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Research Article

Employment Dynamics and determinants of Transition from Solo Self-Employment to Employer status

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KEYWORDS: Employer; Solo self-employment; transition; employment dynamics

Abstract

The labour markets of many developing countries, particularly Tanzania, are dominated by small businesses that are typically owned and operated by a single family member. Evidence suggests that these individual owned businesses make a slow transition from solo self-employment to employer status. There is little understanding of the mechanisms behind this low transition, particularly in the context of Tanzania. Using panel data, a Markov transition framework is employed to model movements between employment states. A logit regression model is then applied to estimate the determinants of transitioning from self-employment in period t to employer status in period t+1. The findings reveal that the extent of transition between labor market status is small while owner characteristics, environmental and business-related factors, play a significant role in explaining the transition across labour market status. According to the study, policies promoting balanced regional development, enterprise market experience, education, microcredit accessibility, and business information access are critical in accelerating the transition of solo elf employment to employer status.

1 Introduction

1.1 Background of the Study

Entrepreneurial activity has been playing a crucial role worldwide in contributing to economic growth by creating employment opportunities, improving income distribution, expanding the tax base, and enhancing people's well-being (Basu et al., 2018; Binder & Blankenberg, 2021; Borghi et al., 2025; Gevaert, 2024). It is also argued that the sector is a significant source of new jobs and an alternative to paid employment (Audretsch et al., 2020; Gindling & Newhouse, 2014). However, in most developing countries, the labor market is dominated by small enterprises, primarily owned by a single household member as a Solo self-employed worker (Bonnet et al., 2019; Kweka & Fox, 2011). For instance, in Tanzania, 97 percent of enterprises employ 1-4 people, with 66 percent being Solo self-employed, while only 3 percent of non-farm enterprises employ more than 5 people, with the majority of these businesses operating in the informal sector. Additional

evidence from the Tanzanian labor market indicates that solo self-employment workers (own account workers) accounted for 46.6 percent of business activities from 2000 to 2019 (See appendix A Table A2).

Contributing family helpers accounted for 39.6 percent, followed by wage employees and employers, constituting the smallest percentages (11.7 and 2.0 percent, respectively). Over time, employment shares in Tanzania have changed (See Table A2) with more Solo self-employed workers and family helpers in 2019 than in 2000, and the share of employees and employers almost doubling from 2000 to 2020. While the relative numbers make it difficult to determine whether there is a low transition of non-farm enterprises from Solo self-employment to employers' status, the slight increase in the number of employers within a decade from 1.7 to 2.8 percent, and an increase in the share of solo self-employment workers from 42.1 to 50.2 percent as indicated in Table A2 in appendix A, suggests that the transition from solo self-employment to employer is relatively constant. To ensure that the sector provides maximum benefits to the economy, it is essential to investigate and address the barriers to this low transition from solo self-employment to being an employer of these non-farm enterprises.

Despite the potential for individual success and wealth among some self-employed individuals, the natural progression for most entrepreneurial endeavors involves a shift from Solo self-employment to an employer status. And from this perspective it's important to recognize the complexities involved in the growth process these kind of business and not oversimplify the challenges it may face, such as financial constraints, inadequate infrastructure, or limited technology (Aigbavboa & et al., 2018; Gevaert, 2024; Petković et al., 2016). Previous research on business growth has primarily focused on supply-side factors like infrastructure development, technological advancements, credit policies, market access, and product quality improvements. However, I believe that unique individual, business and regional characteristics may play a critical role in explaining the limited transition of non-farm enterprises from solo self-employment to employer status. Factors influencing a business's growth may not solely be macroeconomic but also individual-specific, contributing to their transition. This study suggests that evolving into an employer can lead to formalizing and expanding an enterprise, thereby significantly contributing to the overall economy. Other studies on similar topics such as Henley (2019), Danquah et al. (2019), and Caliendo et al. (2019) have found that the personal resources and characteristics of business owners are vital not only for job creation but also for understanding the transitions between self-employed, paid employees, and own-account workers. Therefore, this study aims to explore specific circumstances that demonstrate the importance of individual characteristics in explaining the transition of non-farm businesses from self-employment to employer status in Tanzania.

The paper aims to analyze why household non-farm enterprises of Solo self-employment status do not trans to become employer status and uses a logit regression model to estimate the determinants of this transition. Previous studies have mainly focused on self-employment creation, reasons for leaving self-employment for wage work, and the duration of self-employment (Alilović & Blecich, 2017; Krasniqi, 2014; Olaposi & Adelowo, 2014). The study utilizes Tanzania National Panel Survey data (round 1 to 3), including individual, household-level, labor market, and other regional characteristics, to comprehensively analyze the factors responsible for the low transition of household enterprises from Solo self-employment to employer status in Tanzania. There is limited knowledge about the reasons for leaving self-employment to become an employer, particularly in the context of Tanzania, which this study aims to address by analyzing factors associated with the low transitions of non-farm enterprises from self-employment to employer status. To the author's knowledge, no single study in Tanzania has investigated all these issues using three waves of panel data. The panel data used in this paper allows for a thorough examination of key aspects of the labour market.

The descriptive results of this paper on occupational mobility using transition matrix in-

dicate that the dynamics of the Tanzanian labour market, on average, involves transitions from wage employment to self-employment or from employer to self-employment, with a significantly low transition from self-employment to employer status. For example, in 2010, 11.7 percent of wage employee households became self-employed in 2012. In the same year, 60 percent of employers became self-employed, while only 10 percent of self-employed individuals became employers. This evidence suggests that in the Tanzanian labour market, there is a significant transition from employee to self-employed, but a very low transition from self-employed to wage employee. These findings align with previous research such as Sarkar et al. (2019) and Fields (2019b) which suggest that the transition from less preferred forms of work to more preferred forms, such as working for oneself instead of working for others, is an improvement. Another potential reason for the low transition might be that the lower average income from self-employment is offset by the possibility to evade taxes, which could make self-employment more appealing (Aigbavboa & et al., 2018; Cieślik et al., 2024; Slonimczyk & Gimpelson, 2015). The literature also indicates that self-employment and entrepreneurship provide individuals with non-pecuniary rewards such as psychological utility (Hamilton, 2000). Furthermore, the results demonstrate that key socioeconomic characteristics play a significant role in explaining the low transition of household non-farm enterprises from self-employment to employer status, including factors such as family size, owner's marital status, area of residence, enterprise market experience, owner's wealth, education, unequal regional development, microcredit availability, and low access to labour market information as indicated by ownership of a mobile phone.

The rest of the paper is organized as follows. Section 2 provides a review of literature from theoretical and empirical perspectives whereas Section 3 is devoted to the analytical framework of the study. Section 4 is devoted to the study context, data, and methods used in the analysis. Section 5 gives results of the study such as descriptive analysis of the sample population, distribution of the population by employment status, and regression results of the factors behind the low transition of household non-farm enterprises from Solo self-employed to employer status. Section 6 summarises the findings and concludes.

