P-value**
Purchase of material	-321E-03	0.45E-04	-0.102101	0.5020	1.24E-03	0.45E-03	1.364012	0.0002
Raw material	-2.30E-05	1.33E-03	-0.020202	0.4010	5.15E-04	1.33E-04	2.235213	0.0003

Inventory management	-9.17E-09	1.28E-07	-0.071539	0.9432	-2.12E-07	1.06E-07	-1.991962	0.0492 *
Creditors management	8.18E-09	4.32E-09	1.894504	0.0370 *	1.15E-08	3.43E-09	3.357141	0.0011 *
Prepayments	-1.49E-07	3.08E-07	-0.484037	0.6298	3.27E-07	1.08E-07	3.022163	0.0032 *
Inbound logistics	-7.31E-08	1.70E-07	-0.429011	0.6691	-1.42E-07	1.09E-7	-1.299746	0.1967
Outbound logistics	-5.25E-08	2.20E-07	-0.239293	0.8115	-1.67E-07	1.98E- 07	-0.842025	0.4018
Firm operations	-9.87E-08	1.76E-07	-0.560699	0.5767	1.09E-07	1.35E-07	0.804311	0.4242
Management cost	-1.72E-08	3.22E-07	-0.533666	0.5952	-5.72E-07	2.92E-07	-1.957701	0.0531
Development cost	-6.22E-08	1.78E-07	-0.349986	0.7273	-1.67E-07	1.28E-07	-1.299876	0.1967
Marketing and sales	1.07E-06	6.15E-07	1.745421	0.0250 *	-8.98E-08	3.91E-07	-0.229520	0.8189
Firm size	3.26E-09	7.52E-09	0.433565	0.6658	-9.72E-09	6.51E-09	-1.492098	0.1389
Firm capital structure	-2.48E-07	2.31E-07	-1.073939	0.0486 *	-1.68E-07	2.09E-07	-0.802266	0.4243
Constant β_0	6.394484	1.419638	4.504308	0.0000 *	5.708411	0.631841	9.034575	0.0000 *

Note: * Implies significant at a 5% level of significance.

Table 9: Hausman Test for Selection of Model 3

Correlated Random Effects -Hausman Test Test Cross-Section Random Effects			
Test Summary	Chi-square	Chi-sq. d.f	Prob
Cross section	69.359210	12	0.0000

H0: Random effect model is consistent H1: Fixed effect model is consistent.

From the above Table 9, it suggests that the fixed effect model is appropriate, hence, we accept the alternative hypothesis that the fixed effect model is consistent. Therefore, our parameter estimation for model 3 in this study was done using the fixed effect regression model.

Table 8 shows that the coefficients of the model differ significantly from 0 and the P-value 0.000 is less than 5%. There are also analyzed the significance tests of individual coefficients for each predictor's variable in the model. The coefficient of determination shows a slightly good linear model that describes the phenomena that occur in the twenty-two analyzed variables in an amount of 49.3%, corresponding to the explanation variables. The remaining 50.7% refers to the impact of unidentified or unconsidered factors on the profitability of South Africa's edible oil company. Holding all other variables constant, each edible oil company is expected to have β0 = 6.394 units of profitability (with respect to return on investment) with a probability value < 0.05. The results also show that firm capital structure (P-value = 0.0486) is very significant and affects profitability at a 5% level of significance. Other predictor variables are not significant at a 5% level of significance. In exclusive research by Mabandla and Makoni (2019) experimentally developed the connection between the value chain methods and their financial issues, affecting how they were moving forward.

Influencing the company and determining profitability alongside return on investment and discovering significant connections among profitability and value chain approaches. Another research, based on Aldubhani et al. (2022) found that financial Value Chain management affects profitability calculated by return on invested capital (ROIC). Based on this research, supply chain financing is a financial remedy that offers mutually beneficial effects for all the power sources who participated in the supply-side Value Chain and might improve

commercial economic strength in the sales and keep competitiveness. Research conducted by Ukaegbu (2014) revealed that Value Chain planning assists the organization to get a genuine return on investment. The research additionally showed that supply chain finance is a financial approach that produces mutually beneficial solutions and results for all the respondents in the supply-side Value Chain. Each of these research studies enhances the profitability of the company. The research's correlated independent variable using return on investment r-sqr value description variation is 49.3%. This result would contrast with the result of the return on investment and Tobin Q to determine our model that describes the largest variance in the profitability of edible oil manufacturing companies in South Africa.

5. Conclusion and Recommendations

The research aim was to evaluate value chain financing on profitability for South Africa's Edible oil manufacturing companies via raw materials and working capital approaches. Based on the research's findings, conclusions were produced after assessing the data and analyzing every research objective. On financing in raw materials, there was a negative correlation among the two variables, but it is not statistically significant ($r = -0.030$, $p = .424$). However, the relationship between financing in the purchase of materials via agreements with suppliers and profitability in the edible oil industry has a positive correlation between the two variables ($r = .30$, $p = .481$). There was a somewhat negative connection between raw material financing and the South African edible oil industry's profitability. An increase in financing for the purchase of material ($r = .30$, $p = .481$) is associated with a reduction in profitability. The financing of the raw material variable was also not significant at the 5% level of significance. On financing in working capital, the research concludes that there was a positive correlation ($r = .201$, $p = .012$), the connection between financing in creditors management and profitability in the edible oil company has a positive correlation ($r = .162$, $p = 0.09$) but is not statistically significant.

Furthermore, the connection between financing in prepayment and profitability in the edible oil company has a negative correlation (r =-018, p = (386) but is not significant. In summary, there seemed to be a weak positive connection between working capital financing and profitability in the South African edible oil company. A weak positive correlation indicates that there is no significant link between financing working capital and profitability, but the direction is positive, implying that more financing aids in boosting profitability. The research recommends that South African edible oil manufacturing companies engage in an extremely competitive commercial environment, thus they must analyze adequate finance demands throughout the value chain to enhance technology, decrease costs of production, and maximize capacity utilization. The research analyzed and compared the profitability of several firms, and the findings show that every organization may learn standards from the industry and implement them to attain the industry average or higher in terms of profitability. It also turns out that extra financing in the value chain has an impact on profitability and should therefore come from a longer-term source of finance. Overall, the researcher advises that a proper balance of investment in fundamental operations and financing in working capital be decided to maximize potential utilization.

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Financial Literacy, Access to Digital Finance and Performance of Ugandan SMEs in Mbarara City

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Abstract: This study investigates the relationship between financial literacy and access to digital finance, and how these impact the performance of small and medium-sized enterprises (SMEs) in Uganda. From a population of 4,776 SMEs in Mbarara City, the research uses a sample of 351 SMEs with a response rate of 99%, chosen based on the Krejcie and Morgan (1970) tables. To investigate the correlations between the variables, a cross-sectional design is used. The findings indicate a positive and significant relationship between financial literacy, access to digital finance and SME performance in Uganda. The regression analysis indicates that 45.7% of the variation in Ugandan SME performance can be explained by the combination of the effect of financial literacy and access to digital finance (adjusted R square = 0.457). This implies that the remaining 54.3% of the variation in SME performance was not taken into account in this study and is due to other factors. Given the significant amount of variation explained by these two variables, the study suggests that policymakers and stakeholders in Uganda's SME sector prioritize programs aimed at enhancing SMEs' financial literacy and access to digital finance. Additionally, the study recognizes the presence of other factors influencing SME performance, emphasizing the need for further research and attention in future planning.

Keywords: *Financial literacy, access to digital finance and performance of Ugandan SMEs, Mbarara City.*

1. Introduction

Uganda distinguishes itself with the second-highest Total Entrepreneurial Activity (TEA) index and start-up activity among Global Entrepreneurship Monitor (GEM) countries. However, it grapples with challenges, registering the weakest performance among Small and Medium Enterprises (SMEs) compared to other GEM nations (Abaho et al., 2017). Moreover, less than half of small businesses remain operational for more than five years (OECD, 2019). Despite making up 80% of the economy, the SME sector only contributes 20% of the GDP of the nation as a result of its poor performance (Turyahebwa et al., 2013). Various empirical research works have examined the elements that impact SME performance and growth barriers. Nkundabanyanga, 2016; Odoom et al., 2017; Pucci et al., 2017) lists these components as innovative capability, strategic goals, inventory management, managerial competencies, dynamic capabilities, marketing orientation, entrepreneurial orientation, networking capability, experiential learning, internal capabilities, board governance, intellectual capital, and branding capability. Nevertheless, a lot of these studies haven't examined how financial literacy affects SMEs' success. Financial literacy in the modern financial environment goes beyond standard duties like creating financial statements and company evaluations for fundraising (Gomber et al., 2017). Despite this, the relationship between company performance, digital finance accessibility, and financial literacy has received little attention.

This study offers access to digital banking as a mediating factor, in line with the broader trend of financial and economic digitization. Numerous scholarly works underscore the significance of digitalization in enhancing business financial outcomes and economic performance (Ozili, 2018; Agyapong, 2021; Gomber et al., 2017). The study's theoretical foundation is the Resource-Based Theory, which provides a framework for identifying the strategic resources that businesses may use to boost productivity and acquire a sustained competitive advantage. These resources include features that are relational, organizational, financial, legal, and human. The resource-based perspective states that enhanced performance and long-term competitive advantages are outcomes of enhancing capabilities and resources. According to the notion, a company cannot operate effectively without access to certain resources, many of which—like human and legal resources—require sufficient finance (Enio, 2018). The availability of financial resources is therefore one of the biggest problems small firms have, and if such resources are insufficient, it could impair their performance and capacity to expand. This study modifies the theoretical framework and critically explores the potential mediating role that access to digital finance may have in investigating the relationship between financial literacy and the performance of SMEs.

2. Literature Review

Theoretical Underpinning of the Study

The Resource-Based Theory: The resource-based theory, a managerial paradigm that explains how businesses can achieve long-term competitive advantages by utilizing their strategic resources, was first proposed by Wernerfelt (1984). (Prahalad & Hamel, 1990b; Barney, 1991). Both tangible and intangible assets are included in this category, such as real estate, human resources, organizational culture, brand name, patents, and trademarks. They include material, technological, human (skills and knowledge), financial, and marketing assets. These resources affect business strategy when paired with the organizational traits and practices of the company (Daft, 1983; Barney, 1991; Andrews et al., 1965; Mata et al., 1995). The Resource-Based Theory asserts that these resources have a significant influence on a firm's profitability, growth, and overall performance. These resources should ideally be highly sought after, hard to come by, and difficult to replicate (Barney, 2001; Dierickx & Cool, 1989). According to the resource-based approach, firms differ from one another in the resources they own, and these resources are not entirely transferable from one firm to another. Consequently, some firms may possess unique resources that confer a competitive advantage, enabling them to outperform their competitors.

The resource-based theory facilitates the assessment of a firm's strengths and weaknesses by providing a fundamental framework for recognizing and developing a firm's basic talents and capabilities. According to the thesis, businesses should safeguard their strategic assets from eroding or copying them by rivals and use them to generate value for their stakeholders and clients. One of the main trends in economic development now being seen is digital finance. Digital platforms have been continuously improving, providing small and medium-sized businesses (SMEs) and their clients with practical options. As a result, both consumers and businesses are calling for digitization at an accelerated rate. Any business can increase product sales by drawing in a larger user base by incorporating digital money into trading. SMEs can leverage digital platforms like mobile apps to make their products and pricing more accessible to a broader customer base. These platforms can also facilitate payment processing and product delivery. Digital platforms are also easily reproducible, allowing continuous upgrades and improvements. Therefore, digital finance can be viewed as a technological resource that can enhance SME performance, aligning with the principles of the Resource-Based Theory. The Resource-Based Theory further highlights how important resources are to performance.

Financially literate human resources are able to make strategic decisions about the acquisition, use, management, and disposal of financial assets (Agyapong & Attram, 2019). This strategic financial decision-making can contribute to enhanced business performance. Financial choices represent some of the most critical decisions made by managers and carry significant implications for a firm's profitability, growth, and long-term sustainability. The notion emphasizes how crucial it is from a strategic standpoint to have, use, and dedicate resources to create value. In essence, internal resources such as human capital can draw in more company prospects when they are fully utilized (Minola & Cassia, 2012). Giving managers financial management training can improve their financial literacy and enable them to access digital financial instruments and recognize the risks involved in using them. The Resource-Based Theory states that when a company has access to all the resources it needs, it operates at its best. Organizations with financial resources are able to purchase additional resources that are necessary for their operations (Stacey, 2011). Put another way, when SME management has the financial resources, it becomes more viable for them to become experts in technical improvements and other business-related areas. Adopting affordable digital platforms such as Mobile Money can raise revenue and profits, which can then be reinvested to acquire other necessary resources and ultimately improve the company's overall performance (Agyapong & Attram, 2019).

Financial Literacy and Access to Digital Finance of SMEs in Uganda: Buchdadi (2020) asserts that having financial literacy improves one's ability to obtain funding. Nevertheless, digital financing was not factored into the cited paper's computation of funding accessibility. Although it avoided discussing digitization, the author's paper defined financial literacy as the capacity to create and display financial statements. Additionally, Konigsheim, Lukas, and Noth (2017) emphasize that financial literacy is associated with the advantageous and efficient use of digital financial services. Technical literacy was defined by Kulathunga et al. (2020) as a body of knowledge that can be distinguished from financial literacy. The study suggested that management needed

knowledge about digital finance and was carried out with Kenyan businesses. According to the study's findings, Ugandan SME owner-managers ought to incorporate digital financial access into their operations. In Uganda, not much study has been done on the connection between digital finance access and financial literacy. Thus, the purpose of this study is to investigate how financial literacy affects SMEs' capacity to obtain digital funding in Uganda. This will consequently lead to the generation of the study's initial hypothesis:
Hypothesis 1: Financial literacy and SMEs' access to digital finance in Uganda are positively correlated.

Access to Digital Finance and Performance of SMEs in Uganda: Kulathunga et al. (2020) claim that SMEs perform better when they are technologically literate. The ability of a manager to leverage digital financial services and benefit from financial growth revolutions is known as technology knowledge. According to the report, managers require access to digital finance to advance their knowledge and boost the productivity of the business. It was observed that there is either a dearth of researcher data or a lack of empirical investigation into the digital channels utilized in Uganda to obtain digital financing. Agyapong (2021) also discovered that the usage of mobile money platforms as a payment method is widespread. This is also demonstrated by the fact that 24% of Africans have access to mobile internet and 45% of them currently own a mobile phone. This suggests that Fintechs and mobile money wallets in particular have emerged as important weapons in the fight for financial inclusion across the continent.

By using digitization in their service delivery, firms are reaching a bigger segment of their client base, claims Agyapong (2021). According to studies like Hernando & Nieto (2007) and Siddik et al. (2016), the payback period for technological expenditures is longer than two years. This brings up a crucial query that hasn't received enough attention in the literature: What is the optimal digitization amount in terms of monetary and non-monetary return on investment? What additional elements affect this perfect digitization? Finding out if technology innovation and client receptiveness are advancing at the same time could be fascinating. Most research shows that digital financial services improve a business's productivity and profitability (Abbasi & Weigand, 2017; Ozili, 2018); nevertheless, earlier studies in this area reveal that no research has been able to refute this finding. This leads to the following research hypothesis:
Hypothesis 2: There is a positive relationship between access to digital finance and the performance of SMEs in Uganda.

Financial Literacy, Access to Digital Finance and Performance of SMEs in Uganda: Eniola and Entebang (2018) assert that if an owner-manager is financially literate and understands how financial decisions affect the success of their firm at every level of growth, they can confidently deal with suppliers and receive the best goods and services. Marriott et al. (1996) characterized financial literacy as the ability of a manager to comprehend and evaluate financial information in an ethically sound way. Lusardi and Tufano (2008) emphasized the impact of financial literacy on managers' aptitude and judgment. All of these experts have unequivocally shown that financial literacy and business performance are positively associated. Atakora (2013) emphasizes that dealers with higher education levels are more financially literate than dealers with lower education levels. He finds that the market women with greater degrees of education and work experience were more financially knowledgeable than the other women using the market as a focus group. Additional studies on the relationship between financial literacy, funding availability, and business success were carried out by Tuffour et al., 2020; Agyapong & Attram, 2019; Salia & Karim, 2019; Gathungu & Sabana, 2018; and Hussain, Mabula, & Ping, 2018.

Nonetheless, funding accessibility and financial literacy were the study's main foci. They did, however, ignore the impact of digital finance. SMEs used access to funding as a bridge between financial literacy and performance, whereas digital access was often ignored. Gomber, Koch, and Siering (2017) emphasized that financial literacy goes beyond the creation and presentation of financial numbers due to the state of the financial industry today. A modern economic trend is the increasing digital connectivity of product deliverables. The widespread product advertising on platforms like Twitter, Instagram, TikTok, and others serves as evidence of this. Despite this, it is alarming that financial performance, financing accessibility, and financial literacy have not received the necessary attention. Numerous studies have examined the importance of digital systems for economies and how they improve businesses' financial performance (Ozili, 2018; Gomber et al., 2017; Agyapong, 2020). Haucap, Karacuka, and Myovella (2020). Several of these experts developed an innovation-based theory of economic development to explain how technology, particularly the digital economy,

influences economic growth and development.

The majority of their research backs up the idea that digitalization promotes economic growth. Kulathunga et al. (2020) evaluated SMEs using the evolutionary theory of economic transformation and the knowledge base theory, and they concluded that techno-finance literacy has a substantial impact on SMEs' performance. He underlines that for SMEs to operate more effectively, they must consider potential technological advancements in their immediate surroundings. Businesses need to understand that by providing access to their services, they will be able to increase their clientele and income flow. Numerous academics have examined the ways in which financial literacy and the availability of capital impact the operations of small and medium-sized enterprises (SMEs). Among these scholars are Hussain, Mabula, & Ping (2018); Gathungu & Sabana (2018); Salia & Karim (2019); Agyapong & Attram (2019); and Tuffour, Amoako, & Amartey (2020). They are all in agreement that SMEs' success is positively and significantly impacted by financial literacy. These studies also showed that obtaining capital requires a certain level of financial knowledge and that a company's financial availability has a significant impact on its success.

3. Methodology

The study employed a correlation design and a cross-sectional research methodology using a quantitative approach. We decided on a cross-sectional study design because we wanted to comprehend the factors under investigation at a specific point in time. The correlational research design, on the other hand, was selected because it is thought to be suitable for focusing on events during a specific period of time and quantitatively evaluating relationships among study variables. This will make it easier to evaluate the proposed connections between SMEs' success, financial literacy, and access to digital finance. The quantitative survey will be pre-planned and structured, and item questions will be redesigned based on previous studies.

Study Population and Sample Size: The target population was 4,776 registered SMEs in Mbarara City (MoFPED, 2022). These SMEs were picked from 3 different business categories. These categories are: Trade (4483 SMEs), Manufacturing (248 SMEs) and Education Services (45 SMEs). These categories were preferred for selection because they are commonly registered industries in Mbarara City. These were purposively sampled. The sample size was determined by the study using the tables created by Krejcie and Morgan (1970). The table 1 below illustrates this:

Table 1: Target Population and Sample Size

Industry (SMEs category)	Target Population	Percentage	Simple Size
Trade	4483	94	333
Manufacturing	248	5	17
Education Services	45	1	5
Totals	**4776**	**100**	**355**

Source: MoFPED report, 2022.

Owners and managers were the unit of inquiry, and SMEs were the unit of analysis.

4. Presentation of the Results

Demographic Characteristics of the Manager /Owner of SMEs: The table displays the distribution of the manager /owner demographics of SMEs in Uganda.

Table 2: Demographic Characteristics of the Manager /Owner of SMEs in Uganda

Category	Item	Frequency	Percent
Gender			
	Male	164	46.5
	Female	189	53.5
Age			

	20-29	134	38
	30-39	121	34.3
	40-49	60	17
	50 and above	38	10.7
Religion			
	Anglican	107	30.3
	Moslem	115	32.6
	Catholic	57	16.1
	Pentecostal	66	18.7
	Seventh-day Adventist	8	2.3
Marital Status			
	Married	64	18.1
	Single	25	7.1
	Cohabiting	153	43.3
	Divorce	98	27.8
	Widowed	13	3.7
Highest level of education			
	Certificate	156	44.2
	Diploma	75	21.2
	Degree	85	24.1
	Professional Qualifications	5	1.4
	Post Graduate	25	7.1
	Masters	4	1.1
	PhD	3	0.9
	Total	**353**	**100**

Primary Data Source 2022

The results indicate that the sample has a slightly higher proportion of females (53.5%) than males (46.5%), which may reflect the gender composition of the SME sector in Uganda or the sampling strategy used in the study. The results also show that most respondents are young, with more than 70% being between 20 and 39 years old. This may suggest that the SME sector is dominated by young entrepreneurs seeking opportunities and challenges in the market. The results also reveal that the sample is religiously diverse, with a substantial presence of both Muslims (32.6%) and Anglicans (30.3%). This may indicate that the SME sector is inclusive and tolerant of different faiths and beliefs. The results also show that the most common marital status among the respondents is cohabiting (43.3%), followed by divorce (27.8%). This may imply that the SME sector is characterized by unstable or unconventional family structures, which may affect the social and economic well-being of the SME managers and their dependents. The results also show that the most common educational level among the respondents is a certificate (42.1%), followed by a degree (24.1%) and diploma. This may indicate that the SME sector requires a moderate level of formal education but not necessarily a high academic qualification. The results also show that the sample has a low representation of postgraduate, professional, master's, and Ph.D. holders, which may suggest that the SME sector does not offer attractive incentives or opportunities for highly educated individuals.

Demographic Characteristics of SMEs: The demographics of the owners of SMEs in Uganda were distributed as indicated in Table 3.

Table 3: Demographic Characteristics of SMEs in Uganda

Category	Item	Frequency	Percent
Ownership Structure			
	Sole Trader	8	4.5
	Partnership	56	18.4
	Limited Company	289	77.1
Trading period of business			
	Less than 1 year	166	47
	1-2 years	97	27.5
	3-5 years	32	9.1
	6-10 years	43	12.2
	More than 10years	15	4.2
Form of business			
	Manufacturing	8	2.3
	Education Service	18	5.1
	Trade	327	92.6
Number of Employees			
	Less than 10	319	90.4
	10-19	26	7.3
	20-29	8	2.3
	Total	**353**	**100**

Primary data Source 2022

The results indicate that the sample is dominated by limited companies (77.1%), which account for more than three-quarters of the SMEs. This suggests that most SMEs are incorporated entities with limited liability and separate legal personalities. The results also show that partnerships (18.4%) are the second most common legal form, while sole traders (4.5%) are the least common. This may indicate that the SMEs prefer to operate as joint ventures rather than individual enterprises. The results also show that most SMEs are relatively new, with almost half operating for less than a year (47%). This may suggest that the SME sector is dynamic and entrepreneurial, with a high entry and exit rate. The results also show that the SMEs are mainly involved in trade, which accounts for 92.6% of the sample. This would suggest that the SME sector is more focused on the service than the manufacturing sector. The results also show that the SMEs are primarily small, with 90.4% having less than ten employees. This may indicate that the SME sector faces challenges in scaling up and expanding its operations.

Relationship between the Study Variables

Table 4: Correlations

Variables	1	2	3
Access to Digital Finance-1	1		
Financial Literacy-2	.519**	1	
Performance-3	.491**	.655**	1

**. Correlation is significant at the 0.01 level (2-tailed).

Establishing the Relationship Between Financial Literacy and Access to Digital Finance of SMEs: The study's findings demonstrate a positive and significant relationship between financial literacy and access to digital finance ($r = .519$, $p < 0.01$). This implies that SME owners are more likely to access and utilize digital finance platforms and services if they have greater financial knowledge. This finding is in line with earlier studies (Demirguc-Kunt et al., 2018; Klapper et al., 2016; Mandell & Klein, 2009), which show that financial literacy plays a significant role in influencing both the adoption of digital banking and financial inclusion.

Enhanced financial literacy can help SME business owners understand, and confidently use digital finance, which will allow them to handle their money more efficiently, effectively and economically. Financial literacy can help SME business owners overcome obstacles and difficulties in accessing digital finance, such as lack of trust, and security. Therefore, the results accept Hypothesis 1 by concluding that there is a positive relationship between financial literacy and access to digital finance of SMEs in Uganda.

Establishing the Relationship between Access to Digital Finance and the Performance of SMEs: The results of the study also show a positive and significant relationship ($r=0.491$, $p<0.01$) between access to digital finance and the performance of SMEs in Uganda. Higher performance is more likely to be shown by SME owners who have better access to or use digital financial platforms or services. The results are in line with earlier studies that show that SMEs can perform better when they have access to digital finance since it gives them more affordable, dependable, and convenient financial services (Beck et al., 2015; Demirguc-Kunt et al., 2018; Mago & Chitokwindo, 2014). By having access to digital finance, SMEs may boost productivity, sales, and profitability while lowering expenses, risks, and inefficiencies. They can also broaden their market reach, diversify their offerings, and improve their competitiveness and creativity. Therefore, the findings of this study accept Hypothesis 2 by concluding that there is a positive relationship between access to digital finance and the performance of SMEs in Uganda.

Regression Analysis to Confirm the Relationship between Variables: Regression analysis was used to confirm the relationship between SMEs' access to digital finance and their performance, as well as the relationship between financial literacy and SMEs' access to digital finance. The model summary in Table 5 below displays the results.

Table 5: Regression Results

Model		Unstandardised Coefficients		T	Sig.
		B	Std. Error		
1	(Constant)	0.635	0.125	5.097	0.000
	Digital Finance	0.173	0.038	4.493	0.000
	Financial Literacy	0.516	0.043	11.943	0.000
R	0.679				
R Square	0.461				
Adjusted R Square	0.457				
F	149.41				
Sig.	0				
N	353				

a. Dependent Variable: Performance of SMEs.

The regression analysis results show that the constant term is statistically significant, indicating that there is a positive baseline value of the performance of SMEs even when both financial literacy and access to digital finance are zero (Beta = 0.635, $t = 5.097$, $p < 0.01$). This may suggest the existence of additional factors, such as SME characteristics, external environmental factors, or measurement errors, influencing SME performance beyond the purview of financial literacy and access to digital finance. When other predictors are held constant, the regression analysis highlights a positive and significant influence of digital financial access on SME performance (Beta = 0.173, $t = 4.493$, $p < 0.01$). This shows that if SME owners have better access to or use digital finance platforms or services, they are more likely to achieve higher performance levels, including increased sales, profits, and productivity along with decreased expenses, risks, and inefficiencies. More so, the adjusted R square is 0.457. This indicates that 45.7% of the variation in the model on SME performance can be explained by the combined variation in financial literacy and access to digital finance. This suggests that the regression model has a moderate level of explanatory power, confirming the importance of digital finance access and financial literacy as indicators of SME performance. But it also implies that other unaccounted-for factors explain the remaining 54.3% of the variation in SME performance. Therefore, the regression model may

suffer from omitted variable bias, which may affect the validity and accuracy of the estimates.

Discussion

The study results show a positive and significant relationship between financial literacy and access to digital finance for SMEs in Uganda. This implies that when SME owners have a greater comprehension of financial concepts, they are more likely to use digital finance platforms and services. This finding is consistent with resource-based theory, which holds that improving operational knowledge builds a company's human resource capabilities and skills, giving the business a competitive edge and better firm performance (Barney, 1991; Wernerfelt, 1984). Consequently, empirical literature suggests that a deeper understanding of financial concepts influences management's capacity to obtain finance from a variety of sources, including digital channels. Further, empirical findings by Königsheim, Lukas, and Nöth (2017), show a positive correlation between financial competence and the propensity to use digital financial services. Therefore, the results accept Hypothesis 1 by concluding that there is a positive relationship between financial literacy and access to digital finance of SMEs in Uganda. The results of the study also show a positive and significant relationship between access to digital finance and the performance of SMEs in Uganda.

This demonstrates that SME owners typically perform better when they have better access to or use digital financial platforms or services. This outcome is consistent with resource-based theory, which maintains that companies can make money if they have access to all necessary resources, including digital financing. Organizations with solid finances are able to purchase additional resources that are necessary for their daily operations (Stacey, 2011). The empirical findings of Abbasi and Weigand (2017) and Ozili (2018), who found that access to digital funding has a significant impact on business success, further support this conclusion. Therefore, the findings of this study accept Hypothesis 2 by concluding that there is a positive relationship between access to digital finance and the performance of SMEs in Uganda. Overall, the study results point to financial literacy and access to digital finance as two significant factors that influence SMEs' performance. Therefore, the study recommends that policymakers, educators, and practitioners aggressively promote and support the expansion of financial literacy and access to digital finance for SMEs. SME owners are also urged to broaden their financial expertise by investigating and making use of the advantages provided by digital finance platforms and services.

5. Contribution to Literature and Theory

The results of the study show that SMEs' performance is highly dependent on their capacity to secure digital funding. Consequently, it suggests that decision-makers in government, academia, and business aggressively encourage and facilitate the growth and broad implementation of digital finance among small and medium-sized enterprises. |The study also implies that SME owners should proactively work on enhancing their access to and utilization of digital finance platforms or services, leveraging the opportunities and advantages offered by digital financial tools. SMEs are acknowledged as crucial contributors to economic development and social inclusion, driving employment, income generation, and GDP growth (Donkor et al., 2018; OECD, 2019). The study's conclusions provide SME owner-managers with insightful advice, highlighting the significance of raising their level of financial literacy to successfully negotiate today's financial obstacles and make well-informed decisions that enhance company performance. The results also highlight the benefits of using the several digital platforms that are accessible throughout the nation to improve SMEs' overall performance.

The study's policy implications highlight how important it is for regulators of digital financial services, government agencies, the Ministry of ICT, and other relevant parties to develop and implement favorable legislation and policies. This ought to encourage the creation and uptake of a variety of digital financial services that enhance the performance of SMEs. Policymakers must make sure that SMEs and their customers can continue to access, afford, rely on, and feel secure when using digital financial services. The study broadens the body of knowledge regarding the connection between the financial performance of SMEs in Uganda, access to digital finance, and financial literacy. The study closes a gap in the literature because the majority of earlier research in this field concentrated on the function of governance and how it affects the performance of SMEs. The resource-based hypothesis, which maintains that a company will function more effectively when it has access to resources that are valuable, uncommon, difficult to replicate, and non-replaceable, is further supported by the study's empirical data. According to the survey, SMEs may get a competitive edge in the

market by enhancing their capabilities and competencies through the strategic utilization of digital finance and financial literacy.

Limitations and Further Research

The study employed a cross-sectional survey to collect data. On the other hand, the methodology of the longitudinal study may have produced a more accurate assessment of SMEs' performance. It is advisable to investigate the relationship that exists between financial literacy and the usage of digital financial platforms across the nation. This study's longitudinal replication will also help reveal how performance will be impacted over time by having access to digital finance. The study also recognizes the difficulties and constraints that came with conducting the research, including the cross-sectional design, the small sample size, the self-reported measures, and the bias associated with the omitted variable. The study recommends that future research use larger and more representative samples, longitudinal or experimental designs, objective or secondary data sources, and more comprehensive and robust regression models. The study suggests that future investigations look into additional variables, such as the features of digital finance platforms or services, the external environment, and the interaction effects, which may have an impact on the relationship between SMEs' performance and their ability to access digital finance.

Conclusion and Implications

The regression study findings demonstrated that a combined effect of financial literacy and access to digital finance account for 45.7% of the variability in SME performance in Uganda (Adjusted R Square = 0.457). This suggests that the remaining 54.3% of variations are caused by additional factors that are not taken into account in this study. The results suggest that when SME owners are financially literate and knowledgeable, they are more likely to access digital finance, leading to enhanced business performance. Financial literacy and access to digital finance of SMEs should be improved, so policymakers and stakeholders in Uganda's SME sector are urged to give priority to these initiatives. The study's findings also showed a positive and significant relationship between financial literacy and access to digital finance. This means SME owners who have better financial knowledge are more likely to access and use digital platforms and services. Additionally, a positive and significant relationship was shown between access to digital finance and the performance of SMEs, suggesting that SMEs with better access to digital finance generally outperform others. When other factors are held constant, the regression model showed a moderate explanatory power confirming that SME performance is positively and significantly impacted by access to digital finance.

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Factor Input Prices and Unemployment in Uganda

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Abstract: Examining the impact of input costs on unemployment in Uganda, this study employed an ARDL model based on the Efficiency Wage Theory. Analyzing annual data from 1987 to 2019 and controlling for economic size and currency value, the research found that lending interest rates, real exchange rates, and GDP have a short-term negative impact on unemployment, suggesting an initial rise. However, the study highlights a positive long-run relationship between these factors and unemployment, indicating their potential to contribute to lower unemployment over time. Interestingly, no significant short-run or long-run effect of global crude oil prices on Uganda's unemployment was identified. These findings suggest that while central bank policies promoting lower interest rates can encourage short-term investment and potentially lower unemployment, long-term economic growth is also crucial. Furthermore, the lack of impact from oil prices underscores the need for Ugandan policymakers to diversify the economy beyond oil dependence for sustainable unemployment reduction.

Keywords: *Unemployment, Input prices, Auto Regressive Distributive Lag (ARDL)*

1. Background to the study

Unemployment in a country has profound and complex effects on its economy. It not only hampers productivity by underutilizing the available labor force but also leads to a reduction in consumer spending due to lower income levels among the unemployed (Feng, Lagakos & Rauch, 2024). Moreover, high unemployment rates often result in social unrest and political instability, posing challenges to the overall governance and stability of a nation (Azzollini, 2023). The strain on government resources is another significant consequence, as increased spending on unemployment benefits and social welfare programs puts pressure on public finances (Feng, Lagakos, & Rauch, 2024). Furthermore, persistent unemployment hinders economic growth by limiting the potential for expansion and innovation, as well as hampering investment and entrepreneurship (Uddin & Rahman, 2023). Thus, managing unemployment levels is crucial for fostering economic stability, promoting social well-being, reducing poverty, enhancing human capital development through employment opportunities, and ultimately achieving inclusive growth (Feng, Lagakos, & Rauch, 2024). According to the International Labour Organization (ILO) report titled World Employment and Social Outlook Trends: 2024 (WESO Trends), global unemployment witnessed a modest decline from 5.3% to 5.1% in 2023 (ILO, 2024). However, the situation remains challenging, particularly in Africa, where unemployment rates have been persistently high (World Bank, 2023). Since 2020, unemployment rates in Africa have hovered around 7.1%, demonstrating the severity of the issue on the continent (World Bank, 2023). In 2022, the world's highest unemployment rates were observed in African countries and occupied Palestine, with South Africa leading at 29.8%, followed by Djibouti at 27.9%, West Bank and Gaza at 25.7%, Eswatini at 24.4%, and Republic of Congo at 21.8% (World Bank, 2023). The situation worsened in 2023, with countries like Sudan (45.96%), South Africa (32.8%), Ukraine (19.37%), and Georgia (18.4%) experiencing alarming unemployment rates (World Bank, 2023).

Factor input prices significantly impact unemployment levels within a country (Feng, Lagakos, & Rauch, 2024). Various economic factors, such as international oil prices, lending interest rates, fluctuations in the real effective exchange rate, and GDP growth, possess significant impacts on the labor market dynamics (Adeosun et al., 2023). For instance, international oil prices have far-reaching implications on production costs, transportation expenses, and overall business operations (Adeosun et al., 2023). Fluctuations in oil prices directly affect industries reliant on oil-based inputs, leading to adjustments in employment levels (Adeosun et al., 2023). Lending interest rates also exert a considerable influence on unemployment levels, as they affect borrowing costs for businesses and individuals (Adeosun et al., 2023). Higher interest rates discourage borrowing for investment purposes, leading to reduced business expansion and job creation (Adeosun et al., 2023). Conversely, lower interest rates stimulate economic activity, resulting in increased investment and employment opportunities (Adeosun et al., 2023). Variations in the actual effective exchange rate affect a

nation's export and import competitiveness, which in turn affects employment levels in export-oriented industries (Umoru et al., 2023). Additionally, growth in gross domestic product (GDP) is a good indicator of the state of the economy and is strongly related to employment patterns (Feng, Lagakos, & Rauch, 2024). In Uganda, these factor input prices have had significant impacts on unemployment levels (James, Eria, & Ibrahim, 2023). For instance, international oil prices fluctuated between $65.32 per barrel in 2021 and $79.40 per barrel in 2023, influencing transportation costs and production expenses across various sectors (Adeosun et al., 2023). Lending interest rates averaged 15.7% in 2021, increasing to 16.5% in 2023, affecting borrowing costs for businesses and individuals (Adeosun et al., 2023). The dynamics of employment have also been impacted by fluctuations in the real effective exchange rate, with the Ugandan Shilling falling from 3,700 UGX per US dollar in 2020 to 3,850 UGX per US dollar in 2022 (Umoru et al., 2023). Additionally, GDP growth in Uganda, which stood at $114 billion in 2023, has been characterized by fluctuations, highlighting the intricate relationship between economic growth and unemployment (James, Eria, & Ibrahim, 2023). Managing these factor input prices is crucial for mitigating unemployment and fostering sustainable economic development in Uganda (James, Eria, & Ibrahim, 2023).

2. Literature review and hypothesis development

Theoretical literature review

The efficiency wage hypothesis, which states that unemployment arises from businesses paying wages above the level of the market-clearing wage such that labor supply exceeds labor demand, serves as the foundation for this investigation. According to the hypothesis, worker effort and firm success are positively connected, making it beneficial for enterprises to pay wages beyond the market-clearing wage. Because of the potential negative impact on firm performance from the corresponding decline in productivity, businesses are often hesitant to lower salaries in the face of surplus supply. The goal of paying above-market wages is to encourage high output by discouraging worker shirking, lowering employee turnover, and lessening the negative selection behavior of workers. The efficiency wage theory has several variations, which may be traced back to at least four different models: the sociological, turnover, adverse selection, and shirking models. Higher wage payments, in accordance with the shirking model, diminish shirking by raising the penalty of losing one's employment (Shapiro & Stiglitz, 1984; Solow, 1979). According to the turnover model, companies are compelled to offer efficiency salaries to prevent labor turnover, which might be expensive for them (Salop, 1979). A higher salary can encourage employee loyalty, which in turn encourages workers to put in more effort, according to the efficiency wage sociological model (Akerlof, 1988). The models imply a causal connection between pay levels and an employee's productivity while they are working. As a result, workers with comparable observable traits—such as education and occupation—may have compensation disparities as a result of these productivity variations.