2 Literature

The transition to and from Solo self-employment has been extensively studied in the literature, with most studies focusing on the shift from paid employment to Solo self-employment. Some researchers have analyzed the determinants of transitioning from wage work to Solo self-employment (Bento & Restuccia, 2019; Boeri et al., 2020; Burke et al., 2021; Cho et al., 2015), but few have explored the transition from self-employment to becoming an employer (Alilović & Blecich, 2017; Krasniqi, 2014; Naudé, 2022; Olaposi & Adelowo, 2014). One study, Kunt et al. (2007) for example, used household panel data from 2001 to 2004 to examine the factors influencing the transition to Solo self-employment, highlighting the role of financial constraints and the impact of household wealth and income transfers. However, this study did not specify whether individuals were transitioning from unemployment or paid employment to Solo self-employment. Other studies have delved into the transition from Solo self-employment to employer status.

For instance, Henley (2019) assessed whether local economic factors or owner characteristics drive the transition from solo self-employment to becoming a microbusiness employer. The study found that personal resources such as education, vocational training, and individual characteristics like gender, age, and ethnicity played a significant role in this transition. While the study provides an insight to this study especially by considering the categories of the employers by the number of employees, the results may not

be expected to confer with the situation in Tanzania. This is because the present study has considered the transition from Solo self-employed without employees to employer status disregarding the number of employees. In addition, the peculiarity of the labour market in which more than 70 percent of the labour force is employed in rural areas and is employed in informal sector in most developing countries makes the current study differ significantly from the study of Henley (2019).

In a study by Caliendo et al. (2019), an investigation was carried out to determine the factors that influence the decision to hire and the survival of an employer. The study utilized multinomial logit to identify the factors responsible for transitioning into different categories of employment. The employment status was divided into four categories: employer, non-employer, wage employees, and no-employer. The findings indicated that personal traits, such as trust in others, have varying effects compared to other individual characteristics when considering their impact on hiring decisions and employer survival. While the study provided valuable insights by incorporating personal traits to assess their influence on hiring and survival as an employer, it did not consider other important variables, such as regional economic disparities. In countries with low income levels, like Tanzania, regional disparities play a significant role in explaining labor transitions. Furthermore, in my analysis, I included variables such as access to electricity and telephone, as these factors are essential for productivity and accessing market information in low-income countries.

Krasniqi (2014) examined the attributes of self-employed individuals within the transitional economy of Kosovo, utilizing data from the Labour Force and Household Survey. The findings from the multinomial logit analysis suggest that individuals often transition to the status of solo self-employment workers as a means to evade unemployment. Consequently, the choice to become a solo self-employment worker is primarily driven by the scarcity of employment opportunities within the country. Furthermore, the study reveals notable differences in characteristics between employers and solo self-employment workers. A limitation of this research is its reliance on a cross-sectional data set, which fails to adequately capture the dynamic nature and annual transitions of firms across various employment statuses. Additionally, the use of cross-sectional data may lead to biased estimates, as unaccounted heterogeneity among individuals could result in an overestimation of variable impacts. Contributions from studies by Semenza and Pichault (2019) and Conen and Schippers (2019), Danquah et al. (2019), and Tammelin (2019) have significantly enriched the empirical foundation of this research. Specifically, these studies have provided insights into the influence of individual, institutional, sociological factors, and other labor market characteristics on the determinants of labor market transitions. However, data constraints have compelled some of these investigations to adopt a snapshot perspective, neglecting the dynamic elements of the labor market. While these studies employed a static model based on cross-sectional data, Evans and Jovanovic (1989) and Aigbavboa and et al. (2018) have pointed out that such an approach does not effectively capture the determinants influencing transitions between different levels of business activity. Generally, despite a growing body of recent research on entrepreneurial mobility and firm growth, limited attention has been given to intertemporal transitions from self-employment to employer status using panel data in developing economies.

3 Conceptual framework

The current research study's definition of Solo self-employment encompasses both employers and Solo self-employed workers as outlined in the 2014 analytical report of Tanzania Mainland Integrated Labour Force Survey (ILFS). The idea of Solo self-employment can be viewed as the tiniest yet most vital form of entrepreneurial work. An employer is

someone who runs their own business or works independently in a profession or trade and brings on one or more workers. A Solo self-employed individual runs their own business or works independently in a profession without employing anyone. This paper uses the terms entrepreneur, Solo self-employed worker, and independent worker interchangeably when referring to those who are Solo self-employed. A thorough investigation of this activity's impact on an employer's status is crucial as researches has shown that Solo self-employed individuals possess unique characteristics in both the labour market and as individuals compared to those who are employed.

The Consumer choice theory is the theoretical basis for this study, influencing the variables in the empirical model employed. While human capital theory operates within the context of maximizing utility, as noted by Teixeira (2014), recent literature (Simoes et al., 2016) stipulate that individuals selecting the most beneficial outcomes for themselves and their families. In this framework, people select their occupation and decide whether to switch or not based on resources like income, technology, and the environment. The model forecasts that a family's wellbeing is determined by various factors: shared consumption of market goods, number of children, leisure time for both genders, quality of home life, and personal preferences. Family members choose the outcomes that maximize their family's well-being, but these choices are constrained. Individuals face two constraints—a constraint on their time and a constraint on the number of market goods they can purchase.

Due to limited access to financing, some potential entrepreneurs are forced to stay Solo self-employed rather than becoming employers. When individuals identify a business opportunity, they must decide whether to pursue it or not. Their decision hinges on comparing the expected utility or pay-off for each potential occupation. If the expected utility of being an employer surpasses that of self-employment, they will transition to the employer status. Various factors can influence the expected returns of each activity. 'Traditional variables' studied in empirical research as potential determinants of transition include education, labour market experience, age, job stability, capital, marital status, spouse's educational attainment, spouse's employment status, number of children, health status, religion, and macroeconomic variables such as local unemployment rate (Sorgner et al., 2017).

Although consumer choice theory and human capital theory explain individual occupational mobility, transition from solo self-employment to employer status can also be influenced by demand conditions and firm level resource availability (Kösters & Smits, 2022). Demand pull theory posit that individual can expand to employer status when the market opportunity increase return to expansion. Similarly, the resource-based theory postulate that heterogeneity in access to financial, human and social resources can be significant in influencing the transition from solo self-employment to employer status. These two perspectives are complementing human capital and consumer choice theory in addressing individual decision within broader market and resource availability.

Figure 1 outlines a conceptual framework for analysing the study's main objective and specific goals, based on the transitions across individuals' employment statuses, including those from Solo self-employment without employees (OAW) to self-employed with employees (employers).

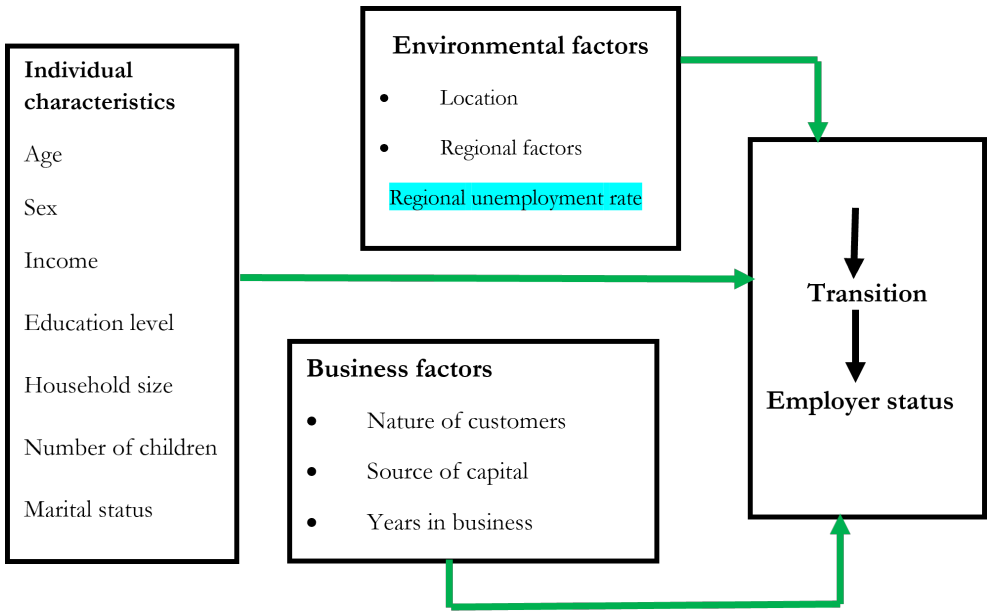

Figure 1: Analytical framework for factors contributing to transition from self-employment to employer(Source: Author's construction)

4 Methodology

4.1 Data, Descriptive statistics, and Empirical model

The information in this research is sourced from two different places. The first data comes from the National Panel Survey, which was gathered in 2008/09, 2010/'11, and 2012/'13 by the National Bureau of Statistics (NBS) of Tanzania in partnership with the World Bank (WB). The second data source consists of country-specific macro data from the World Bank. The NPS is a comprehensive household survey that provides information on poverty, agricultural productivity, and various important development indicators. It covers a wide range of topics in a single questionnaire, including education, health, crime, gender-based violence, and more, allowing for an analysis of the connections between different sectors and the factors influencing development outcomes. The term "panel" in the NPS title indicates that the same individuals are surveyed on multiple occasions over time. The initial wave (2008/09) of the NPS involved 3,265 households, encompassing all regions and districts of Tanzania, both mainland and Zanzibar. The sample size increased to 3,924 households in the second wave, mainly due to tracking and interviewing split households. An impressive 97 percent of the first wave households were successfully located and interviewed in their original locations during the second wave, resulting in a low attrition rate of 3 percent. The third wave of the NPS follows up on the previous two waves, with the sample size growing to 5,010 households. The increase is again due to tracking and interviewing members from split households, with about 96 percent of the year two households successfully found and interviewed during the third wave, resulting in a low attrition rate of 4 percent. This type of data enables a dynamic analysis of transitions from self-employment to becoming an employer and an exploration of the key factors that limit these transitions.

The study's final sample includes adults aged 15 to 64, based on the Tanzanian definition of the active labor force. It excludes family members under 15, over 64, disabled individuals, students, and self-employed individuals in agriculture. The exclusion of agricultural workers is due to the potential for biased estimates, as they possess unique char-

acteristics requiring a different analytical approach (Henley, 2019). Employment status is categorized into paid employees, self-employed with employees, self-employed without employees, and unemployed, based on the 2014 Tanzania Integrated Labor Force Survey report. The sample consists of 5908 individuals for each wave, totaling 17724 individuals across all three waves. The panel is strongly balanced, retaining the same households across all waves and excluding new members in waves 2 and 3 from the analysis as shown in Table A4 in Appendix A.

4.2 Descriptive characteristics of the sample

The information in Table A3 in appendix A outlines the characteristics of the population analyzed in the three waves. It includes definitions, mean values, and standard deviations (S.D) for each variable. The statistics generally align with the known facts about the population of Tanzania. Table 1 shows that the average household size is 4.6 individuals across all three waves. This is close to the national household size of 4.8 members reported in the 2012 Tanzania national panel survey. The majority of individuals are married, with over 71 percent in 2008/09, 72 percent in 2010, and 73 percent in 2012. Around 79 percent of the population resides in rural areas in 2012, compared to 76 percent in 2010 and 78 percent in 2008. Approximately 54 percent of the population is male. Primary education is the most common level of education, with around 68 percent of the population having this level across all waves. On average, individuals have approximately 8 years of schooling, indicating a prevalence of primary education. The average age of respondents is 39 in wave one, 40 in wave two, and 42 in wave three, suggesting that many are at an age where they might be seeking employment. The average household income across the three waves is approximately 102,600 TZS, which is typical for rural areas in many African countries. About 43 percent of households own their homes, and nearly 15 percent have access to financial resources through borrowing from friends or financial institutions. Non-farm businesses have been in existence for about 9 years on average, and the main customer base consists of end consumers.

Table A3 in the appendix A also shows that all regions of Tanzania have an average of 4 per cent rate of unemployment according to wave 1, wave 2, and wave 3, while their economy is not very strong as they have a per capita GDP of around 960,000 TZS in each wave. As per findings, more than 76 percent of the individuals who own a business have access to the telephone which is either mobile or landline as per the wave 1 while 88 per cent as per the wave 2 and 92 per cent as per the wave 3. On the other hand, some individuals have considerable access to electricity because around 48 per cent are connected to the main grid across all waves.

4.3 Empirical model

Since the study focuses on intertemporal transition rather than static occupational status, panel data provide a methodological advantage by enabling direct observation of mobility across periods. Cross-sectional data would not allow identification of transition events. The logit model is therefore estimated within panel models framework to model the conditional probability of moving from solo self-employment in period t to employment status in period t+1. So, to identify and evaluate the barriers to the transition from solo self-employment to employer status, a transition indicator from solo self-employment to employer status is created. The main dependent variable, denoted as SE2EMP, equals 1 if household non-farm businesses transitioned from solo self-employment work to employer status in 2010 or 2012. The explanatory variables include demographic, household, community, and geographical characteristics, which are detailed in Table A1 in Appendix A. A logit model is used to examine the factors that hinder the transition of house-

hold non-farm businesses from self-employment to employer status. Given the limited panel data with only three waves, the evolution of household enterprises in waves 2 and 3 is taken into account. The indicator variable SE2EMP takes the value of 1 if a household non-farm business transitioned from solo self-employment to employer status between wave 2 and wave 3, and 0 otherwise. The model is based on a binomial logit model as follows:

$$Pr\left(y_{it}=1\right)=\frac{exp\left(\acute{\beta}x_{it}\right)}{1+exp\left(\acute{\beta}x_{it}\right)} \tag{1}$$