This research employs the shirking model of the efficiency wage theory, as expounded by Carruth (1998), in compliance with the methodology employed by Doğrul and Soytas (2010) to examine the correlation between Turkey's unemployment rate, interest rates, and oil price.

Conceptual literature review

International Oil Prices: International oil prices denote the price of crude oil in the worldwide market, usually expressed in US dollars per barrel (Zhao, Cui, Liu, & Zhang, 2023). Numerous factors influence these prices, such as the dynamics of supply and demand, geopolitical developments, the decisions made by oil-producing nations about their production, and macroeconomic situations (Gil-Alana & Monge, 2020). Because oil is a vital component of many industries, including manufacturing, energy generation, and transportation, changes in the price of the commodity have a substantial impact on economies all over the world (Zhao, Cui, Liu, & Zhang, 2023). Higher oil prices can lead to increased production costs for businesses, higher transportation costs for consumers, and inflationary pressures on the overall economy (Zhao, Cui, Liu, & Zhang, 2023; Beckmann, Czudaj, & Arora, 2020). Conversely, lower oil prices can stimulate economic growth by reducing input costs for businesses and lowering inflationary pressures, thus affecting the balance of trade and fiscal policies of oil-importing countries (Gil-Alana & Monge, 2020).

Lending Interest Rate: Lending interest rates represent the cost of borrowing funds from financial institutions, such as banks or credit unions, typically expressed as an annual percentage of the principal loan amount (Molyneux, Reghezza, Thornton, & Xie, 2020). These rates are influenced by central bank policies,

inflation expectations, credit risk, and market conditions (Molyneux, Reghezza, Thornton, & Xie, 2020; Hofmann et al., 2021). Lending interest rates have a significant impact on how businesses and individuals borrow money and make investments, which in turn shapes economic activity (Molyneux, Reghezza, Thornton, & Xie, 2020). Increased loan interest rates often deter borrowing and investment, which in turn inhibits the growth of businesses, consumer spending, and the economy as a whole (Molyneux, Reghezza, Thornton, & Xie, 2020; Hofmann et al., 2021). Conversely, reduced lending interest rates encourage investment and borrowing, boosting the creation of jobs and the economy (Molyneux, Reghezza, Thornton, & Xie, 2020). The economy's patterns of wealth accumulation and consumption can be impacted by changes in lending interest rates, which can also have an impact on the pricing of assets like stocks and real estate (Hofmann et al., 2021).

Real Effective Exchange Rates: The real effective exchange rate, or REER, accounts for inflation differences between the home and foreign economies when determining the value of a country's currency relative to a basket of other currencies (Darvas, 2021). It reflects the competitiveness of a country's goods and services in international markets (Kassouri & Altıntaş, 2020). A higher REER implies that the country's exports become relatively more expensive compared to its trading partners, while a lower REER implies increased competitiveness (Darvas, 2021; Kassouri & Altıntaş, 2020). Fluctuations in the REER can impact a country's trade balance, as well as its domestic production, employment, and inflation levels (Darvas, 2021; Kassouri & Altıntaş, 2020). For instance, whereas a depreciation can increase export competitiveness and spur economic activity and job creation, an appreciation of the REER can lower export competitiveness and impact export-oriented industries and employment levels (Darvas, 2021; Kassouri & Altıntaş, 2020).

Gross Domestic Product (GDP) Growth: GDP growth, which is typically stated as a percentage, is a measure of the rate of change in the total value of goods and services produced within a nation's borders over a given period of time (Dynan & Sheiner, 2018). An economy's general health and expansion are reflected in its GDP growth, which is a crucial measure of economic performance (Dynan & Sheiner, 2018). Positive GDP growth indicates that an economy is expanding, while negative growth indicates contraction or recession (Dynan & Sheiner, 2018). Consumer spending, company investment, government spending, net exports, and inventory changes are some of the factors that affect GDP growth (Ge & Tang, 2020). In contrast, lower growth rates can result in job losses, income stagnation, and financial hardship for people and businesses. Higher GDP growth rates are linked to more employment opportunities, higher incomes, and improved living standards (Ge & Tang, 2020).

Unemployment: Unemployment denotes the state in which individuals who are both willing and capable of working cannot secure appropriate job opportunities (Kiley, 2022). It is commonly expressed as the portion of the labor force that is actively looking for work but is having trouble finding positions (Kiley, 2022). Many causes can lead to unemployment, including labor market rigidities, technological improvements, industry structural changes, cyclical oscillations in the business cycle, and mismatches between skill requirements and job requirements. (Feng, Lagakos, & Rauch, 2024). Negative economic and social outcomes, such as decreased consumer spending, income disparity, poverty, social unrest, and lost human capital, are linked to high unemployment rates (Feng, Lagakos, & Rauch, 2024). Policymakers often use unemployment rates as a gauge of labor market health and implement measures such as fiscal and monetary policies, labor market reforms, and education and training programs to address unemployment challenges and promote full employment (Feng, Lagakos, & Rauch, 2024).

Empirical Literature Review

The relationship between international oil prices and unemployment: Researchers have studied the relationship between global oil prices and unemployment empirically, looking at the several ways that fluctuations in oil prices affect labor market dynamics (Raifu, Aminu, & Folawewo, 2020). Firstly, fluctuations in international oil prices have been found to affect consumer spending patterns, particularly in oil-importing countries, which can subsequently impact employment levels (Kocaarslan, Soytas, & Soytas, 2020). Consumers pay more for fuel and energy-related products as oil prices rise, which reduces their disposable income for other goods and services (Wang et al., 2022). Because of this, companies in non-energy industries might see a decline in customer demand for their goods, which could result in reduced output and possibly job losses (Nusair, 2020). On the other hand, a decrease in oil prices may result in consumers having more discretionary income, which would encourage them to spend more on non-energy products and services. This would boost

the economy and create jobs (Chan & Dong, 2022). For instance, research found that oil price shocks negatively affected employment levels in the United States during the 1970s oil crises, as higher energy costs led to reduced consumer spending and investment, leading to widespread job losses across various sectors of the economy (Almutairi, 2020). Similarly, studies provide evidence of a significant relationship between oil price shocks and employment fluctuations in both advanced and emerging economies, highlighting the global relevance of this relationship (Gupta, Pierdzioch, & Salisu, 2022). Additionally, the impact of international oil prices on unemployment is mediated by the response of businesses to changes in production costs and profitability (Daniel et al., 2021). Higher oil prices increase input costs for businesses, particularly those heavily reliant on energy-intensive production processes or transportation (Kocaaslan, 2019). To preserve profitability in response, businesses may use cost-cutting strategies, such as lowering labor costs through layoffs or hiring freezes (Ghosh, 2021). Furthermore, higher oil prices may prompt firms to invest in energy-saving technologies or alternative energy sources, which can lead to structural changes in the labor market, such as shifts in employment from energy-intensive industries to cleaner and more sustainable sectors (Ehikioya et al., 2020). Conversely, when oil prices decline, businesses may experience cost savings, which can translate into higher profit margins and increased investment in expansion and hiring (Elder & Payne, 2023). Empirical studies provide evidence of the impact of oil price fluctuations on firm-level employment decisions, suggesting that changes in oil prices can lead to significant adjustments in labor demand across industries, ultimately affecting overall unemployment rates (Ogede, George, & Adekunle, 2020).

Moreover, the link between international oil prices and unemployment is influenced by the response of monetary and fiscal policies to oil price shocks (Mathenge & Muturi, 2021). Increased production costs are transferred to customers in the form of higher pricing for products and services, which might result in inflationary pressures when oil prices rise (Raifu, Aminu, & Folawewo, 2020). Central banks may respond by hiking interest rates to reduce inflation, which could stifle the economy and drive up unemployment rates (Kocaarslan, Soytas, & Soytas, 2020). To counteract the detrimental effects of rising oil prices on budget deficits and inflation, governments may also enact contractionary fiscal measures, such as cutting back on public expenditure or raising taxes (Wang et al., 2022). However, a number of variables, such as the degree of wage and price flexibility, the responsiveness of monetary policy to changes in inflation expectations, and the legitimacy of fiscal policy commitments, affect how effective monetary and fiscal policies are in reducing the negative effects of oil price shocks on unemployment (Nusair, 2020). The transmission mechanism of oil price shocks to unemployment is shaped by macroeconomic policy responses, as evidenced by empirical research. Proactive policy interventions can potentially lessen the negative impact of oil price volatility on labor market outcomes (Chan & Dong, 2022). As a result, the relationship between global oil prices and unemployment is intricate and multidimensional, and empirical data indicates that shifts in oil prices may have a big impact on the dynamics of the labor market (Gupta, Pierdzioch, & Salisu, 2022). To mitigate the negative effects of oil price volatility on labor market outcomes and promote sustainable economic growth, policymakers and researchers must have a thorough understanding of the mechanisms through which shocks to the price of oil affect unemployment (Almutairi, 2020).

Effect of lending interest rate and unemployment

The correlation between lending interest rates and unemployment is intricate and multifaceted, carrying significant implications for macroeconomic stability and policy design (Panigrahi et al., 2020). Financial institutions and central banks determine lending rates, which heavily influence borrowing and investment decisions, thereby impacting employment and economic activity (Kaufmann, 2020). Increased lending rates raise borrowing costs for individuals and businesses, leading to decreased consumer borrowing, investment, and overall economic activity (Mansouri et al., 2021). This economic contraction can contribute to higher unemployment as companies reduce production and employment to adapt to lower demand and profitability (Shen et al., 2021). Conversely, lower lending rates make borrowing cheaper, stimulating investment, consumer borrowing, and economic growth (Iddrisu & Alagidede, 2020). This expansionary effect may prompt businesses to increase production and hire more workers, potentially lowering unemployment rates (Obinna, 2020). Thus, fluctuations in lending rates directly impact overall economic activity, consequently affecting unemployment rates.

Moreover, various factors such as the responsiveness of households and businesses to interest rate changes, the structure of the financial system, and the credibility of monetary policy influence the relationship between

lending rates and unemployment (Batrancea et al., 2022). Businesses may adjust investment and hiring decisions in response to lending rate changes, influenced by credit availability, capital costs, and economic outlook (Hayat et al., 2021). Similarly, households may alter borrowing and spending behaviors, affecting consumption patterns and overall demand (Dimitriou et al., 2024). Additionally, the structure of the financial system, including the prevalence of fixed-rate versus variable-rate loans, can impact how changes in lending rates affect the real economy (Panigrahi et al., 2020). In economies with a significant portion of variable-rate loans, lending rate changes may more immediately affect borrowing costs and economic activity, potentially influencing unemployment rates more significantly (Kaufmann, 2020). Furthermore, the credibility of monetary policy, reflected in central banks' ability to maintain price stability and anchor inflation expectations, can affect the effectiveness of lending rate changes in achieving macroeconomic goals, including full employment (Mansouri et al., 2021).

Additionally, other macroeconomic variables and structural features of the economy affect the relationship between lending rates and unemployment (Shen et al., 2021). Aggregate demand levels, influenced by factors like government spending, net exports, and household consumption, can affect the overall impact of lending rate changes on unemployment (Iddrisu & Alagidede, 2020). Even significant reductions in lending rates may not suffice to generate adequate job creation and economic activity in a situation of weak aggregate demand, as businesses remain cautious without strong consumer demand (Obinna, 2020). The responsiveness of unemployment to lending rate changes can also be influenced by structural features such as labor market flexibility, the presence of wage negotiation institutions, and the frequency of structural unemployment (Batrancea et al., 2022). In economies with rigid labor markets and high structural unemployment, lending rate changes may have a limited impact on employment levels due to other hiring constraints and production limitations (Hayat et al., 2021). Thus, while lending rate changes are pivotal in influencing unemployment, their effectiveness in reducing unemployment rates depends on the complex interaction of various macroeconomic factors and structural characteristics of the economy (Dimitriou et al., 2024).

Fluctuations in the real effective exchange rate and unemployment

The relationship between fluctuations in the real effective exchange rate (REER) and unemployment is a subject of extensive empirical research, with scholars exploring various channels through which changes in exchange rates influence labor market dynamics (Cacciatore & Ghironi, 2021). Firstly, fluctuations in the REER can significantly impact the competitiveness of a country's exports and imports, thereby affecting employment levels in export-oriented industries (Cahyadin & Ratwianingsih, 2020). When the REER appreciates, indicating a strengthening of the domestic currency relative to foreign currencies, exports become relatively more expensive for foreign buyers (Zahra et al., 2023). This can lead to a decline in export demand, resulting in potential job losses in sectors reliant on export markets (Bošnjak, 2021). Conversely, when the REER depreciates, exports become more competitive internationally, leading to increased demand for domestically produced goods and supporting employment in export-oriented industries (Bošnjak et al., 2021). Empirical studies provide evidence of a significant relationship between changes in the REER and employment fluctuations in countries such as China and Mexico, highlighting the importance of exchange rate movements in shaping labor market outcomes (Hegeland & Taalbi, 2019). Additionally, fluctuations in the REER can influence domestic production costs and profitability, thereby affecting firms' hiring and investment decisions (Bakhshi & Ebrahimi, 2016). A strengthening REER reduces the cost of imported inputs for domestic producers, leading to lower production costs and potentially higher profit margins (Jaffri et al., 2017). This may encourage firms to expand production and hire additional workers, thus reducing unemployment. Conversely, a depreciating REER increases the cost of imported inputs, leading to higher production costs and reduced profitability for domestic producers (Usman & Elsalih, 2018). In response, firms may cut back on production and employment to maintain profitability, leading to higher unemployment rates (Ridhwan et al., 2024). Empirical research provides evidence of the impact of exchange rate movements on firm-level employment decisions, suggesting that changes in the REER can lead to significant adjustments in labor demand across industries, ultimately affecting overall unemployment rates (Ijirshar et al., 2022).

Moreover, the relationship between fluctuations in the REER and unemployment is influenced by the response of monetary and fiscal policies to exchange rate movements (Beckmann et al., 2020). Changes in the REER can lead to inflationary or deflationary pressures, depending on whether the currency appreciates or depreciates (Cacciatore & Ghironi, 2021). In response to inflationary pressures resulting from a depreciating REER, central

banks may raise interest rates to curb inflation, which can dampen economic activity and lead to higher unemployment rates (Cahyadin & Ratwianingsih, 2020). Conversely, in the case of deflationary pressures resulting from an appreciating REER, central banks may lower interest rates to stimulate economic activity and reduce unemployment (Zahra et al., 2023). Additionally, governments may implement expansionary fiscal policies, such as increasing public spending or reducing taxes, to offset the negative impact of an appreciating REER on employment levels (Bošnjak, 2021). However, the effectiveness of monetary and fiscal policies in mitigating the adverse effects of exchange rate fluctuations on unemployment depends on various factors, including the degree of wage and price flexibility, the responsiveness of monetary policy to changes in inflation expectations, and the credibility of fiscal policy commitments (Hegeland & Taalbi, 2019). Empirical research highlights the importance of macroeconomic policy responses in shaping the transmission mechanism of exchange rate movements to unemployment, suggesting that proactive policy interventions can help mitigate the adverse effects of exchange rate volatility on labor market outcomes (Bakhshi & Ebrahimi, 2016).

Effect of GDP growth and unemployment

The relationship between GDP growth and unemployment is a fundamental aspect of macroeconomic analysis, reflecting the dynamics of economic expansion or contraction and its impact on labor market conditions (Feng et al., 2024). GDP growth, which measures the rate of change in the total value of goods and services produced within a country's borders, is closely linked to employment levels, as higher levels of economic activity typically translate into increased demand for labor and lower unemployment rates (Bartolucci et al., 2018). When GDP growth is robust, businesses expand production to meet growing demand, leading to increased hiring and job creation (Musara, 2020). This expansionary phase of the economic cycle is characterized by declining unemployment rates as more individuals find employment opportunities (Hashmi et al., 2021). Conversely, during periods of economic contraction or negative GDP growth, businesses may reduce production levels in response to weakening demand, leading to layoffs and higher unemployment rates (Pasara & Garidzirai, 2020). Therefore, changes in GDP growth have a direct impact on the overall level of economic activity and, consequently, on the level of unemployment within an economy.

Moreover, the relationship between GDP growth and unemployment is influenced by various factors, including the composition of GDP growth, labor market flexibility, and the effectiveness of macroeconomic policies (Anderton et al., 2014). The composition of GDP growth, reflecting the contribution of different sectors to overall economic activity, can influence its impact on employment levels (Sanchez & Liborio, 2012). For example, GDP growth driven by sectors such as manufacturing and construction, which are labor-intensive, may lead to greater job creation and lower unemployment rates compared to growth driven by sectors such as finance or information technology, which are less labor-intensive (Conteh, 2021). Additionally, labor market flexibility, including factors such as wage flexibility, ease of hiring and firing, and mobility of labor, can shape the responsiveness of unemployment to changes in GDP growth (Al-Sawaiea, 2020). In flexible labor markets, firms may adjust employment levels more quickly in response to changes in economic conditions, leading to smaller fluctuations in unemployment rates during economic downturns or recessions (Chuttoo, 2020). Conversely, in rigid labor markets with strict labor regulations and protections, adjustments in employment levels may be slower, leading to larger fluctuations in unemployment rates during economic downturns (Hjazeen et al., 2021). Furthermore, the effectiveness of macroeconomic policies, including monetary and fiscal policies, in supporting GDP growth and reducing unemployment rates depends on their timeliness, credibility, and coordination (Musara, 2020). Well-designed and coordinated macroeconomic policies can help stimulate economic activity during periods of weak GDP growth and mitigate the adverse effects of economic downturns on unemployment levels. Additionally, the relationship between GDP growth and unemployment is subject to the presence of other macroeconomic factors and structural characteristics of the economy (Bartolucci et al., 2018). For example, the total effect of GDP growth on unemployment can depend on the amount of aggregate demand, which is defined by variables like consumption, investment, government spending, and net exports. (Feng et al., 2024). In an environment of strong aggregate demand, characterized by robust consumer spending, business investment, and government expenditure, Lower unemployment rates are probably going to follow GDP growth as companies increase production and hire more people to keep up with demand (Hashmi et al., 2021). Conversely, in an environment of weak aggregate demand, characterized by subdued consumer spending, business investment, and government expenditure, GDP growth may fail to translate into significant job creation, leading to higher unemployment rates (Pasara & Garidzirai, 2020). Similarly, structural characteristics of the economy, such as the prevalence of structural unemployment, demographic trends, and

technological advancements, can shape the responsiveness of unemployment to changes in GDP growth (Anderton et al., 2014). In economies with high structural unemployment, characterized by mismatches between the skills of job seekers and the requirements of available jobs, GDP growth may have a limited impact on overall employment levels, as structural barriers prevent unemployed individuals from finding suitable employment opportunities. Therefore, while changes in GDP growth play a crucial role in influencing unemployment, their effectiveness in reducing unemployment rates depends on a complex interplay of various macroeconomic factors and structural characteristics of the economy.

3. Model specification, data and estimation procedures

Theoretical framework

An escalation in oil prices results in profit margin erosion, causing firms to incur losses and potentially face closure. To attain a zero-profit equilibrium, an adjustment in an economic variable is necessary. Labor costs must go down because labor and energy are the two main inputs, assuming that interest rates stay mostly steady. However, this adjustment can only be made if a no-shirking condition results in an inverse relationship between earnings and unemployment. Because equilibrium unemployment drives workers to accept lower pay scales dictated by the growing portion of real economic revenue that goes to oil owners, equilibrium unemployment must rise. A similar pattern emerges with every increase in the actual interest rate. As profits for capital owners soar, lower rewards for workers are required to create a new zero-profit equilibrium. If unemployment serves as a "discipline device," then rising real input costs lead to increased rates of unemployment and lower wages.

Thus, the unemployment function is given as;

$UNEM = f(IOP, INT, REER, GDP)$ …… (1)

Description of the variables and model estimation

Unemployment: Total Unemployment (UNEM), represents the dependent variable and was used to measure the level of unemployment in the study. Total Unemployment was used because its international definition enables it to present a more accurate picture of the labor market in Uganda. The variable is measured as a percentage of the total labor force in Uganda.

International Oil Price: International Oil Prices (IOP), represents the Price of a barrel of crude oil. Oil prices usually impact positively the level of unemployment in a given economy; as oil prices rise, unemployment as well and vice versa. International Oil prices are therefore expected to display a positive relationship with the unemployment level.

Lending Interest Rate: Lending Interest rate (INT) represents the amount charged by lenders for a certain period as a percentage of the amount lent. Interest rate is expected to display a positive significant relationship with unemployment.

Real effective Exchange rate: Real Effective Exchange rate (REER) represents the weighted average of Uganda's shilling in relation to the US dollar. The variable was used in the model as a control for the value of the local currency.

Gross Domestic Product: Gross Domestic Product (GDP) refers to the comprehensive monetary value of all finished goods and services generated within the borders of a country during a specified time frame. This variable was incorporated into the model as a control measure for assessing the magnitude of the economy.

Model estimation

The estimated model is adapted and changed as follows from the previous research conducted by Dogrul and Soytas (2010) and Frenkel and Ros (2006):

$UNEM_t = \beta_0 + \beta_1 IOP_t + \beta_2 INT_t + \beta_3 REER_t + \beta 4\, GDP_t + \mu_t$ …… (2)

Model 3.2 was estimated in ARDL form as

$\Delta UNEM_t = \beta_0 + \beta_1 UNEM_{t-1} + \beta_2 IOP_{t-1} + \beta_3 INT_{t-1} + \beta_4 REER_{t-1} + \beta_5 GDP_{t-1} + \sum_{P=0}^{n1} \theta 1\, \Delta UNEM_{t-p} + \sum_{P=1}^{n2} \theta 2\, \Delta IOP_{t-p} + \sum_{P=0}^{n3} \theta 3\, \Delta INT_{t-p} + \sum_{P=0}^{n4} \theta 4\, \Delta REER_{t-p} + \sum_{P=0}^{n5} \theta 5\, \Delta GDP_{t-p} + \varepsilon_1$ …… (3)

Data type and source

Time series analysis and a quantitative research design are used in this study. The analysis uses annual data for the years 1987 to 2018 from the World Bank (WB), Bank of Uganda (BOU), and Uganda Bureau of Statistics (UBOS).

Variables	Description	Data Source
Unemployment Rate	The share of the labor force that is without work but available for and seeking employment.	World Bank
International Oil Price	Price of a barrel of crude oil in US dollars	World Bank
Lending interest rate	Average rate (percentage of lent amount) charged by commercial banks annually	Bank of Uganda
Real Effective Exchange rate	A weighted average of Uganda's shilling in relation to the US dollar	Bank of Uganda
Gross Domestic Product (GDP)	The total monetary value of all finished goods and services produced inside a country's borders over a given period of time.	Uganda Bureau of Statistics

4. Empirical results and discussion

Descriptive analysis

Table 1 presents aggregate descriptive statistics regarding the determinants of interest rates. These statistics, which were calculated to provide an overview of the observed data, include means, standard deviations, minimums, and maximums. Determining whether the statistical means and standard deviations appropriately represented the observed data was the main goal of the descriptive analysis. The results show that the standard deviations are modest when compared to the mean values. Because the data and the means are so close together, the computed means provide a good depiction of the observed data and are, thus, realistic. Reviewing the mean, lowest, maximum, and standard deviation values reveals that the real effective exchange rate, oil price, and interest rate showed more variability than the other variables. On the other hand, there was some variation in the unemployment and GDP.

Table 1: Descriptive statistics of the input factors

Variable	Mean	Max	Min	Std. Dev.
UNEM	13.625	28	1	8.990138
IOP	45.70687	111.63	12.76	32.5927
INT	16.5	32	1	9.380832
REER	149.8781	507.1206	91.30151	104.2932
GDP	6.446335	11.52324	3.141907	2.166605

This is a reflection of the events during the research period. An increased degree of fluctuation in global oil prices and lending interest rates signals unstable input costs for employers. Volatile REER could be a result of volatile crude oil prices given that Uganda is a net oil importer. Modest variability in GDP could be an indication of slower expansion in economic activities stemming from the high and volatile input costs.

Unit Root Tests

The variables underwent unit root tests utilizing the Augmented Dickey-Fuller (ADF) test. The alternative hypothesis in the unit root test contends that the time series is stationary, in contrast, the null hypothesis states that the time series under study is non-stationary since it has a unit root (Greene, 2003). The level series of the variables' non-stationarity suggests that these variables' variances and means change over time. Every variable was subjected to the tests at both the level and first difference of the variables. Table 2 shows the outcomes of the unit root testing.

Table 2: Augmented Dickey-Fuller test results

Variables	Intercept		Trend and intercept		INT
	ADF		ADF		
	Levels	**First difference**	**Levels**	**First difference**	
logUNEM	-2.485	-5.279***	-0.643	-6.796***	I(1)
logIOP	-1.271	-4.817***	-2.165	-4.743***	I(1)

logINT	-2.469	-6.890***	-5.220***	-	I(1)
logREER	-5.032***	-	-5.853***	-	I(0)
logGDP	-4.832***	-	-4.980***	-	I(0)

While logUNEM, logIOP, and logINT are non-stationary and contain a unit root at the level, they are stationary at the first difference at the 1% significance level, according to Table 2's results. At the 1% significance level, the other variables, logREER and logGDP, are stationary at the level.

Regression results

Table 3 displays the findings of the ARDL model, which was used to ascertain how the independent variables affected the dependent variable. The results indicate that in the long run, only real effective exchange rate and GDP significantly positively affect unemployment. Interest rates and oil prices are not significant.

Table 3: Estimated Long-Run Coefficients for selected ARDL Model

Dependent Variable: logUNEM			
Independent Variables	Coefficient	Standard Error	P-Value
ADJ logUNEM L1.	-0.3493609**	0.1463129	0.033
logIOP	0.1347732	0.2077118	0.528
logINT	0.5820967	0.3818487	0.151
logREER	3.82357*	2.003837	0.079
logGDP	1.794063**	0.6966875	0.023

Notes: **,* Indicate significance at 5% and 10% significance levels respectively. Source: Calculation made by the author using survey data

Based on the coefficient of the error term (-0.3493609), Table 3 shows that the rate at which unemployment responds to changes in its equilibrium level is 35%. Consequently, the deviation of unemployment from equilibrium is corrected at a rate of 35% in a year as unemployment moves in the direction of restoring equilibrium. This rate of adjustment has a statistically significant p-value of 0.033. Uganda's respectable rate of adjustment in unemployment reflects the influence of additional factors affecting unemployment that are not taken into account by the model.

From Table 3, the long-run impact of internal oil prices and lending interest rate on unemployment can be shown using equation 4.0 below:

$UNEM = -7.75 + 0.135IOP + 0.582INT + 3.824REER + 1.794GDP$…… (4)

Table 4: Estimated Short-run Coefficients for the Selected ARDL Model

	Coef.	**Std. Err.**	**P>|t|**
$D(logUNEM)_{t-1}$	0.0972176	0.2342674	0.685
$D(logUNEM)_{t-2}$	0.3908333	0.1972105	0.069
$D(logUNEM)_{t-3}$	0.4977496***	0.1574105	0.007
D(logINT)	-0.2402963	0.1529068	0.140
$D(logINT)_{t-1}$	-0.3388359**	0.1152923	0.012
$D(logINT)_{t-2}$	-0.0819042	0.0604354	0.198
D(logREER)	-1.568371***	0.44166	0.004
D(logGDP)	-0.2518129**	0.1129843	0.044
Z	0.6264923**	0.2831702	0.045
Constant	-7.75403**	2.288558	0.05

Notes: D = first difference in variable. ***, ** Indicate significance at 1% and 5% significance levels respectively. ARDL regression (3, 2, 1, 1). Source: Calculation made by the author using survey data

Table 4, which depicts the short-run dynamics of the link between international oil prices, lending interest rates, real effective exchange rates, GDP, and unemployment, is an error correction representation of the long-run relationship in Table 4.

The error correction model in Table 4 establishes that the third lagged difference in unemployment, and the real effective exchange rate is significant at 1% while the first lagged difference in lending rates and the gross domestic product is significant at 5%. The model also established that the dummy variable for the structural break and the constant is significant at 5%.

Diagnostic tests

A crucial component of time series analysis for determining a model's robustness and spuriousness is the diagnostics test. The tests listed below were performed.

Normality test

The study carried out the Jarque-Bera (JB) normality Test as shown in Table 4.3.1

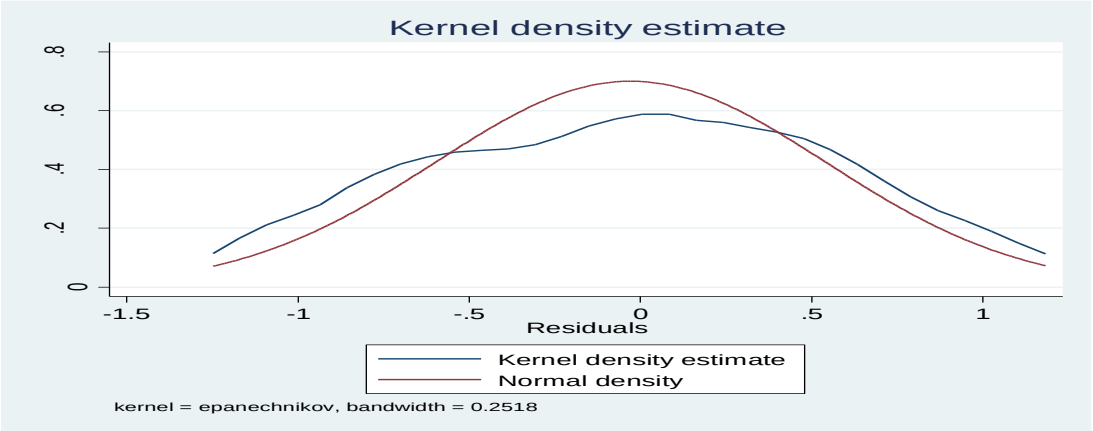
Table 5: Jarque-Bera Normality test results

Chi(2)	Prob.
1.351	0.5088

Source: Author's computation based on survey data

H_0: Normality

Figure 1: Kernel Density estimate



Source: Calculation made by the author using survey data

Table 5 results demonstrate that the p-value (.5088) is more than the significance criterion of 5%. This suggests that, at a 5% significance level, the null hypothesis—that the error term is normally distributed—cannot be rejected. Hence, the error term is found to be normally distributed.

Heteroskedasticity test

Table 6: White Test results for Heteroscedasticity

Source	Chi2	df	P
Heteroskedasticity	24.57	14	0.0391
Skewness	0.69	4	0.9528
Kurtosis	2.67	1	0.1022
Total	27.93	19	0.0848

Ho: homoskedasticity. Source: Author's computation based on survey data

The econometric model exhibits homoscedasticity (no heteroscedasticity), according to Table 6's results. A positively skewed distribution with a longer right tail is shown by the skewness of 0.69. Apart from that, the kurtosis value of 2.67 is less than the typical kurtosis coefficient of three, indicating a positive kurtosis. The distribution is said to have thicker tails and a sharper peak if the kurtosis is positive.

Autocorrelation test

Table 7: Breusch-Godfrey Serial Correlation LM Test results

Lags (p)	F	df	Prob > F
1	0.511	(1, 10)	0.4911

Ho: no serial correlation. Source: Calculation made by the author using survey data

Given that the p-value from Table 7 is 0.4911 and higher than the significance level of 0.05, it is not possible to reject the null hypothesis that there is no serial association. Consequently, it can be said that autocorrelation does not exist.

Multicollinearity test

Table 8: VIF results

Variable	VIF	1/VIF
logREER	1.99	0.50304
logINT	1.58	0.63127
logIOP	1.47	0.68008
logGDP	1.02	0.977577
Mean VIF	1.52	

Source: Calculation made by the author using survey data

Table 8's results showed that tolerance levels were supported by VIF values less than 10 and ranged from 0.978 and higher. Thus, the study variables did not exhibit multicollinearity.

Specification Error test

To check for specification errors in the variables included in the study, the Regression Specification Error Test (RESET) was used. Alema and Odongo (2016) claim that specification error is an all-inclusive phrase that encompasses any deviation from the maintained model's underlying presumptions. Table 9 provides specifics about the Ramsey RESET test outcomes in this investigation.

Table 9: Ramsey RESET test results

Variable	Obs	F (3, 23)	Prob > F
logUNEM	58	0.80	0.5062

Ho: the model has no omitted variables. Source: Calculation made by the author using survey data

The F-statistic and P-value in Table 9 show that the specification error has been rejected at the five percent significant level. The theory that all of the coefficients on the power of the fitted values are zero is supported by this. The diagnostic tests conducted in this study are followed by an estimation of the impact of macroeconomic variables on unemployment in Uganda.

Discussion

The effect of International oil prices on the level of unemployment in Uganda: There is a positive but statistically insignificant relationship between international oil prices and unemployment in Uganda, indicating

that a positive increase in international oil prices is associated with a rise in the level of unemployment. However, the lack of statistical significance suggests that this relationship cannot be conclusively attributed to international oil prices alone, as other factors such as oil import tariffs established by the Ugandan government play a significant role in influencing oil prices within the country. This obscures the direct effect of international oil prices on unemployment, leaving no credible indication that international oil prices affect unemployment in Uganda, but also no proof that they cannot. These findings align with Senzangakhona & Choga (2015), who found a similar positive long-run relationship between crude oil prices and unemployment in South Africa, emphasizing the complex interplay of economic variables and policy factors in shaping labor market dynamics and highlighting the need for further research to better understand these relationships.

The impact of lending interest rate on the level of unemployment in Uganda: According to the ARDL model's conclusions, lending interest rates have a favorable long-term impact on unemployment. Nonetheless, this effect is hardly noteworthy. But in the short term, unemployment is significantly impacted negatively by the lending interest rate's first lag. This implies that in the short run, an increase in lending interest rate leads to a reduction in unemployment, after one year. Such results indicate the presence of disguised unemployment. As lending interest rates rise, the cost of business operations rises and hence as some employees lose their jobs, those that remain employed retain less workload due to business downscales (Roberto & Jódiney, 2019)

The combined effect of international oil prices and Lending interest rate on the level of unemployment in Uganda: The findings under the regression analysis indicate that the model was able to explain about 72% of the variations in unemployment (R-squared = 0.7241). The value of the adjusted R-squared which is a stronger measure of the goodness of fit of a model since it penalizes for the inclusion of insignificant variables was 68%. Hence, the estimated model was able to explain the majority of the variations in the dependent variable (about 68%, based on the adjusted R-squared). However, the value of the adjusted R-squared also implies that the model does not explain about 32% of the variations in unemployment. Nonetheless, lending interest rates and international oil prices remain important predictors of Ugandan unemployment that should not be ignored. These findings concur with Shaaria, Hussain, & Rahima (2013) who established that international oil prices and lending interest rates impacted unemployment in Malaysia.

5. Conclusions, implications and suggestions

Conclusion: This study looked into the effects of loan interest rates and global oil prices, both separately and in combination, on Uganda's unemployment rate. The research examines the interrelationships among international oil prices, lending interest rates, real effective exchange rates, GDP growth rates, and unemployment. These factors are expected to have had a major effect on unemployment in the Ugandan economy between 1987 and 2018. Because it yields asymptotically normal estimates of the long-term connection regardless of whether the underlying regressors are integrated at order 1 (I(1)) or order 0 (I(0)), the Autoregressive Distributive Lag technique has been used. The findings discussion reveals a positive and statistically significant relationship between lending interest rates and unemployment in Uganda, suggesting that an increase in lending interest rates leads to a rise in unemployment levels. However, there is a positive yet insignificant relationship between international oil prices and unemployment, indicating that although increases in international oil prices are associated with higher unemployment levels, the relevance of this relationship is not significant in Uganda's context.

Policy Implications: Policy recommendations for labor-intensive industries should be made to boost output and lower Uganda's unemployment rate. Only then does rising productivity lead to a decrease in unemployment. This study indicates that the central bank (BOU) should endeavor to maintain low lending interest rates throughout time as this will encourage investment and lower unemployment because there is a definite association between lending interest rates and unemployment. In the near term, though, lending interest rates must be left to the discretion of the money market.

To reduce dependence on oil's volatile prices and create new jobs, Uganda should diversify its economy by focusing on high-potential sectors like agriculture and tourism. This can be achieved by offering investment incentives, developing necessary infrastructure, equipping the workforce with relevant skills, and fostering

innovation in these sectors. While successful implementation requires long-term commitment and addressing broader economic issues, diversification is a key strategy for a more stable and prosperous Uganda.

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Does Investment in Human Capital Offset Oil Dependence? Unveiling the Drivers of Unemployment in Uganda

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Abstract: This study explored the impact of human capital development on unemployment in Uganda. Employing a Vector Auto Regression (VAR) model informed by the Neoclassical growth theory, the research analyzed the relationship between education expenditure (a human capital component) and unemployment, while controlling for physical capital (represented by GDP) and inflation. Utilizing annual data from 1986 to 2022, the findings revealed a complex dynamic. In the short run, higher real effective exchange rates (stronger local currency) and GDP growth might lead to a temporary rise in unemployment. However, the long-term picture suggests a positive influence of real exchange rates and GDP on unemployment, implying they contribute to lower unemployment over time. Interestingly, the study found no direct impact of international oil prices on Uganda's unemployment. The research concludes by highlighting the need for effective population management strategies, such as family planning and education, to ensure sustainable population growth that aligns with economic expansion.

Keywords: *Unemployment, Human capital, Vector Auto Regression (VAR)*

1. Background

The Neoclassical theory of unemployment, developed by economists such as Milton Friedman and Edmund Phelps in the mid-20th century, posits that unemployment arises due to imbalances in the labor market, primarily caused by wage rigidities and mismatches between the skills possessed by workers and the skills demanded by employers (Tanaka, 2020). According to this theory, unemployment occurs when wages are artificially kept above the equilibrium level by factors such as minimum wage laws, labor unions, or government regulations (Bougrine, 2020). In such cases, employers are unwilling to hire workers at the prevailing wage rates, leading to involuntary unemployment (Michaelides & Papadakis, 2023). Additionally, the Neoclassical theory highlights the role of human capital in determining unemployment levels, emphasizing the importance of education, training, and skill development in reducing unemployment rates (Đukić, 2021).