The $Pr(.)$ is the probability of an individual in household i exiting self-employment at time t. This is modelled as a function of individual-specific characteristics and the amount of time the person has been self-employed. The dummy variable y_{it} takes on the values of 0 if the self-employed worker remains self-employed and 1 if s/he leaves the self-employment in year $t+1$ to become an employer in year $t+2$. The probability of exiting self-employment depends upon a vector of variables x_{it}. By linearizing the standard specified probability model above, I obtain the following actual model to be estimated;

$$log\left(\frac{y_{it}}{1-y_{it}}\right)=\beta_0+\beta_1 x_{it}+\varepsilon_{it} \tag{2}$$

The vector of variables x_{it} is comprised of the standard set of variables such as individuals, households as well as demographic variables, and geographic or regional variables. As such the model can further be written as;

$$log\left(\frac{y_{it}}{1-y_{it}}\right)=\beta_0+\beta_1 I_{it}+\beta_2 D_{it}+\beta_3 F_{it}+\beta_4 G_{it}+\varepsilon_{it} \tag{3}$$

where I_{it}, D_{it}, F_{it} and G_{it} are individuals as well as demographic variables such as, household characteristics, and geographic or regional variables respectively. The β_s are the vector of parameters of the respective variables.

4.4 Variable selection and definition

Research into the growth of businesses at micro level has been associated with both economic and social factors. Existing literature has made a distinction between the influence of institutions, sociological elements, and personal traits in understanding the decision to engage in entrepreneurial endeavors (Kelley et al., 2022). In this study, I investigate the social and economic factors linked to the shift of non-farm household businesses from Solo self-employment to employer status. The rationale for selecting these variables is as follows (See Table A1): individual and demographic characteristics: - Based on a review of empirical studies and theoretical research, it is suggested that factors such as gender (male), age, marital status, education, experience, training, and family size have the potential to explain entrepreneurial activity. Gender is justified by the differing family responsibilities between men and women, which can impact their economic activities. Age is particularly significant when appropriately categorized, as the 30s and 40s are considered pivotal ages for career exploration and occupational choices (Dvouletý & Lukeš, 2016). While education is a crucial variable in understanding an individual's entrepreneurship, its role is complex. On one hand, it enhances a person's business

management capabilities, but on the other hand, it indicates that business success does not solely depend on a good education. In the case of marital status and family size, it is believed that families can support entrepreneurial activities by providing inexpensive labour, although the evidence is not conclusive when considering the transition from one status to another.

Numerous studies have extensively researched variables such as wealth, access to finance, and financial institutions. A considerable body of literature has explored the correlation between wealth, measured in terms of asset ownership, and entrepreneurial endeavors. For instance, Struckell et al. (2022) suggest that challenges in obtaining loans may lead to a positive relationship between an individual's assets and their likelihood of not engaging in entrepreneurial activities. It is important to acknowledge that wealth is likely to be endogenous because individuals involved in entrepreneurial activities are more inclined to save more compared to the general population (Watson & Kaeding, 2019). In this study, wealth has been represented by equivalized per capita consumption, calculated by adjusting household consumption per adult equivalent. The purpose of incorporating wealth variables is to gauge the liquidity constraints faced by individuals seeking to expand their businesses. This study has incorporated access to finance and affiliation with financial institutions as variables to assess their impact on the transition from self-employment to employer status.

The next set of variables pertains to geography, which includes the residential location of households, such as whether they are in rural or urban areas. Geographical location is used as a proxy to gauge the local economy's strength, as seen in Henley (2019). Additionally, rural and urban settings also help explain an individual's employment activity. Urban areas are more conducive to small business entrepreneurial activities and transitioning to employer status compared to rural areas (Srhoj & Zilic, 2021) due to better market access for urban entrepreneurs. It is crucial to include these variables in empirical studies to assess entrepreneurship policy measures implemented by authorities in different regions. While the idiosyncratic factors mentioned earlier are important for explaining household business transitions, omitting other relevant factors may lead to bias in regression models. Therefore, this study has included factors such as proximity to urban centres, ownership of a phone, and access to electricity to reflect the accessibility of essential infrastructure and support services for conducting business.

In addition to individual, household, and business characteristics, this study incorporates regional economic factors to capture spatial heterogeneity in economic conditions across Tanzania. Specifically, two key variables are included. First, the regional unemployment rate shows how the job market is doing in that area by showing how many job openings there are and how many people are not working. Higher unemployment can either force people to start their own businesses or make it hard for businesses to grow because demand is low. Second, the regional GDP per capita is used as a stand-in for the level of economic activity and development in the region. This variable shows how income levels, market size, and economic opportunities vary from one region to another. These variables enable the analysis to consider the impact of the overall economic environment on the probability of shifting from independent self-employment to employment status.

5 Empirical results, interpretation, and discussion

5.1 Dynamics of the working age population across employment status and waves

The study aims to present evidence regarding the limited transition of household non-farm businesses from self-employment to employer status. It estimates the shift of in-

dividuals who own a non-farm business in the household among various employment categories to comprehend the transition from solo self-employment to becoming an employer. Table 1 illustrates the percentage of individuals who persist, move out, or regress into specific employment statuses across surveys. Each cell in the table displays the percentage of households in each of the four employment categories, indicating the extent of employment transition across the three NPS waves. For instance, the second row of Table 1a demonstrates that 45.7% of the total active labour force was categorized as self-employed in 2008. Among these, 32.3% remained in self-employment in 2010, 1.9% transitioned to unemployment, 5.1% moved to employer status, and 6.5% became wage employees. This implies that 60.1% of those self-employed in 2008 remained in self-employment in 2010, with only 6.5% transitioning to employers. Moreover, while 6.7% of the labour force in 2008 were employers, only 0.7% remained employers in 2010, and 3.7% reverted to self-employed activity within this period.

Table 1: Labour market transitions in Tanzania between the year 2008, 2010 and 2012

	Destination Employment Status				
Origin Employment Status	**Unemployed**	**Self-employed**	**Employer**	**Wage employee**	**Total**
(a) Employment status 2010					
Employment status 2008					
Unemployed	2.8%	1.6%	0.5%	1.1%	6.0%
Self-employed	1.9%	32.3%	5.1%	6.5%	45.7%
Employer	0.1%	2.7%	1.7%	0.4%	4.9%
Wage employee	1.5%	6.8%	1.2%	33.8%	43.4%
Total	**6.2%**	**43.4%**	**8.6%**	**41.8%**	**100.0%**
(b) Employment status 2012					
Employment status 2010					
Unemployed	2.3%	2.0%	0.1%	1.8%	6.2%
Self-employed	2.1%	31.7%	4.5%	5.0%	43.3%
Employer	0.5%	5.2%	2.2%	0.7%	8.6%
Wage employee	0.4%	4.9%	1.7%	35.0%	41.9%
Total	**5.2%**	**43.7%**	**8.5%**	**42.6%**	**100.0%**
(c) Employment status 2012					
Employment status 2008					
Unemployed	2.1%	2.2%	0.0%	1.7%	6.0%
Self-employed	1.8%	30.9%	5.2%	7.6%	45.5%
Employer	0.5%	3.2%	0.6%	0.6%	4.9%
Wage employee	0.8%	7.4%	2.5%	32.7%	43.5%
Total	**5.2%**	**43.8%**	**8.3%**	**42.7%**	**100.0%**

Source: Author's calculation based on NPS waves 2008, 2010, and 2012.

Likewise, results in Table 1b reveal a significant labour market dynamic in terms of transitioning between different employment statuses from 2010/11 to 2012/13. For instance, looking across the second row, while 40.0% of the active population was self-employed in 2010, a substantial proportion (23.8%) remained in the self-employed category in 2012, while 2.1% moved back to unemployment, and only 3.7% transitioned to employer status. The results indicate that nearly 56% of individuals who were employers in 2010 shifted back to self-employed activity by 2012, 24% transitioned to wage employee status, and only 16% remained as employers in the same year. Furthermore, 5.0% of the active population were employers in 2010/11, with nearly 3% reverting to self-employed activity in 2012, and only 0.8% remaining as employers in the same period.

So generally, the transition matrices in Tables 1(a) and 1(b) show that the percentage of individuals that were in the self-employed category for two consecutive surveys declined

from 26.1 per cent to 23.8 per cent between 2008-09 and 2010-11 whereas those who were employers declined from 2.8 per cent to 0.8 per cent within the same period. These results provide two major implications. First is that when individuals are employers they do not sustain to remain as they either turn to self-employed activity or they become unemployed. Second, when individuals are in self-employed activity, they tend to remain so for a sustained period which reflects the difficulty of moving to the employer status. The information in Table 1(a) to Table 1(c) shows that the transition of household's enterprise from self-employed category to employer category is minimal.

5.2 The distribution of the population by employment status across waves

Analysis in this section presents the distribution of employed people by occupations ignoring those self-employed in agriculture. Categorization of status in employment helps in understanding the composition and dynamics of the labour market. Table 2 shows the distribution of the population by employment status across all waves of the survey.

Table 2: Tanzania Labour market composition as per National Panel Survey (excluding agriculture and family helpers)

	Across Years						Total	
	2008		2010		2012		All Years	
Categories	**Number**	**(%)**	**Number**	**(%)**	**Number**	**(%)**	**Number**	**(%)**
Unemployed	70	4.2	38	2.0	179	7.9	280	4.8
Self-employed	883	53.9	900	47.8	910	39.9	2,695	46.4
Employer	81	4.9	137	7.3	123	5.4	344	5.5
Paid employee	606	37.0	808	42.9	1,067	46.8	2,483	42.8
Total	**1,640**	**100.0**	**1,883**	**100.0**	**2,279**	**100.0**	**5,802**	**100.0**

Source: Author's construction based on Tanzania NPS (2008/'09, 2010/'11, and 2012/'13).

The data in Table 2 clearly shows that solo self-employment (own account) is the largest employment category in Tanzania across all waves, especially when those working in agriculture are excluded. Following self-employment, the next largest categories are wage employees, employers, and unemployed individuals, which make up the smallest category. Analysis of Table 2 reveals a consistent decline in the percentage of self-employment workers over the years. This trend may indicate that some individuals are transitioning to become employers. However, when examining the employer category, particularly in waves 2 and 3, it becomes evident that individuals from solo self-employment (own account) are either becoming unemployed or moving to the wage employee category. The statistics presented in Table 2 indicate that a significant number of people are involved in self-employment without employees, and once they transition to becoming employers, they tend to remain in that occupation for an extended period. For instance, in 2008, 54% of individuals were self-employed, while 5% were employers. In 2010, the percentage of self-employed individuals decreased to 48%, while the percentage of employers increased to 7%. This suggests that those previously engaged in self-employment may have transitioned to employer status over the two periods. However, it is important to note that there is no clear evidence that individuals from self-employment have transitioned to employer status, as other categories such as wage employees have also increased. Even if this were the case, the decline is minimal. This pattern suggests that there are obstacles preventing household enterprises from transitioning from self-employment to employer status. This issue will be further explored in the following section.

5.3 Factors for transition of household enterprises from Solo self-employment to employer status

In order to ensure the accuracy of our estimates, it is necessary to conduct various pre- and post-estimation diagnostic tests including checking for multicollinearity, normality, model specification, and performing the Hausman test to determine whether to use the fixed effects model or random-effects model. The VIF test results in the appendix indicate that there is no significant multicollinearity, and the model specification test also confirms that the model is well-defined. The findings in Table 3 display the outcomes of the multivariate logit model, presenting the estimations of the factors influencing the low transition of households' non-farm enterprises from self-employed to employer. Identifying the socio-economic variables responsible for this transition would provide valuable insights for policy implementation, focusing on the most significant factors affecting the likelihood of transition.

Table 3: Determinants of household enterprises' transitions from self-employed to employer status

	Rural sample	Urban sample	Total sample
Variables	**Coefficients (SD)**	**Coefficients (SD)**	**Coefficients (SD)**
Individuals and Household characteristics			
Household size	0.169***	0.0784***	0.117***
	(0.0356)	(0.0220)	(0.0191)
Marital status (married = reference)			
Dummy for separated	0.0675	-0.730***	-0.463***
	(0.305)	(0.213)	(0.177)
Dummy for single	0.500**	0.0525	0.241*
	(0.234)	(0.154)	(0.131)
Gender (Male = 1)	-0.0474	0.252**	0.158*
	(0.143)	(0.103)	(0.0854)
Education (years in school)	0.0193	-0.0197	-0.00811
	(0.0255)	(0.0163)	(0.0140)
Age (25–40)	-0.0888	-0.0553	–
	(0.250)	(0.192)	(0.155)
Age (> 40)	-0.337**	-0.106	-0.197**
	(0.160)	(0.112)	(0.0932)
Number of juniors	-0.285***	-0.138***	-0.218***
	(0.0592)	(0.0460)	(0.0366)
Number of seniors	-0.0496	0.264*	0.143
	(0.190)	(0.143)	(0.116)
Wealth and economic status			
Household income (proxy consumption)	0.562***	0.467***	0.508***
	(0.140)	(0.0975)	(0.0831)
House status (Owned = 1)	-0.311*	-0.216*	-0.275***
	(0.176)	(0.115)	(0.0975)
Number of assets owned	-0.00203**	0.000183	-0.000412
	(0.000979)	(0.000683)	(0.000311)
Business factors			
Number of years in business	0.0161**	0.00643	0.00926*
	(0.0075)	(0.00618)	(0.00475)
Nature of customers (Final consumers = 1)	-0.648	0.129	-0.214
	(0.439)	(0.328)	(0.260)
Regional economy factors			