The link between the Neoclassical theory of unemployment and the study on human capital and unemployment in Uganda is significant (Liotti, 2022). Uganda, like many African countries, faces persistent challenges of high unemployment rates despite efforts to promote economic growth and development (Gruzina, Firsova, & Strielkowski, 2021). The Neoclassical theory provides insights into the root causes of unemployment, highlighting the importance of investing in human capital development to address skill mismatches and enhance labor market efficiency (England & Folbre, 2023). By focusing on education, vocational training, and skill-building programs, Uganda can improve the employability of its workforce and reduce unemployment rates (Olowookere et al., 2022). Moreover, the global context of unemployment trends underscores the urgency of addressing this issue, particularly in regions like Africa where unemployment rates are disproportionately high (Perrotta, 2021). Therefore, the purpose of this paper is to explore how the principles of the Neoclassical theory of unemployment can inform policies and interventions aimed at managing unemployment in Uganda and beyond, ultimately contributing to sustainable economic development and poverty reduction efforts on the continent (Farmer & Schelnast, 2021).

2. Literature review and hypothesis development

Theoretical literature review

The neoclassical theory of unemployment assumes that the labor market is in equilibrium when the supply and demand of labor are equal and that any deviation from this equilibrium is due to voluntary or frictional factors. According to this theory, human capital, which comprises the skills and health of workers, is a key determinant of labor productivity and employability. Higher levels of human capital are expected to reduce unemployment by increasing the compatibility between workers and employers. Physical capital, as determined by the Gross

Fixed Capital Formation, is another element that influences labor demand (GFCF). Higher GFCF indicates more investment in productive assets, which implies economic growth and job creation. Therefore, the neoclassical theory predicts a negative relationship between human capital, GFCF, and unemployment. However, the theory is less clear about the effects of population growth and inflation on unemployment. Population growth can have both positive and negative effects, depending on whether it stimulates aggregate demand or creates excess labor supply. Inflation, in the long run, is assumed to be neutral with respect to real variables like unemployment, but in the short run, it may affect unemployment through wage rigidity and real wage adjustment. The proposed model aims to test these theoretical hypotheses empirically, using data from Uganda. The model includes human capital variables (education expenditure, health expenditure, population growth) and control variables (GFCF and inflation) as explanatory variables, and unemployment as the dependent variable. These variables are chosen based on the neoclassical theory and the specific context of Uganda, where unemployment is a major socio-economic challenge. According to the latest data from the World Bank1, Uganda's unemployment rate was 5.8% in 2022, which was higher than the average of 4.6% for Sub-Saharan Africa. Moreover, Uganda's unemployment rate has been fluctuating over the years, reaching a peak of 9.4% in 20121. The causes and consequences of unemployment in Uganda are complex and multifaceted and require a comprehensive and rigorous analysis. The model seeks to provide such an analysis by examining the effects of human capital and other factors on unemployment, using appropriate econometric methods and techniques.

Empirical Literature Review

Relationship between Expenditure on education and unemployment

The relationship between expenditure on education and unemployment is multifaceted, with numerous factors influencing the labor market dynamics and employment outcomes. First off, education spending is generally recognized as a key factor in the development of human capital since it gives people the abilities, skills, and information required to contribute to society as productive members of the workforce (Singh & Shastri, 2020). As such, higher levels of education expenditure often correlate with a better-educated workforce, which in turn can lead to reduced unemployment rates (Bhattacharyya, 2019). Education not only enhances individuals' employability by providing them with relevant qualifications and training but also fosters innovation, creativity, and adaptability, enabling workers to meet the evolving demands of the labor market (Bashir & Amir, 2019). Consequently, countries that prioritize education expenditure tend to experience lower unemployment rates due to the higher quality and suitability of their workforce for available job opportunities.

Furthermore, expenditure on education plays a crucial role in addressing structural and frictional unemployment by reducing mismatches between labor supply and demand (Ayeni & Omobude, 2018). Structural unemployment arises when there is a disparity between the skills possessed by job seekers and those required by employers, leading to prolonged periods of job search and unemployment. By investing in education and vocational training programs that align with the needs of industries and sectors experiencing labor shortages, policymakers can mitigate skill mismatches and facilitate smoother transitions from education to employment (Binuomoyo, 2020). Moreover, education expenditure can enhance labor market flexibility by empowering individuals to adapt to changing economic conditions, technological advancements, and job market disruptions (Mallick & Dash, 2015). By equipping workers with transferable skills, critical thinking abilities, and lifelong learning capabilities, education expenditure can facilitate smoother labor market transitions and reduce the incidence of frictional unemployment caused by temporary job separations and search frictions.

Additionally, expenditure on education can have a positive impact on unemployment reduction through its broader socioeconomic effects on poverty alleviation, income inequality, and social mobility (Mallick et al., 2016). Education is not only an essential tool for individual empowerment and upward mobility but also a driver of economic growth, productivity, and competitiveness at the national level (Rathnasiri, 2020). By investing in education, governments can break the cycle of intergenerational poverty, improve access to economic opportunities, and create a more inclusive society where everyone has a fair chance to succeed (Chandra, 2010). Higher levels of educational attainment are associated with higher employment rates, lower unemployment rates, and higher earnings potential, thereby contributing to greater economic stability and prosperity (Agboola et al., 2018). Moreover, education expenditure can enhance social cohesion, civic

engagement, and political participation, fostering a conducive environment for sustainable development and job creation.

On the contrary, inadequate expenditure on education can exacerbate unemployment and perpetuate socioeconomic inequalities (Rathnasiri, 2020). Insufficient investment in education may result in a lack of access to quality educational opportunities, particularly for marginalized and disadvantaged populations, leading to lower levels of educational attainment and skill development (Mallick et al., 2016). This, in turn, can limit individuals' ability to compete in the labor market and secure gainful employment, perpetuating cycles of poverty and exclusion. Moreover, underfunded education systems may struggle to meet the evolving needs of the labor market, resulting in outdated curricula, inadequate facilities, and shortages of qualified teachers, further widening the gap between education and employment. Furthermore, the quality and effectiveness of education expenditure are crucial determinants of its impact on unemployment outcomes (Singh & Shastri, 2020). Simply increasing expenditure on education does not guarantee improved labor market outcomes if resources are misallocated or if educational programs fail to meet the needs of the economy and society. Effective education expenditure requires a holistic approach that encompasses not only increased funding but also reforms in curriculum development, teacher training, vocational education, and lifelong learning initiatives. Investing in education quality assurance mechanisms, monitoring, and evaluation systems can help ensure that resources are allocated efficiently and that educational outcomes align with labor market demands (Binuomoyo, 2020). Additionally, promoting equity and inclusivity in education expenditure by targeting resources toward disadvantaged groups, rural areas, and underserved communities can help address disparities in access to education and reduce unemployment among vulnerable populations.

Moreover, the link between education expenditure and unemployment is influenced by broader macroeconomic factors, such as economic growth, technological advancements, and labor market policies (Ali et al., 2022). While education expenditure is essential for building a skilled and adaptable workforce, it must be complemented by conducive macroeconomic conditions and supportive policy environments to translate into meaningful employment opportunities. For instance, countries experiencing stagnant economic growth, structural transformation, or technological disruptions may struggle to absorb an educated workforce, leading to higher unemployment rates despite increased education expenditure. Similarly, labor market policies, such as minimum wage laws, labor market regulations, and employment protection measures, can affect the demand for labor and the bargaining power of workers, influencing unemployment dynamics alongside education expenditure. Therefore, addressing unemployment requires a comprehensive approach that integrates education expenditure with macroeconomic policies, labor market interventions, and social protection measures to create an enabling environment for sustainable job creation and inclusive growth.

Relationship between Expenditure on health and unemployment

The relationship between expenditure on health and unemployment is intricate and multifaceted, encompassing various economic, social, and public health factors that influence labor market dynamics and employment outcomes (Maruthappu et al., 2015; Maruthappu et al., 2016; Qehaja et al., 2023). Firstly, investment in healthcare systems and services plays a crucial role in maintaining a healthy and productive workforce, thereby contributing to lower unemployment rates (Papanicolas et al., 2018). Access to quality healthcare services, including preventive care, treatment, and rehabilitation, can enhance individuals' overall health and well-being, reducing absenteeism, disability, and the prevalence of chronic diseases that may hinder their ability to work (Raghupathi & Raghupathi, 2020). By promoting a healthier workforce, expenditure on health can increase labor force participation, productivity, and job retention rates, ultimately leading to lower unemployment levels and greater economic prosperity.

Furthermore, expenditure on health can mitigate the adverse effects of illness, injury, and disability on employment outcomes, thereby reducing the incidence of involuntary unemployment (Maruthappu et al., 2016). Illnesses and disabilities can disrupt individuals' ability to work, limit their job opportunities, and lead to prolonged periods of unemployment, particularly among vulnerable populations with limited access to healthcare services (Piabuo & Tieguhong, 2017). Investing in healthcare infrastructure, medical treatments, and rehabilitation programs can help individuals recover from health setbacks more quickly, regain their ability to work, and reintegrate into the labor market. Moreover, expenditure on preventative healthcare measures, such as immunizations, screenings, and health education, can prevent the onset of diseases and

disabilities, reducing the burden of illness-related unemployment and promoting sustained workforce participation.

Additionally, expenditure on health can indirectly affect unemployment rates by influencing broader socioeconomic factors that shape labor market dynamics and employment opportunities (Yang, 2020). Healthy populations are more likely to be economically productive, contribute to economic growth, and create demand for goods and services, thereby stimulating job creation and reducing unemployment (Esen & Çelik Keçili, 2021). Moreover, investments in health can foster human capital development, improve educational attainment, and enhance labor market outcomes, as individuals with better health tend to have higher levels of educational attainment, higher earning potential, and greater job opportunities (CEBECİ & Ay, 2016). Furthermore, expenditure on health can reduce income inequality and poverty, as individuals with access to healthcare services are less likely to incur catastrophic healthcare costs or fall into financial distress due to illness, thereby reducing their vulnerability to unemployment and socioeconomic deprivation. Therefore, countries that prioritize expenditure on health as part of their broader economic and social development strategies are likely to experience lower unemployment rates and greater economic resilience in the face of health-related shocks and crises.

Moreover, expenditure on health can have a positive impact on unemployment by addressing structural barriers to employment and promoting social inclusion (Erasmus, 2021). Individuals with chronic health conditions or disabilities often face significant challenges in accessing employment opportunities and participating fully in the labor market (Oni, 2014). Investing in healthcare services, rehabilitation programs, and assistive technologies can help mitigate these barriers, enabling individuals with disabilities to overcome health-related limitations and engage in meaningful work. Moreover, expenditure on mental health services and psychosocial support can address the psychological barriers to employment, such as stigma, discrimination, and lack of support networks, which may prevent individuals from seeking or maintaining employment. By promoting the social inclusion and economic integration of individuals with health-related challenges, expenditure on health can expand the pool of available talent, increase labor market participation, and reduce unemployment rates.

Furthermore, the quality and accessibility of healthcare services are critical determinants of the impact of health expenditure on unemployment outcomes (Esen & Çelik Keçili, 2021). Inadequate healthcare infrastructure, healthcare workforce shortages, and limited access to essential health services can exacerbate health inequalities, increase the prevalence of preventable diseases, and impede individuals' ability to work (Piabuo & Tieguhong, 2017). Therefore, effective expenditure on health requires not only increased funding but also targeted investments in healthcare system strengthening, healthcare workforce development, and healthcare infrastructure expansion to ensure universal access to quality healthcare services. Moreover, investing in health promotion and disease prevention initiatives, such as nutrition programs, sanitation improvements, and health education campaigns, can reduce the burden of illness and disability, improve population health outcomes, and enhance workforce productivity and participation. By addressing the root causes of ill health and disability, expenditure on health can create a healthier, more resilient workforce that is better equipped to withstand economic shocks and disruptions, thereby contributing to lower unemployment rates and sustained economic growth.

Additionally, the link between expenditure on health and unemployment is influenced by broader macroeconomic factors, such as economic growth, fiscal policy, and social protection measures (Piabuo & Tieguhong, 2017). Countries with robust healthcare systems and social safety nets are better positioned to mitigate the adverse effects of health-related shocks, such as pandemics, epidemics, or natural disasters, on unemployment rates (Raghupathi & Raghupathi, 2020). Adequate expenditure on health can help countries build resilience to health crises, maintain social stability, and protect vulnerable populations from falling into poverty or unemployment during times of economic downturns. Moreover, investment in health can stimulate economic activity, create jobs in the healthcare sector, and spur innovation and technological advancements, thereby generating positive spillover effects on employment and economic growth. Therefore, a comprehensive approach to addressing unemployment requires integrating health expenditure with broader economic policies, social welfare programs and labor market interventions to promote inclusive growth, social equity, and sustainable development.

Relationship between population growth and unemployment

The relationship between population growth and unemployment is a complex and multifaceted phenomenon that is influenced by various demographic, economic, and social factors (Wang & Li, 2021; Obayori & Udeorah, 2020; GIDEON, 2017). Population growth can affect unemployment rates through its impact on labor supply, demand for goods and services, and labor market dynamics. On one hand, rapid population growth can lead to an expansion of the labor force, increasing the number of individuals seeking employment opportunities (Egessa, Nnyanzi, & Muwanga, 2021). This influx of workers can exert downward pressure on wages and increase competition for available jobs, resulting in higher unemployment rates, particularly in regions with limited job creation capacity or sluggish economic growth (Mukisa, Nathan, & Bulime, 2020; Bala, Ibrahim, & Hadith, 2020). Additionally, population growth can strain social infrastructure and public services, exacerbating unemployment challenges by stretching resources thin and hindering investments in education, healthcare, and other critical sectors that promote labor market participation and productivity (Bahadur, 2019; Kamarudin et al., 2018).

Conversely, population growth can also stimulate economic activity and job creation, thereby reducing unemployment rates under certain conditions (Maijama'a et al., 2019; Ali, Omar, & Yusuf, 2021). A growing population can create new markets, increase consumer demand, and drive investment in infrastructure, housing, and manufacturing sectors, generating employment opportunities across various industries (Al Faruq & Yuliana, 2023). Moreover, a younger population demographic, characterized by a higher proportion of working-age individuals, can fuel innovation, entrepreneurship, and productivity growth, leading to higher labor force participation rates and lower unemployment levels (Manuhuttu & Kimirop, 2019). In this context, population growth can act as an engine of economic development, driving GDP growth, expanding the tax base, and fostering long-term prosperity, provided that appropriate policies are in place to harness the potential of the growing workforce and channel investments toward job creation, skills development, and inclusive growth initiatives (Irawan, 2022).

However, the relationship between population growth and unemployment is not solely determined by demographic factors but is also influenced by broader economic and social dynamics, such as technological advancements, globalization, and labor market policies (Obayori & Udeorah, 2020). Technological innovations, automation, and digitalization, for instance, can disrupt traditional industries, displace workers, and create structural unemployment challenges, regardless of population growth trends (GIDEON, 2017). Moreover, globalization can affect unemployment rates by reshaping the global division of labor, outsourcing jobs to lower-cost locations, and increasing competition for skilled labor, thereby influencing employment patterns and labor market outcomes independent of population growth rates (Egessa et al., 2021). Similarly, labor market policies, such as minimum wage laws, unemployment benefits, and labor market regulations, can impact unemployment rates by affecting labor demand, labor supply, and the bargaining power of workers, irrespective of population growth dynamics (Mukisa et al., 2020). Therefore, understanding the relationship between population growth and unemployment requires considering a broad range of factors and adopting a nuanced approach that addresses the complex interplay between demographic trends, economic conditions, and policy interventions.

Moreover, the impact of population growth on unemployment varies across different regions and contexts, depending on factors such as urbanization, migration patterns, and resource availability (Manuhuttu & Kimirop, 2019). In rapidly urbanizing areas, population growth can exacerbate unemployment challenges by straining urban infrastructure, increasing competition for housing and public services, and concentrating unemployment in informal or low-skilled sectors (Obayori & Udeorah, 2020). Conversely, in rural areas experiencing population decline or stagnation, outmigration of working-age individuals can lead to labor shortages, declining productivity, and higher unemployment rates, particularly in sectors reliant on agricultural labor (GIDEON, 2017). Additionally, migration flows, both internal and international, can affect unemployment rates by redistributing labor supply and demand dynamics, altering local labor market conditions, and influencing wage levels and job availability in sending and receiving regions (Egessa et al., 2021). Thus, spatial and demographic characteristics that necessitate customized policy responses to address regional inequities and promote inclusive development impact the link between population increase and unemployment.

Additionally, demographic factors that impact labor force participation, productivity, and unemployment trends—like age structure, fertility rates, and dependence ratios—have an impact on the relationship between population growth and unemployment (Maijama'a et al., 2019). Countries with a youthful population demographic, characterized by a high proportion of young working-age individuals, may experience higher unemployment rates due to the challenges of absorbing large cohorts of new entrants into the labor market (Ali, Omar, & Yusuf, 2021). Conversely, countries with an aging population may face labor shortages, skill mismatches, and declining workforce participation rates, leading to labor market imbalances and structural unemployment challenges (Manuhuttu & Kimirop, 2019). Moreover, changes in fertility rates, family size, and household composition can impact labor supply dynamics, labor force participation rates, and the availability of caregivers, affecting unemployment outcomes for different demographic groups, such as women, youth, and older workers (Al Faruq & Yuliana, 2023). Therefore, understanding the demographic drivers of population growth and their implications for labor market dynamics is essential for designing effective policies to address unemployment and promote sustainable economic growth.

Additionally, population growth can interact with other socioeconomic factors, such as education, healthcare, and income inequality, to influence unemployment outcomes (Bahadur, 2019). Investments in education and skill development, for example, can enhance labor market participation, productivity, and employability, mitigating the adverse effects of population growth on unemployment by equipping individuals with the skills and qualifications needed to secure gainful employment (Kamarudin et al., 2018). Similarly, investments in healthcare and social protection programs can improve health outcomes, reduce absenteeism, and increase workforce participation rates, thereby bolstering the resilience of the labor market to population growth shocks and reducing unemployment rates (Irawan, 2022). Moreover, addressing income inequality and promoting inclusive growth can ensure that the benefits of population growth are equitably distributed, reducing social disparities, promoting social cohesion, and enhancing overall labor market outcomes (Maijama'a et al., 2019). Therefore, addressing unemployment requires a comprehensive approach that considers the interplay between population growth, demographic trends, and broader socioeconomic factors to foster inclusive and sustainable development.

3. Methodology

Model specification, data and estimation procedures

Empirical model

The functional form of the model conceptualizes the relationship between unemployment and its determinants:

$U = f(E, H, G, P, I)$ …… (i)

Where: U represents the unemployment rate; E represents expenditures on education (investment in human capital); H represents expenditures on health (investment in human capital); G represents Gross Fixed Capital Formation (investment in physical capital); P represents population growth; I represent the rate of inflation.

The functional form posits that unemployment is a function of these variables, with expected signs: E and H are expected to have a negative relationship with U (as they increase, unemployment decreases). G is also expected to have a negative relationship with U. The sign of the relationship between P and U is ambiguous. The long-term relationship between I and U is expected to be neutral, but it may have a short-term negative relationship.

Control variables

In our analysis, Gross Fixed Capital Formation (GFCF) and inflation are added as control variables to sharpen our insights into Uganda's unemployment. GFCF highlights the role of economic expansion and job creation through investment in physical assets, helping us differentiate the effects of human capital on employment from those of economic growth. Inflation is included to capture its influence on wages and the cost of living, which can temporarily sway unemployment rates. By controlling for these factors, we aim to isolate and understand the specific impact of education and health investments on unemployment, ensuring our findings reflect the nuanced interplay of these variables in the labor market.

Econometric Form

To empirically test these relationships, we can specify an econometric model. Assuming a linear relationship for simplicity, the model can be written as:

$U_t = \beta_0 + \beta_1 E_t + \beta_2 H_t + \beta_3 G_t + \beta_4 P_t + \beta_5 I_t + \varepsilon_t$ …….. (ii)

Where: $U_t$is the unemployment rate at time t. E_t, H_t, G_t, P_t, and I_t are the values of the respective variables at time t. β_0 is the intercept term. β1, β2, β3, β4, and β5 are the coefficients to be estimated. ϵ_t is the error term, capturing all other factors affecting unemployment not included in the model.

Description of the variables and model estimation

Unemployment: This is the dependent variable, which measures the percentage of the labor force that is unemployed in Uganda. It is measured as a share of the labor force that is without work but available for and seeking employment.

Education expenditure: This indicates the portion of Uganda's GDP that goes into education. It is expressed as a proportion of the overall amount spent by the general government on all fields (health, education, social services, etc.). It includes spending that is paid for by government transfers from outside sources.

Health expenditure: This measures the percentage of GDP that is spent on health in Uganda. It is a continuous variable that reflects the level of human capital investment in health improvement. It is expected to have a negative effect on unemployment, according to the neoclassical theory.

Population: This measures the total annual workforce of Uganda. It is measured as the total population between the ages of 15 to 64. It may have a positive or negative effect on unemployment, depending on the balance between labor supply and demand, as suggested by the neoclassical theory.

Gross fixed capital formation: This is a control variable, which measures the percentage of GDP that is invested in physical capital in Uganda. In addition to purchasing plants, machinery, and equipment, it also covers the construction of roads, railroads, and similar infrastructure, such as private residences, offices, hospitals, schools, and commercial and industrial structures. Land improvements include things like fences, ditches, drains, and the like. Current U.S. dollars are used for data.

Inflation: This control variable calculates the yearly percentage change in Ugandan general prices. The GDP deflator is used to calculate inflation. The rate of change in prices throughout the economy is shown by inflation, which is calculated using the GDP implicit deflator's annual growth rate.

4. Empirical Results and Discussion

Descriptive evidence of the study

To give an overview of the features of the data, descriptive statistics were condensed. This approach ensured the suitability of the data for estimation and mitigated the risk of producing inaccurate findings. It involved performing computations to summarize key statistical metrics such as the mean, minimum, maximum, and standard deviation. The data processing and analysis were conducted using the statistical software application STATA, version 14.

Table 1: Summary of study variables

Variable	Observations	Mean	Std Deviation	Minimum	Maximum
Unemployment	37	13.40541	8.731996	1	28
Educ. Expenditure	37	4.675676	5.260197	1	17
Health Exp.	37	6.837838	6.593404	1	20
GFCF	37	3.78e+09	3.53e+09	3.31e+08	1.07e+10
Population growth	37	3.094061	.2088564	2.712952	3.496469
Inflation	37	12.94595	9.547966	1	30

Source: Researchers' calculations with secondary data

The summary statistics suggest that there is considerable variability in the data, with some variables having relatively high means and standard deviations, while others are more concentrated. This variability is taken into account when analyzing the relationships between the variables. Additionally, the range of minimum and maximum values indicates that there are outliers in the data that could influence the analysis. To this effect, the study variables were log-transformed to reduce variability and also to interpret results easily

Pre-estimation diagnostic tests

Before estimating a model, statistical tests known as pre-estimation diagnostics are performed to make sure the variables chosen are suitable to be part of the model that will be estimated.

The test for multicollinearity

Multicollinearity is an econometric problem that arises when an independent factor in a multiple regression equation demonstrates a significant correlation with one or more other autonomous factors. The statistical significance of the affected factors in the model is undermined by multicollinearity. This investigation constructed a correlation grid between each independent factor and computed the variance inflation factor (VIF) for each factor to assess multicollinearity. The findings are displayed as follows:

Table 2: Pairwise correlation analysis results

	1	2	3	4	5	6
Unemployment (1)	1.0000					
Educ. Exp. (2)	0.2533	1.0000				
Health Exp. (3)	-0.0056	-0.0736	1.0000			
GFCF (4)	0.4525*	0.5099*	0.3235	1.0000		
Population grw.(5)	0.2187	0.2162	-0.4559*	0.0631	1.0000	
Inflation (6)	0.1222	0.0782	0.2522	0.2367	-0.3451*	1.0000

* Indicates significance at 0.05 level. Source: Researchers' calculations with secondary data

In evaluating the provided correlation matrix with reference to Gujarati and Porter's (2009) threshold for high correlation (±0.8), it is observed that none of the pairwise correlations among the variables - Unemployment, Educational Expenditure, Health Expenditure, Gross Fixed Capital Formation (GFCF), Population Growth, and Inflation - surpass this benchmark, suggesting an initial absence of severe multicollinearity concerns. However, given that moderate correlations do exist, particularly between Unemployment and GFCF (0.4525), and Educational Expenditure and GFCF (0.5099), a further in-depth analysis using the Variance Inflation Factor (VIF) is warranted to rigorously assess the impact of these correlations on the regression model. The VIF analysis would specifically identify if any of these moderately correlated variables, despite falling below the high correlation threshold, contribute significantly to multicollinearity. This step is crucial to ensure the stability and reliability of the regression coefficients in the model. Should the VIF results indicate significant multicollinearity, appropriate remedial measures, such as removing or combining variables, would be necessary. Conversely, if the VIF results do not reveal substantial multicollinearity issues, it would reinforce the suitability of the current model specification, allowing for a more confident progression to regression analysis

Table 3: VIF Results

Variable	VIF	1/VIF
LogGFCF	3.08	0.324608
LogEduc	1.93	0.519371
LogHealth	1.75	0.572246
LogINFL	1.69	0.590675
LogPOP	1.40	0.714625
Mean VIF	1.97	

Source: Researchers' calculations with secondary data

Based on the criteria set forth by Suleiman (2019), which posits that Variance Inflation Factor (VIF) values should be below 10 and tolerance values (1/VIF) above 0.2 to rule out concerns of multicollinearity in a regression model. The VIF values for all the variables in the table—LogGFCF, LogEduc, LogHealth, LogINFL, and LogPOP—range from 1.40 to 3.08. Notably, none of these values approach the threshold of 10, suggesting that multicollinearity is not a significant concern for any of these variables. This conclusion is further corroborated by examining the tolerance values (1/VIF), which all exceed the minimum recommended value of 0.2, with the lowest being approximately 0.325 for LogGFCF and the highest being around 0.715 for LogPOP.

Given these findings, it can be confidently concluded that the data does not exhibit multicollinearity issues that could potentially compromise the integrity and reliability of the regression model. Therefore, proceeding to model estimation is justified, as the variables included are unlikely to cause multicollinearity-related distortions in the analysis.

Stationarity tests on the model variables

The study employed the widely used Augmented Dickey-Fuller (ADF) test in the subsequent stationarity tests on model variables. This test is commonly used in academic literature. Through examining a null hypothesis, the ADF examination aims to ascertain the presence of a unit root within a provided time series sample. The null hypothesis remains unaltered if the test statistic (t-statistic) within the ADF is lower than the relevant critical value (at the 5% significance level). The search for unit roots at the variable and initial difference levels is shown in Table 4 below.

Table 4: ADF test results

ADF			
Variables	Levels	First difference	Integration
Unemployment	-2.403	-6.308***	I(1)
Educ. Exp.	-2.069	-3.860***	I(1)
Health Exp.	-1.181	-6.308***	I(1)
GFCF	-0.220	-5.069***	I(1)
Population grw	-2.704*	-4.312***	I(1)
Inflation	-2.664*	-7.834***	I(1)

Source: Researcher's computation using secondary data

The unit root test results presented in the redrawn table reveal a compelling pattern regarding the stationarity of the economic variables under study. It is observed that all the variables—Unemployment, Educational Expenditure, Health Expenditure, Gross Fixed Capital Formation (GFCF), Population Growth, and Inflation—are non-stationary at levels, as indicated by their respective ADF test statistics, which do not fall within the critical values for stationarity. However, upon differencing once (first difference), all these variables achieve stationarity, as evidenced by the highly significant ADF test statistics (denoted by *** for a 1% significance level). This uniform shift from non-stationarity at levels to stationarity at first difference indicates that each of these variables is integrated of order one, I(1). Given this uniformity in the order of integration across the variables, the study is positioned to adopt a modeling approach that effectively handles such characteristics.

Before proceeding to model estimation, it was imperative to conduct a cointegration test, despite the identified I(1) integration of all variables. For this, the Johansen cointegration test was utilized. The test's justification stems from its capacity to ascertain whether a long-term equilibrium relationship between the I(1) integrated variables exists. Cointegration suggests that, while individual series may be non-stationary over time, they move together in a way that their linear combinations are stationary, implying a meaningful long-term equilibrium relationship among them.

The Johansen cointegration test is particularly suitable for models with multiple time series, as it can test for the existence of multiple cointegrating vectors. This is a crucial step, especially in an econometric context, as economic variables often move together over the long term due to underlying economic forces.

Cointegration test

Given that all of the research variables were initially identified as unstable but eventually attained stability during differentiation, the findings imply that the variables may be forming a long-term relationship. The quality of variables showing a persistent link is known as cointegration. Therefore, it is essential to confirm that the study variables cointegrate. The Johansen test for cointegration was used in the study to determine this persistent connection.

Table 5: Results from the Johansen Cointegration test

Null Hypothesis	eigenvalue	Trace statistic	5% critical value
r ≤ 0		325.3803	94.15
r ≤ 1	0.98480	187.2194	68.52
r ≤ 2	0.91257	106.8004	47.21
r ≤ 3	0.77460	57.6339	29.68
r ≤ 4	0.64227	23.7102	15.41
r ≤ 5	0.40124	6.7844	3.76
r ≤ 6	0.18583		

Note: Sample: 1990 - 2022. Number of observations = 33. Lags = 4. Source: Author's calculations using stata14 based on World Bank annual data

The null hypothesis of no cointegrating relationship (r ≤ 0) shows a trace statistic (325.3803) that is substantially higher than the 5% critical value (94.15). This pattern of the trace statistic exceeding the critical value continues for all subsequent hypotheses (r ≤ 1, r ≤ 2, r ≤ 3, r ≤ 4, r ≤ 5), indicating rejection of these null hypotheses. However, there is no point in the table where the trace statistic falls below the critical value for any hypothesized number of cointegrating relationships.

This consistent pattern suggests that the null hypothesis of no cointegrating relationship cannot be rejected for any of the variables. In simpler terms, the results point to the absence of any stable long-term equilibrium relationship among the variables. Therefore, despite the initial indications of integration at order one (I(1)) for each variable, the Johansen cointegration test reveals that these variables do not move together in a way that their linear combinations are stationary.

Table 6: Model Estimation

	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
LogUNE						
LogUNE L4.	-.2208271	.1039756	-2.12	0.034	-.4246155	-.0170388
LogEduc L4.	-.1065122	.1212711	-0.88	0.380	-.3441992	.1311747
LogHealth L4.	-.3919375	.1344963	-2.91	0.004	-.6555454	-.1283296
LogGFCF L4.	.4872139	.1803976	2.70	0.007	.1336411	.8407867
LogPOP L4.	4.284547	1.8024	2.38	0.017	.7519087	7.817186
LogINFL L4.	.4238548	.1211932	3.50	0.000	.1863206	.6613891
_cons	-12.5199	4.026507	-3.11	0.002	-20.41171	-4.628095

Source: Researchers' calculations with secondary data

The lagged variable of unemployment with a coefficient of -0.22 significant at a 5% level, suggests a negative relationship with the current level of unemployment. Specifically, a one percent increase in unemployment in the previous period is associated with a 0.22 percent decrease in the current unemployment rate, holding all else constant. This also indicates a potential mean-reverting dynamic in the unemployment rate over time. The coefficient for the natural logarithm of education expenditure is -0.11 and is not statistically significant at

conventional levels (p-value of 0.380). This suggests that the model does not find robust evidence to assert that changes in education expenditure have a clear short-term impact on unemployment.

Conversely, the health expenditure variable is statistically significant with a coefficient of -0.39, implying that a one percent increase in health expenditure is associated with a 0.39 percent decrease in the current unemployment rate. With a statistically significant value of 0.487, the coefficient for the natural logarithm of Gross Fixed Capital Formation is positive. This suggests that the present unemployment rate will rise by 0.49 percent for every 1% increase in capital creation. The positive sign could be a result of a temporary displacement effect, in which more investment pushes labor demand aside in favor of capital-intensive output. Population growth also exhibits a positive and significant coefficient of 4.28, suggesting that a one percent increase in population growth leads to a 4.28 percent increase in the current unemployment rate. This substantial effect may reflect the increased labor supply that could outpace job creation, leading to higher unemployment.

The coefficient for inflation is 0.42 is statistically significant at the 1% level. This implies that a one percent increase in inflation leads to a 0.42 percent increase in the current unemployment rate. This result may be indicative of the adverse effects of inflation on the labor market, potentially through the distortion of wage and price signals or by affecting the real costs of hiring.

Post-estimation diagnostic tests

Serial correlation test

The study carried out the Breusch-Godfrey LM test for serial correlation. The null hypothesis under this test is *no serial correlation.* The null hypothesis is invalidated if the pertinent chi-square measure fails to satisfy the 5% importance benchmark. The investigation identified that the B-Godfrey examination's chi-square measure (0.462) lacked significance at the 5% threshold. Therefore, the null hypothesis remained unverifiable. Consequently, the scrutiny concluded that the model remained unaltered by sequential correlation. The findings are available in section below.

Breusch-Godfrey LM test for autocorrelation

lags(p)	chi2	df	Prob > chi2
1	**14.902**	**1**	**0.0001**

H0: no serial correlation

Heteroscedasticity test

The Breusch-Pagan assessment was utilized in the investigation to scrutinize the presence of heteroscedasticity. The null hypothesis posited by this examination states the absence of heteroscedasticity. The null hypothesis remains unverifiable if the chi-square value associated with this assessment lacks significance at the 5% significance threshold; conversely, if it does, the null hypothesis is rejected. The chi-square value (0.00) in this study was established as non-significant at the 5% threshold. Consequently, the null hypothesis of the examination could not be discarded. Thus, the inquiry concluded that the generated model did not display heteroscedasticity. Table 4.8 following provides more information on the outcomes.

```
Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
         Ho: Constant variance
         Variables: fitted values of LogUNE

         chi2(1)      =     4.56
         Prob > chi2  =   0.0328
```

Test for Normality of Residuals

To ascertain whether the residuals in the model adhered to a Gaussian distribution, the investigation utilized the Skewness & Kurtosis examination for Normality. Conformity with normality serves as the null hypothesis for this test. The null hypothesis remains unchallenged if the asymmetry, peakedness, and chi-square values lack significance at the 5% level. Conversely, if they do, the null hypothesis is refuted. The outcomes of the scrutiny are depicted below.

Skewness/Kurtosis tests for Normality

Variable	Obs	Pr(Skewness)	Pr(Kurtosis)	joint adj chi2(2)	joint Prob>chi2
r	37	0.9801	0.2374	1.48	0.4761

Source: Researchers' calculations with secondary data

Discussion

The effect of education expenditure on unemployment in Uganda.

The VAR model results suggest that changes in education expenditure do not have a statistically significant impact on the unemployment rate in the short term. This finding may seem counterintuitive to neoclassical theory, which posits that education expenditure should enhance human capital, increase labor productivity, and thereby reduce unemployment. There are several possible explanations for this finding. First, the returns to education in the labor market may take time to manifest. Second, the economy may not be able to absorb educated workers into productive employment due to factors such as macroeconomic instability or slow growth in job-intensive sectors. This finding suggests that simply increasing education expenditure may not be sufficient to reduce unemployment. Complementary reforms, such as improving the quality and relevance of education to meet labor market demands, enhancing the entrepreneurial capacity of the workforce, and ensuring macroeconomic policies that facilitate job creation, may also be necessary.

The effect of health expenditure on unemployment in Uganda.

The results reveal a statistically significant negative association between health expenditure and unemployment in Uganda. This aligns partially with neoclassical theory, which proposes that human capital investments, like health, improve labor productivity. Enhanced health can translate to higher worker productivity, reduced absenteeism, and potentially longer working lives, leading to a more efficient and productive workforce. This, in turn, can contribute to economic growth and potentially lower unemployment rates. Previous empirical studies support this finding, highlighting a positive link between health investments and labor market outcomes. Improved health fosters a more reliable and robust workforce, attracting investors and potentially stimulating job creation. In Uganda, where the disease burden hampers economic activity, this result emphasizes the dual importance of health expenditure: improving individual well-being and serving as a strategic human capital investment to facilitate economic development and reduce unemployment. The observed relationship is particularly relevant considering Uganda's struggles with infectious diseases and other health challenges that hinder labor productivity. This suggests that health interventions have the potential to unlock economic productivity and labor market participation, especially in sectors reliant on physical well-being.

The effect of Population on unemployment in Uganda.

The results exhibit a significant positive relationship between population and unemployment, indicating that a one percent increase in population size four periods earlier is correlated with a substantial increase in the current unemployment rate. This finding can be interpreted within the neoclassical theory of unemployment, which suggests that labor supply increases with population growth. If the labor demand does not keep pace due to rigidities in the labor market or slower economic growth, the natural result is increased unemployment. The scale of the coefficient suggests that in Uganda, the labor market may be experiencing substantial pressures from a growing population, which is not being fully absorbed into productive employment.

This relationship is reflective of broader demographic trends observed in many developing countries, where high population growth rates can outstrip job creation and economic development, leading to higher unemployment rates. In the Ugandan context, this finding underscores the challenges posed by rapid population growth, which can exacerbate unemployment if not matched by commensurate economic growth and job creation. It contributes to the current literature by quantifying the lagged effect of population growth on unemployment, emphasizing the need for policies that address both the supply side of the labor market through population management strategies and the demand side through sustained economic development

5. Conclusions, implications and policy suggestions

Merely increasing expenditure on education does not have a significant short-term effect on unemployment in Uganda, implying that the country's nature of education investment may be misaligned with the labor markets. However, it appears that the impact of education investment also takes longer to materialize beyond the period under review. Therefore, the government and policymakers should enhance the quality and relevance of education, especially vocational and technical education, to equip young people with skills that are in demand. Moreover, fostering collaboration between educational institutions and industry could help to align curricula with practical skills and job market needs.

Health investments can boost labor productivity and economic performance, and lower unemployment rates. Good health is essential for economic participation, meaning that health investments can generate economic returns through a more productive workforce. This finding implies that health expenditure is not only a social investment but also a strategic economic investment for Uganda's development.

The results demonstrate a strong positive effect of population growth on unemployment, highlighting the challenge of providing jobs for a fast-growing workforce. This poses a serious threat to economic stability and social cohesion if not handled well. The Ugandan government has a crucial challenge in creating employment opportunities at a speed that keeps up with or surpasses population growth. This requires a multi-faceted approach that involves economic policies aimed at boosting job creation, such as encouraging investment in labor-intensive industries, enhancing the business environment, and investing in infrastructure to unlock economic potential in underserved areas. There is also a need for effective population management policies, such as family planning and education, to ensure that population growth rates are sustainable and in harmony with economic growth rates.