Continued on next page

Table 3 – Continued from previous page

Variables	Rural sample Coefficients (SD)	Urban sample Coefficients (SD)	Total sample Coefficients (SD)
Regional unemployment rate	0.09017***	0.0259	0.055067**
	(0.0335)	(0.0453)	(0.0229)
Regional GDP per capita	-0.266	-0.406	-0.355
	(0.356)	(0.353)	(0.253)
Access to Finance			
Ever take a loan (Yes = 1, No = 0)	-0.215	0.433***	0.252**
	(0.248)	(0.139)	(0.122)
Source capital (sale of assets = reference)			
A loan from a family member	1.096**	0.111	0.535**
	(0.433)	(0.319)	(0.255)
Own savings	0.923**	-0.0154	0.364
	(0.425)	(0.319)	(0.252)
Credit from micro banks	0.628	-0.194	0.485**
	(0.563)	(0.379)	(0.230)
Infrastructure and location factors			
Ownership of phone (mobile/landline = 1)	0.495***	0.540***	0.520***
	(0.181)	(0.209)	(0.135)
Location (Rural = 1)	–	–	-0.420**
	–	–	(0.167)
Electricity connection	0.0905	-0.0461	-0.00219
	(0.199)	(0.113)	(0.000557)
Constant	-5.085	-0.771	-2.548
	(5.307)	(5.124)	(3.711)
Observations	**1,391**	**1,976**	**3,367**
Number of UPI3	**1,073**	**1,229**	**2,176**
Wald $\chi^2(26)$	115.01	119.86	222.86
Prob $> \chi^2$	0.0000	0.0000	0.0000
Log likelihood	-717.84785	-1244.9343	-1984.6053
Pseudo R^2	0.10414	0.10068	0.11698
LR test of $\rho = 0$: $\bar{\chi}^2$ (Prob $\geq \bar{\chi}^2$)	6.34 (0.006)	– (0.095)	– (0.0000)

Source: Author's estimations based on NPS data. Standard errors in parentheses.
*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

The results presented in Table 3 demonstrate that the location of residence, whether rural or urban, plays a significant role in explaining the transition of household enterprises from solo self-employment to becoming employers. The estimation shows that non-farm businesses in rural areas are less likely to expand into employer status compared to those in urban areas. This difference may be attributed to the limited market for non-agricultural goods and services in rural areas due to lower income levels. Consequently, household non-farm businesses in rural areas may not perceive the necessity to expand beyond self-employment. These findings are also evident in the strata, where the rural variable shows a negative value. However, when analyzing the rural or urban samples independently, this variable appears to have no impact on the enterprise's transition. The results further indicate that men are more inclined to transition from self-employment to employer status compared to women. This gender disparity may be linked to family responsibilities in low-income countries like Tanzania. This observation aligns with previous studies such as Fields (2019b) which found that married men and urban residents are more likely to transition into self-employment compared to their female and rural counterparts, respectively. It is important to note that gender's influence is evident in the full sample and urban sample, but in the rural sample, gender does not play a role in the enterprise's transition from self-employment to becoming an employer.

Education plays a critical role in the advancement of business activities within any nation. It is be-

lieved that education equips individuals with the knowledge necessary for effectively running and managing businesses. The findings in Table 3 suggest that households with solo self-employment, led by heads of households with more years of schooling, show a neutral tendency to transition from self-employment to employer status. This holds true for rural, urban, and overall samples. While this result may seem contradictory, it is not surprising because the influence of education cannot be predetermined in advance (Blumberg & Pfann, 2016). According to Lucas (1978) model, education can potentially improve an individual's managerial capabilities, thereby increasing the likelihood of transitioning to employer status. Furthermore, education can function as a tool for better-informing individuals about business environments and assessing employer status opportunities (De Meza et al., 2019). However, some research has indicated that the qualifications that make someone a successful entrepreneur do not necessarily stem from formal education (Coad et al., 2017). while Fairlie and Miranda (2017) discovered a negative and statistically significant relationship between transitioning to self-employment and education, the study found no established correlation, particularly in the context of Tanzania. Factors such as the unemployment rate play a crucial role in explaining the transition of non-farm businesses from self-employment to employer status. The results in Table 3 demonstrate that the unemployment rate has a positive and significant impact on the household's transition from non-farm business to employer status. High unemployment rates tend to discourage investors from expanding their businesses, as companies are hesitant to hire new workers until they are confident that the economy is well into the expansion phase of the business cycle, as observed by Raj et al. (2020). However, a moderate unemployment rate may indicate an abundant supply of affordable human resources, generally encouraging investors to hire and transition to employer status.

The expansion of the regional economy reduces the likelihood of individual non-farm businesses transitioning from self-employment to employer status in order to take advantage of new opportunities. With a larger economy, there is increased competition in terms of job availability. The finding from table 3 shows that regional GDP per capita is not statistically significant in explaining employment dynamics or transitions from solo self-employment to employer status. This result is quite plausible, especially in developing and highly informal economies like Tanzania. In these countries, higher regional GDP per capita does not necessarily translate into opportunities for small entrepreneurs because growth of the economy may be driven by capital-intensive sectors such as mining, large-scale infrastructure with limited job spillovers. In addition, the informal entrepreneurs, a characteristic of many developing economies, often operate outside formal growth channels, so they don't benefit directly from regional prosperity.

Proximity to the market, as indicated by ownership of a phone (Mobile or landline), is a crucial factor in determining the transition of individual non-farm businesses from self-employment to employer status. However, the type of customers served and access to electricity are not significant factors in this transition. Household characteristics such as size, gender, and marital status have a positive and significant influence on the transition of household non-farm businesses from self-employment to employer status. A household non-farm business owned by an individual with a large family is more likely to transition to employer status, possibly due to the need to support the family. The results in Table 3 show that owners of non-farm enterprises with many assets are 20 percent less likely to become employers, especially in rural areas. This result may seem surprising, but it is consistent with the nature of assets owned by rural dwellers, which may not reflect household wealth.

6 Conclusion

The low transition of household non-farm enterprises from solo self-employment (own-account) to employer status should be understood by considering not only supply factors such as lack of technology, poor infrastructure, and lack of finance but also the individual characteristics of the owner. Using national panel data (all three waves), this study estimated the socio-economic factors contributing to the low transition of household non-farm businesses from self-employed to employer status in Tanzania. The study utilized a Logit model to estimate the socio-economic determinants, aiming to uncover the microeconomic foundations of economic growth in Tanzania.

The findings indicate that several factors explain the transition of household non-farm businesses from self-employment status to employer status. One crucial factor is the location of the business

entity. The study suggests that a household non-farm business located in a rural area is less likely to transition to employer status compared to one located in an urban area. Financial constraints also play a role in explaining the transition to employer status, with only around nine percent of individuals having access to financial resources through borrowing from microfinance or friends. Surprisingly, the study found that the variable measuring "access to finance" had no influence on the transition of non-farm businesses.

Income was shown to significantly influence the transition of non-farm businesses to employer status, suggesting that business expansion in Tanzania largely depends on finance. Therefore, non-farm businesses owned by individuals with low income are less likely to transition to employer status due to financial constraints in borrowing from microfinance. Policy measures aimed at improving financial accessibility for household non-farm business owners are important in this context. In urban areas, there is a market for goods and services, low unemployment, and high-quality infrastructure, making it easier for household non-farm businesses to transition to employer status compared to rural areas.

6.1 Implication for theory and policy

The findings of this study provide important implications for both theoretical understanding and policy design in the context of employment dynamics and enterprise growth. From a theoretical perspective, the results strongly support the theories of consumer choice and human capital, which say that people choose jobs based on the expected benefits, limited by the resources and opportunities they have. The importance of factors like education, work experience, and household characteristics shows that personal traits are very important in determining the transition from self-employment to being an employer. The findings also show that these traditional frameworks don't work as well in developing countries. The lack of significance of regional GDP per capita indicates that macroeconomic prosperity alone does not adequately affect micro-level entrepreneurial transitions. This underscores the significance of resource-based theory and demand-pull perspectives, which emphasize the necessity of access to finance, infrastructure, and market opportunities. In this sense, the study contributes to theory by demonstrating that occupational mobility in developing economies is better explained by a hybrid framework that integrates individual agency with structural constraints such as informality, limited financial access, and uneven regional development.

From a policy perspective, the findings suggest that promoting enterprise growth and employment transformation requires more targeted and inclusive interventions rather than reliance on aggregate economic growth. First, the importance of education and business experience implies that policies should invest in entrepreneurial training, vocational education, and skills development to enhance the managerial capacity of solo entrepreneurs. Second, the strong role of access to finance indicates the need to expand microcredit schemes, improve financial inclusion, and reduce borrowing constraints that prevent business expansion. Third, the relevance of infrastructure and information access, such as electricity and mobile phones, highlights the importance of improving connectivity and access to market information, especially in rural areas.

6.2 Limitations and Future Research Directions

Despite its contributions, this study has several limitations that open avenues for future research. The study utilizes panel data comprising merely three waves (2008–2012), constraining the capacity to observe long-term dynamics and the lagged effects of significant variables, such as regional economic growth. Subsequent research may utilize extended panel datasets to enhance comprehension of the persistence and timing of transitions between employment states. This study's analysis utilizes a logit model framework, which, while appropriate for binary transitions, may inadequately represent the intricacies of employment dynamics, including multiple and concurrent transitions across various states. Subsequent research may utilize more sophisticated methodologies, including multinomial logit models, duration models, or dynamic panel techniques, to more effectively address these complexities. Finally, the study does not fully account for institutional and behavioral factors, such as regulatory barriers, taxation, risk preferences, and social norms, which

may influence entrepreneurial decisions. Incorporating such variables in future research could provide deeper insights into the mechanisms driving or constraining transitions to employer status.

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Data Availability

Data can be made available on the behavior of the request

Declaration of interests' statement

The author declare no competing interests.

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Research Article

The Impact of Financial Services Access on Household Entrepreneurship in Ethiopia

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Abstract

This paper analyzes the influence of financial accessibility on entrepreneurship in small business ownership in Ethiopia, using data from the World Bank's Ethiopia Socioeconomic Survey of 2018-2019. The analysis seeks to find out whether different financial services, including using ATM cards, online banking, mobile banking, and agent banking influence household business ownership. The methods used in this study include descriptive statistics, as well as binary logistic regression analysis. The analysis of results reveals that urban location, and proximity to financial institutions have a significant positive association with entrepreneurship, whereas interest-free banking has a significant negative association. Variables, including other measures of financial access, such as ATMs, mobile, online, and agents, have insignificant positive relationships. The results imply that financial inclusion does not essentially influence entrepreneurship but depends upon the functional form of financial services, either as a facilitator or as a barrier to entrepreneurship in different contexts. From this study, it is clear that for Ethiopia to grow in terms of entrepreneurship, a combination of infrastructure development in financial sectors, as well as improvement in financial literacy, and an overhaul of interest-free banking to accommodate small to micro-enterprises, is necessary.

1 Introduction

Increasingly, the concept of entrepreneurship is becoming a driving factor in economic expansion, job creation, and innovation in emerging countries. In countries such as Ethiopia, where a substantial section of the working population is considered to be underemployed or involved in the informal sector as a means of livelihood, small business start-ups act as a foundation stone of sustained economic and social development. Nonetheless, business start-ups and business sustainability are impeded by several challenges. Among them is limited or inadequate access to suitable financial services. An understanding of how differing mechanisms in financial services impact business start-up is thus of profound value.

Evidence from previous studies emphasizes finance as a stimulant in entrepreneurship. Research trends analysing financial inclusiveness and entrepreneurship have provided

evidence that increasing credit, savings, and payment facilities to all segments of society will have a positive effect on entrepreneurship (Asongu & Odhiambo, 2020; Elouaourti & Ibourk, 2024). Currently, digital technology has transformed how entrepreneurs use finance provided by financial institutions using the internet, mobile, and agent networks. In Sub-Saharan countries, initiatives such as mobile banking and agency banking have increased financial inclusiveness in society, but their effect on entrepreneurship is a subject of discussion (Demirgüç-Kunt et al., 2022). In Ethiopia, increasing initiatives designed by the Ethiopian Government to make the current finance system more inclusive have increased opportunities for entrepreneurship.

Despite increased focus on financial inclusion, studies that examine the impact of alternative channels of accessing financial services, such as ATMs, online banking, mobile banking, agent banking, and interest-free banking in Ethiopia for entrepreneurship formation remain limited. Currently, studies have overwhelmingly highlighted microfinance institutions and financial literacy within Ethiopian research confines (Meressa, 2023; Mossie, 2022). Nonetheless, this study considers that such current research approaches neglect alternative channels that influence entrepreneurship activities. In essence, current studies have also considered accessing financial services as one factor without considering or distinguishing between channels such as ATMs or online banking systems.

This paper will bridge that gap by analysing how the usage of financial services is related to business start-ups in small firms in Ethiopia based on a country-level data set of households surveyed in the World Bank's Socio-Economic Survey. In particular, based upon theories of Financial Inclusion and Pecking Order Theory, it will analyse how different types of financial services affect people's decisions to start new business enterprises. By employing descriptive statistics and binary logistic regression analysis, it will measure how significant each type of service is compared to others.