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The Role of Artificial Intelligence on Market Performance: Evidence from Scientific Review

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Abstract: The study's primary purpose was to review studies on the role of artificial intelligence in market performance. Artificial intelligence significantly impacts market performance by providing data analysis, personalization, demand forecasting, pricing optimization, customer support automation, risk assessment, and enhanced decision-making capabilities. By leveraging artificial intelligence (AI) effectively, Businesses can improve their competitiveness, improve customer satisfaction, increase revenue, and achieve sustainable growth in the market. A thorough assessment of the literature was done, and screening standards were applied, all to improve the study. Based on the inclusion and exclusion criteria for the articles, data extraction was done by Preferred Reporting Items for Systematic Reviews and Meta-Analyses. 45 published articles were analyzed, and significant data was extracted. The review's findings collectively emphasize the crucial role of AI in enhancing market performance by improving sales, customer satisfaction, demand forecasting, pricing optimization, risk mitigation, and decision-making processes. As AI continues to advance, further research and practical implementations will likely uncover additional benefits and insights into its impact on market performance. To help more scholars understand and advance the numerous theories and models related to the topic, this concept overview provides guidance.

Keywords: *Artificial Intelligence, Marketing, Performance.*

1. Introduction

Today many technologies are making our world smarter by automating tasks, computing solutions, and improving efficiency. AI is one of them. Artificial intelligence is a technology that enables computers or machines as intellectual as humans, able to perform activities associated with those performed similarly to the human brain (Thilagavathy & Kumar, 2021). Emerging technologies provide competitive advantages to firms by facilitating the goods and services offered to the targeted customers (Balaji & Roy, 2017). With the advancement in the field of technology, the world has become a web of interconnected networks and Artificial Intelligence is finding its applications in different contexts in today's business scenario. Technological advancements have gone along the long side in the evolution of marketing and have strongly established that marketing can work with artificial intelligence (Siau, 2017). AI technology can help optimize and speed up many marketing tasks, improving customer experiences and driving conversions. However many marketers still do not understand the benefits of AI over traditional marketing software (Brenner, 2020). The use of AI in business opens opportunities for utilizing and analyzing large datasets that could not be analyzed using traditional methods and tools.

Artificial intelligence can also analyze different types and formats of data, structured, unstructured, and semi-structured, coming from different platforms and develop a recommendation based on the analysis, extensively supporting the decision-making processes in the organization (Serravalle & Pantano, 2021). AI helps organizations track real-time data to analyze and respond swiftly to customers' requirements (Wirtz J. et al., 2018). Artificial Intelligence through the program-based algorithm can automate the business process generate consumer and market insights, and learn insights from past data (Davenport & Ronanki, 2020). Artificial Intelligence Marketing (AIM) is a marketing approach that makes the best use of technology and market data to improve the customer experience (Jain & Aggarwal, 2020). AI is transforming the marketing landscape and will completely transform it shortly. Even though marketing is one of the most important commercial uses of AI today, and early adopters are striving to build value from it (Bughin, 2017). Artificial intelligence (AI) is revolutionizing the marketing landscape and will completely transform it in the near future (Shahid & Li, 2019).

AI-powered marketing solutions that are advanced and innovative can quickly adapt to changing business needs and provide communications and solution packages that are vital and profitable to relevant stakeholders (Epstein, 2018). According to Khoa (2021), the major drivers of digital transformation are increased

profitability and revenue, increased operational efficiency, competitive advantage, increased employee productivity, and increased overall customer satisfaction. According to previous research "When technology works on a personal level, it creates an endearing bond with the users, when marketers tap into such a bond, the potential for customer value creation is enormous" (Kumar, V., Rajan, B., Venkatesan, R., & Lecinski, 2019). Currently, marketing and artificial intelligence are being used in the world of business as a means to communicate with businesses and guide them on the way to achieving their goals (Tiwari, 2022). Another way to characterize AI is through its marketing and business applications, such as automating corporate processes, generating insights from data, or engaging customers and employees (Davenport &Ronanki, 2018).

There have been several other reviews conducted on the topic of applying artificial intelligence in marketing. These include: " Marketing Applications of Artificial Intelligence" by (Khajuria, 2023). "Marketing Practices using Artificial Intelligence" published by (Patience, 2023). "AI-Enabled Marketing Solutions in Marketing Decision Making" by (Ljepava, 2022). "Artificial Intelligence in Marketing" by (Chintalapati, 2022). Artificial intelligence's changing role in marketing by (Vlacic et al., 2021) even though still there may be a lack of reviews on the role of artificial intelligence in market performance. Reviewing articles on the role of AI on market performance can be important for various bodies, such as businesses, policymakers, and researchers and articles on this issue can help various bodies stay up to date with the latest developments in AI marketing, which can inform decisions, policies, and research in this field.

Research Questions

- What is the concept of artificial intelligence in marketing, and how does it work to improve marketing strategies?
- What is the impact of artificial intelligence on market performance and how does it compare to traditional methods of analysis?
- What are the key factors influencing the use of artificial intelligence in digital marketing, and how do they impact marketing outcomes?
- How does the use of AI affect various areas of marketing decision-making, and what are the implications for businesses?
- What are the academic and practitioner implications of research on this topic?

2. Theoretical and Empirical Review

Artificial Intelligence: Artificial intelligence (AI) is a type of technology that aims to simulate the decision-making and cognitive processes of the human brain. John McCarthy defined AI as "machines that can perform tasks that are characteristics of human intelligence" (Al-Ghamdi, 2021). Abidin & Triono (2020) defined AI as a computer science technology that can teach computers to understand and emulate human communication and behaviors. Authors such as Shabbir & Anwer (2015) argue that AI can be defined as the use of machines and computer programmers to accomplish human intellectual and creative tasks. Panch, Szolovits & Atun (2018), meanwhile, argue that AI exhibits certain behaviors that resemble human intelligence, and highlights planning, learning, reasoning, problem-solving, and knowledge representation. In turn, Gungor (2020) argues that AI is a generic term for various methodologies designed to provide computers with human-like abilities to see, hear, reason, and learn.

Impact of Artificial Intelligence on Market Performance

Marketing Operations: Some recent research has concentrated on direct marketing analytics employing support vector data description, one of the primary tasks is to witness the effects of AI, to drive operating proficiencies in marketing (Rekha et al. 2016). AI-driven environments in branding (Kumar et al., 2019), various real-time use cases of AI-powered marketing automation (Faggella, 2019b), AI's integration in marketing (Shahid & Li, 2019), sales forecasting, and the softer changes in occupations in sales and marketing (Yang & Siau, 2018). Marinchak (2018) asserts that practically every aspect of marketing might be impacted by the exponential rise in the use of AI-powered marketing.

Market Research Studies- The market research field has predominantly focused on understanding consumer behavior (Davenport, et al., 2020). A study by Wirth (2018) explored the application of AI in market research

and customer segmentation. Various research has looked into the effects of AI on B2B ideas (Paschen et al., 2019). AI in the evaluation of marketing strategies (Rekha, Abdulla & Asharaf, 2016).

Marketing Operations: One of the main objectives is to observe the effects of AI, recent research has focused on direct marketing analytics using support vector data description to increase operational efficiencies in marketing (Rekha, Abdulla & Asharaf, 2016). AI-driven environments in branding (Kumar, Rajan, Venkatesan & Lecinski, 2019). Various real-time use cases of AI-powered marketing automation (Faggella, 2019b), asserts that practically every aspect of marketing might be impacted by the exponential rise in the use of AI-powered marketing. Twenty real-world instances of how digital adoption has occurred is changing the process of making strategic decisions (STONE and JACOBS, 2020) and a quantitative study using the fuzzy logic for marketing segmentation problem.

Artificial Intelligence and Marketing Strategy: Business executives must assess the new facts about the situation and, if necessary, adapt their planned and emergent plans (Janssen, van der Voort & Wahyudi, 2017). AI crucial for strategic decision-making and competitive updates (Akter, Wamba, Gunasekaran, Dubey & Childe, 2016). AI capabilities help companies identify ideal market categories for CL and DF by analyzing cost structures and unique features (Weng, 2021). The company maintains cost positioning by collecting and examining marketing information, considering client preferences and distinguishing qualities (Mchergui, Moulahi Zeadally, 2021). AI enhances competitive pricing, differentiation, and cost management (Xie, Wu, Xiao & Hu, 2016). AI is transforming the marketing environment and will entirely change it in the near future (Shahid & Li, 2019b). The use of AI in marketing has been found to have the highest income potential and success rates, making it one of the most feasible areas for improvement (Fagella, 2019). According to Jain & Aggarwal (2020), "Marketers are capable of processing vast volumes of data and analyzing client expectations. With the aid of AI, it has become possible to guarantee consumer pleasure.

The speed with which this transition occurs will alter the general landscape of marketing in academia, research, and the commercial world. Organizations will have significant difficulty in adapting to the shifting environment of marketing. With the start of new-fangled technologies, businesses will need to train their personnel regularly. Working with AI is no longer considered science fiction, but rather a reality that will become a need for the existence (Shahid & Li, 2019b). AI is transforming the marketing environment and will entirely change it in the near future. Even though marketing is among the most crucial commercial uses of AI today, and early adopters are striving to build value from it (Bughin, 2017), there is a paucity of literature on this topic when two disciplines are integrated (Wierenga, 2010). AI is used in a diversity of business processes across numerous functional domains and business operations. One of them is marketing, which is regarded as the business's heart.

Influence of Artificial Intelligence in Digital Marketing: Digital marketing promotes a company's brand through various digital media, transforming traditional advertising methods and businesses' promotion strategies (Bughin, 2015). In light of this definition, the term "digital marketing" has become prevalent in the modern digital era (Muljono, 2018). Digital marketing encompasses consumer acquisition, preferences development, product promotion, customer retention, and sales growth (Purwana, & Rahmi, 2017).

AI in Marketing Decision-Making: AI is expected to revolutionize marketing by enhancing customer segmentation, providing personalized experiences, understanding consumers, and making predictions (Koehn, Lessmann & Schaal, 2020). Marketing data is unstructured and comes from various sources, including social media posts, behavioral data, app usage, geo-location services, transaction history, and browsing history. AI can cluster customers based on online behavior, preferences, and previous transactions, enabling data-driven marketing practices. This data enables personalized product recommendations, advertisement offerings, and precise targeting. Advanced technologies like virtual and augmented reality will enable companies to target customers with more realistic, visualized offerings in the future (Kartajaya, Setiawan & Kotler, 2021). Biometrics face recognition technologies enable personalized offerings by identifying customers and offering customized products or services using AI-enabled algorithms (Lee, Dabirian, McCarthy & Kietzmann, 2020).

3. Methodology and Review Process

Methodology: This article review aims to examine how artificial intelligence affects market performance by analyzing both theoretical and empirical literature. There are several different scientific literature reviews, such as structured reviews, bibliometric reviews, framework-based reviews, and meta-analysis reviews. Among these, the structured review approach was found to be the most appropriate for this article's objectives, as it allows for a thorough understanding of the role of artificial intelligence in market performance. Additionally, the review suggests potential areas for future research. This methodology is beneficial as it enables the reviewer to identify and highlight the theories and frameworks commonly used in artificial intelligence research.

Review Process: The PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) is a widely used framework for conducting and reporting systematic reviews and meta-analyses. The article selection process is a critical aspect of a systematic review, and the PRISMA framework guides how to conduct this process in a transparent and reproducible manner. The article selection and review process in PRISMA involves the following steps:

Identification of Relevant Studies: The first step is to identify all potentially relevant studies using a comprehensive search strategy. This involves searching electronic databases, reference lists, and other sources to identify all studies that meet the inclusion criteria.

Screening of Titles and Abstracts: The second step is to screen the titles and abstracts of all identified studies to determine their eligibility for being included in the review. This involves applying pre-defined inclusion and exclusion principles to each study to determine its relevance.

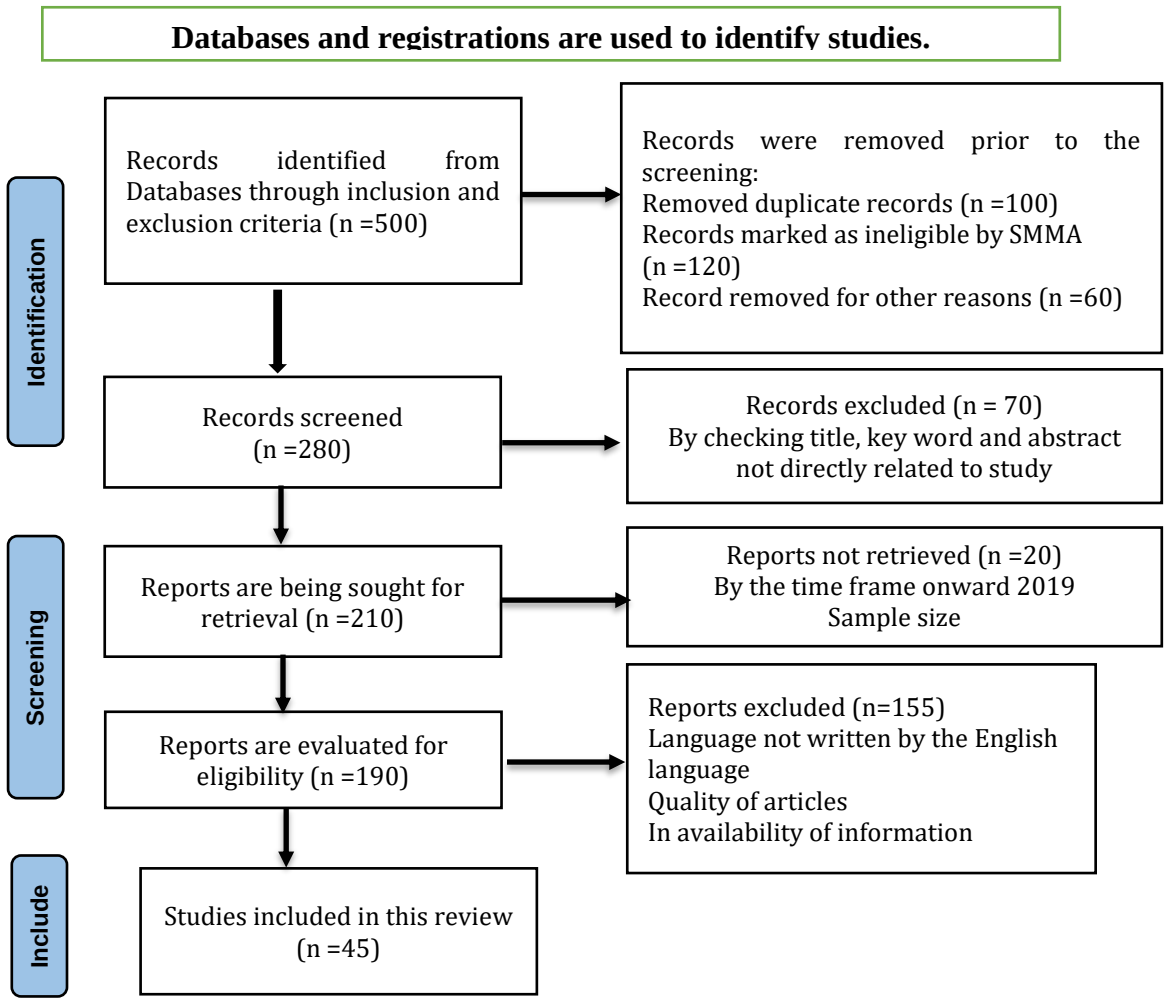
Full-Text Screening: The third step is to obtain and screen the complete text of all studies that meet the inclusion criteria identified in the first two steps. This involves a more detailed assessment of the study to determine if it meets all of the inclusion criteria and if there are any reasons to exclude it.

Data Extraction: The fourth step is to extract data from the included studies using a pre-defined data extraction form. The data extracted may include information about study design, participants, interventions, outcomes, and other relevant data.

Quality Assessment: The fifth step is to evaluate the quality of the included studies using a pre-defined quality assessment tool. This involves evaluating the jeopardy of bias in each study and assessing the overall quality of the evidence.

Data Synthesis: The final step is to synthesize the data extracted from the included studies. This involves summarizing the findings of each study and using statistical methods to combine the results of multiple studies to generate an overall estimate of the effect size estimation.

Figure 1: PRISMA



Source: Moher et al. (2009)

To conduct a structured review, a review protocol is developed to outline the criteria for selecting relevant studies. In this article review, the criteria used to determine whether a study would be encompassed in the search were language, year of publication, content, and relevance to the topic of AI and market performance. Only articles written in English, published between 2019 and 2023, and with a clear connection to the thematic focus were included in the review. This ensured that the literature review covered a comprehensive range of studies spanning about 5 years. Studies that did not meet these criteria, such as publications in Additional languages than English, pre-2019 publication dates, irrelevant content, duplicates, or those unrelated to the research question were omitted from the review. By applying these inclusion and exclusion criteria, the reviewer was able to efficiently and effectively achieve the objectives of the scientific review.

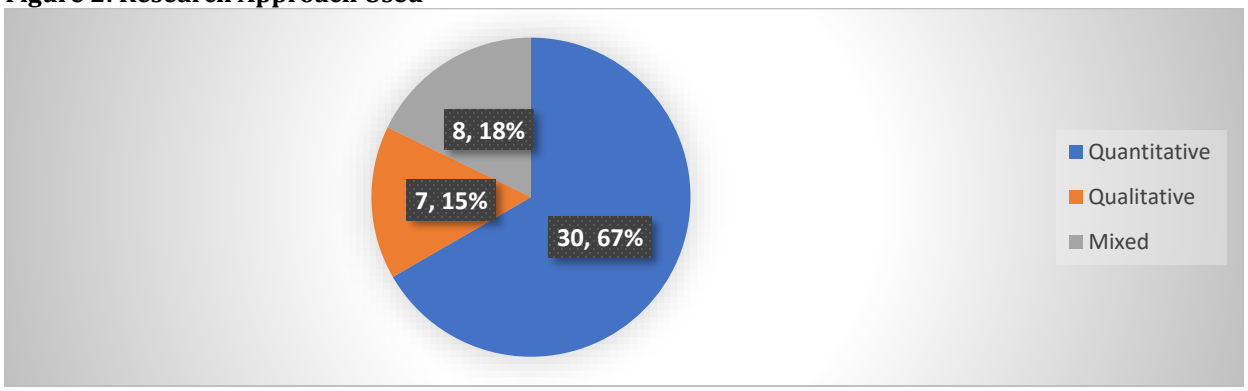
Selection of Databases: To gather relevant and up-to-date literature on the impact of online artificial intelligence and market performance, this review utilized various online sources. These sources included well-known databases such as Emerald Insight, Google Scholar, Wiley, Springer, Taylor & Francis, PubMed, and Science Direct. The search was conducted solely in the English language. By searching these databases, the reviewer was able to access a vast range of academic publications, including journals, articles, and other relevant literature. This approach ensured that the review was comprehensive and included the most current and pertinent studies on the topic of online AI and market performance.

Data Analysis: The analysis of the data gathered for this study was accompanied using a structured review methodology. A structured review is similar to a scientific review in that it aims to summarize the most recent

information and data pertinent to a particular research subject. However, it differs from a scientific review in that the information is organized in a contemporary and calculable way.

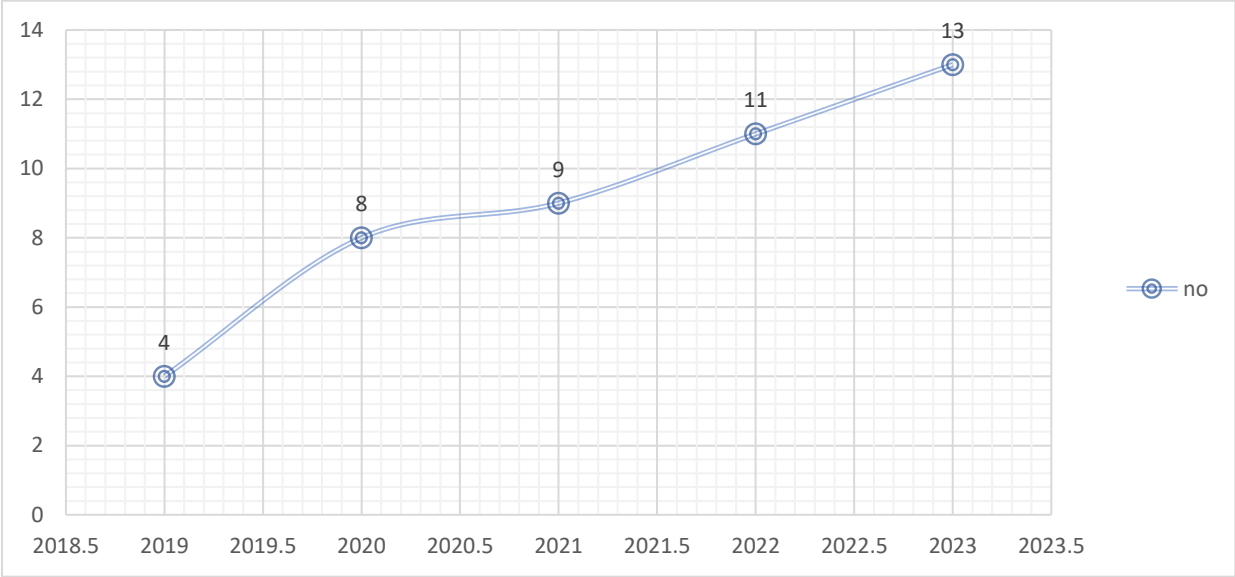
The Approach Used in the Reviewed Articles

Figure 2: Research Approach Used



In the study, a variety of research methods were used, including qualitative, quantitative, and mixed methods. After analyzing the data, it was found that a very small percentage of the examined publications (15%) used a purely mixed research strategy, while the majority (67%) used a quantitative research approach. Additionally, a small number of papers (15%) used a qualitative research approach, which combines both qualitative and quantitative methods. Based on these findings, it can be concluded that the subject matter of the examined publications was better suited to quantitative research methods

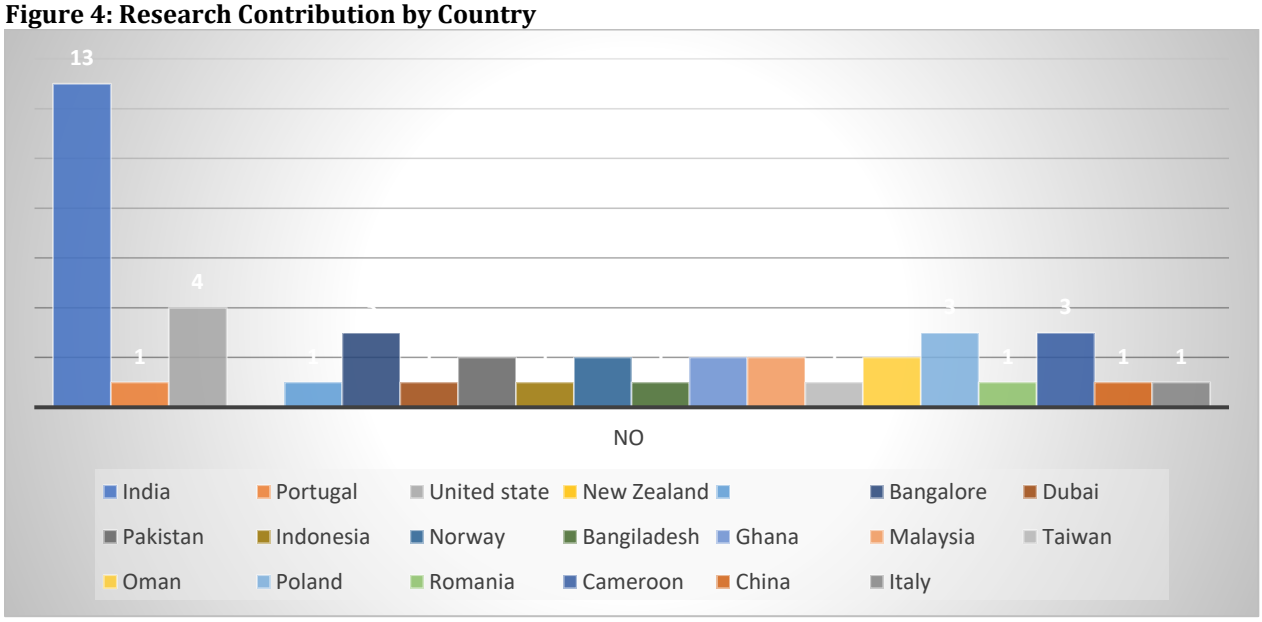
Figure 3: Year of Publication for Articles Included in the Review



The Figure displays the year of publication of the articles that were encompassed in the review. The data analysis revealed that there were varying numbers of publications released on the topic of AI's role in marketing performance between the years 2019 and 2023. The frequency of articles published on this topic has demonstrated an upward trajectory over time, with certain years exhibiting a greater volume of publications in comparison to others.

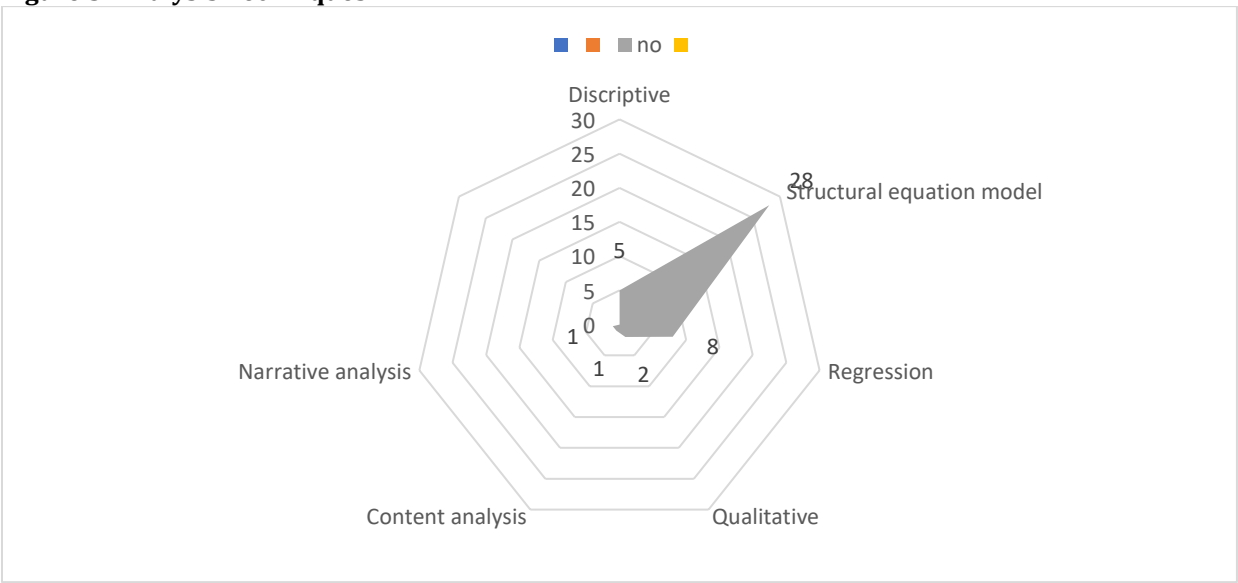
Regional Distribution of Papers Under Review

Figure 4: Research Contribution by Country



It appears to the extent that articles for the review on Artificial intelligence and market performance were collected from India, with 13 articles representing 28.8% of the total reviewed articles. The United States had the second-highest number of articles, with four articles representing 8.88% of the total. After that, the countries with the most articles were Bangalore, Poland, and Cameroon, each with three articles representing 6.6% of the total. Other countries such as Pakistan, Norway, Ghana, Malaysia, and Oman had two articles each, representing 4.4% of the total. Finally, the remaining countries (New Zealand, Dubai, Indonesia, Bangladesh, Taiwan, Romania, China, and Italy) had one article each, representing 2.2% of the total.

Figure 5: Analysis Techniques



Data Analysis Techniques: The analysis of the reviewed articles on Artificial intelligence and market performance indicates that Structural Equation Modeling (SEM) was the most commonly used analysis technique, with 28 articles (62.2%) utilizing this method. Regression analysis was the second most popular technique, used in 8 articles (17.7%), followed by descriptive analysis in 5 articles (11%). Two articles (2.2%) utilized qualitative techniques, and the remaining 1 article (2.2%) used content analysis and narrative analysis.

In summary, most of the articles on Artificial intelligence and market performance utilized structural equation modeling as their main analysis technique. This indicates that SEM is a popular choice for researchers studying this topic, possibly due to its ability to model complex relationships among multiple variables.

4. Results and Discussion

The systematic literature review introduces the existing literature on AI and marketing that might appeal to researchers, particularly those working in the domain of AI wishing to further explore marketing performance. Several research studies on the impact of AI on market performance have been conducted. The following findings have been presented and discussed: The study found that a positive impact of artificial technology, and market automation on digital marketing exists (Alkhayyat & Ahmed, 2022). Because of its relevance to present and future industries, artificial intelligence (AI) in marketing has gained popularity (Verma et al., 2021). Marketers using AI technology and techniques are more likely to run successful campaigns. AI enhances understanding of dataset relationships, assists in dynamic digital commerce, and enables decision models to predict events with higher precision, enabling one-to-one engagement and economic value(Alkhayyat & Ahmed, 2022). The results of the study emphasized the continuous evolution of AI to become more intelligent and smarter to augment human thinking. In modern times, marketing operations are data-driven, and the use of AI in the different themes of marketing has the ability to continuously learn and interpret the customers buying intents and emotions that help in future marketing efforts which leads to extreme automation and personalization (Khajuria, 2023).

AI's impact on predictive tasks requires solving tacit knowledge transfer challenges between models and marketing organizations to fully realize its potential in various domains (Bruyn et al., 2020). AI is essential in marketing by improving search engines, ads, content delivery, bots, learning, fraud prevention, image and voice recognition, sales forecasting, and customer segmentation (Thilagavathy & Kumar, 2021). Study highlights AI integration's influence on marketing, benefits, obstacles, company strategy, ethical considerations, and marketing industry use (Basha, 2023). Artificial intelligence plays a crucial role in anticipating the demand, customer choices and guided experiences to match customer expectations (Dulloo & Shahu, 2021). Artificial Intelligence has been treated as the next industrial revolution, people believe that artificial intelligence can provide a solution to most of the problems, and challenges that exist right now in the world (Nalini et al., 2021). The findings of this study indicate that competition will intensify as of increased AI capacity, which will lead to more niched and specialized products and brands. This implies that firms need to adapt to this at an early stage, to continue being an attractive choice for their customers (Hussain et al., 2022).

The findings indicate that digital marketing and artificial intelligence affect customer purchase intention (Busman & Ananda, 2022). Artificial intelligence and machine learning revolutionize marketing by enhancing storytelling, transforming interactions with information, technology, brands, and services, and enhancing digital marketing strategies (Sabharwal, 2022). AI has also played an important role in personalization, such that it helps marketers to know people in terms of classifying them with the type of products that they could be interested in (Sakib, 2022). The study highlights the AIM approach's importance in achieving financial, customer, internal, and growth performance using IoT, CDMS, VAR, and personalization (Abrokwah-Larbi, 2022). Studying cumulative models demonstrates that artificial intelligence is broadly brought into the advertising field; however, the applications are at the functional level (Sirajuddin & Jagannadharao, 2020). This investigation's conclusions indicate that upgrading AI helpers is also significant. Because each operator's search engine optimization has been optimized and saturated, the benefit of competition is reduced to a hygiene concern (MR, 2021). Embedded technologies, artificial intelligence, and automation have had a significant impact on the four Ps of marketing and will continue to do so (Zhang, 2022).

AI marketing solutions optimize and streamline campaigns while removing the possibility of human error (Kumari, 2021). Artificial intelligence enables digital marketers to understand their consumers' demands better to increase sales and revenues (Hadalgekar, 2023). To enhance company performance and, as a result, attain profitability and competitive advantage, the study suggests integrating AI into marketing operations (Basha, 2023). AI has an impact on all parts of the marketing mix, including both consumer value delivery and marketing organization and management (Krystyna & Grzegorz, 2019). AI-powered technologies can change organizations and boost marketing effectiveness (Devang et al., 2019). Chatbots, machine translation, and self-

learning algorithms are just a few examples of the many technologies that go under the umbrella term "AI," all of which can help people well understand their surroundings and take appropriate action (Wamba et al., 2020). To increase the competitiveness of the corporate core Heart and maximize the use of AI (Huang, Chang, Yeh & Liao, 2021). An important factor is a "creative-possibility perspective," which emphasizes the potential for using AI in the future for both logical and creative thinking objectives (Eriksson & Bonera, 2020).

Implications: The following are the implications for marketers, customers, and researchers: Marketers have a rare opportunity to investigate how Artificial Intelligence (AI) might improve their consumer engagement tactics in the quickly changing business environment of today. Given the wide-ranging applications of AI technology, marketers must devote time and money to evaluating various AI-based tactics that can give their customers individualized experiences. Organizations will benefit from this experimentation by remaining competitive and achieving long-term success now and in the future. To maximize their marketing efforts and enhance the overall consumer experience, marketers must seize this chance and investigate the potential of AI. Practically speaking, AI has a big impact on how markets perform. Marketers may gain a competitive edge by employing AI-based research to make data-driven decisions, optimize their marketing plans, and provide customers with personalized experiences. AI may assist marketers in locating new markets, forecasting demand, and fine-tuning pricing plans, all of which will enhance sales and profitability.

Businesses should spend money on AI technologies that can aid them. To find patterns and make decisions based on data, a lot of data must be analyzed. Predictive analytics, natural language processing, and machine learning methods can all be applied. The application of AI can have a big impact on a variety of marketing decision-making processes, resulting in better business performance and more effective and efficient marketing tactics. Businesses should invest in AI technologies, concentrate on developing a data-driven culture, and continuously hone and enhance their AI-based marketing tactics to fully benefit from AI. Overall, the availability of data, the complexity of the algorithms, the implementation cost, and ethical considerations are the main variables affecting the use of AI in digital marketing. Businesses should concentrate on gathering and analyzing data, assembling a team with a variety of expertise, investing in reasonably priced AI technologies, and creating clear ethical norms if they want to take advantage of AI's advantages in digital marketing.

5. Conclusion and Recommendations

Applications based on artificial intelligence (AI) have a promising future and will considerably advance marketing in terms of efficiency, client satisfaction, speed, problem-solving, and decision-making. Businesses will see enhanced brand loyalty and significant revenue growth as a result. Through the use of AI marketing solutions, businesses can provide highly individualized and personalized experiences to their customers, which enhances customer engagement, increases sales, and deepens customer loyalty. To fully benefit from AI's advantages in marketing, businesses should invest in AI technologies, focus on creating a data-driven culture, and continually hone and improve their AI-based marketing tactics. The use of AI in marketing is now a crucial component of corporate success and is revolutionizing how businesses approach client engagement. Businesses can gain a competitive edge by making data-driven decisions, optimizing marketing tactics, and providing customers with individualized experiences thanks to the availability of enormous amounts of data and the capacity to analyze this data using AI technology. AI has a major impact on market performance, including higher sales, enhanced profitability, and better client engagement and loyalty. Businesses should invest in AI technologies, concentrate on developing a data-driven culture, and continuously hone and enhance their AI-based marketing strategies to take advantage of the importance of AI in marketing. To create and implement efficient AI-based marketing solutions, a multidisciplinary approach involving cooperation between data scientists, marketers, and other professionals is necessary. To increase customer trust, it also entails addressing ethical issues and making sure that AI algorithms and decision-making processes are transparent.

Limitation and Future Research Direction: There are a number of limitations to the research on how AI affects market performance that need to be taken into account. The following are some of the primary obstacles that researchers encounter while examining how AI affects market performance: Lack of Historical Data: Because AI is a relatively new marketing technology, there is a lack of historical data on the effects of AI on market performance. It becomes challenging to identify trends and patterns that could inform marketing strategies as a result. Complexities of algorithms may be challenging for academics to evaluate AI algorithms'

effectiveness and impact on market performance due to their complexity and difficulty in comprehension. Limited Generalizability: Numerous AI-based marketing solutions are created for certain markets or industries, which can restrict their applicability to other markets or industries. Ethical Considerations: The usage of AI in marketing poses ethical questions about privacy and bias that could restrict the scope of research and force researchers to carefully weigh the ethical ramifications.

Implementation issues: Organizations, particularly small and medium-sized ones, may find it challenging to implement AI-based marketing solutions due to the cost and complexity of the technology. Human Factors: Even while AI may provide useful insights, it's important to remember that marketing is ultimately a human-driven activity. The success of marketing efforts based on AI depends on marketers' capacity to comprehend and put to use the data provided by AI. Even though research on the impact of AI on market performance is growing, there are a number of limitations that researchers must take into mind. To overcome these limitations, researchers should focus on building a strong theoretical framework, following tight research protocols, and collaborating with commercial partners to gain access to data and technology. By overcoming these restrictions, researchers may provide valuable information regarding the influence of AI on market performance and help businesses develop effective AI-based marketing strategies.

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Human Capital Development and Unemployment in Uganda: The Keynesian Theory of Unemployment in Perspective

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Abstract: This study delves into the dynamic relationship between human capital development and unemployment in Uganda, employing a Vector Error Correction Model (VECM) to analyze time series data on education and health expenditures as a percentage of GDP, Gross Fixed Capital Formation, and Government Consumption Expenditure. The study applied aggregated secondary data on an annual basis trenching from 1986 to 2022 and from the World Bank Development Indicators (WBDI). For data analysis purposes, the STATA software was utilized. The findings reveal a significant negative effect of education expenditure on unemployment rates in the short term, highlighting the critical role of educational investment in mitigating unemployment. Health expenditure is similarly beneficial in the long term, though its short-term effects are less pronounced. The results advocate for prioritizing educational spending in economic policies to foster sustainable employment growth. These insights are crucial for policymakers aiming to leverage human capital development as a means to counter unemployment and promote economic stability.

Keywords: *Human Capital Development, Unemployment, Keynesian Theory*

1. Background

Developed by British economist John Maynard Keynes in the 1930s during the Great Depression, the Keynesian theory of unemployment holds that unemployment results from a lack of aggregate demand in an economy (Kahn, 2022). Keynes argues that businesses lower production and then fire employees due to aggregate demand not meeting aggregate supply, which results in unemployment (Kahn, 2022). Keynes argued that in such situations, government intervention is necessary to stimulate demand through fiscal and monetary policies (Prasetyo & Cahyani, 2022). While monetary policies entail acts by central banks such as decreasing interest rates and increasing the money supply, fiscal policies involve government expenditure on welfare programs, public projects, and tax cuts (Prasetyo & Cahyani, 2022). By boosting demand, Keynes believed that unemployment could be reduced and the economy could be brought back to full employment equilibrium (Kahn, 2022). The Keynesian theory revolutionized economic thought and influenced government policies worldwide, particularly during times of economic downturns (King, 2022). The understanding of unemployment based on the Keynesian theory remains relevant today, especially in the context of global and regional unemployment trends (Cappelli et al., 2021).

As per the World Employment and Social Outlook Trends: 2024 (WESO Trends) report by the International Labour Organization (ILO), global unemployment experienced a slight decrease from 5.3% to 5.1% in 2023 (ILO, 2024). However, the scenario remains challenging, especially in Africa, where unemployment rates have consistently remained high (World Bank, 2023). Since 2020, Africa has seen unemployment rates hovering around 7.1%, indicating the gravity of the issue across the continent (World Bank, 2023). In 2022, African nations and occupied Palestine registered some of the world's highest unemployment rates, with South Africa topping the list at 29.8%, followed by Djibouti at 27.9%, West Bank and Gaza at 25.7%, Eswatini at 24.4%, and the Republic of Congo at 21.8% (World Bank, 2023). The situation worsened even worse in 2023, with worrisome unemployment rates reported in nations including Georgia (18.4%), South Africa (32.8%), Sudan (45.96%), and Ukraine (19.37%) (World Bank, 2023).

The development of human capital is essential for controlling unemployment in all countries (Kim, 2021). Investing in education, skills training, and healthcare improves the employability of individuals, thereby reducing unemployment rates (Kim, 2021). Various efforts have been employed by different nations to enhance human capital development and manage unemployment (Alfonsi et al., 2020). For instance, many developed countries offer comprehensive education and training programs, as well as robust social safety nets to support individuals during periods of unemployment (Alfonsi et al., 2020). Human capital development is prioritized in Africa by programs like the African Union's Agenda 2063, which views it as a vital component of job creation

and economic progress (Alfonsi et al., 2020). Uganda, for example, has implemented policies aimed at improving education quality, expanding vocational training, and promoting entrepreneurship to address unemployment (Nakirijja et al., 2020). These efforts align with the Keynesian theory, as they aim to increase aggregate demand by enhancing the productivity and employability of the workforce (Nakirijja et al., 2020). This study examines the relationship between unemployment, human capital development, and Keynesian theory, with an emphasis on Uganda (Adejumo et al., 2021). By examining global and regional unemployment trends, assessing efforts in human capital development, and linking them to Keynesian principles, this paper aims to provide insights into effective strategies for addressing unemployment in Uganda and similar contexts (Adejumo et al., 2021). Through a comprehensive examination of theory and practice, the paper seeks to contribute to the discourse on economic development and employment policy formulation in Uganda and beyond (Adejumo et al., 2021).

2. Literature review

Theoretical literature review

This study is informed by the Keynesian theory of Unemployment. The 1930s Great Depression saw the development of the Keynesian theory of unemployment by British economist John Maynard Keynes. This theory postulates that cyclical changes in output and employment levels can result from a lack of aggregate demand in the economy (King, 2022). Keynesian economics states that during recessions, individuals and companies may cut down on their spending, which lowers aggregate demand and, ultimately, lowers output and employment (Ogujiuba & Cornelissen, 2020). Keynes contended that government involvement through fiscal policy, especially through increased spending and tax breaks, might stimulate aggregate demand, raise economic activity, and lower unemployment at such times of economic slack (Kahn, 2022). The theory underscores the importance of government intervention in stabilizing the economy and promoting full employment, especially during periods of recession or depression (Prasetyo & Cahyani, 2022). In the context of Uganda, the Keynesian theory of unemployment is highly relevant as it highlights the role of government consumption and investment in addressing unemployment by stimulating aggregate demand and economic growth (MUSE, 2022).

However, the Keynesian theory has its limitations, including the potential for fiscal deficits, inflationary pressures, and crowding out of private investment when pursued excessively (Abbass et al., 2022). Additionally, the effectiveness of Keynesian policies in reducing unemployment may be constrained by factors such as supply-side constraints, structural rigidities, and external shocks, which can limit the impact of demand-side interventions on labor market outcomes (Mukisa et al., 2020). Despite these limitations, the Keynesian theory provides valuable insights into the dynamics of unemployment and the role of government policy in mitigating economic downturns, making it a relevant framework for understanding and addressing unemployment challenges in Uganda (Mathenge & Muturi, 2021).

Empirical literature review

Education expenditure and unemployment in Uganda

Education expenditure in Uganda significantly influences the unemployment landscape within the nation, marking a critical nexus between investment in human capital and labor market outcomes (Lawanson & Umar, 2020). The allocation of financial resources towards education holds immense potential to mitigate unemployment by fostering a skilled and adaptable workforce (Singh & Shastri, 2020). Uganda's commitment to education expenditure reflects its recognition of education as a fundamental driver of socioeconomic development (Lawanson & Umar, 2020). The government wants to improve human capital development by investing more in education so that people have the information and skills needed to find work and make a significant economic contribution (Lawanson & Umar, 2020). The correlation between education expenditure and unemployment is evident in various aspects of the education system, including infrastructure development, teacher training, curriculum enhancement, and vocational education initiatives (Azolibe et al., 2020). Moreover, Infrastructure development stands as a cornerstone of education expenditure in Uganda, with investments directed towards expanding and improving educational facilities nationwide (Robert et al., 2021). The construction of schools, classrooms, libraries, and laboratories not only enhances access to education but also creates employment opportunities within the construction sector (Alfonsi et al., 2020).

Moreover, upgraded infrastructure fosters a conducive learning environment, attracting more students to enroll and complete their education (Rasul et al., 2020). In rural areas, where access to education is often limited, infrastructure development initiatives play a crucial role in bridging the urban-rural divide and reducing disparities in educational opportunities (Rasul et al., 2020). Additionally, investments in information and communication technology (ICT) infrastructure facilitate e-learning initiatives, enabling students to access educational resources remotely and enhancing the quality of education delivery (Bandiera et al., 2023). By prioritizing infrastructure development, Uganda lays the foundation for a more inclusive and effective education system that equips students with the skills needed for gainful employment and economic empowerment.

Literature highlights that Monitoring and evaluation mechanisms play a critical role in assessing the effectiveness of education expenditure in Uganda and informing evidence-based policymaking and resource allocation decisions (Robert et al., 2021). Through rigorous monitoring and evaluation frameworks, the government evaluates the impact of education investments on key performance indicators such as enrollment rates, dropout rates, learning outcomes, and employment outcomes (Bandiera et al., 2023). Policymakers can address issues and inadequacies in the education system by gathering and evaluating data on education indicators, identifying areas for improvement, allocating resources wisely, and putting targeted initiatives into action (Bandiera et al., 2023). Furthermore, stakeholder engagement and participatory approaches to monitoring and evaluation foster transparency, accountability, and collaboration among government agencies, educational institutions, civil society organizations, and the private sector (Bandiera et al., 2023). By fostering a culture of evidence-based decision-making, Uganda enhances the efficiency and effectiveness of its education expenditure, ultimately contributing to the reduction of unemployment and the promotion of sustainable development.

Health expenditure and unemployment in Uganda

The relationship between health expenditure and unemployment in Uganda is multifaceted, reflecting the intricate interplay between public health outcomes and labor market dynamics. Health expenditure, defined as the financial resources allocated towards healthcare services and infrastructure, directly influences the health status and productivity of the population, which in turn impacts unemployment rates (Ndaguba & Hlotywa, 2021). Uganda's investment in health expenditure reflects its commitment to improving healthcare access, quality, and outcomes, to promote population health and enhance economic development (Somé, Pasali, & Kaboine, 2019). By allocating resources towards healthcare infrastructure, personnel training, medical supplies, and disease prevention programs, Uganda aims to address the underlying health determinants that contribute to unemployment, such as illness, disability, and reduced productivity (Arthur, 2015). Infrastructure development forms a critical component of health expenditure in Uganda, with investments directed towards the construction, renovation, and equipping of healthcare facilities across the country (Anowor, Ichoku, & Onodugo, 2020). The expansion of hospitals, clinics, health centers, and dispensaries improves access to essential healthcare services, particularly in rural and underserved areas where healthcare infrastructure is often lacking (Kamanda, Lanpin, & Sesay, 2022). Additionally, investments in medical equipment, laboratory facilities, and diagnostic tools enhance the capacity of healthcare providers to diagnose and treat diseases effectively, reducing morbidity and mortality rates (Kilanko, 2019). Furthermore, investments in telemedicine and e-health technologies facilitate remote healthcare delivery and patient monitoring, extending the reach of healthcare services to remote and marginalized communities (Faruk et al., 2022). By prioritizing infrastructure development, Uganda aims to strengthen its healthcare system, enhance health outcomes, and ultimately reduce unemployment by improving the health and productivity of its population.

Initiatives aimed at providing communities and individuals with the information, tools, and resources needed to make decisions regarding their health and well-being are fundamental parts of Uganda's health expenditure framework (Kilanko, 2019). Investments in health education encompass a wide range of activities, including community health campaigns, school-based health education programs, mass media campaigns, and peer education initiatives (Ndaguba & Hlotywa, 2021). These efforts promote health literacy, raise awareness about preventive measures, and encourage healthy behaviors such as regular exercise, balanced nutrition, vaccination, and hygiene practices (Kilanko, 2019). Moreover, investments in health promotion activities address social determinants of health such as poverty, gender inequality, environmental pollution, and inadequate access to clean water and sanitation, which disproportionately affect vulnerable populations and

contribute to poor health outcomes and unemployment (Arthur, 2015). By prioritizing health education and promotion, Uganda aims to empower individuals and communities to take charge of their health, reduce the burden of preventable diseases, and ultimately improve workforce participation and productivity. In addition, Research and innovation in healthcare constitute critical pillars of Uganda's health expenditure strategy, driving advancements in medical science, technology, and healthcare delivery that have profound implications for unemployment and economic development (Ndaguba & Hlotywa, 2021). Investments in health research support the discovery of new treatments, diagnostics, and preventive strategies for diseases, as well as the evaluation of existing healthcare interventions to determine their effectiveness and cost-effectiveness (Anowor, Ichoku, & Onodugo, 2020). Moreover, investments in research capacity building, infrastructure development, and collaborative partnerships with academic institutions and international research organizations strengthen Uganda's research ecosystem and position the country as a leader in health innovation within the region and beyond (Kamanda, Lanpin, & Sesay, 2022). Furthermore, investments in health innovation foster the development of local solutions to healthcare challenges, create opportunities for entrepreneurship and job creation in the health sector, and attract investment and talent to the country's burgeoning healthcare industry (Faruk et al., 2022). By prioritizing research and innovation in healthcare, Uganda aims to harness the transformative power of science and technology to improve health outcomes, drive economic growth, and create sustainable employment opportunities for its citizens.

Gross Fixed Capital Formation and Unemployment in Uganda

The relationship between Gross Fixed Capital Formation (GFCF) and unemployment in Uganda underscores the critical role of investment in physical capital and infrastructure in shaping labor market dynamics and employment outcomes (Pasara & Garidzirai, 2020). The gross fixed capital formation (GFCF) of an economy is the sum of all investments made over a certain time period in fixed assets such as buildings, machinery, equipment, and infrastructure (Meyer & Sanusi, 2019). GFCF is a major force behind Uganda's economic growth and development, with physical capital investments boosting the country's capacity for production, modernizing its industries, and raising productivity levels (Uneze, 2013). By allocating resources towards GFCF, Uganda aims to create a conducive environment for business investment, stimulate job creation across various sectors, and ultimately reduce unemployment through sustained economic growth and expansion.

Infrastructure development stands out as a central component of GFCF in Uganda, with investments directed towards the construction, maintenance, and improvement of transportation networks, energy systems, communication facilities, and other essential infrastructure assets (Ramey, 2020). The expansion of roads, highways, railways, airports, ports, and energy generation facilities not only enhances connectivity and access to markets but also reduces transportation costs, facilitates trade and commerce, and attracts investment to key economic sectors (Aprilianti et al., 2021). Moreover, investments in infrastructure create significant employment opportunities throughout the construction value chain, including laborers, engineers, technicians, and project managers, thereby reducing unemployment and stimulating economic activity. Furthermore, improved infrastructure supports the growth of industries such as manufacturing, agriculture, tourism, and services, leading to further job creation and economic diversification. By prioritizing infrastructure development as part of GFCF, Uganda aims to address structural bottlenecks, unlock growth potential, and create a conducive environment for sustainable job creation and poverty reduction.

Investments in human capital development represent a critical aspect of GFCF in Uganda, with expenditures directed toward education, healthcare, and skills training programs aimed at enhancing the productivity and employability of the workforce (Adejumo et al., 2021). Education expenditure focuses on improving access to quality education, enhancing learning outcomes, and equipping students with the knowledge and skills necessary to succeed in the labor market. Investments in primary, secondary, and tertiary education, as well as technical and vocational training, expand educational opportunities, reduce illiteracy rates, and prepare individuals for a wide range of employment opportunities. Additionally, investments in healthcare infrastructure, medical equipment, and healthcare personnel training contribute to improved health outcomes, reduced absenteeism, and increased labor force participation. Moreover, investments in skills training programs, apprenticeships, and vocational education initiatives bridge the gap between education and employment, providing individuals with practical skills and work experience that are directly applicable to the demands of the labor market. By prioritizing human capital development within GFCF, Uganda aims to build a skilled and healthy workforce, enhance labor productivity, and reduce unemployment through sustained

economic growth and development. Furthermore, To finance, build, and operate infrastructure projects and productive assets, public-private partnerships (PPPs) are essential to GFCF in Uganda. They do this by combining the resources and strengths of the public and private sectors (Nduhura et al., 2021). PPPs facilitate the mobilization of private sector investment, expertise, and technology to address infrastructure gaps, improve service delivery, and promote economic development. Through PPPs, Uganda can access additional sources of funding for infrastructure projects, reduce the burden on public finances, and allocate resources more efficiently towards priority areas. Moreover, PPPs foster innovation, risk-sharing, and accountability, leading to the timely delivery and cost-effective management of infrastructure assets. Additionally, PPPs create opportunities for job creation and skills development, particularly in construction, operations, and maintenance activities associated with infrastructure projects. By promoting PPPs as part of GFCF, Uganda aims to harness the potential of public-private collaboration to accelerate economic growth, enhance infrastructure quality, and create employment opportunities for its citizens.

Government consumption and unemployment in Uganda

The relationship between government consumption and unemployment in Uganda is intricate, reflecting the role of public spending in influencing aggregate demand, economic activity, and labor market conditions (James, Eria, & Ibrahim, 2023). Through its effects on investment, consumption, and the provision of public services, government consumption—which is the total amount of money spent by the government on goods and services for current use—plays a vital role in promoting economic growth and employment (Sinha, 2023).

In Uganda, government consumption encompasses spending on public administration, defense, education, healthcare, infrastructure, and social services, among other areas (James, Eria, & Ibrahim, 2023). By increasing government consumption, Uganda aims to stimulate aggregate demand, boost economic activity, and create employment opportunities across various sectors of the economy (Akhmad et al., 2022). However, the efficiency of public spending, the makeup of government spending, and the macroeconomic climate as a whole all affect how effective government consumption is at lowering unemployment (Chindengwike & Tyagi, 2022). Additionally, the effectiveness of public sector employment in reducing unemployment depends on factors such as the quality of public administration, merit-based recruitment and promotion practices, and the overall fiscal sustainability of the public sector. Government consumption also influences unemployment indirectly through its impact on macroeconomic stability, investor confidence, and business environment conditions (Uneze, 2013). High levels of government consumption may lead to fiscal deficits, inflationary pressures, and increased borrowing costs, which can negatively affect private sector investment, job creation, and economic growth (Pasara & Garidzirai, 2020). Moreover, inefficient or misdirected government spending may result in resource misallocation, rent-seeking behavior, and corruption, further undermining economic performance and employment prospects (Meyer & Sanusi, 2019). Therefore, while government consumption can play a crucial role in reducing unemployment through its impact on aggregate demand and public service provision, its effectiveness depends on the efficiency, effectiveness, and sustainability of public spending policies and practices (Muchira, 2018).

Inflation and unemployment in Uganda

In the field of macroeconomic policy and management, the relationship between inflation and unemployment in Uganda is a topic of great interest and relevance. A country's economic well-being is directly impacted by two crucial macroeconomic indicators: unemployment, which is the percentage of the labor force that is actively looking for work but is unable to find it, and inflation, which is defined as the consistent increase in the general price level of goods and services over time (Anguyo, Gupta, & Kotzé, 2020). Understanding the dynamics between inflation and unemployment is essential for policymakers in Uganda to formulate effective monetary and fiscal policies that promote price stability, sustainable economic growth, and full employment. The short-term inverse link between unemployment and inflation is depicted by the Phillips curve, which was first proposed by economist A.W. Phillips in the 1950s (Andyega, 2023). The Phillips curve states that inflation tends to be high and unemployment tends to be low. The Phillips trade-off, which implies that policymakers can achieve lower unemployment rates at the expense of higher inflation rates, or vice versa, through appropriate monetary and fiscal policies, is responsible for this relationship between inflation and unemployment (Jeza, Greyling, & Ilesanmi, 2021). However, the Phillips curve relationship has evolved over time, with various factors influencing the dynamics between inflation and unemployment, including supply shocks, changes in inflation expectations, and structural changes in the labor market (Elliot, 2015). In Uganda,

the Phillips curve framework provides valuable insights into the trade-offs and policy dilemmas faced by policymakers in managing inflation and unemployment, particularly in the context of economic stabilization efforts and development objectives.

In recent years, Uganda has experienced a combination of inflationary pressures and persistently high unemployment rates, posing challenges for policymakers in achieving macroeconomic stability and promoting inclusive growth (Munyambonera, Ndatira, & Mfite, 2023). Inflationary pressures in Uganda are often driven by a combination of domestic and external factors, including rising food and fuel prices, exchange rate fluctuations, supply chain disruptions, and monetary factors such as excessive money supply growth (Mawejje & Odhiambo, 2021). These inflationary pressures can erode the purchasing power of consumers, reduce real incomes, and exacerbate poverty and inequality, particularly among low-income households (Mawejje & Odhiambo, 2021). Moreover, high inflation rates can distort economic decision-making, reduce investment incentives, and undermine business confidence, leading to adverse effects on economic growth and employment creation (Mawejje & Odhiambo, 2021). Therefore, managing inflationary pressures is a key priority for policymakers in Uganda to ensure price stability, protect the welfare of the population, and promote sustainable economic development. To effectively manage inflation, policymakers in Uganda implement a combination of monetary, fiscal, and exchange rate policies aimed at controlling aggregate demand, managing supply-side constraints, and maintaining price stability (Mawejje & Odhiambo, 2021).

Exchange rate fluctuations can affect import prices, export competitiveness, inflation expectations, and monetary policy effectiveness, thereby influencing inflationary pressures and economic activity (Munyambonera, Ndatira, & Mfite, 2023). By implementing exchange rate policies that promote exchange rate stability, mitigate currency volatility, and maintain external balance, Uganda can reduce inflationary pressures, support export-led growth, and enhance investor confidence, thereby promoting sustainable economic development and job creation (Munyambonera, Ndatira, & Mfite, 2023). Additionally, exchange rate interventions and foreign exchange reserve management by the central bank can help stabilize the exchange rate, prevent currency crises, and mitigate external shocks, contributing to macroeconomic stability and employment growth in Uganda (Munyambonera, Ndatira, & Mfite, 2023). Therefore, a comprehensive approach to managing inflation and unemployment in Uganda requires coordinated efforts across monetary, fiscal, structural, and exchange rate policy domains to address underlying economic imbalances, promote sustainable growth, and improve living standards for the population.

3. Methodology

The study employs a research design predicated on identifying causal linkages. To explore the fundamental association among the variables in question, the study utilizes econometric techniques specialized in time series analysis.

Data and Data Sources

The study applied aggregated secondary data on an annual basis trenching from 1986 to 2022 and from the World Bank Development Indicators (WBDI). For data analysis purposes, the STATA software was utilized.

Specification of the Model, variable selection and Measurement of Variables

The investigation was informed by existing literature and theoretical frameworks within economics to select the independent variables and predict the directionality of their coefficients. Necessary alterations were incorporated to ensure relevance to the context of the current study, with consideration also given to the accessibility of pertinent data.

In examining the link between unemployment and human capital development, the study developed a linear regression model characterized by a dynamic specification. This approach was chosen to account for the dynamic behavior of human capital variables. Specifically, a Vector Error Correction Model (VECM) was specified for the study.
The functional form of the model is given by;

$$UE = f(Educ, Heal, Gfcf, GovtCons, Inf) \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \textit{(i)}$$

Where; Educ = Education expenditure as a percentage of GDP, representing the proportion of national output allocated to education; Heal = Health expenditure as a percentage of GDP, indicating the share of GDP devoted to health services; GFCF = Gross Fixed Capital Formation, measuring investment in physical assets; GovtCons = Government Consumption Expenditure, capturing public spending on goods and services; Inf = Inflation rate, reflecting the annual percentage increase in the general price level

The VECM form of the model is given as;

$$\Delta UE_t = \alpha_i + \sum i=1p-1\ \alpha_1 \Delta UE_{t-1} + \sum_i^p \beta_1 \Delta Educt_t + \sum_i^p \beta_2 \Delta Heal_t + \sum_i^p \beta_3 \Delta GFCF_t + \sum_i^p \beta_4 \Delta GovtCons_t + \sum_i^p \beta_5 \Delta Inf_t - \gamma\,(UE_{t-1} - \delta_0 - \delta_1 Educt_{t-1} - \delta_2\, Heal_{t-1} - \delta_3 GFCF_{t-1} - \delta_4 GovtCons_{t-1} - \delta_5 Inf_{t-1}) + \varepsilon_t$$

Where:

- Δ denotes the first difference of a variable, indicating short-term changes.
- α is a constant term.
- β_1 - β_5 are the short-term coefficients for lagged differences of the dependent variable and each of the independent variables, respectively.
- γ captures the speed of adjustment back towards the long-term equilibrium after a short-term shock.
- δ_1 - δ_5 βj are the long-term coefficients showing the equilibrium relationship between UE and each independent variable.
- ε_t is the error term.

This formulation allows for the analysis of both the short-term dynamics and the long-term relationship between unemployment and human capital development within a coherent econometric framework

4. Presentation and Interpretation of Findings

Descriptive evidence of the study

To give an overview of the features of the data, descriptive statistics were condensed. By doing this, it was possible to guarantee that the data was suitable for estimation and would not yield inaccurate findings. Specifically, a computation was made to summarize the values of the mean, minimum, maximum, and standard deviation. The statistical software application STATA, version 14, was used to process and analyze the data.

Table 1: Summary of study variables

Variable	Observations	Mean	Standard Deviation	Minimum	Maximum
Unemployment	37	13.40541	8.731996	1	28
Educ. Expenditure	37	4.675676	5.260197	1	17
Health Exp.	37	6.837838	6.593404	1	20
GFCF	37	3.78e+09	3.53e+09	3.31e+08	1.07e+10
Govt consumption	37	10.68802	2.967409	6.585332	16.79247
Inflation	37	12.94595	9.547966	1	30

Source: Researcher's computation using secondary data

Examining the descriptive statistics, we observe a general tendency of the data to cluster around the mean values, as indicated by the smaller standard deviations relative to the means. This suggests the data is largely representative of the underlying population. However, individual variables like GFCF, Inflation, and Unemployment exhibit higher variability, highlighting potential volatility in these aspects. While this could reflect the inherent dynamism of these factors, the relatively small sample size (37 observations) might also contribute to the larger standard deviations. To address this potential issue and facilitate analysis, the study employed log transformation on the variables, aiming to partially mitigate the observed variability and enhance the interpretability of the results.

Pre-estimation diagnostic tests

Pre-estimation diagnostics are statistical tests carried out before model estimation to ensure that the selected variables are fit to be included in the model to be estimated.

The test for multicollinearity

An econometric issue known as multicollinearity arises when an independent variable in a multiple regression equation has a significant correlation with one or more other independent variables. The statistical significance of the impacted variables in a model is compromised by the presence of multicollinearity. This study first created a correlation matrix between the independent variables and then estimated the variance inflation factor (VIF) for each independent variable to test for multicollinearity. The following results are displayed;

Table 2: Pairwise correlation analysis results

	1	2	3	4	5	6
Unemployment (1)	1.0000					
Educ. Exp. (2)	0.2093	1.0000				
Health Exp. (3)	0.1632	0.1573	1.0000			
GFCF (4)	0.4420*	0.6224*	0.5618*	1.0000		
Govt Consump (5)	0.2904	-0.2051	0.1302	-0.2651	1.0000	
Inflation (6)	0.3430*	0.2888	0.3846*	0.5675*	0.1764	1.0000

* Indicates significance at 0.05 level. Source: Researcher's computation using secondary data

Examining the correlation matrix, we observe both positive and negative relationships between unemployment and the other variables. On the positive side, moderate correlations exist between unemployment and Gross Fixed Capital Formation (GFCF) (0.4420) and education expenditure (0.2093). This suggests a potential link between increased investment and education with slightly lower unemployment, possibly due to enhanced economic activity and job creation. Additionally, a weak positive correlation between unemployment and inflation (0.3430) hints at the possibility that inflationary pressures might exacerbate job losses. On the negative side, government consumption exhibits a slightly negative correlation with GFCF (-0.2651). This implies that potentially, higher government spending might be associated with slightly lower private investment.

However, the most crucial aspect to consider is the potential for multicollinearity. While no correlations exceed the suggested threshold of 0.8 for concern (Gujarati and Porter, 2009), the strong positive correlations between GFCF and education expenditure, warrant further investigation. These high correlations could distort the estimated coefficients in a regression model. Therefore, before proceeding with such analysis, calculating Variance Inflation Factors (VIF) would be prudent to assess the severity of multicollinearity and potentially address it through appropriate statistical techniques.

Table 3: VIF Results

Variable	VIF	1/VIF
GFCF	4.02	0.248606
Health Exp	1.84	0.543360
Educ Exp	1.82	0.550359
Inflation	1.80	0.554786
Govt Consumption	1.48	0.675635
Mean VIF	2.19	

Source: Researcher's computation using secondary data

The VIF values for all variables (ranging from 1.48 to 4.02) comfortably fall below the suggested threshold of 10. This preliminary assessment suggests that none of the included variables exhibit concerning levels of multicollinearity. Further strengthening this conclusion, the tolerance values, calculated as the reciprocal of the VIF, all surpass the recommended minimum of 0.2. The lowest tolerance value observed is 0.2486 (for GFCF), while the highest reaches 0.6756 (for Govt Consumption). These figures also show that there is no undue inflation of each coefficient's variance as a result of correlations with other variables. We can declare with confidence that multicollinearity in this model is not a serious concern based on the VIF and tolerance analyses.

Stationarity tests on the model variables

The Augmented Dickey-Fuller (ADF) test, one of the stationarity tests most frequently used in academic literature, was employed in the study's subsequent stationarity tests on model variables. The purpose of the ADF test is to determine whether a unit root exists in a given time series sample by testing the null hypothesis. The null hypothesis cannot be rejected if the test statistic (t-statistic) within the ADF is less than the corresponding critical value (at the 5% significance level). As shown in Table 4 below, the study looked for unit roots at the levels of the variables as well as their initial differences.

Table 4.: ADF test results

ADF			
Variables	**Levels**	**First difference**	**Integration**
Unemployment	-2.403	-6.308***	I(1)
Educ. Exp.	-2.069	-3.860***	I(1)
Health Exp.	-1.181	-6.308***	I(1)
GFCF	-0.220	-5.069***	I(1)
Govt Consumption	-2.130	-4.429***	I(1)
Inflation	-2.664*	-7.834***	I(1)

Source: Researcher's computation using secondary data

The Augmented Dickey-Fuller (ADF) test results in the table reveal that none of the variables under examination exhibit stationarity at their levels, at the 5% significance threshold. This suggests the presence of unit roots, implying the means and variances of these variables wander over time, potentially invalidating traditional regression analysis. However, upon differencing, all variables achieve stationarity, as confirmed by the highly significant ADF test statistics in the first difference column. This uniform integration picture necessitates the use of an appropriate model like the Vector Error Correction Model (VECM), which effectively handles such scenarios and allows for robust and reliable estimation of the relationships between the variable

Cointegration test

The Augmented Dickey-Fuller (ADF) unit root tests revealed non-stationarity in all analyzed variables at their levels, implying the presence of stochastic trends. However, differencing once transformed the series into stationary I(1) processes, suggesting a potential long-run equilibrium relationship among them. This characteristic cointegration necessitates formal testing. Consequently, the Johansen cointegration test was employed to confirm the existence and nature of the long-run equilibrium relationship within the model.

Table 5: Results from the Johansen Cointegration test

Null Hypothesis	eigenvalue	Trace statistic	5% critical value
r ≤ 0		269.1424	94.15
r ≤ 1	0.97288	150.0969	68.52
r ≤ 2	0.84342	88.9088	47.21
r ≤ 3	0.74885	43.3130	29.68
r ≤ 4	0.58248	14.4901*	15.41
r ≤ 5	0.35528	0.0049	3.76
r ≤ 6	0.00015		

Note: Sample: 1990 - 2022. Number of observations = 33. Lags = 4. Source: Author's calculations using stata14 based on World Bank annual data

Model estimation

	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
D_LogUNEM						
_ce1						
L1.	-.121564	.0428806	-2.83	0.005	-.2056085	-.0375196
LogUNEM						
LD.	.1208073	.154977	0.78	0.436	-.1829421	.4245566
L2D.	-.0642646	.149828	-0.43	0.668	-.357922	.2293929
LogEDUC						
LD.	-.4641897	.1499194	-3.10	0.002	-.7580262	-.1703531
L2D.	-.3290445	.1178058	-2.79	0.005	-.5599395	-.0981495
LogHEAL						
LD.	.0652185	.1953151	0.33	0.738	-.3175921	.4480291
L2D.	-.0299352	.2191574	-0.14	0.891	-.4594758	.3996055
LogGFCF						
LD.	1.83866	.8829821	2.08	0.037	.1080466	3.569273
L2D.	-.5180523	.6708292	-0.77	0.440	-1.832853	.7967488
LogGOVTEXP						
LD.	1.749178	.5884558	2.97	0.003	.5958254	2.90253
L2D.	-.549672	.6366188	-0.86	0.388	-1.797422	.6980779
LogINFL						
LD.	-.2760153	.1194205	-2.31	0.021	-.5100752	-.0419555
L2D.	-.1493587	.1400159	-1.07	0.286	-.423785	.1250675
_cons	.1293287	.1259838	1.03	0.305	-.117595	.3762524

Post-estimation diagnostic tests

Serial correlation test

The Breusch-Godfrey LM test for serial correlation was used in the investigation. There is no serial association, which is the null hypothesis for this test. The null hypothesis is rejected if the corresponding chi-square value is not significant at the 5% threshold of significance. The B-Godfrey test's chi-square value (0.462), according to the study, was not significant at the 5% level. It was therefore impossible to reject the null hypothesis. Thus, the investigation concluded that serial correlation was not an issue for the model. The outcomes are displayed in below.

Breusch-Godfrey LM test for autocorrelation

lags(p)	chi2	df	Prob > chi2
1	**14.902**	**1**	**0.0001**

H0: no serial correlation

Heteroscedasticity test

The Breusch-Pagan test was used in the study to determine whether heteroscedasticity was present. In this test, the absence of heteroscedasticity is the null hypothesis. The null hypothesis cannot be rejected if the chi-

square value related to this test is not significant at the 5% level of significance; otherwise, it is rejected. The chi-square value (0.00) in this investigation was found to be non-significant at the 5% level. Therefore, it was not possible to reject the test's null hypothesis. Thus, the study concluded that there was no heteroscedasticity in the calculated model. The outcomes are shown below.

```
Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
         Ho: Constant variance
         Variables: fitted values of LogUNE

         chi2(1)      =     4.56
         Prob > chi2  =   0.0328
```

Test for Normality of Residuals

The Skewness & Kurtosis test for Normality was utilized in the study to verify if the residuals in the model had a normal distribution. Normalcy is the test's null hypothesis. The null hypothesis cannot be rejected if the chi-square value, skewness, and kurtosis values are not significant at the 5% significance level. If not, it is rejected. The outcomes are shown in Table below.

Skewness/Kurtosis tests for Normality

Variable	Obs	Pr(Skewness)	Pr(Kurtosis)	joint adj chi2(2)	joint Prob>chi2
r	37	0.9801	0.2374	1.48	0.4761

Test for Model Stability

The predicted model's stability was verified through testing in the study. There was use of the Cumulative Sum (CUSUM) tests. Recursive regression residuals displayed against potential model breakpoints within critical boundaries of 5% significance form the basis of this test. If the residuals' CUSUM is within the 5% crucial boundaries, the model is stable. The test results are shown in Figure 2 below as a graph.

Discussion of results

Education Expenditure: The coefficient for education expenditure (LogEDUC) is negative, indicating that, as the percentage of GDP allocated to education increases, unemployment tends to decrease. The z-value is statistically significant ($p < 0.05$), which means this result is unlikely to be due to chance. This finding supports the Keynesian perspective that investment in human capital can potentially reduce unemployment by improving the employability and productivity of the workforce. Health Expenditure: The coefficient for health expenditure (LogHEAL) is also negative but not statistically significant ($p > 0.05$), suggesting that there is no clear evidence from this model that changes in health expenditure as a percentage of GDP have a significant impact on unemployment rates in Uganda. This may imply that health investment does not have an immediate or direct effect on the job market, although it could have long-term benefits for labor productivity and economic growth.

Gross Fixed Capital Formation: The positive coefficient for Gross Fixed Capital Formation (LogGFCF) suggests that an increase in investment in physical assets is associated with an increase in unemployment, which is counterintuitive. This result is significant at the 5% level. A possible interpretation is that capital-intensive investments may not immediately translate into job creation if they are not matched by sufficient demand or if they lead to labor-saving technological advancements.

Government Consumption Expenditure: Government Consumption Expenditure (LogGOVTEXP) has a positive and significant effect on unemployment ($p < 0.05$). This could indicate that an increase in public spending on goods and services is not effectively reducing unemployment. This may reflect inefficiencies in government spending or the possibility that government consumption is not translating into productive job-creating activities.

Inflation Rate: the negative coefficient for the inflation rate (LogINF) is significant ($p < 0.05$), indicating that higher inflation is associated with lower unemployment. This could be consistent with the short-run Phillips Curve, which suggests an inverse relationship between inflation and unemployment. However, this relationship is complex and may not hold in the long run.

5. Conclusion and Recommendations

Conclusion: The negative relationship between education expenditure and unemployment in Uganda underscores the value of increasing investment in education. Enhanced educational funding can boost the skill level of the workforce, making them more employable and promoting job creation. It is recommended that the government prioritize education in budget allocation to improve long-term economic prospects through a skilled labor force.

Health expenditure did not directly impact unemployment rates in the ARDL model. Nonetheless, a healthy workforce is fundamental to a productive economy. Therefore, continued investment in healthcare is advised, potentially boosting job opportunities in the health sector and ensuring a healthier, more efficient workforce.
The unexpected positive association between physical capital investment and unemployment signals a need for a nuanced approach that harmonizes capital and human capital development. Policies should encourage investment in both physical assets and the labor force to ensure that economic growth benefits a broad base of the population through job creation.

Policy recommendations: Firstly, the government should enhance allocations to the education sector. By prioritizing educational spending, Uganda can cultivate a more skilled workforce that is adaptable and equipped for the modern job market. This policy could focus on not only expanding access to education but also on improving the quality and relevance of the curriculum to meet the current and future needs of the economy.

Secondly, despite the lack of a significant direct link between health expenditure and unemployment, investing in health remains a strategic choice. A healthy population is more productive and can engage more effectively in economic activities. Therefore, increasing the budget for health could indirectly contribute to reducing unemployment by improving overall worker productivity and possibly stimulating job creation within the health sector itself.

Lastly, a dual focus on both Gross Fixed Capital Formation and human capital is essential. The government should encourage investments in technology and infrastructure that complement the workforce, avoiding a scenario where technological advancement leads to job displacement. Incentivizing industries that employ labor-intensive methods or that support employment through their supply chains can ensure that investment in physical capital also expands employment opportunities.

Implementing these recommendations requires an integrated approach, where education and health are not viewed in isolation but as parts of a comprehensive strategy for economic growth and development. By focusing on human capital development through these policy measures, Uganda can build a foundation for a more robust and inclusive economy.

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Stakeholder Involvement and Team Capacity on the Performance of Rural Electrification Projects in Southwestern Uganda

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Abstract: This research delves into the dynamics of stakeholder involvement and team capacity in shaping the success of rural electrification projects in Southwestern Uganda. The study adopted a cross-sectional design using a quantitative approach. Data was collected from a population of 38 rural electrification projects in Southwestern Uganda. A sample of 34 projects was determined using Krejicie and Morgan's Table 1970, and these were selected through simple random sampling. Findings indicate significant positive relationships between stakeholder involvement, team capacity, and project performance. The analysis reveals that 41.9% of the variations in project performance are explained by stakeholder involvement and team capacity, with 58.1% unaccounted for, signaling potential avenues for future research. The study concludes by advocating for strategic interventions that prioritize stakeholder engagement and team capacity in rural electrification projects in Southwestern Uganda. Therefore, it is important to emphasize the critical role of engaging stakeholders and enhancing team capabilities for successful rural electrification projects.

Keywords: *Rural electrification, stakeholder involvement, team capacity, project performance*

1. Introduction

In Uganda, the landscape of electrification projects reveals a substantial urban-rural disparity, emphasizing the need for a closer examination of the challenges impeding progress. The International Trade Administration's (2023) data highlights a significant contrast, with 57.2% of urban Ugandans having access to electricity compared to a mere 10% in rural areas, resulting in a national average of 22.1%. This stark reality necessitates a comprehensive understanding of global rural electrification rates, wherein countries like Norway and Sweden exhibit high success, while numerous African nations, including Uganda, grapple with electrification of remote areas (Clark, 2017; Trotter et al., 2019; Hansen & Xydis, 2020). Our research delves into the dynamics of rural electrification in Southwestern Uganda, specifically investigating the intertwined effects of stakeholder involvement and team capacity on project performance (Mubarok, 2017; JOSEPH, 2023).

Stakeholder engagement and effective team capacity emerge as pivotal elements in the success of rural electrification initiatives. In the realm of electricity projects, stakeholders encompass diverse entities, ranging from local communities and government bodies to non-governmental organizations and private enterprises (Nederhand & Klijn, 2019). Their collective involvement proves instrumental in shaping project goals, securing resources, and navigating regulatory frameworks. Simultaneously, the competence and cohesion of project teams play a crucial role in surmounting the inherent challenges of electrification efforts (Lehtinen & Aaltonen, 2020). Examining instances in Uganda, our study uncovers scenarios where stakeholder engagement and robust team capacity propelled success. Community-driven initiatives, actively involving local residents and leveraging their regional insights, exhibited heightened sustainability (Masika, 2020). Conversely, projects facing team capacity issues or internal conflicts encountered setbacks (Englund & Graham, 2019). Through an exploration of these dynamics, our research provides insights into the intricate interplay between stakeholder involvement, team capacity, and the outcomes of rural electrification projects in Southwestern Uganda (Gómez-Hernández et al., 2019).

This study makes a substantive contribution to the existing body of knowledge on rural electrification in Uganda by unraveling the combined impact of stakeholder involvement and team capacity. Unlike previous research, which often scrutinized these factors in isolation, our approach dissects the complex interdependencies defining project success (Stritzke et al., 2021). By concentrating on Southwestern Uganda, we acknowledge the region's unique contextual factors influencing electrification efforts (Lo & Kibalya, 2023). Through an in-depth analysis of case studies and empirical data, our research aims to offer a nuanced understanding of the challenges and opportunities associated with rural electrification. Ultimately, we aspire

to furnish actionable recommendations informing policy decisions, project management strategies, and future research in the broader domain of sustainable rural electrification (Leary et al., 2019; Backe et al., 2021).

2. Review of Existing Literature

Stakeholder Theory: A Balancing Act

Drawing inspiration from Harrison, Barney, Freeman and Phillips (2019), our study aligns with the Cambridge Handbook of Stakeholder Theory, providing a comprehensive understanding of the relationships organizations maintain with stakeholders. Stakeholder theory, as discussed by Freeman (2023) and Friedman and Miles (2002), emphasizes the moral and strategic perspectives. Freeman's (2023) work, housed in Selected Works on Stakeholder Theory and Business Ethics, deepens our understanding of the political dimensions inherent in stakeholder theory, offering future directions for exploration. The moral view, articulated by Freeman (1984) and Mitchell et al. (1997), posits that stakeholders impacted by organizational operations have a rightful claim to information and can demand certain standards of performance. This theory, grounded in strategic and moral considerations, provides a comprehensive framework to navigate the complex landscape of rural electrification projects, where ethical considerations and strategic imperatives intersect.

The synthesis of stakeholder theory, stewardship theory, and insights from Pinto (2019) forms a robust theoretical foundation for understanding how knowledge, skills, and abilities possessed by stakeholders and team members influence the performance of rural electrification projects. This blend of paradox theory, stakeholder theory, and stewardship theory offers a comprehensive framework to navigate the complexities inherent in electrification initiatives. By integrating these theories, our study provides a nuanced understanding of the intricate dynamics shaping the success of rural electrification projects, shedding light on the collective responsibility of top management, the delicate balancing act required in stakeholder relationships, and the autonomy and trust crucial for effective project performance.

Combined Impact of Stakeholder Involvement, Team Capacity, and Success in Rural Electrification Projects: The exploration of stakeholder involvement, team capacity, and project success in rural electrification projects unfolds across diverse global contexts, with studies offering nuanced insights into the interplay of these factors. Mubarok's (2017) research on the Capacities and Accountabilities of Stakeholders in Indonesia's Rural Electrification Program serves as a foundational pillar in understanding the complexities of rural electrification. The study, conducted at Eindhoven University of Technology, underscores the critical role of leveraging stakeholders' capacities for effective electrification. In tandem, Wanner and Pröbstl-Haider's (2019) examination of Barriers to Stakeholder Involvement in Sustainable Rural Tourism Development in Southeast Europe complements this discourse, revealing the region-specific challenges obstructing stakeholder engagement. By illuminating the hurdles faced in involving diverse stakeholders in sustainable rural tourism, the study indirectly contributes to the broader global understanding of how overcoming barriers is essential for successful rural electrification projects. These studies collectively argue for a comprehensive approach that recognizes and leverages the capacities of stakeholders, underscoring their importance in the success of rural electrification initiatives globally.

In Europe, Stober et al.'s (2021) Comparative Analysis of Participatory Renewable Energy Planning in 25 projects enriches the discourse by providing a comparative lens across diverse European projects. The study refines the understanding of stakeholder engagement in renewable energy planning, emphasizing the need for innovative practices. This aligns with Mubarok's (2017) findings, as both studies emphasize the dynamic and context-dependent nature of stakeholder involvement. Concurrently, Furmankiewicz et al.'s (2021) exploration of the Role of Rural Stakeholders in Driving the Low-Carbon Transition in Poland broadens the scope by integrating climate-related activities. The study in Poland not only speaks to the unique challenges and opportunities in the region but also contributes to the global narrative by emphasizing the potential for rural stakeholders to drive sustainability initiatives. Together, these studies construct a compelling argument for the importance of context-specific stakeholder engagement strategies and innovative practices in ensuring the success of rural electrification projects on a global scale.

The intersection of stakeholder involvement, team capacity, and project success finds resonance in the synthesis of diverse studies. Mubarok's (2017) emphasis on understanding stakeholder capacities aligns with

Wanner and Pröbstl-Haider's (2019) identification of barriers in Southeast Europe. This conjointly underscores the global imperative to recognize and address challenges in stakeholder engagement. Additionally, the comparative insights from Stober et al.'s (2021) analysis across European projects strengthen the argument by emphasizing the need for innovative practices tailored to specific contexts. Furmankiewicz et al.'s (2021) exploration in Poland augments this narrative by highlighting the broader sustainability dimension, reinforcing the argument that rural stakeholders play a pivotal role in driving both electrification and climate-related initiatives. Together, these studies form a cohesive narrative, emphasizing the combined effect of stakeholder involvement, team capacity, and innovative practices on the success of rural electrification projects globally.

In Kenya, Limo and Muchelule's (2023) study on Community Engagement and Implementation of Rural Electrification Projects in Kwale County provides insights into the critical nexus of stakeholder engagement and rural electrification success. Conducted within the local context of Kwale County, the research emphasizes the pivotal role of community engagement in the successful implementation of electrification projects. The findings highlight that a collaborative approach involving local communities positively influences project outcomes, reinforcing the argument for stakeholder involvement in the African context (Limo & Muchelule, 2023).

Moving to Ethiopia, Abrham's (2021) work on Rural Electrification Projects in the Amhara Region delves into the effectiveness, challenges, and implications of rural transformation. By specifically analyzing the Amhara Region, the study provides context-specific insights into the intricacies of rural electrification. The research emphasizes the need for a nuanced understanding of local challenges and opportunities, echoing the broader global discourse on tailoring electrification initiatives to specific contexts (Abrham, 2021). In Cameroon, Njoh et al.'s (2019) study on Opportunities and Challenges to Rural Renewable Energy Projects further contributes to the African narrative.

Rwanda becomes a focal point in the analysis of Factors Affecting the Performance of Rural Electrification Projects by Mwizerwa and Mulyungi (2023). The study, centered on the Scaling Up Energy Access Project (SEAP), dissects the various elements influencing project success in the Rwandan context. The findings underscore the critical role of understanding local dynamics and tailoring strategies to enhance the performance of rural electrification initiatives in Africa (Mwizerwa & Mulyungi, (2023)). Lambooij's (2020) Master's thesis on Achieving Universal Access to Electricity and Cleaner Cooking Fuels in Sub-Saharan Africa offers a comprehensive Stakeholder Influence Analysis of Energy Sector Development in Rwanda. The study provides a detailed understanding of stakeholder dynamics, emphasizing their influence on electrification initiatives in the region. Both studies contribute to the broader discourse on stakeholder involvement, team capacity, and success in African rural electrification projects, highlighting the need for context-specific approaches (Lambooij, 2020).

Nigeria's electricity sector comes into focus with Edomah, Ndulue, and Lemaire's (2021) review of stakeholders and interventions. The study delves into the multifaceted landscape of Nigeria's electricity sector, offering insights into the complex relationships between stakeholders. By examining the various interventions, the research provides a foundation for understanding the dynamic nature of stakeholder involvement in the African electrification context (Edomah et al., 2021). In a related Nigerian context, Dunmade's (2021) exploration of Community/Shared Solar Power as a Pathway to Sustainable Rural Electrification delves into innovative approaches. The study advocates for community-driven solutions, emphasizing the need for active stakeholder engagement and collaboration to achieve sustainable rural electrification in Nigeria (Dunmade, 2021). Community acceptability becomes a central theme in Antwi and Ley's (2021) research on Renewable Energy Project Implementation in Africa. The study, addressing sustainability through community acceptability, brings to the forefront the critical role of stakeholders in determining project success. By emphasizing the need for community buy-in, the research contributes to the discourse on how stakeholder involvement is intertwined with the success of renewable energy projects in Africa (Antwi & Ley, 2021). Downs et al.'s (2020) integrative collaborative project approach in Zambia unlocks high sustainable energy potential. The electrification landscape in Uganda is a complex tapestry woven by the interplay of stakeholder involvement, team capacity, and project success. Expanding the discourse, Lo and Kibalya's (2023) examination of electric cooperatives and the political economy of rural electrification in Africa adds depth to the

understanding of the Ugandan context. The study provides a nuanced analysis of the political and economic dimensions that shape electrification projects, highlighting the pivotal role of stakeholders in influencing outcomes. Existing study gaps in the literature

The existing literature on rural electrification projects, when viewed through the global, African, and Ugandan contexts, reveals discernible gaps, particularly concerning Southwestern Uganda. A predominant trend across these contexts is the prevalence of studies that often adopt a global or national perspective, neglecting the nuances specific to regional settings. While the global discourse on rural electrification provides valuable insights, its applicability to the unique socio-economic and geographic conditions of Southwestern Uganda remains uncertain. Furthermore, existing African studies, while contributing to a broader understanding of electrification dynamics on the continent, may not adequately capture the intricacies of this specific region. In the Ugandan context, literature tends to focus more broadly on national rural electrification efforts, overlooking the localized factors that could significantly impact project success in Southwestern Uganda. A critical observation is the scarcity of literature that explicitly links the variables of stakeholder engagement, team capacity, and the success of rural electrification projects in the context of Southwestern Uganda. Most existing studies tend to discuss these variables in a general rural electrification framework, lacking the specificity required to inform targeted interventions in this particular region. The dearth of research exploring the interconnectedness of stakeholder involvement and team capacity in influencing project outcomes further exacerbates this gap. Therefore, the identified study gap emphasizes the need for research endeavors that adopt a more granular approach, addressing the specific dynamics of Southwestern Uganda and establishing a robust connection between stakeholder engagement, team capacity, and the success of rural electrification projects in this particular context.

3. Methodology

A cross-sectional design was employed and this is because it allows the researcher to collect data in a short period of time (Maier et al, 2023). The study population is composed of 38 projects that are still under contraction (Uganda Electricity Regulatory Authority, 2022). The sample size was 34 projects based on Krejicie and Morgan's Table (1970). Data was collected from 32 projects representing a 94% response rate. Inferential statistics were then applied for quantitative data analysis, allowing the study to explore and evaluate relationships between variables (Saunders et al., 2009). Each project was examined by one project manager, three foremen, and two heads of engineering. Primary data gathered through self-administered closed-ended questionnaires, constituted the main data source. The questionnaire encompassed sections addressing background information, stakeholder involvement, team capacity, and project performance. In this study, Stakeholder involvement and team capacity are the dependent Variables and the independent variable is Project performance. These variables were measured using item scales derived from existing literature and theories. The data collection instrument was anchored on a 5-point Likert scale. Stakeholder Involvement was Measured by engagement, communication, and compliance, aligned with Discenza and Forman (2017) and Probst (2016). Team Capacity was assessed through attitude, knowledge, critical thinking, and collaboration as coined by (Brooks and Silva (2016; Figl, 2017). Project Performance was evaluated based on timeliness, cost-effectiveness, service quality, and scope (Davis (2016; Tabish & Jha, 2011).

4. Study Findings

Demographic characteristics of the Rural Electrification projects staff.

The findings presented reveal a gender distribution among respondents, with the majority being male (58.7%), while their female counterparts constitute 41.3%. This balanced representation of both genders suggests inclusivity and addresses affirmative action, fostering a diverse and comprehensive perspective conducive to high performance. Furthermore, the age demographics of the respondents show that the age bracket of 31-40 years had the highest representation, encompassing 93 individuals (47.4% of the total). Another significant portion, comprising 41-50-year-olds, consists of 84 respondents (42.9% of the total sample), indicating a concentration of participants in their thirties and forties, contributing valuable experience to the study. Moreover, the educational distribution underscores a well-educated participant pool, as 112 individuals (57.1% of the total) reported holding master's degrees, while 7 respondents (3.6% of the total) held doctorate degrees, reflecting a noteworthy presence of individuals with advanced academic qualifications. In terms of

marital status, a considerable majority of 162 respondents were married, constituting 82.7% of the total, while 34 respondents were single, comprising 17.3% of the total. Overall, these demographic characteristics provide a comprehensive understanding of the diverse participant profile, encompassing factors such as gender, age, education, and marital status, contributing to the richness and inclusivity of the study.

Distribution by demographic characteristics of Rural Electrification Projects.

Southwestern Uganda, the study reveals that the predominant size of Rural Electrification Projects involves 31-40 employees, constituting 50% of the sampled projects. Notably, a limited proportion, specifically 2.9%, of projects surpass this range, having more than 50 employees. This implies a prevalence of smaller to moderately sized projects in the surveyed sample. Additionally, concerning the existence period of these projects, a substantial majority, accounting for 47.1% of the projects, have operated for 6 to 10 years. In contrast, a smaller fraction, constituting 14.7%, extends beyond the decade mark, indicating a cohort of projects with a more prolonged operational history. In summary, the surveyed Rural Electrification Projects in Southwestern Uganda predominantly fall within the 31-40 employee range, and most have been in operation for 6 to 10 years. These insights shed light on the demographic characteristics of these projects in terms of size and operational experience. A more in-depth exploration could further examine the interplay between employee count, existence period, and the key variables of stakeholder involvement, team capacity, and project performance in Rural Electrification Projects in Southwestern Uganda.

Multiple regression analysis

A multiple regression analysis was run to explain the predictive power of the independent variables to the dependent variable and to show the causal relationship among the study variables.

Table 1: Multiple regression analysis

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-0.726	0.347		-2.092	0.0038
	Stakeholder involvement	0.38	0.146	0.238	2.604	0.001
	Team capacity	0.612	0.166	0.446	4.885	0.000
R	.652[a]					
R Square	0.425					
Adjusted R Square	0.419					
F	198.311					
Sig.	.000[b]					

The results of the regression analysis underscore significant relationships between Stakeholder Involvement, Team Capacity, and Project Performance in Rural Electrification Projects in Southwestern Uganda. Stakeholder involvement exhibited a positive and significant relationship (Beta=.238, $p<.05$), indicating that an incremental engagement with stakeholders correlates with a substantial increase of 0.238 in project performance. Similarly, Team Capacity demonstrated a positive and significant relationship (Beta=.446, $p<.05$), suggesting that enhancing team capacity leads to a statistically significant increase of 0.446 in project performance. In essence, the analysis highlights a statistically significant association between Stakeholder Involvement, Team Capacity, and Project Performance in Southwestern Uganda's Rural Electrification Projects. These findings emphasize the critical importance of prioritizing and enhancing these factors to bolster the likelihood of successful project performance. Furthermore, the regression results indicate that 41.9% of the variations in project performance are explained by Stakeholder Involvement and Team Capacity, leaving 58.1% unaccounted for, pointing to the influence of other unexplored factors in this study.

Discussion of the results

The identified positive and significant relationship between Stakeholder Involvement and Project Performance aligns with extant literature emphasizing the crucial role of stakeholder engagement in project success (Davis, 2016; Tabish & Jha, 2011). Stakeholders, ranging from local communities to government entities, play instrumental roles in shaping the trajectory of electrification projects. The positive Beta coefficient of 0.238 indicates that as Stakeholder Involvement increases, project performance experiences a considerable upswing. This aligns with the argument posited by Discenza and Forman (2017) and Probst (2016), who stress that involving stakeholders positively influences project outcomes. Effective engagement fosters a sense of shared responsibility, enhances communication channels, and ensures compliance with project objectives. Consequently, the project becomes more attuned to local needs, garnering support and cooperation critical for success. As such, the current findings accentuate the necessity of tailored strategies for engaging stakeholders throughout the project life cycle to optimize rural electrification outcomes in Southwestern Uganda (Davis, 2016).

The parallel positive and significant relationship identified between Team Capacity and Project Performance corroborates the broader literature linking team competencies with project success (Brooks & Silva, 2016; Figl, 2017). The Beta coefficient of 0.446 underscores the substantial impact that an increase in Team Capacity can have on project performance. This aligns with Dasí et.al. (2021), who emphasize that team capacity forms the bedrock for effective project performance in various work settings. The multifaceted nature of Team Capacity, encompassing attributes such as attitude, knowledge, critical thinking, and collaboration, aligns with the complex demands of electrification projects. Project teams endowed with a diverse skill set, a collaborative ethos, and a capacity for critical problem-solving are better positioned to navigate the challenges inherent in rural electrification. These findings resonate with the assertion that investing in the development and empowerment of project teams is integral to achieving successful project outcomes (Hirschfeld et al., 2017). Consequently, stakeholders involved in rural electrification initiatives should prioritize interventions that enhance the capacities of project teams, ensuring they possess the requisite skills and attributes for navigating the intricacies of electrification projects in the Southwestern Ugandan context.

The combined effect of Stakeholder Involvement and Team Capacity in explaining 41.9% of the variations in Project Performance indicates the significance of these factors, yet it also leaves a substantial proportion (58.1%) unaccounted for. This underscores the complexity of the rural electrification landscape in Southwestern Uganda, suggesting the presence of other influential variables not considered in this study. Previous literature, such as that by Falk et al. (2021) and Antwi & Ley (2021), indicates that contextual factors, policy frameworks, and unforeseen challenges may contribute to the unexplained variations. Therefore, future research endeavors should delve into exploring these unexplored dimensions, ensuring a more comprehensive understanding of the intricate dynamics shaping the success of rural electrification projects in the region.

In summary, the present discussion unravels the intricate relationships between Stakeholder Involvement, Team Capacity, and Project Performance in the context of Rural Electrification Projects in Southwestern Uganda. The positive and statistically significant associations emphasize the instrumental roles these factors play in shaping the trajectory of electrification initiatives. Stakeholder engagement emerges as a linchpin for aligning projects with community needs, fostering cooperation, and ensuring compliance. Simultaneously, the robust relationship between Team Capacity and Project Performance highlights the pivotal role of skilled, collaborative, and critical-thinking project teams in navigating the complexities of electrification projects. The nuanced insights gained from this analysis contribute to the growing body of knowledge on rural electrification, providing a foundation for future research, policy formulation, and strategic interventions aimed at enhancing project outcomes in Southwestern Uganda.

Contribution to literature and theory

This study significantly contributes to the existing literature and theoretical frameworks in the field of rural electrification projects, particularly in Southwestern Uganda. The findings extend our understanding of the critical factors influencing project performance by highlighting the substantial impact of stakeholder involvement and team capacity. The positive relationship observed between stakeholder engagement and project performance aligns with the works of Turner and Zolin (2017), Discenza and Forman (2017), and Probst (2016), providing empirical support to the theoretical assertions regarding the importance of involving

stakeholders in project activities. By emphasizing the roles of engagement, communication, and compliance, this research contributes nuanced insights into the specific dimensions of stakeholder involvement that are most influential in the unique context of rural electrification projects in Southwestern Uganda.

Furthermore, the study enriches existing theoretical perspectives on project success by underscoring the pivotal role of team capacity. The positive and statistically significant relationship between team capacity and project performance resonates with the findings of Brooks and Silva (2016), Figl (2017), and Dasí et al. (2021), emphasizing the importance of individual and collective competencies within project teams. This contribution refines our understanding of the dynamics within project teams, indicating that attitudes, knowledge, critical thinking, and collaboration collectively shape project success in the context of rural electrification. Theoretical frameworks in project management and rural development can benefit from integrating these nuanced insights, recognizing the multifaceted nature of team capacity in driving successful outcomes in the unique setting of electrification projects in Southwestern Uganda. Overall, this research advances the theoretical discourse on rural electrification by offering context-specific evidence on the roles of stakeholders and project teams, bridging gaps in the existing literature and providing a foundation for future theoretical development in the field.

5. Conclusion and Recommendations

In conclusion, the regression analysis of Rural Electrification Projects in Southwestern Uganda has unearthed significant insights into the dynamics of stakeholder involvement, team capacity, and their influence on project performance. The findings reveal a robust positive relationship between stakeholder involvement and project performance, emphasizing the pivotal role of engaging stakeholders in the success of rural electrification initiatives. As indicated by the beta coefficient (Beta=.238, $p<.05$), each incremental increase in stakeholder involvement corresponds to a substantial 0.238 increase in project performance. This underscores the importance of proactive engagement, communication, and compliance with stakeholders, aligning with existing literature (Turner and Zolin, 2017; Discenza and Forman, 2017; Probst, 2016). Moreover, team capacity emerges as a critical determinant of project success, showcasing a statistically significant positive relationship (Beta=.446, $p<.05$). Enhancing team capacity, encompassing attitudes, knowledge, critical thinking, and collaboration, is associated with a noteworthy 0.446 increase in project performance. These findings align with the work of Brooks and Silva (2016), Figl (2017), and Dasí et al. (2021), highlighting the integral role of competent and collaborative teams in driving project success.

Furthermore, the study's holistic view, considering both stakeholder involvement and team capacity, indicates that 41.9% of the variations in project performance are explained by these factors. This underlines the interconnectedness of stakeholder engagement and team capabilities in shaping the outcomes of rural electrification projects. The unaccounted 58.1% suggests the existence of other unexplored factors influencing project performance, opening avenues for future research. These findings carry significant implications for policymakers, project managers, and stakeholders involved in rural electrification endeavors in Southwestern Uganda. Prioritizing strategies that enhance stakeholder engagement and team capacity becomes imperative for fostering successful project outcomes. The study not only contributes empirical evidence to the field but also provides a basis for strategic interventions and policy frameworks aimed at optimizing the impact of rural electrification initiatives in the region.

Recommendations: Based on the comprehensive analysis of Rural Electrification Projects in Southwestern Uganda, several recommendations emerge to optimize project performance. Firstly, stakeholders involved in rural electrification initiatives should prioritize proactive engagement, effective communication, and compliance mechanisms. The positive and significant relationship found between stakeholder involvement and project performance underscores the need for structured approaches to involve communities, local authorities, and other relevant stakeholders in decision-making processes. This could be achieved through participatory planning, regular communication channels, and adherence to compliance standards. Secondly, enhancing team capacity is crucial for project success. Project managers should focus on fostering positive attitudes, providing continuous training, promoting critical thinking skills, and encouraging collaboration within project teams. The significant positive relationship identified between team capacity and project performance emphasizes the pivotal role of competent and collaborative teams in achieving successful outcomes. Thirdly, policymakers and

project managers should consider implementing interventions that simultaneously address both stakeholder involvement and team capacity. The study's finding that 41.9% of the variations in project performance are explained by these factors underscores their interconnected nature. Strategic interventions, training programs, and policies that synergistically enhance both stakeholder engagement and team capabilities are likely to yield more significant positive impacts on rural electrification projects. Finally, given the limitations of the study, further research is recommended. Future studies should explore the dynamics of stakeholder involvement, team capacity, and project performance in different geographical, cultural, and socio-economic contexts to enhance the generalizability of findings. Longitudinal research designs, mixed-methods approaches, and comparative studies could provide richer insights into the temporal and contextual nuances of these relationships.

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Elements of Stakeholder Involvement and Performance of Rural Electrification Projects

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Abstract: The research aimed to explore how different aspects of stakeholder participation correlate with the effectiveness of rural electrification projects in southwestern Uganda. Employing a cross-sectional research design, data was gathered from 32 projects as the primary unit of analysis, with a sample size of 34 projects selected from a total population of 39 rural electrification projects, determined using Krejicie and Morgan's method from 1970. Analysis methods included Pearson correlation and regression. The findings demonstrated a statistically significant positive relationship between communication, compliance, and engagement with the performance of rural electrification projects. Regression analysis further supported these results, showing significant unstandardized coefficients for each respective dimension. Moreover, the regression model indicated that communication, compliance, and engagement, as measures of stakeholder involvement, accounted for 39.5% of the variability in rural electrification project performance in southwestern Uganda. This suggests that other factors not addressed in this study explained the remaining 60.5%. Therefore, the study suggests that comprehensive stakeholder involvement, involving clear communication before and during project implementation, adherence to regulations agreed upon by stakeholders, and active engagement of all parties at each project stage, is crucial for achieving project success.

Keywords; *Stakeholder involvement, Performance, Rural Electrification*

1. Introduction

Stakeholder participation is the process by which an organization involves people who might be affected by its decisions or who have the power to influence how those decisions are carried out (Dwivedi & Dwivedi, 2021). According to Turner and Zolin (2017), the involvement of stakeholders and their prioritization of interests are critical to the success of any project. One of the factors that raise the project's performance rate is stakeholder involvement through communication, compliance, and involvement (Discenza and Forman, 2017). This is further explained by the stakeholder theory, which holds that an organization should maximize the creation of business value based on relevant stakeholder interests and an equal distribution of business value to stakeholders (Phillips et al., 2003).

Project performance is quite valuable, especially as it emphasizes ongoing improvement through various project kinds (Al-Nabae & Samoan, 2021). Increasing the success of the project's outcome is the main goal of project performance (Mohamed et al., 2017). Projects are used worldwide to organize actions aimed at achieving desired objectives in all domains, both economic and non-economic (Ioana, Emil & Razvan, 2016). Project effectiveness is heavily influenced by stakeholder engagement and team capability. While definitions of project effectiveness vary, researchers generally agree that the "iron triangle" or "triple constraint" of cost, time, and quality standards should be included to define the achievement or realization of project objectives (Al-Nabae & Sammani, 2021). Stakeholders' requirements are satisfied, risks are controlled, and resources are made available when they are involved. In the meantime, efficiency, quality, and on-time delivery are increased by a competent project team with the necessary abilities, cooperation, and flexibility.

Rural electrification is a key component of the Government of Uganda's (GOU) national policy to end rural poverty and promote prosperity among rural Ugandans (Ministry of Energy and Mineral Development, 2013). The government launched the Electrical Connection Policy in 2018 to guarantee that 60% of households have access to electricity by 2027. Customers can purchase an electrical connection for UGX 20,000, or around $5.50, according to Nile Post (2021) and the Rural Electrification Agency (2018). Even with these efforts, official figures from the Uganda Bureau of Figures (2019) show that just 26.7% of households have access to electricity, with only 18% of those being in rural areas. Barriers include high electricity bills and connection fees in addition to the restricted grid (Nabukeera, 2020; Blimpo, McRae & Steinbuks, 2018).

The government launched the rural electrification program in Southwestern Uganda as one of its initiatives to guarantee that the nation is supplied with power through the implementation of policies. According to a study by the Auditor General (2021), a number of obstacles have seriously impeded the execution of rural electrification projects, even though they have made a substantial contribution to the development of Southwestern Uganda. This is demonstrated by the lack of finance, which has delayed project completion and led to the Electricity Connection Policy's suspension in late 2020. Furthermore, just sixteen (30%) of the fifty-four (54) projects in Southwestern Uganda that EXIM Bank-TBEA, under the Electricity Regulatory Authority, was charged with finishing by 2021 had been completed completely, and thirty (70%) had only been half completed (NTV News, 2020; Kakumba, 2021). A recent Kakumba (2021) survey shed light on the region's power access, showing that just 25% of Southwestern Ugandans live in homes that are linked to the grid, and only roughly half of the population lives in areas that are served by the electric system.

2. Literature Review

Overview of Rural Electrification Projects in Southwestern Uganda

Rural electrification is a key component of the government's overall policy and goal to enhance national economic and social development and integration. About 15 years ago, Uganda experienced a power crisis as a result of delayed capacity expansions and low Lake Victoria water levels, with a 2:1 ratio between supply and demand for electricity (RMI, 2020). The nation currently produces more electricity than it needs. As of 2019 (Electricity Regulatory Authority, 2019), the plant's 1,254-megawatt production capacity was predicted to increase to 1,800 megawatts if Karuma Dam was put into service later that year. However, due to the lack of access to electricity in the majority of Ugandan households, the country's maximum consumption capacity is limited to only 600 megawatts (Global Press Journal, 2020). Between 2010 and 2015, the government implemented National Development Plans I & II as well as the Rural Electrification Strategy and Plan in a bid to narrow the gap between supply and demand. These initiatives aimed to expand the national electric grid and accelerate improvements in electricity access and service penetration (Ministry of Energy and Mineral Development, 2018). To ensure electricity access for 60% of households by 2027, the government introduced the Electrical Connection Policy in 2018, providing customers with an electrical connection for a mere UGX 20,000 (about $5.50) (Nile Post, 2021; Rural Electrification Agency, 2018). Despite these efforts, more households rely on solar energy than on power from the national grid (Nile Post, 2021). The poorest people and rural communities, particularly those in the Southwestern areas, are most likely to lack access to and a link to the national electric grid (Nabukeera, 2020). Additionally, as of right now, less than 7% of rural residents have access to electricity (Kakumba, 2021).

Stewardship theory, as described by Davis et al. (1997), provides the theoretical basis for the study. To achieve their utility functions, stewards safeguard and optimize shareholder capital through corporate success. From this perspective, company managers and executives act as stewards, protecting the interests of the shareholders and making money for them. According to the stewardship concept, people become driven and fulfilled when an organization achieves success.

Agyris (1973) goes on to say that ideology undermines a person's objectives by viewing an employee or person as an economic entity. However, stewardship theory recognizes the value of trust-based, maximum-leave regimes for stewards, as updated by Donaldson & Davis (1991). This can lower costs associated with behavior monitoring and control. It highlights the responsibility of executives or employees to behave more autonomously to maximize returns to shareholders (Davis et al., 1997).

Project performance, according to Kerzner (2015), is finishing tasks on schedule, within budget, at the appropriate performance or specification level that the client has approved, with little to no scope modifications that are mutually agreed upon and without causing disruptions to the organization's regular operations or changing its corporate culture. According to the findings of other researchers, project performance should take into account the general stakeholders' satisfaction in addition to the evaluation of budget, time, quality, and client satisfaction (Koops et al., 2017). The "golden triangle" was seen to be insufficient to describe project performance as understanding in the field of project management advanced. It was acknowledged that project performance was a multifaceted, intricate idea that encompassed a wide range of characteristics (Davis 2016; Tabish and Jha 2011). Due to the unique nature of each project, each projects

have different performance requirements (Turner and Zolin 2012). Many factors influence a project's chance of success or failure; changing these factors when necessary raises the chance of success (Ika and Donnelly, 2017).

Stakeholder participation, as defined by Turner and Zolin (2017), is the process through which an organization consents to include stakeholders in a constructive manner in its operations. According to Dispenza and Forman (2017), stakeholder involvement is the process of including stakeholders to determine ahead of time what, when, why, how, and who will complete the activity. Stakeholder involvement in decision-making, according to Probst (2016), improves the extent to which employers communicate with stakeholders and allow or encourage them to contribute or participate in organizational decision-making. Involving stakeholders also encourages participatory decision-making, which is anticipated to increase productivity since stakeholders will be more dedicated to seeing decisions through to completion to meet organizational objectives and raise productivity. It will also help to lessen employee agitation, misunderstandings, and lack of commitment. It's a collaborative technique that encourages individual contributions to organizational management by granting decision ownership to the entire group. According to Balogun and Johnson (2018), a successful organization will probably engage all significant stakeholders in the formulation and application of strategy and policy. Throughout the implementation process, stakeholder involvement is crucial, and to inform and include the stakeholders, a communication strategy is required. The public's special role as an intermediate necessitates stakeholder involvement in communication during project execution (Robyn, 2016). A wave of failures or the failure of an institution itself tests the efficacy of stakeholder involvement in communication.

Stakeholder Involvement and Project Performance

Stakeholder participation may create conflicts and uncertainty that could hinder project performance, according to research by Johansen, Eik-Andresen, and Ekambaram (2018) using a qualitative approach to examine stakeholder benefit appraisal and project performance. On the other hand, as the PMI (2017) noted, stakeholder participation is acknowledged as a component leading to improved project performance (Project Management Institute, 2017). Stakeholders, however, have a significant impact on project performance, especially for complicated projects with a diverse range of stakeholders. For this reason, it is crucial to comprehend their influence to plan and execute projects successfully.

This is corroborated by Sachs and Ruhli's (2017) study, which used a descriptive design to show that the amount of time a company spends interacting with its stakeholders is a strategic decision that managers make regarding their companies' operations and affects the outcome of projects. This is in line with a study by Edelenbos and Klijn (2016) that used a representative sample of 69 Dutch local governments along with a combined longitudinal data set consisting of 3,434 Social Support Act participants. The study found that involving stakeholders in the decision-making process makes it much easier for them to support and carry out the plan; as a result, stakeholder involvement improved project performance.

Menoka (2016) researched the relationship between stakeholder involvement and the performance of sustainability-related building projects. The study focused on stakeholder involvement to achieve construction sustainability and improve building project performance. A framework that integrated stakeholders and project performance motivated by sustainability was developed. The best way to conduct an empirical investigation was mixed-method research, which was employed in this study. An analysis of variance in participant perceptions of their roles and the strategic priorities of their organizations with respect to stakeholder involvement, construction sustainability, and project performance was conducted using ANOVA. To achieve sustainability in construction and increase the efficiency of building projects, a conceptual framework was established that centers on the communication and organization of stakeholder participation. This framework was developed with the help of information obtained from interviews as well as questionnaire surveys.

Pavez et al. (2021) conducted interviews with managers of twenty (20) distinct projects to evaluate the efficacy of organizations. The initiatives included chemical, aeronautical, and energy-related activities. Their analysis indicated that fixing problems with stakeholders involved was preferable to project performance. They identified manager-to-manager communication as a crucial requirement. Additionally, they discovered that

project characteristics including precisely specified cost-effectiveness, timeliness, high-quality service that responds to needs, and team participation were crucial for success.

Conversely, Dvir et al. (2008) pointed out that different stakeholder viewpoints can influence the outcome of a project. Stakeholder involvement may be a problem for project performance in that it may lead to misunderstandings and uncertainty, according to Johansen et al. (2018). Therefore, to prevent them from impeding project performance, comprehensive criteria that take into account the interests and viewpoints of all stakeholders are required. This study will concentrate more on the relationship between stakeholder involvement and project performance, even if prior research suggests that stakeholder involvement is essential for project success.

However, Daly et al. (2003) argued that to maintain their status as decision-makers in businesses, executives and directors are likely to manage the company to maximize shareholder profits as well as financial performance. In this sense, opinions on the performance of each employee are believed to be directly influenced by the success of the company. According to Fama (1980), executives and directors are actually handling their careers to be seen as competent stewards of their organization.

The existing literature on rural electrification projects, when regarded at the global, African, and Ugandan levels, reveals distinct gaps, particularly concerning Southwestern Uganda. A predominant trend across these contexts is the prevalence of studies that often adopt a global or national perspective, neglecting the shades specific to regional settings. While the global discourse on rural electrification provides valuable insights, its applicability to the unique socio-economic and geographic conditions of Southwestern Uganda remains uncertain. Furthermore, existing African studies, while contributing to a broader understanding of electrification dynamics on the continent, may not sufficiently capture the details of this specific region. In the Ugandan context, literature tends to focus more broadly on national rural electrification efforts, overlooking the localized factors that could significantly impact project success in Southwestern Uganda. A critical observation is the scarcity of literature that explicitly links the variables of stakeholder involvement to the success of a project in the context of Southwestern Uganda. Most existing studies tend to discuss these variables in a general rural electrification framework, lacking the specificity required to inform targeted interventions in this particular region. The dearth of research exploring the interconnectedness of stakeholder involvement and the success of a project is still lacking. Therefore, the identified study gap emphasizes the need for research to address the specific dynamics of Southwestern Uganda and establish a robust connection between stakeholder involvement and project performance.

3. Methodology

Design, Population, and Sample: This study focused on a population of 38 projects utilizing a cross-sectional survey design (Auditor-General Report, 2022). 34 projects were chosen in accordance with Krejcie and Morgan's (1970) criterion to determine the sample size. There were 238 possible responses overall because the unit of analysis included the project manager, three foremen, two heads of engineering, one chairperson for LCI, and the parish chief for each project. A response rate of 94.1% was achieved by compiling data from 32 initiatives, based on the unit of analysis.

Table 1: Measurement and operationalization of Variables

Variables	Constructs	Definition & Measurement	Authors
project performance	Cost-effectiveness and timeliness, Service quality Scope	One of the most studied subjects in project management literature is project performance. Despite the large number of studies that offer a thorough analysis of project performance, opinions on various aspects of it are divided (Davis 2016).	Davis 2016; Tabish and Jha 2011
Stakeholder involvement	Engagement, Communication Compliance	Stakeholder participation, as defined by Turner and Zolin (2017), is the process through which an organization consents to include stakeholders in a constructive manner in its operations. According to	Discenza and Forman, 2017; Probst (2016

		Dispenza and Forman (2017), stakeholder involvement is the process of including stakeholders to determine ahead of time what, when, why, how, and who will complete the activity.

The validity of the study instrument was assessed using Cronbach's (1951) alpha coefficient to make sure that it produced results that were consistently comparable when given to the same respondents over a brief period of time. In addition, a content validity index was used to evaluate the content validity of the study instrument. The results, which are shown in Table 1, showed that the instrument was more reliable and valid than the 0.7 cutoff point (Nunnally, 1978). Before any analysis or data management, the data was carefully checked to make sure it was comprehensive. The study was conducted using SPSS (Statistical Package for Social Scientists) version 21. Inferential statistics were employed in accordance with the research objectives to evaluate the relationships between the study variables and the ability of the independent variables to predict the dependent variable, respectively. Among these analyses were regression and correlation analysis.

4. Results

Table 2: **Demographic characteristics of the respondents**

Category	Item	Frequency	Percent
Gender	Male	115	58.7
	Female	81	41.3
Age bracket	21-30	11	5.6
	31-40	93	47.4
	41-50	84	42.9
	above 50	8	4.1
	Total	196	100
Marital Status	Married	162	82.7
	Single	34	17.3
	Total	196	100

The results in Table 1 indicate that the majority of the respondents were male (58.7%) and their female counterparts were 41.3%. This implies that both categories of female and male were fully represented and the combination of both male and female bridges the gap of affirmative action which promotes high performance. In addition, the findings indicated that the age bracket of 31-40 had the highest number of respondents, with 93 individuals, comprising 47.4% of the total. This suggests a significant concentration of participants in their thirties and the age bracket of 41-50, were 84 respondents, representing 42.9% of the total sample. This age group constitutes a substantial portion of the participants who had worked with the organization. This group accounts for 57.1% of the total, indicating a significant proportion of well-educated participants. There were 7 respondents with a doctorate degree, making up 3.6% of the total. This indicates a notable presence of individuals with advanced degrees in the study. Additionally, a number of 162 respondents were married making up 82.7% of the total whereas 34 of the total were found single making up 17.3% of the total.

Table 3: **Distribution by demographic characteristics of Rural Electrification Projects.**

Category	Item	Frequency	Percent
Time spent			
	1-5years	12	38.2
	6-10years	15	47.1
	more than 10years	5	14.7
Number of employees			
	21-30	2	5.9

31-40	16	50
41-50	13	41.2
above 50	1	2.9
Total	**32**	**100**

The majority of the Rural Electrification Projects in Southwestern Uganda 16 in total, have 31-40 employees, representing 50% of the sample. This indicates that a significant proportion of the Rural Electrification Projects in Southwestern Uganda surveyed fall within this employee range whilst 1 Rural Electrification Projects in Southwestern Uganda have above than 50 employees, making up 2.9% of the total. This suggests a smaller proportion of Rural Electrification Projects in Southwestern Uganda with larger employee counts in the study. In addition, in the Rural Electrification Projects Existence Period in southwestern Uganda, The majority of the Rural Electrification projects 15 in total, have an existence period ranging from 6 to 10 years, accounting for 47.1% of the sample. This indicates a significant concentration of Rural electrification projects in Southwestern Uganda that have been operating within this time frame and 5 Rural electrification projects have an existence period of more than 10 years in southwestern Uganda making up 14.7% of the total. This suggests an even smaller proportion of Rural electrification projects that have been operating for a slightly longer duration in southwestern Uganda.

Results of the Correlation Analysis: Stakeholder participation indicators and project performance in Southwestern Uganda's Rural Electrification Projects were compared using Pearson's Correlation analysis, with the strength of the link indicated by the letter "r." Table 4 shows that there is a statistically significant and positive correlation ($r = 0.413^{**}$, $p < 0.01$) between project performance and communication. Additionally, the results show that compliance and project performance have a favorable and statistically significant association ($r = 0.482^{**}$, $p < 0.01$). Analogously, the data show a favorable and statistically significant link ($r = 0.473^{**}$, $p < 0.01$) between involvement and project performance. All of these results point to a beneficial shift in project performance that is correlated with any positive change in stakeholder involvement, supporting the study's hypothesis. In conclusion, the analysis shows that there is a statistically significant and positive correlation ($r = 0.612^{**}$, $p < 0.01$) between the comprehensive variable of stakeholder involvement and project performance. This means that every improvement in stakeholder participation in rural electrification projects corresponds to an improvement in project performance.

Table 4: Pearson's Correlation analysis

Variables	1	2	3	4	5
Communication-1	1				
Compliance-2	.535**	1			
Engagement-3	0.113	.239**	1		
Stakeholder Involvement-4	.579**	.642**	.457**	1	
Project Performance-5	.413**	.482**	.473**	.616**	1

** Correlation is significant at the 0.01 level (2-tailed).

Multiple Regression Analysis

The results in Table 5 indicate a unit increase in engagement will result in a 0.541 unit increase in project performance ($B = .541$, $p<.01$). The results further indicate that a unit increase in communication would result in 0.262 unit increase in project performance ($B =.262$, $p<.01$) and a unit increase in compliance with standards would result into 0.294 units increase in project performance. Lastly, in southwestern Uganda, the three aspects are highly significant indicators of project performance for rural electrification programs.

Financial success is the dependent variable; $R2 = 0.404$, Adj $R2 = 0.395$, F-stat = 43.450, and sig. = 0.000. The findings of the regression analysis indicate that factors pertaining to stakeholder involvement, such as communication, engagement, and standard compliance, are significant in predicting the success of rural electrification projects. Overall, 39.5 percent of the variance in project performance is explained by the model, suggesting that factors not included in this study account for the remaining 60.5% of the variance.

Table 5: Regression Analysis

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-0.273	0.328		-0.832	0.406
	Engagement	0.541	0.081	0.383	6.678	0.000
	Communication	0.262	0.077	0.225	3.414	0.001
	Compliance	0.294	0.073	0.2700	4.004	0.000
R	.636					
R Square	0.404					
Adjusted R Square	0.395					
F	43.450					
Sig.	.000b					
N	196					

a Dependent Variable: Project Performance

5. Discussion, Conclusion, Recommendations and Policy Implications

In Southwestern Uganda, the discourse emphasizes the noteworthy affirmative correlation between project performance and stakeholder involvement components in rural electrification programs. It emphasizes the importance of project management engaging in various aspects such as feasibility studies, awareness of stakeholder demands, worker recruitment, and involvement during project stages like demarcation and compensation, all of which contribute to improved project performance. These findings align with those of Iqbal (2022) and Shiferaw & Abuye (2019), who have indicated that stakeholder engagement is vital for project success. Effective communication, both within the project management team and with workers, regarding project details and channels for addressing complaints, is also highlighted as crucial for success. This notion is supported by Johansen, Eik-Andresen, and Ekambaram (2018), who advocate for proper communication between project implementers and stakeholders for project success.

Compliance with standards and guidelines, including those set by regulatory bodies like ERA, is identified as another key factor driving project performance enhancement. These findings are consistent with the observations of Akbar & Shahid (2023), who underscore the importance of compliance with standards for project success.

Conclusion: To summarize, Table 5's results highlight the noteworthy benefits of stakeholder involvement aspects including communication, engagement, and standard compliance on the project success of rural electrification initiatives in Southwestern Uganda. These dimensions serve as vital predictors of project success, emphasizing the importance of active stakeholder engagement, effective communication practices, and adherence to established standards in optimizing project outcomes. Stakeholders and project managers should prioritize these aspects to ensure the efficient and sustainable implementation of rural electrification initiatives in the region.

Policy Recommendation; A practical recommendation stemming from the discussion would be to prioritize stakeholder engagement throughout all phases of rural electrification projects in Southwestern Uganda. This entails actively involving stakeholders in feasibility studies, understanding their demands, ensuring effective communication channels are established between project management teams and workers, and adhering to compliance standards set by regulatory bodies like ERA. By emphasizing stakeholder engagement and effective communication, project managers can enhance project performance and increase the likelihood of successful outcomes.

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The Necessity of the Digital Economy for Sustainable Economic Growth in OECD Countries

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Abstract: This paper's main intent is to study the relationship between the digital economy and the sustainable economic growth of selected OECD countries from 2016 to 2020. In doing so, we will also endeavor to shed a brighter light on distinct elements of the digital economy and to comprehend their collective inputs on the economic returns of the digital systems. To achieve this, secondary data have been gathered to contribute to the quantitative design research method. We further employed a panel data set and regression techniques such as the unit root test, the cointegration test and the dynamic GMM amongst others. The results of the study revealed that sustainable economic growth is slightly significantly linked to the input of the digital economy in the short and long run. However, it has also been discovered that e-commerce revenues have a significantly positive effect on sustainable economic growth in the short and long run. Lastly, this study recommended the establishment of national and international economic metrics, reflecting more on the presence of digital systems.

Keywords: *Digital economy, economic growth, digital system, sustainable.*

1. Introduction

Our world is moving at a fast rate and technology's role in this global shift is being perceived by the acceleration of the momentum of activities and processes core to the traditional economy. Considering those movements in the economy, we leaned on countries part of the OECD given its potential to fast-track those occurrences and monitor the causes of those shifts. The OECD is the Organization for Economic Co-Operation and Development established on December 14, 1960, with 18 European countries alongside Canada and the United States. By 2020, it has grown to a total number of 38 countries discussing and formulating global social and economic policies.

Having contended with several nation's issues over the years, the OECD contributed to the rise of world trade and the stabilization of economies. Unlike many sectors, technology didn't settle in its sphere, it merged itself with almost every other industry in direct partnership with human expertise. It blossomed beyond being an industry, to now invading at diverse span almost all the economic sectors at different scales. While technology can be seen as the ground for the digital economy, digital itself stands as the building materials of the new methods of production and payments occurring in this age. By digitalizing the core element of the economy, digital is challenging and reshaping bit by bit the economic process itself. The digital economy springs up as an aggregate of those distinct innovations empowering individuals, and helping them achieve their core activities culminating in the sustenance of the economic system. Observing the merger between the traditional economy and the digital economy (DE); the various amount of industries shaped by the innovations occurring in the DE; the increasing and consistent level of attention the convoke and their ability to integrate and run almost entire internal activities of most business, it is only a question of time until the digitalization fully supersedes all economic processes (Choong & Leung, 2021).

The DE is a data-led economy. Its value can also be perceived through the creation, collection, storage and analysis of data to be used and merchandised as intelligence. Basically, individuals and groups able to do properly the above or part of it and hand it over to business in the most simplistic manner stand to gain. The digital economy includes all segments of the economy that employ digital to affect the process and outcome of day-to-day activities, either internally or externally. The way we interact, shop, share, work and receive from each other has been greatly affected but another aspect that has also encountered adjustments is the way value is created and traded.

The DE is continually expanding, a full comprehension of its current situation and elements will enable business to deliver steadily and reflect in a continual monetary gain. The digital economy is progressing at lightning speed, nevertheless, this progress is linked to its capacity to gather, use and interpret a huge number of

information created and stored in a computerized system; regardless of the topic. The spread of the DE has been furthered by COVID-19, with the need for accurate and timely information and rapid adaptability. Between 2019 and 2023, mobile- and fixed-broadband traffic has had an estimated annual average growth of 30 percent, with a peak rate of growth at the start of the COVID-19 pandemic in 2020. Post-pandemic traffic growth slowed between 2021 and 2022: mobile broadband traffic increased by 22 percent, and fixed broadband increased by 10 percent (International Telecommunication Union, 2023). Fixed broadband remains the service of choice for heavy Internet data usage. During the pandemic, a considerable share of mobile traffic was rerouted through fixed networks using home Wi-Fi connections. In 2020, fixed broadband accounted for 96.6 percent of all Internet traffic. In 2022, the mobile broadband share of traffic had increased from 3.4 to 4.2 percent (International Telecommunication Union, 2023). Estimations also showed that the DE's global spread will be accountable for 70% of the new economic value created over the coming decade. However, Doreen Bogdan-Martin, The International Telecommunications Union's Secretary General revealed that one-third of the world's population or an estimated 2.7 billion people still lack access to the Internet (International Telecommunication Union, 2023). Hence, whilst we are sure of the existence of a high potential of the digital economy to further economic value for everyone, there also lies the opportunity for the creation of wider economic disparities and social instability, if the bedrock of those innovations remains partial.

2. Literature Review

Although It's hard to attribute a specific date of birth to the digital economy, the Information and Communication Technologies (ICT) tools and the Internet both building grounds of the DE saw the light of day in the late 1980s. The public launch of the World Wide Web occurred in the early 1990s and the appearance of the first smartphones in the late 90s. Nonetheless, the share of digital access is highly unequally distributed among countries. Internet use remains tightly linked to the level of a country's development. In 2020, nine out of ten people in high-income countries used the Internet. In 2023, the share edged up to 93 percent, getting closer to universality (International Telecomunication Union, 2023). Within the OECD countries, the digital gap is getting closer but for the rest of the world, the experience is different. The business world is also experiencing a shift, and whilst new business models and companies emerge, the old ones failing to adjust themselves to the changes are falling. The inability of the business to satisfy its clientele via its current medium of choice (digital) will result in a loss of profit and ultimately in bankruptcy. For instance, tourism and real estate industries are industries that have been positively disrupted by platforms such as TripAdvisor and Airbnb, among others.

Digital photography offered by smartphones has highly challenged the market share of Kodak. Bookstores, movies and music stores endured similar challenges due to the rise of eBook and streaming platforms (Gannes, 2016). Banks through online banking, FinTech and several other industries, pillars of the global economy are facing the same restructuring. The way human beings fulfill their basic needs and wants has shifted through the use of digital technology, and a whole economic system is taking form under this evolution. The economic benefits are attributed to companies behind those innovations, and for valid reasons, but besides them, there is also a large number of users simultaneously deriving economic benefits from their efficient use of those tools. The commission has also stated that if all the country's members learned from the best-performing European nations or the USA and China, the EU internet economy would witness the arrival of 400,000 to 1.5 million new jobs (Commission, 2016). Since its appearance in the mid-90s, the digital economy has progressed due to the dynamic nature of technology which is a high rate of adoption by both producers and customers (Barefoot & Curtis, 2018). The term internet economy can be traced back to the late 1990s, and from then on, the economic potential it could bring about if fully adopted by society, was apparent (Brynjolfsson & Kahin, 2002).

Economic growth is defined as an increase in the real income or production level of a country during a specific timeframe. At first, the digital economy emerged in developed countries but given its information, goods and services sharing abilities, it spread itself to new regions. This includes developing countries due to the continual ongoing international trade and political bonds which simultaneously further the expansion of digital devices (UNCTAD, 2019). The scale at which the DE penetrates regions varies on the mean of penetration and the current development level in the place. 98 percent of the population living in rural areas of high-income economies is covered with a mobile broadband network. This implies that almost every person without access to a mobile broadband network lives in a rural area of a developing country (International Telecommunication Union, 2023).The bilateral relations between developed and developing countries are fertile ground for the

prosperity of digital tools and processes. Although they are quite costly to acquire and maintain, they are undoubtedly time and cost-saving in the long term. Additionally, the level of professionalism and efficiency they provide is irrefutable in this age. At the Central Economic Work Conference in 2019 in China, it was clearly stated that reviving the development of the digital economy is a sure path to reaching a place of sustainable and high-quality economic growth (Zheng, Jiang & Yang, 2021). Most governmental sectors are being affected by the digital economy, but its impact on the manufacturing industry is one of the highest. It is the physical extension or the tangible expression of the DE given that its outcomes usually empower all the other economic sectors. The economic benefit straightly derived from the usage of the internet in a nation can be identified as the iGDP or e-GDP (Manyika & Castillo, 2013). A high iGDP translates into an important online trade in a country. The share of e-commerce in the European economy was 4.3% in 2020 and accounted for 4.6% in 2021. As a comparison, the spending on defense in Europe amounted to 1.2 % of GDP in 2019 (Lone & Weltevreden, 2021). There are a specific number of online industries that result in the growth of iGDP, notably online media, e-commerce, online advertising and digital financial services.

In these last years, we have witnessed the accentuation of digital services, products and methods which are imposing themselves on society across all the spheres of the economy (Brennen & Kreiss, 2014). This change is often described as digitalization, the advancement of business operations and human activities through digital services and products (Malecki & Moriset, 2007). A recent focus has addressed the several cross-sectoral digitalization trends ongoing in the traditional economic sectors (OECD, 2016). Based on the terminology of the DE, the global value of the DE is also fluctuating. However, it has been esteemed that the DE is responsible for around 4.5% and 22.5% of world GDP, according to the attributed definition of the digital economy employed. In the case whereby the DE constitutes around 4,5% of the GDP, the DE is attributed to the narrowest range of impact, only considering the value-added by the ICT industry alone. When considering this description, its impact on global GDP remained constant at around 4.5% from 2008-2018 (UNCTAD, 2019). Higher figures are obtained when we tend to include the spilling effects of the ICT industry in other sectors of activity constituents of the economy. The World Bank estimates that the digital economy contributes to more than 15% of global domestic Product (GDP), and in the past decade, it has been growing at two and a half times faster than physical world GDP (WEF, 2022). Deemah AlYahya, Secretary-General of the Digital Cooperation Organisation (DCO), expects the digital economy to grow tremendously contribute 30% to the global GDP and create 30 million jobs by 2030. The world's digital economy industry is controlled by two countries, the USA and China. The fact that developing nations have the upper hand in the digital economy and its potential benefits doesn't come as a surprise. It compels us to assess the correlation between the existing development level of a nation and the economic benefit a country can derive from the DE.

Approximately sixty-seven percent of the world's population, or 5.4 billion people, is now online. This represents a growth of 4.7 percent since 2022, an increase from the 3.5 percent recorded from 2021 to 2022 (International Telecommunication Union, 2023). The number of people offline in 2023 decreased to an estimated 2.6 billion people, representing 33 percent of the global population. Internet use remains tightly linked to the level of a country's development. In 2020, nine out of ten people in high-income countries used the Internet. In 2023, the share edged up to 93 percent, getting closer to universality. In low-income countries, 27 percent of the population uses the Internet, up from 24 percent in 2022. This 66-percentage point gap reflects the width of the digital divide between high-income and low-income countries and regions (International Telecommunication Union, 2023).

Is a strong economic level a prerequisite for a nation to derive the most from the digital economy? Seeing those two countries have been in the top ten largest economies by average values of (GDP) during the past 40 years. In 2015, The USA and China represented around 44% of the world's digital economy (Knickrehm, Berthon & Daugherty, 2016). Moreover, they both hold 75% of all patents concerning blockchain and account for 50% of the spending on the Internet of Things. Additionally, they hold 90% of the 70 largest digital platforms (UNCTAD, 2019). As of 2019, they were responsible for approximately 72% of global e-commerce sales (E-Marketer, 2019). Does the digital economy necessitate a preexisting level of development for it to be fully profitable? Those are some of the questions we will try to cover in this topic. But the fact that aside from the USA and China other relatively strong developing countries hold quite a small fraction of the global digital economy, reveals that aside from being a developed nation several additional and major factors have to be considered to derive a consistent economic benefit from the digital economy. The DE has been found to amount to up to 10% of the

GDP of developing nations, while in advanced nations it was responsible for nearly 18.4% of their GDP (Huawei, 2017). In the same year, developing nations accounted for 27% of participation in the global digital economy, (Huawei, 2017). While evaluating the importance of the DE, it has to be observed through the lens of a given set of technologies. As highlighted by (UNCTAD, Information Economy Report: Digitalization, Trade and Development, 2017). the development of the DE can be tracked by a continuous increase of robotic innovations and the adoption rate by society of the infrastructure constituents of the Internet of Things (IoT). However, observing the latest trending innovations will not always result in a proper understanding of the DE, hence its main constituents should be explored.

In recent years, scholars have investigated both the practical and theoretical aspects of the digital economy, it has been noted that the period to assess the bond between economic growth and the digital economy has passed and now researchers should rather shift from the benefiting relationship to now elucidate how digital systems directly and indirectly influence the economic performance (Vu, Hanafizadeh & Bohlin, 2020). Although the development of the DE triggers a rise in regional economies it also fosters a vast digital separation (Lopez & Nanclares, 2003). A study equipped with surveys sourced from the Dutch population observed that considerable inequalities in society will continually spring up as the internet gains in maturity (Van & Duy, 2020). With the use of empirical techniques, Cardona assessed the digital economy and its elements and their role in pushing forward productivity in all the spheres of activities it penetrates (Cardona & Kretschmer, 2013). Scholars also observed that high-quality economic growth can originate from the DE, given its ability to enhance the production factor, time efficiency, quality, and the economic inputs of previously irrelevant elements (Hong, 2019). Among the several traits of the digital economy, the highlight traits of the digital economy are its large diffusion, continuous rise, high sphere of influence, and ability to increase returns and reduce cost in the long term (Song, 2019). Also, given its informational feature, and both the external and internal support it gives business, it has the potential to increment marginal gains. In an aim to assess the relationship between the DE and economic growth, the two variables within 222 prefectural regions in China have been gathered and results that the DE has the potential to significantly promote sustainable economic growth (Zhao & Zhang, 2020).

In the same region, with the use of the Digital Inclusive Finance Index and Household Tracking Survey data, digital finance was observed to be a generator of inclusive growth in China's economy regarding the DE (Zhao & Zhang, 2020). Ren & Yang (2020) believed that quality economic development emanates from innovations in technology. Other economists have had quite divergent conclusions on this view (Wang & Chen, 2018). This is one of the main reasons why this study has been instigated. The impact of the DE on economic prosperity is perceivable tangibly but theoretically, it is hardly perceivable and poorly reflects the true state of reality. Zheng, Jiang & Yang (2021) focusing on how much of the high-quality development of 30 Chinese provinces from 2011 to 2019 relies on the digital economy discovered a low significant correlation between the two elements. We often blame the government for not establishing proper policies and laws to fast-track certain innovations. But when it comes to digital, the groups at the forefront have to be the first to both explain and showcase realistic findings and the economic benefits of digital systems. The economic benefit from the digital economy showcased is often that of turnover made by the sale of digital products and services to the market. These habits in itself conceal the many avenues through which economic gain is made digitally. Groups have to showcase how the internal use of those digital systems translates into economic gains by helping them to save cost, time and resources. Users also have to be surveyed and disclose the gains they made from digitalizing their business. We often highlight unemployment levels due to digital but seldom mention the various new professions human beings are venturing into through the digital economy. The negative aspects of the rise of the digital economy on humans (often linked to their misuse of the digital), as it regards health, security and unemployment are many blatant (Guliyev, 2023). On the other hand, the lack of theoretical reports on how several individuals are endeavoring into online business and entrepreneurship quite easily, with few experiences and qualifications daily is far undermined. The high level of privacy of digital companies affects the availability of accurate literature on the economic gains of implementing digital systems. It is also responsible for the shortage of conclusive studies, established theories and the absence of internationally accepted deep digital measurement tools.

3. Data and Methodology

This segment of the study focuses on the approach used to assess the role of the digital economy in the economic growth of 21 OECD country members, from 2016 to 2020. On this basis, the following section begins with the research design and next will be an elaborate presentation of the variables to be processed. The source of the data as well as the regressors and analysis techniques employed for their assessment, will also be revealed in this segment.

Research Design: This study's theoretical frameworks draw on existing theories and research which revealed that technology has a positive impact on economic growth. On this basis, this study brought forward two key players of both technology and economic growth, which are respectively the digital economy and sustainable growth. These days the topic of sustainability cannot be properly discussed without mentioning the integral usage of digital systems. We observed that the digital economy seems to bring suitable answers to most of society's sustainable issues. Our collection of data will be made with the intent to verify if this observation is equally perceived theoretically.

As briefly stated by Creswell (1994), quantitative research elucidates happenings through the collection of numerical data which are processed mathematically mostly in statistics. Quantitative research enables researchers to perceive the world's happenings, as a reality that can be objectively grasped. The findings of the quantitative analysis are founded on logic, impartiality and statistics. Both the primary and secondary methods can be applied in the collection of variables. The variables for our study are secondary data and the collection method and source will be displayed in the following part. Although several theories have been found on the impact of digital on productivity, its financial outcome is usually acknowledged and effectively reported by companies but rarely by countries and governments if not in speech. Therefore, this research can be classified as correlational and experimental given the assessment of the interconnection between those two parties.

Data Source and Collection: The yearly secondary data used for this study have been sourced from various databases. The main one is from the E-commerce Europe (EE) report 2021. Ecommerce Europe is a European association representing the digital commerce sector in Europe. It is the principal European structure representing the retail sector.

The EE aims to equip nations with tools that will help lawmakers design frameworks more fitted for the evolution of DE and online entrepreneurs and businesses. The EE also intervenes in public affairs and stands for the interest of digital commerce. It is shaped as a working committee whose outcome is transferred understandably for non-IT individuals and legislators to make informed policy recommendations. The second source was the United Nations Conference on Trade and Development (UNTCAD) a permanent structure designed by the General Assembly of the United Nations in 1964. It is an intergovernmental organization, part of the UN Secretariat and the United Nations Development Group. The UNTCAD works with several governments to ensure a proper implementation of Financing for Development.

For our study, we gather from their reports the e-commerce sales of some countries in the chosen time periods. The third source was the OECD Stat which is a segment of the Organization for Economic Co-operation and Development (OECD). It is an international organization devoted to constructing policies that once implemented result in an amelioration of the life of citizens to an extent. To achieve this, they design policies that further equality, prosperity and the availability of development opportunities. It's in this vein that their statistics branch has been developed and also made available to the public. They not only disclose their analysis and projects but also part of the information they use to establish policies and monitor their impact in countries. Unavailable variables on the aforementioned databases, during a certain period have been obtained from the OECD Stats. In total, for our estimation of the econometric model, the variables concerning 21 countries members of the OECD from 2016-2020 have been selected every year for the composition of the balanced panel.

Data Presentation

Independent variables

-E-commerce sales (ECOM) refer to the annual revenue generated online by businesses in each country. It is expressed in euros and varies based on the scale of online activities in a country. Several elements such as

internet penetration, ICT usage and adoption rate and IT literacy affect its value. However, a low e-commerce sale shouldn't directly translate into a low internet penetration or usage rate. A more detailed analysis has to be conducted, and factors like demography have to be included. E-commerce is so dense that in cases where products cannot be digitalized or the services are unable to be provided digitally, businesses still find a way to enlarge by multiples their customer shares and by doing so their economic returns.

-E-Shoppers (ESH) or online customers, are the first portion of the total population which are accessing the internet annually. It highlights the percentage of internet users who bought goods and paid for services online. Knowing that the total online population is not necessarily engaged in buying and selling online, it is important to separate those who do engage in it from those who do not. In our analysis we opted for the growth rate in online shoppers for a more distinct analysis of their ascent or decline over the years in regions. The e-shoppers' growth rate can be either positive or negative since it considers the data of prior years.

-The GERD or Gross Expenditure on Research and Development, refers to the total domestic spending on research and development performed on the national territory over a period of time. It includes all sectors of activity such as governmental, public and private business, higher education and healthcare. The GERD focuses on all R&D activities executed locally or within the limit of the country. Regardless of the source of R&D funding, GERD encompasses both domestic and overseas funds.

-The Gross Domestic Product per Capita (GDPC) is globally acknowledged for indicating the economic growth of a nation. It is derived from the Gross Domestic Product, which is calculated as the sum of investment, consumption, government spending and net export, generated by a country on an annual basis. The GDPC can be obtained by dividing the real GDP of a nation by its population.

Dependent variables

The Sustainable Development Index (SDI) is an index that first of all acknowledges and supports the fact that progress shouldn't be achieved at the expense of the planet's wellness. It states that genuine development should be pursued within the delineations of the environmental limits and progress should only be recognized through the lens of its conformity with the planetary boundaries. The Sustainable Development Index has been designed to efficiently assess the ability of society to further development, whilst abiding by the environmental and societal norms (Jyoti, 2019). Generally, several elements are included in the calculation of the SDI. Amongst them, we can cite demography, employment inclusivity, labor force, unemployment, life expectancy, mortality rate, education and industrialization index among many others. In our context, we used a summarized version obtained by the ratio of the development index over the ecological impact index. We opted for the SDI as a dependent factor given the ability of digital factors to provide sustainable solutions and improvements in society.

Methodology and regression equation

Dynamic Panel Model

The usage of panel data analysis is gaining in popularity given its prowess when several countries are involved in the research application. Panel data refers to a common sample set of elements that nations or organizations have during a certain period. The use of panel data holds several benefits, in fact one of them is that given its ability to support and examine a larger number of variables over a long period, it reduces the amount of multicollinearity among the variables, and enhances the performance of the estimation. Given the aim of this study, 21 countries members of the OECD have been observed over five years beginning in 2016, to examine the impact of the digital economy on economic growth. We first of all considered the dynamic panel data model estimated as follows:

$$SDI_{i,t} = \beta 0 + \beta 1GERD_{i,t} + \beta 2ECOM_{i,t} + \beta 3ESH_{i,t} + \beta 4GDPC_{i,t} + \varepsilon_t$$

Where each country in the panel is represented by *i* and *t* reflects the period.

The functional form of the model being used is as follows

$$SDI_{i,t} = f(GERD_{i,t}, ECOM_{i,t}, ESH_{i,t}, GDPC_{i,t}, \varepsilon t)$$

Which, $SDI_{i,t}$ presents Sustainable Development Growth, $GERD_{i,t}$ shows Gross expenditure on research and development, $ECOM_{i,t}$ is E-commerce sales, $ESH_{i,t}$ presents Online customer, $GDPC_{i,t}$ is Gross Domestic Product Per Capita, and ε_t is the Error Term
The coefficients of the regressors are symbolized by $\beta 1$ to $\beta 4$ in the equation above and the constant is symbolized by $\beta 0$.

4. Empirical Results

In this part of the study, we will showcase the results obtained by the application of previous methodologies and interpret each finding in line with our main topic. The overhaul aim of this paper remains the investigation of a relationship between the digital economy and sustainable economic development.

Descriptive Statistics

The descriptive statistic test is used to depict the fundamental aspect of the variables used in our research. It presents a summarized and classified version of the raw variables, to provide a meaningful viewpoint of the raw data. It gives a quantitative depiction of each variable and presents their specifications such as their maximum, minimum, mean, standard deviation, and level of skewness.

Table 1: Descriptive Statistics

Variables	SDI	GERD	GDPC	ECOM	ESH
Mean	78.90402	2.094190	42430.38	50.641771	5.651048
Median	79.40000	2.070000	43784.29	8.200000	4.240000
Maximum	85.60711	3.500000	87097.04	720.0000	22.62000
Minimum	69.81073	0.300000	12447.44	0.260000	9.580000
Std. Dev	3.780484	0.837726	20808.79	117.9223	5.545152
Skewness	-0.364099	0.018014	0.401690	3.685737	0.620955
Kurtosis	2.639828	1.730539	2.260488	17.30507	3.345161
Jarque-Bera	2.887483	7.056130	5.216310	1133.009	7.268963
Probability	0.236043	0.029362	0.073670	0.000000	0.026398
Sum	8284.922	219.8900	4455201	5317.380	593.3600
Observation	105	105	105	105	105

Source: Estimate by the researcher using EViews.

Table 1 above shows the descriptive results of the SDI, GERD, GDPC, ECOM, and ESH of 21 OECD countries members from 2016 to 2020. We have in total 105 observations. The mean value of the SDI of 78.9 reflects that a relatively high degree of sustainability is included in their economic development procedures. Concerning the GERD, the average of 2.09 lies within the findings of previous researchers. It has been revealed that the GERD as a portion of GDP on the global scale rose from 1.8% in 1981 to 2.2% in 1990 and has since then remained as such (May, 1998). The GERD also has the lowest volatility amongst the variables. The online customer population growth, being a proportion of internet users, has a 5% average growth. The mean for the GDP Per Capita of those combined countries expressed in euro is also relatively high. The e-commerce sales of those countries, which are expressed in billions of euros, also have on average a relatively high value. The ecommerce variable also has one of the highest standard deviations, which means that it fluctuates more than the other variables, unlike the GDPC whose composition depends on a greater number of variables absent in

our set. Overall, the proximity between the mean and the median of the variables, except in the case of ECOM, revealed that this econometric model is experiencing a normal distribution.

Table 2: Unit Root

ADF					
		Intercept		Trend & Intercept	
Variables	Significance	T-Statistic	P-Value	T-Statistic	P-Value
SDI	Level	104.743	0.0000***	99.9964	0.0000***
GDPC	Level	-1.68478	0.0460**	-7.7132	0.0000***
ECOM	Level	22.7709	0.9932	34.75787	0.7784
	1st Difference	62.4733	0.0218**	74.8772	0.0013***
GERD	Level	66.0640	0.0103**	7.6432	0.000***
ESH	Level	87.5486	0.0000***	98.8686	0.0000***
Levin, Lin & Chu T					
		Intercept		Trend & Intercept	
Variables	Significance	T-Statistic	P-Value	T-Statistic	P-Value
SDI	Level	-16.7426	0.0000***	23.9964	0.0000***
GDPC	Level	-7.71320	0.0007***	1.7132	0.0000***
ECOM	Level	6.3643	1.0000	34.75787	0.9784
	1st Difference	-1.99436	0.0231**	-6.8772	0.0000***
GERD	Level	-15.4567	0.0000***	7.74532	0.0000***
ESH	Level	-19.2875	0.0000***	98.8686	0.0000***
Phillip Perron					
		Intercept		Trend & Intercept	
Variables	Significance	T-Statistic	P-Value	T-Statistic	P-Value
SDI	Level	119.7426	0.0000***	98.9964	0.0000***
GDPC	Level	77.71320	0.0007***	1.7132	0.0000***
ECOM	Level	34.3643	0.7784	34.75787	0.9784
ECOM	1st Difference	74.8772	0.0013***	-6.8772	0.0000***
GERD	Level	40.8493	0.5214	79.74532	0.0004***
ESH	Level	98.8686	0.0000***	98.8686	0.0000***

*** Significance at 1%; ** Significance at 5%; * Significance at 10%. Source: Estimate by the researcher using EViews.

Table 2 presents results obtained with the use of the Augmented Dickey-Fuller (ADF) test. This test has been used to check the stationary level present in the set of variables. The null hypothesis of the ADF test states that the data are non-stationary and it symbolizes the presence of a unit root in the data set. In the event of the presence of a unit root, the variables are converted in the first difference for correction of the problem. However, if the variables are found to have unit root after being converted it is sometimes advised to remove the variable. The results of the unit root test with only the trend shows SDI, GDPC, GERD and ESH as significant at level, at a 1% significance level. Regarding GERD, it is significant at the 5% significance level and the ECOM is significant at the first difference. However, when the trend is added to the parameters, the p-values of SDI, GERD, GERD and ESH are all below 0.05, hence significant at the level at a 1% significance level. Concerning the ECOM it is statistically significant at first difference with a 1% significance level. The presence of the unit root in the e-commerce variable is treated on the first difference. The SDI, GDPC, ESH and GERD being all significant at level, respectively 1% and 5% significance and the ECOM being significant at first difference, means that the null hypothesis will be discarded. We then accept the alternative hypothesis which states that there is no unit root. Levin Lu & Chu present similar results except for the significance level of GDPC and GERD. Likewise, the findings of the Phillip Perron tests are similar, besides the GERD which is only significant with trend and intercept at level. In consideration of the results of those three tests, we can safely conclude that the collected set of variables is all stationary.

Table 3: Cointegration Test

Kao's Residual Cointegration Test	Hypothesis	T-statistic	P-Value
Null Hypothesis	No Cointegration	-8.128693	0.0000
Residual Variance	-	5.336785	
HAC Variance	-	4.196876	

Source: Estimate by the researcher using EViews.

Table 3 above presents the results from the panel cointegration test, proposed by Kao in 1999 which employs a first regressors technique. The null hypothesis of the test is that there is no cointegration and therefore no long-run relationship exists amongst the variables. The P-value being inferior to 0.005 leads us therefore to the acceptance of the alternative hypothesis. The null hypothesis of no cointegration is then highly rejected at a 1 percent significance level, which indicates that the analyzed variables in all the panel sets are cointegrated, and share a long-run relationship. The statistical information enables us to ascertain the presence of a sure cointegration among the variables.

Table 4: Dynamic Panel Generalized Methods of Moments

	Coefficient	Std. Error	t-Statistic	P-value
SDI (-1)	0.235348	0.118881	1.979689	0.0617*
GERD	1.130857	0.467810	2.417343	0.0253***
LOG (GDPC)	-3.028035	2.380131	-1.272214	0.2179
ESH	0.039383	0.017594	2.238517	0.0367**
ECOM	0.014607	0.002757	5.298816	0.0000***

*** Significance at 1%; ** Significance at 5%; * Significance at 10%. Source: Estimate by the researcher using EViews

Table 4 presents the results for the dynamic Generalized Method of Moments (GMM). First, the effect of e-commerce on sustainability growth shows that a percentage change in the e-commerce return can lead to a 1.4 percent increase in the level of sustainable development, in the short run at a 1% significance level, on average ceteris paribus. Hence, e-commerce and the SDI exhibit an elastic connection. The value of e-commerce sales depicts the involvement scale of a nation with the digital economy. It is a reliable instrument to measure the development of the DE in a nation. Considering that e-markets are vastly composed of digital elements, and are found to be significant for sustainable development, it is quite safe to say that digital systems are contributing significantly to the advancement of sustainable development. The more people remain at home, whilst maintaining or even increasing their economic involvement in their society has a positive impact on the environment, the healthcare of the population and inevitably on the economy. It also mirrors the vital position that digital improvements have globally in the active and effective establishment of durable economic infrastructures. The research and development findings also indicate that a percentage change in the amount allocated by the officials towards research can lead to up to a 113 percent increase in the index of sustainable development, in the short run at a 1% significance level, on average ceteris paribus. The GERD, hence, has a high input in the evolution of sustainable development. As discussed in this study, technological prowess which led to the recent digital improvement couldn't have happened without several research. That research is costly and does not often immediately result in high profits, hence requiring a constant stream of financial support. The gross expenditure on research and development and the SDI shares an elastic connection.

However, the full return on investment in the research tends to be perceivable in the long term. Only then we can say the fruits of this research are ripe, fully matured and well-received by society. Hence, there is a need for high digital literacy in society. The sooner a proven innovation is received, the sooner the people involved in its creation and usage will benefit economically from it. Several research hasn't brought forth concrete results because they tend to focus on the portion of GERD that failed to deliver. However, the knowledge acquired from that failure is invaluable and is more than often directly linked to successful discoveries. It is based on knowledge derived from those failures that the next successes are born. The total return of a single, fully matured and accepted innovation can offset the R&D investments made by officials over several years.

Regarding the involvement of the online customers population in sustainability growth the results reveal that a percentage change in the e-shoppers can lead to a 3.9 percent rise in the index of sustainable development, in the short run at a 5% significance level, on average ceteris paribus. Several benefits for the environment and health can be traced back to the reduction of physical movements of individuals. During the Covid-19 pandemic, we've witnessed the quarantine which was only possible due to the simultaneously high increase in the number of online customers in several industries. The Census Bureau revealed that not only online shoppers spurged but also e-commerce sales increased by $244.2 billion or 43% in 2020, the first year of the pandemic, rising from $571.2 billion in 2019 to $815.4 billion in 2020 (ARTS, 2022) . Those e-shoppers were not only maintaining the economy but also the health condition of each other. Reducing each one's exposure to the outside environment had an advantage on the global health state. On the topic of sustainability, the most crucial end goal is health. But considering that ESH is a function of internet users, it might be difficult to directly perceive its impact at first glance. Regardless, ESH has an elastic relationship with the sustainable development of a nation. The GDP per capita is the only variable disclosing an insignificant probability value. GDPC is a function of GDP and demography which are themselves impacted by several factors external to those used for our study. The GDP is largely composed of the inputs of capitalistic industries and the share of companies involved in the sustainability aspect of their production systems is quite low. It is hence hard to connect the GDPC with sustainable development since the SDI does not portray the amount earned by the population, rather it rates the methods and processes employed by the demography in the acquisition of those riches. The Gross Domestic Product per capita exhibits then an inelastic relationship with the sustainable development index. Finally, the coefficient obtained for the lagged dependent variable, SDI (-1) is quite small nearly 0.2 positive and significant at a 10 percent significance level. This means that a large portion of the model has a relatively small influence (0.2) on the sustainable index in the short term. As discussed above, although most of the constituents of sustainable development are not directly tied to the DE, they are highly connected with digital systems but the SDI structure doesn't equally attest to it. This shouldn't be so, the impact of the DE has to be acknowledged, given the presence of unique elements, characteristic of the DE in today's sustainable economies. The proper reflection of digital systems in the global economy is experiencing several hindrances.

We could have chosen dependent variables such as the returns from the technology and the manufacturing industry which are very profitable to the global economy and also obvious constituents of the digital economy. But the intent of this study being to give a global wakeup call and provoke changes, we opted for a dependent variable that both touches and relies on the involvement of all spheres of economic activities. The technology and related sectors are already aware of the economic advantage of the DE, but other industries are still lagging due to a lack of knowledge on the subject and the committed use of incomplete profitability measurement tools. Those habits obstruct the full acknowledgment of the impact of the DE. Despite this situation, the DE is still finding a way to spring up as a small significant element. Moreover, the discovery of a 0.2 value has not been previously investigated let alone found by prior studies. To ensure the effectiveness and consistency of the GMM estimation, the investigation for the absence of serial correlation amongst residuals and their validity is necessary.

Table 5: Collinearity Variance Inflation Factor

Variable	Coefficient Variance	Uncentered VIF	Centered VIF
GERD	0.415055	11.12022	1.1410345
GDPC	0.000278	4.914534	1.032945
ESH	0.002994	1.879655	1.153693
ECOM	0.000022	1.302560	1.265972
C	2.835467	15.80948	NA

Source: Estimate by the researcher using EViews.

The term multicollinearity indicates a state by which two or more variables are found to be highly correlated to one another. Table 5 presents the findings from the variance inflation factor (VIF), which is a method used to evaluate the presence of multicollinearity among variables in a regression model. As discussed in the methodology, there is no formal VIF value set for the determination of the presence of multicollinearity, such as the thumb rule with other methods. An ideal variable's VIF value lies around 1. When it reaches this value,

we can then be sure of the absence of multicollinearity among variables. Based on the findings of the model, we can conclude that they testify to the absence of multicollinearity, as all p-values for the centered VIF are close to 1.

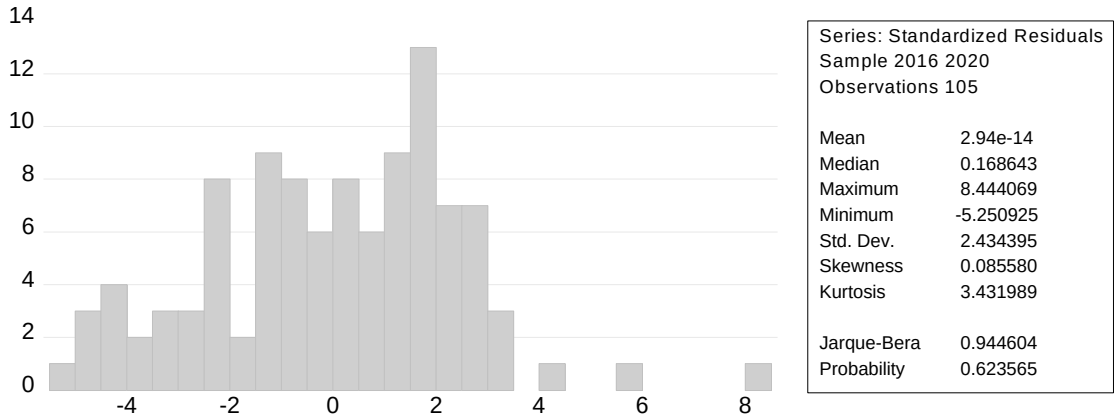
Table 6: Arellano Correlation Bound Test

Test Order	m-Statistic	SE (rho)	P-value
Null Hypothesis:	No first-order serial correlation		
AR (1)	-2.252876	20.319493	0.123
AR (2)	NA	NA	NA

Source: Estimate by the researcher using EViews

The dynamic panel data has been additionally diagnosed with the Arellano-Bond's (1991) test, to investigate the correlation between the variables. According to Arellano and Bond, this diagnostic is of great importance in analyzing the validity of the instruments when a dynamic set of data is involved. Furthermore, it is necessary to examine the reliability of the dynamic outcome using the Arellano–Bond estimator. Table 6 presents the results obtained after investigating serial correlation. The serial correlation of idiosyncratic error term being the aim of the Arellano-Bond test, led to the completion of the test at first difference. The null hypothesis of the test is that there is no first-order serial correlation. The AR (1) p-value of 0.1234 is higher than 0.05, then leads us to the acceptance of the null hypothesis. the error terms are not serially correlated in the first difference.

Figure 1: Normality Test



Source: Estimate by the researcher using Eviews

Figure 1 presents the Jarque-Bera test, which is a multiplier instrument, mostly employed to assess the normality status of the variables to either infirm or confirm the normal distribution of the dataset. The degree of kurtosis and skewness can also be used to assess the normality. The null hypothesis of the Jarque-Bera test is that the data are normally distributed, whilst the alternative hypothesis states that the residuals are not normally distributed. The requirement for Kurtosis is that the value must its value must lie between -3 and 3. Furthermore, regarding the skewness, its boundaries are between -1.96 and +1.96. Finally, to reject the null hypothesis of the test and accept the alternative hypothesis, the P-value should be less than 0.05. Henceforth, as showcased in Table 7, the value of the kurtosis is just above criteria 3, and the value of skewness of 0.08 lies within the -1.96 and +1.96 limits. The investigation also presented a probability value of 0.623565. the P-value being greater than 5%, leads to the acceptance of the null hypothesis. Based on those findings, we then state that the given set of data is normally distributed.

5. Conclusion

In recent years, our personal lives have greatly benefited from digital systems, and they've offered us durable and sustainable solutions for most of our economic and social issues. It is widely considered that our society will enter a phase whereby national and global governance fully backed by the digital economy will be the norm. Proper economic inclusion and globalization are nearly impossible without a global adoption of the digital economy. If economies of the world truly want sustainable economic prosperity, they must be willing to part with the incongruent traditional economics models they simultaneously carrying on. Failure to make drastic decisions for global integration of the DE will equate to the expansion of the economic gap between developing nations and developed ones. Developed countries alike have the ability to quickly forsake certain old methods of operations when they're presented with a new effective and sustainable one. The adoption is complete, when the previous methods are blatantly obsolete when compared to the new ones.

Considering the fast pace of innovations, the problem of waste and emissions can't be ignored. The DE is also at the root problem of various societal issues. The huge gains provided by big data companies often come at the cost of the user's privacy; the free flow of information threatens international and national security. The intelligence agencies behind several IT companies have been accused of mass surveillance and breach of privacy through their software and the personal smart devices they commercialize. Furthermore, the automation processes which largely constitute digital systems, have a great substitution effect on the activities involving mankind, and it ends up affecting the labor industry as we know it. The DE should not be handed the laissez-faire approach, rather governments have a major role in monitoring its evolution by directing its entry and exit points. The economic benefits from the digital economy often seem to increase in nations that have beforehand established a conducive ground for its implementation. Henceforth, the necessity to display information concerning the DE, in an intelligible form by non-IT individuals. Large digital companies must be considered in line with the power they have at their disposal. Besides being some of the largest organizational tax contributors, governments must see them as allies to accurately support innovations and to establish proper legislation on all aspects of the digital economy. The impact of digital on economic growth has been proven both practically and in theories, however, the focus of this study was to highlight the importance of the digital economy on the establishment of sustainability. The results which are less showing than expected are not congruent with reality. The shortage of specific data concerning the digital economy at the national level is one of the barriers. However, the lack of a proper definition of the digital economy further complicates the establishment of the data that can reflect best its sustainability impacts.

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The Mediating Role of Access to Digital Finance on the Relationship between Financial Literacy and Performance of Uganda SMEs in Mbarara City

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Abstract: The study aimed to explore the potential mediating influence of access to digital finance in the relationship between financial literacy and the performance of SMEs in Uganda. To establish this link, the study used a cross-sectional methodology to collect data at a certain point in time. Barron and Kenney's (1986) four phases required each direct influence of the study variables to follow a significant criterion. These requirements were satisfied because there was a significant direct correlation between SMEs' performance and financial literacy (Beta= 0.655; p<.01). Access to digital finance and financial literacy demonstrated a considerable direct impact (Beta= 0.519; p<.01). Moreover, there was a noteworthy direct impact from SMEs' performance to their access to digital finance (Beta=0.491; p<.01). When considering access to digital finance, the direct association between financial literacy and SMEs' performance decreased from Beta=0.655 to Beta=0.548, remaining statistically significant. This indicates that access to digital finance might serve as a moderator in the connection between financial literacy and SME success. further demonstrated by the indirect effect of (0.106/0.655 x 100) percentage. 16.2%, meaning that the direct effect is explained by 83.8% in the model. It is advised that policymakers and stakeholders in Uganda's SME sector should concentrate on developing clear guidelines on how SME owners can access digital finance. This will help in training them to improve the performance of SMEs. To improve SME outcomes, methods should be developed to make it simpler for people to use digital financial services and raise their financial literacy.

Keywords: *Ugandan SMEs, financial literacy, access to digital finance*

1. Introduction

The focus of entrepreneurship research has shifted towards Small and Medium-sized Enterprises (SMEs), recognizing their crucial role in economic growth and development (Eikelenboom & de Jong, 2019). Over the past years, the impact of SMEs on both developed and developing nations has significantly increased. According to the Uganda Bureau of Statistics (2019), SMEs contribute to over 20% of Uganda's GDP and employ approximately 45% of the country's workforce. SMEs play a critical role in global socioeconomic development and poverty reduction, influencing areas such as employment creation, GDP growth, innovation engines, income distribution, resource utilization, and regional development (OECD, 2019; Maldonado-Guzmán et al., 2019).

The bulk of SMEs are found in the manufacturing, trade, services, and agricultural sectors. The industry is the largest in the country, with 1,100,000 enterprises (Uganda Business Impact Survey, 2020). Thus, 90% of the private sector in the nation is made up of small and medium-sized businesses, or SMEs (Al Mamun et al., 2016). These companies contribute significantly to Uganda's economic development and provide jobs for its citizens. SMEs in Uganda have made a substantial economic contribution, but they have consistently struggled with low performance, which has an impact on their ability to survive.

According to existing literature, the limited success of SMEs can be attributed to factors such as a lack of opportunism, organizational skills, networking, partnerships, dedication, execution, and innovative thinking (Man et al., 2002; Vijay & Ajay, 2011). Recent studies propose that a significant impediment to the growth of SMEs is a deficiency in financial literacy. Agyapong and Attram's 2019 research contributes to the understanding of financial literacy in this context.

The ability to manage and use money wisely and with knowledge is known as financial literacy (Nkundabanyanga et al., 2014; Ye & Kulathunga, 2019). Financial knowledge and attitudes, which include an understanding of fundamental financial concepts like borrowing, investing, and saving, are indicators of financial literacy (Garg & Singh, 2018). Due to its significant influence on financial decisions, financial literacy has grown in importance in both established and emerging economies (Hussain et al., 2019).

Agyapong and Attram (2019) assert that a company's performance is influenced by the way it handles and allocates its financial resources. This implies that the management of a company must properly and efficiently allocate, use, and manage its financial resources. The acquisition of expertise by an owner-manager has been a topic of discussion globally. Numerous scholars argue that managers should possess a certain degree of financial expertise or an outstanding educational background to establish efficient financial management systems and make optimal use of limited resources. However, conflicting empirical evidence suggests otherwise (Agyapong & Attram, 2019; Hussain et al., 2019; Amerteifio & Agbeblewu, 2015).

To solve their performance concerns, several empirical research has been conducted to determine the attributes that positively impact these organizations' performance. These factors encompass various aspects such as venture capital, access to financing, training and seminars, financial literacy, and good corporate governance (Salia & Karim, 2019; Agyapong & Attram, 2019; Hussain et al., 2018; Gathungu & Sabana, 2018). While some studies emphasize the role of financial literacy in facilitating access to capital, they often overlook the importance of digitization. Digitization can significantly augment the capital accessible to companies through online savings accounts, trading, and banking, providing easy access to loans. Moreover, digital finance, especially through mobile money wallets and FinTech, has emerged as a potent tool for promoting financial inclusion across the continent. With cell penetration and mobile internet access at 45% and 24%, respectively, throughout Africa, digital finance has gained prominence. As of 2018, Sub-Saharan Africa alone accounted for 395.7 million active mobile money accounts (Tay, 2019).

The value of this study is twofold: Primarily, the study explores how SMEs can harness digital technologies to access, manage, and utilize money effectively, thereby augmenting their competitiveness, innovation, and growth. Secondly, it recognizes both the challenges and opportunities encountered by small and medium-sized businesses (SMEs) in the adoption and utilization of digital financial services. Additionally, the study acknowledges the mediating role of digital finance in elucidating the connection between financial literacy and the success of SMEs. As a result, the study will contribute to our understanding of SME funding and digitization and provide scholars, practitioners, and policymakers with helpful ideas. The study will also address a gap in the literature by focusing on a specific country context with a large share of SMEs in various sectors.

2. Theoretical underpinning of the study

Resource-based Theory (RBT)

Wernerfelt (1984) made the initial presentation of the resource-based theory. According to the notion, resources are necessary for a company to maintain its high level of competitiveness and improve its performance (Wernerfelt, 1984; J. Barney, 1991; Prahaland & Hamel, 1990b). These resources include material, technological, human (competency), financial, and marketing resources. The company reaches corporate strategy by fusing these resources with organizational features and procedures (Mata et al., 1995Andrews et al., 1965; Daft, 1983; J. Barney, 1991). These resources are the elements of a company that affect its performance, growth, and profitability, according to the Resource-Based Theory. These resources ought to be highly sought after, hard to come by, and simple to replicate (Barney, 2001; Dierickx & Cool, 1989).

Digital money is the newest trend in development. Because of continuous improvements in their utilization, SMEs and their clients can easily use these digital platforms. As a result, both homes and businesses are in great demand for digitization. Any business can expect a significant rise in product sales because of integrating digital finance into trading. SMEs might have a digital platform (such as an APP) where more clients could access their offerings and prices. These systems might also make payments and product delivery easier. Digital platforms can also be simply replicated. When an access's lifespan is reached, other forms with better upgrades could be created. Digital finance may therefore be a technology tool that enhances SMEs' performance. The Resource Based Theory is closely related to this.

According to the Resource-Based Theory, resources have a significant influence on performance. Financial assets would be selected, used, managed, and disposed of strategically given that the company's human resources are financially literate (Agyapong & Attram, 2019). The business's performance will increase as a result. One of the most important decisions managers make when running their company is the financial one. These choices have a significant effect on a company's long-term survival, growth, and profitability. The

resource-based approach holds that the strategic importance of commitment, utilization, and holding of resources lies in their ability to generate value. When internal resources, or human resources, are fully employed, more opportunities arise for them to add value to the business (Minola & Cassia, 2012).

Beyond gaining access to digital money and acquiring knowledge about its applications, acquisition methods, and associated risks, students will undergo management training to enrich their financial literacy. In alignment with the resource-based theory, a company operates efficiently when it has access to all the necessary resources. Organizations with financial resources are able to obtain other important resources for their operations (Stacey, 2011). If SMEs had sufficient funding, it would be easy for their management to learn about the latest technological developments in all areas of the firm. If low-cost digital systems like Mobile Money are enabled, sales will increase. Increased profit from high sales would allow the business to purchase more resources. If all of these resources were acquired, the company's performance would rise (Agyapong & Attram, 2019).

Aligned with the literature on resource-based theory, the performance of a firm is fundamentally shaped by the skillful integration of its resources and capabilities. The goal of resource-based theory is to enhance business performance by utilizing available resources to attain or maintain a competitive advantage over time. Following this principle, businesses generate value through proficient resource management, enabling customers to benefit from their offerings (Wernerfelt, 1984; Henard & McFadyen, 2012).

According to the findings of this report, companies with access to digital finance may be more strategically positioned to keep abreast of the latest developments in the economy. Their efficiency will increase as a result, and customers who do business online will profit. Small SMEs that implement digital systems will have more cash on hand if sufficient precautions are taken to address all potential risks (Stacy, 2011). The impact of certain information resources, such as financial literacy, on SMEs' capacity to accept digital financial systems and obtain digital funding has not been thoroughly studied. By investigating how digital finance access affects the relationship between financial literacy and the performance of small and medium-sized enterprises, this study adds to the body of knowledge. More study on this subject is necessary, with a focus on SMEs in Uganda. Because of this, the study will look at how much Ugandan SMEs utilize digital platforms and how informed they are about them, as well as the connection between the availability of digital finance and the performance and financial literacy of SMEs.

Financial literacy, access to digital finance and performance of SMEs in Uganda

Eniola and Entebang (2018) emphasize that a proprietor-manager equipped with financial literacy, understanding the impact of financial decisions on the success of their company at each growth stage, can effectively engage with suppliers and secure optimal goods and services. Marriott et al. (1996) defined financial literacy as the manager's ability to comprehend and evaluate financial data while maintaining ethical standards. Lusardi and Tufano (2008) underscored the importance of financial literacy in improving managers' skills and decision-making. The consensus among these scholars is that the performance of a company is positively correlated with financial literacy.

Atakora (2013) highlights even more how highly educated dealers are more financially literate than traders with low levels of education. He finds that the market women with greater degrees of education and work experience were more financially knowledgeable than the other women using the market as a focus group. Several other research (Tuffour et al., 2020; Hussain et al., 2018; Salia & Karim, 2019; Agyapong & Attram, 2019; Gathungu & Sabana, 2018) investigated the relationship between business performance and access to financing as well as financial knowledge. Nonetheless, the research concentrated on financial literacy and accessibility to capital. They failed to consider the influence of digital finance, though. While internet access was mostly disregarded, SMEs leveraged financial literacy and performance as a mediator through access to financing.

Gomber, Koch, and Siering (2017) highlight that financial literacy extends beyond simply creating and presenting financial data, especially given the current state of the financial world. In the contemporary economic landscape, product deliverables are increasingly becoming digital, as evidenced by the prevalent trend of product marketing on platforms like Twitter, Instagram, TikTok, and others. Despite these changes,

there is a notable lack of attention to company performance, financial literacy, and financial access.

The significance of digital systems for economies and their impact on enhancing the financial performance of companies has been extensively explored in research (Agyapong, 2020; Ozili, 2018; Gomber et al., 2017). Haucap, Myovella, and Karacuka (2020) and other experts have developed an innovation-based theory of economic development, elucidating how technology, particularly in the digital economy, influences economic growth and development. Much of their research underscores the positive relationship between digitalization and economic growth.

Concluding their assessment based on the knowledge base theory and evolutionary theory of economic transformation, Kulathunga et al. (2020) affirm that techno-finance literacy significantly impacts the performance of SMEs.He emphasizes that to increase performance, SMEs need to look at realistic technological and environmental developments. Businesses need to understand that providing users with access to all permitted digital systems could draw in more customers and increase revenue. A great deal of research has been done on the impact that financial literacy and funding availability have on the performance of small and medium-sized enterprises (SMEs). (Tuffour et al., 2020; Gathungu & Sabana, 2018; Agyapong & Attram, 2019 Salia & Karim, 2019; Hussain et al., 2018). They all concur that the success of SMEs is positively and significantly impacted by financial literacy. These studies also found that a business's performance is highly influenced by its access to finance and that acquiring funding necessitates a certain amount of financial understanding.

Understanding the potential influence of an owner-managers financial literacy on their capacity to secure digital funding for a business is vital. Consequently, the study delves into how access to digital funding acts as a mediator in the connection between financial literacy and the success of SMEs. This conceptual framework forms the basis for the hypothesis in this study. It says that:
Hypothesis 1: Access to digital finance acts as a mediator in the relationship between financial literacy and the performance of SMEs in Uganda.

3. Methodology

Research Design
The study used a quantitative technique with a cross-sectional research and correlation design. We chose a cross-sectional research method since our goal is to comprehend the factors being studied at a specific moment in time. This facilitated the assessment of the hypothesized relationships, such as the one wherein financial literacy and the performance of SMEs in Uganda were mediated by access to digital financing. The quantitative survey was scheduled and structured, and the item questions were updated in light of prior research.

Study Population and Sample Size
The target population was 4,776 registered SMEs in Mbarara city (MoFPED, 2022). These SMEs were picked from 3 different business categories. These categories are trade (4,483 SMEs), manufacturing (248 SMEs), and education services (45 SMEs). These categories were preferred for selection because they are commonly registered industries in Mbarara City. These were simply randomly sampled. The study used Krejcie and Morgan (1970) tables to determine the sample size. This can be seen in Table 1 below:

Table 1: Target Population and Sample Size

Industry (SMEs category)	Target Population	Percentage	Simple Size
Trade	4483	94	333
Manufacturing	248	5	17
Education Services	45	1	5
Totals	**4776**	**100**	**355**

Source: MoFPED report, 2022

The unit of analysis was SMEs, and the unit of inquiry was owner/managers.

Demographic characteristics of the owner/manager of SMEs

The demographics of the owners/managers of SMEs in Uganda were distributed as indicated in Table 2

Table 2: Demographic characteristics of the owner/manager of SMEs in Uganda

Category	Item	Frequency	Percent
Gender			
	Male	164	46.5
	Female	189	53.5
Age			
	20-29	134	38
	30-39	121	34.3
	40-49	60	17
	50 and above	38	10.7
Religion			
	Anglican	107	30.3
	Moslem	115	32.6
	Catholic	57	16.1
	Pentecostal	66	18.7
	Seventh-day Adventist	8	2.3
Marital Status			
	Married	64	18.1
	Single	25	7.1
	Cohabiting	153	43.3
	Divorce	98	27.8
	Widowed	13	3.7
Highest level of education			
	Certificate	156	44.2
	Diploma	75	21.2
	Degree	85	24.1
	Professional Qualifications	5	1.4
	Post Graduate	25	7.1
	Masters	4	1.1
	PhD	3	0.9
	Total	**353**	**100**

Source: Primary data, 2023

The findings show that there are somewhat more women in the sample (53.5%) than men (46.5%), which could reflect the sampling technique employed in the research or of the gender makeup of Uganda's SME sector. The results also show that most respondents are young, with more than 70% being between 20 and 39 years old. This may suggest that the SME sector is dominated by young entrepreneurs seeking opportunities and challenges in the market. The results also reveal that the sample is religiously diverse, with a substantial presence of both Muslims (32.6%) and Anglicans (30.3%). This may indicate that the SME sector is inclusive and tolerant of different faiths and beliefs. The results also show that the most common marital status among the respondents is cohabiting (43.3%), followed by divorce (27.8%). This may imply that the SME sector is characterized by unstable or unconventional family structures, which may affect the social and economic well-being of the SME managers and their dependents. The results also show that the most common educational level among the respondents is a certificate (42.1%), followed by a degree (24.1%) and diploma. This may indicate that the SME sector requires a moderate level of formal education but not necessarily a high academic

qualification. The results also show that the sample has a low representation of postgraduate, professional, master's, and Ph.D. holders, which may suggest that the SME sector does not offer attractive incentives or opportunities for highly educated individuals.

Demographic characteristics of SMEs

The demographics of the owners of SMEs in Uganda were distributed as indicated in Table 3

Table 3: Demographic characteristics of SMEs in Uganda

Category	Item	Frequency	Percent
Ownership structure			
	Sole Trader	8	4.5
	Partnership	56	18.4
	Limited Company	289	77.1
Trading period of business			
	Less than 1 year	166	47
	1-2 years	97	27.5
	3-5 years	32	9.1
	6-10 years	43	12.2
	More than 10years	15	4.2
Form of business			
	Manufacturing	8	2.3
	Education Service	18	5.1
	Trade	327	92.6
Number of Employees			
	Less than 10	319	90.4
	10-19	26	7.3
	20-29	8	2.3
	Total	**353**	**100**

Source: Primary data, 2023

4. Results and Discussion

The results indicate that the sample is dominated by limited companies (77.1%), which account for more than three-quarters of the SMEs. This suggests that most SMEs are incorporated entities with limited liability and separate legal personalities. The results also show that partnerships (18.4%) are the second most common legal form, while sole traders (4.5%) are the least common. This may indicate that the SMEs prefer to operate as joint ventures rather than individual enterprises. The results also show that most SMEs are relatively new, with almost half operating for less than a year (47%). This may suggest that the SME sector is dynamic and entrepreneurial, with a high entry and exit rate. The results also show that the SMEs are mainly involved in trade, which accounts for 92.6% of the sample. This may indicate that the SME sector is oriented towards the service sector rather than the manufacturing sector. The results also show that the SMEs are primarily small, with 90.4% having less than ten employees. This may indicate that the SME sector faces challenges in scaling up and expanding its operations.

Table 4: Establishing the extent of digital platform usage by owner-managers of SMEs

Items	N	Min	Max	Mean	Std. Deviation
I have accessed Digital Finance through Mobile Money	353	1	5	4.31	1.35
I have accessed Digital Finance through Momo pay	353	1	5	4.05	1.43

I have accessed Digital Finance through online platforms like PayPal	353	1	5	3.09	1.697
I have accessed Digital Finance through cryptocurrency	353	1	5	2.33	1.612

Source: Primary Data 2023

The findings in Table 4 are interpreted based on the Likert scale of 1 to 5, where the mean ranging between 1 and 2.4 indicates that the respondents disagreed with the statement, the range of mean between 2.5 to 3.4 stands for not sure and the mean ranging between 3.5 to 5 stands for agreement. So, the findings are focused on those statements the respondents agreed with.

I have accessed Digital Finance through Mobile Money (Mean = 4.31, Std. Dev = 1.350). The high mean score of 4.31 indicates that, on average, SMEs agree to access Digital Finance through mobile money. This suggests that a significant number of owners of SMEs are effectively adopting and integrating mobile money solutions. It can be inferred from the comparatively low 1.350 standard deviation that the responses are tightly packed around the mean.

Digital finance is done through online platforms like Momo Pay (Mean = 4.05, Std. Dev = 1.430). The high mean score of 4.05 indicates that, on average, SMEs agree that they access Digital Finance through Momo pay. This suggests that a significant number of owners of SMEs in this category are effectively leveraging digital payment gateways. The relatively low standard deviation of 1.430 implies that the responses are closely grouped around the mean, signifying a consistent and high level of performance among SMEs. This encouraging sign shows how SMEs can prosper when they use well-known digital payment platforms.

It is accessed to Digital Finance through Paypal (Mean = 3.09, Std. Dev = 1.697). The moderate mean score of 3.09 suggests that the SMEs are unsure about using PayPal as an online platform for digital finance. However, some SME owners are likely utilizing PayPal to access digital financing—the relatively high standard deviation of 1.612 highlights significant variability in the performance.

On the other hand, cryptocurrency (Mean = 2.33, Std. Dev = 1.612) is less popular and preferred, as it has low means and high standard deviations, indicating a weak and inconsistent agreement among the respondents. These platforms are unfamiliar or inaccessible to many SME owners, as they may require more technical skills, infrastructure, or regulations.

Table 5: Tests of mediation to determine how access to digital money influences the association between financial literacy and SMEs' performance

Steps	Regressions	B	SE	Beta
IV&DV	FL—PCS	0.617	0.038	0.655
IV&MV	FL—DA	0.582	0.051	0.519
MV&DV	DA---PCS	0.411	0.039	0.491
IV, MV&DV	FL & DA--PCS	FL=0.516	FL=0.043	FL=0.548
		DA=0.173	DA=0.038	DA=0.206
		Part correlations	FL=0.469	
			DA=0.176	
		R Square	0.461	
		N	353	

FL= Financial literacy, DA= Digital Access, PCS= Performance of SMEs

The performance of SMEs and financial literacy were both significantly impacted directly. ($p<.01$; beta=.655). This indicates that, while holding other variables constant, the performance of SMEs improved by 0.655 units for every unit increase in financial literacy. At the 1% level, this effect is statistically significant. Financial

literacy and access to digital finance experienced a substantial impact (Beta=.519; p<.01). Moreover, a direct and significant influence was observed on the performance of SMEs in relation to their access to digital finance (Beta=.491; p<.01).

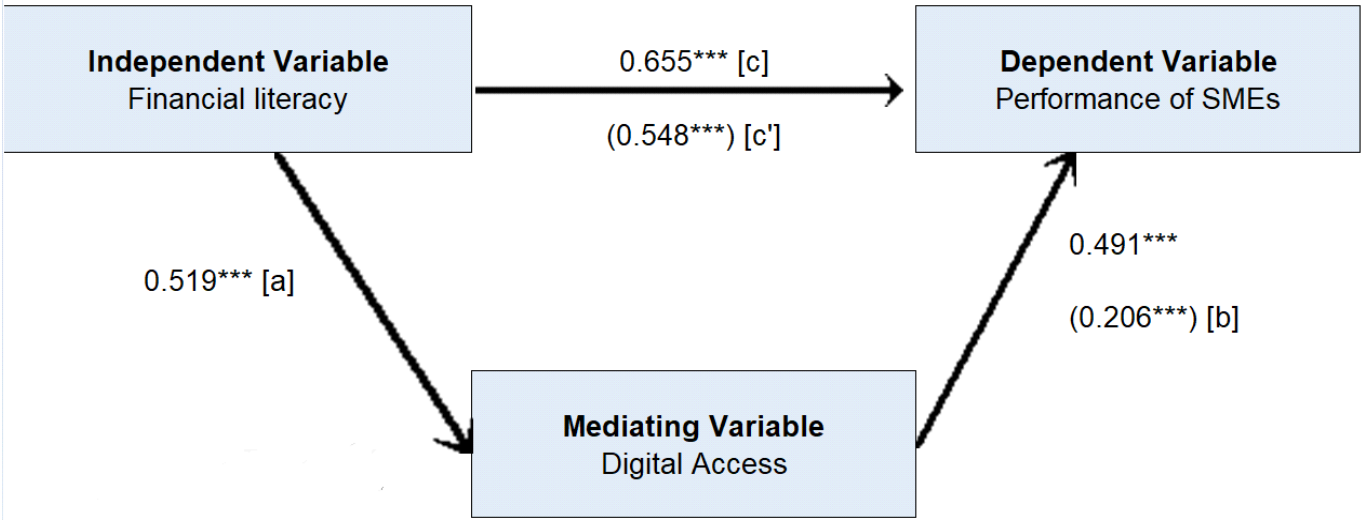
As access to digital funding was taken into account, the direct connection between financial literacy and SMEs' performance decreased from Beta=.655 to Beta=.548 but remained statistically significant. This signifies that even after considering the influence of access to digital funding, the association between financial literacy and SME performance diminished but retained statistical significance. This implies a partial mediation in the connection between financial literacy and SME performance through access to digital finance. Additionally, the indirect effect, constituting 16.2% (0.106/0.655 x 100), suggests that 83.8% of the model's explanation for the direct effect stems from other factors. Additionally, as seen below, the outcomes were displayed on the path diagram.

Figure 1: Using a med-graph to examine how access to digital finance mediates the association between SMEs' performance and financial literacy

Type of mediation	Significant		
Sobel z-value	4.228553	*p* =	0.000024
95% Symmetrical Confidence interval			
Lower	**0.05402**		
Higher	**0.14736**		
Unstandardized indirect effect			
a*b	**0.10069**		
se	**0.02381**		

Effective Size measures

Standardised Coefficients		R^2 Measures (Variance)
Total:	**0.655**	**0.428**
Direct:	**0.548**	**0.220**
Indirect:	**0.106**	**0.208**
Indirect to Total ratio	**0.163**	**0.487**



Discussion: According to the analysis, Mobile Money (4.31) and MoMo Pay (4.05) were the most often used digital platforms by SME Owner-Managers among the platforms examined in this study. In contrast to the others, they were easy for them to use. Due to their lack of experience utilizing those items, respondents' knowledge of other digital products was limited. The respondents went on to say that using MoMo Pay and Mobile Money in their companies has increased the size of their customer base. According to the Resource-Based Theory, digital savings and trading have improved their company's finances and raised financial performance. These outcomes also support a 2015 GSMA analysis that found better financial performance was a result of users' familiarity with digital platforms like Mobile Money.

The respondents explained that using Mobile Money and Momo platforms helps them keep track of their transactions and thus increases their level of financial literacy. This resonates with studies by Atakora (2013), who finds that understanding mobile money transactions boasts experience in digital financing among traders. Therefore, you might be able to transfer and receive money with enough practice if you use Mobile Money frequently. This sheds light on why SME owner-managers tend to rate their understanding of mobile money higher than their comprehension of other digital platforms.

The research investigated how access to digital finance acts as a mediator in the relationship between financial literacy and SME performance. Considering access to digital financing, the direct correlation between financial literacy and SME performance decreased from Beta=0.655 to Beta=0.548, remaining statistically significant. This suggests that the link between financial literacy and SME performance is partially influenced by access to digital finance. The indirect effect of 16.2% further supports this, indicating that 83.8% of the model's explanation for the direct effect is attributed to other factors. This implies that SMEs can enhance their performance by introducing digital financing options such as Mobile money and Momo pay. These findings align with research by Tuffour, Amoako, & Amartey (2020), Agyapong & Attram (2019), and Salia & Karim (2019). These studies underscore the substantial impact of financial literacy on a firm's success, promoting better financial decision-making that ultimately influences business performance. The results confirm the hypothesis that access to digital finance plays a partially mediating role in the connection between financial literacy and SME performance in Uganda.

This study employed the resource-based theory to investigate how a manager's financial literacy influences their inclination to utilize digital money and incorporate digital platforms into their operations. The resource-based approach finds support in the aforementioned research. According to this paradigm, a company operates effectively when it has access to all the necessary resources for daily operations. The findings show that SME Owner-Managers who are financially literate and have access to digital platforms like Mobile Money and Momo pay will statistically increase the performance of their firms by 16.2%, according to the results.

The results also support the underlying presumptions of the resource-based theory, which holds that a corporation can gain a competitive advantage by using its internal resources to affect the external environment in its favor. This study indicates that performance may be enhanced by internal resources and creativity, as demonstrated by SMEs' usage of digital platforms. This suggests that being able to obtain digital financing can facilitate faster performance.

To increase their clientele and revenue, owner-managers of SMEs should think about incorporating digital payments into their current payment structures. This would improve record-keeping and receipt management. Notably, most customers today prefer cashless payments because of various reasons. Adopting digital payments quickly will inevitably increase sales and enhance the SME's financial performance. Additionally, training on the usage of more effective digital payment systems like Momo Pay and Mobile Money should be provided to managers of SMEs.

Using RBT as a theoretical framework, this study has shown, in conclusion, how financial literacy can enhance SME performance in Uganda through access to digital finance. The results suggest that SME owners in Uganda are embracing digital finance to enhance their business operations and opportunities. However, they also face challenges and barriers in accessing some online platforms. Therefore, it is essential to understand SME owners' needs and preferences and provide them with adequate information, training, and support to use digital finance effectively and efficiently.

The study has provided valuable insights into how SMEs can leverage digital technologies to enhance their competitiveness and growth in emerging markets. Further research is necessary to examine additional aspects of financial literacy or access to digital money, verify these findings both empirically and conceptually, and consider other scenarios or contexts in which these variables may interact differently.

5. Contribution to theory and literature

Globally, professionals acknowledge the importance of SMEs in fostering economic growth. In terms of creating jobs and GDP growth, SMEs are essential to socioeconomic development and the fight against poverty (OECD, 2019). The study's findings offer guidance to owner-managers of SMEs, highlighting the necessity of increasing their financial literacy levels. This is essential for fulfilling financial responsibilities and making sound financial decisions that have the potential to boost the productivity of their companies. The study also provides detailed information on the advantages of participating in various digital platforms accessible throughout the country, to enhance overall business performance.

To enhance the performance of SMEs, legislators—comprising government officials, regulators overseeing digital financial services, the Ministry of ICT, and other authoritative policymakers—ought to enact laws that encourage diverse legal manifestations of digital financial services. Methodologically speaking, SMEs were the intended audience. More critical and objective feedback on their experiences with digital finance and financial literacy is provided by the study. This provides innovative insights and informs policy on what needs to be implemented to improve SME performance.

In conclusion, this research aims to shed light on the pivotal role of digital finance in moderating the relationship between financial literacy and the performance of small and medium-sized businesses in Uganda—a topic that has thus far received limited attention. The majority of research in this area has been on governance and how it affects the performance of SMEs. The Resource-Based Theory explains how access to digital finance played a mediating function in this study. According to the theory, when a business has the necessary tangible and intangible resources, its performance will improve. The findings of this study resonate with this theory.

Limitations and Further Research: The study employed a cross-sectional survey for data collection. However, employing a longitudinal study methodology could have yielded a more accurate assessment of the performance of these organizations. Future research should explore the relationship between financial literacy and the adoption of digital financial platforms across diverse regions of the country. Replicating this study longitudinally would contribute to a deeper understanding of how access to digital finance may influence performance over time.

Conclusions and Implications: The findings revealed that access to digital finance operates as a mediating factor in the relationship between financial literacy and the performance of SMEs in Uganda. This significant partial mediating role contributes to performance enhancement by sixteen percent (16%). It suggests that with knowledgeable and astute financial management, accessing digital finance through services like Momo Pay and mobile money becomes more accessible, thereby positively impacting performance. Furthermore, the study demonstrated a strong and positive correlation between the performance of SMEs in Uganda and access to digital finance. This suggests that having access to digital finance holds a substantial influence on SMEs' overall performance.

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