2 Literature Review and Hypotheses Development

2.1 Theoretical Background

Finance and entrepreneurship are interconnected themes in the economics of development. According to the Financial Inclusion Theory, increasing access to financial services of formal regulated institutions empowers entrepreneurs and businesses in a company to pursue investment opportunities, build capital, and mitigate risks (Sarma & Pais, 2011). Access to all possible types of financial infrastructure, including savings, loans, insurance, and payment services, of course, alleviates liquidity constraints and facilitates greater participation in entrepreneurship. Similarly, according to the Pecking Order Theory, because of greater intrinsic reliability, entrepreneurs will tap internal capital sources. Nevertheless, when their sources become inadequate, they will pursue external sources of finance (Myers & Majluf, 1984).

In emerging economies, one of the challenges that hinders entrepreneurship is financial exclusion (Asongu & Odhiambo, 2020). New approaches in finance, including mobile banking, agency banking, and interest-free banking, have emerged as an alternative to existing finance systems. Savings and credit programs are now widely accessed through such approaches, especially by females, youth, and rural dwellers (Demirgüç-Kunt et al., 2022). This aspect of integrating such programs into the entrepreneurship environment enables inclusive economic growth by allowing families to turn their savings into productive projects (Elouaourti & Ibourk, 2024).

2.2 Empirical Evidence on Financial Services and Entrepreneurship

Empirical studies have repeatedly verified that accessibility of finance is one of the most influential determinants of entrepreneurship. To exemplify, Beck et al. (2008) ascertained that financial development encourages business formation in 74 countries, whereas recently, accessibility of finance, or more precisely, accessibility as regards finance, has been stressed as an empowered tool for entrepreneurs (Ayyagari et al., 2021).

In the African context, it has been made clear that financial inclusion serves as a mediating factor between contextual considerations and entrepreneurial willingness, as Elouaourti and Ibourk (2024) explain. Also, the application of specialized financial services, including gender-sensitive products, is essential, as indicated by Akram and Sanyal (2022), as they can boost women's involvement as entrepreneurs, as observed in Ethiopia. Financial education and technology can determine financial inclusion success, as stressed by Wiquar et al. (2022), especially during economic shocks, as experienced during the pandemic of COVID-19.

Although these studies recognize the importance of inclusive finance, most of them use financial access as a single composite indicator that overlooks the heterogeneous effects of specific financial service types such as ATM, mobile, online, interest-free, and agent banking. The present study tries to fill this gap by investigating the specific contribution of each of these services to entrepreneurial start-ups in Ethiopia.

2.3 Financial Services and Start-up Formation in Emerging Economies

Financial services relate to entrepreneurship through several means. Efficiency and outreach of financial systems can be significantly improved through digital and structural financial systems, especially within Sub-Saharan Africa (Donou-Adonsou, 2025). Financial services also promote financial inclusion, which fosters access to start-up capital, and access to capital is an essential element of starting a business. Online or mobile banking helps small businesses conduct low-cost transactions, market their products, and record their financial transactions. Agent banking helps extend formal banking services to rural and distant locations, thereby bridging distances and improving small business liquidity. Islamic or interest-free banking provides financially sustainable, religion-compliant financial choices, which increase accessibility to people who were previously barred (Ahmad et al., 2023). All these have a resultant effect on one's ability and willingness to become an entrepreneur.

However, conclusive empirical studies have been minimal, especially within Ethiopia. Although it has been indicated that financial literacy has a positive effect on small businesses, as indicated by Meressa (2023), little research has been carried out on differentiated financial services and their contribution towards influencing new business creation choices.

2.4 Conceptual Framework

Based on theories and evidence that have been reviewed, this study proposes that having access to financial services increases the chances of entrepreneurs by removing liquidity problems through reducing the costs of transactions and boosting financial capability. Figure 2.1 shows the conceptual framework that connects the influence of having access to financial services (ATM, online, mobile, through an agent, and without any interest charges on banking facilities) on entrepreneurs' venture creation, and its moderators that include age, gender, residence, and proximity to financial institutions.

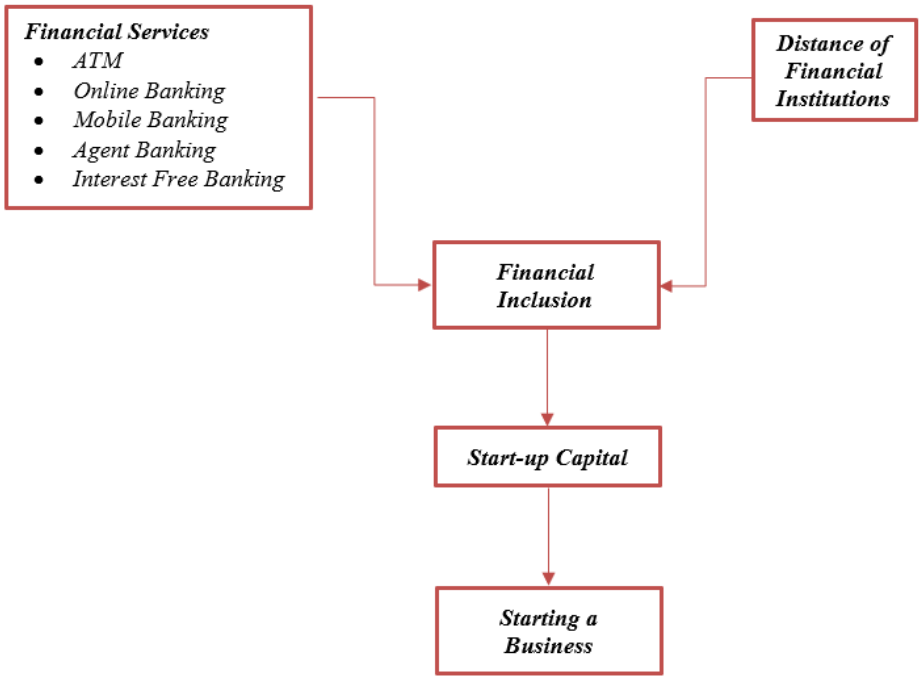

Figure 1: conceptual framework of the study

2.5 Hypotheses Development

Informed by the above theoretical and empirical discussions, this paper formulates seven hypotheses that assess the linkages among access to financial services, spatial attributes, and household entrepreneurship in Ethiopia. The hypotheses are based on sound theoretical foundations, as well as existing empirical data from both Sub-Saharan Africa and other comparable developing contexts.

Table 1: Hypotheses of the Study

No.	Hypothesis	Expected Relationship
H1	Urban households are more likely to start a business than rural households.	Positive
H2	The use of ATM services positively affects the decision to start a business among households.	Positive
H3	Use of online banking positively influences the likelihood of starting a business.	Positive
H4	Mobile banking usage positively affects entrepreneurial start-up decisions.	Positive
H5	Access to agent banking services increases the probability of starting a business.	Positive
H6	Participation in interest-free banking positively influences business start-ups.	Positive
H7	Greater distance from a financial institution reduces the likelihood of starting a business.	Negative

2.5.1 H1: Urban households are more likely to start a business than rural households

A spatial-institutional view also provides a powerful theory for the variation of entrepreneurship across urban and rural areas. Cities have several structural advantages that lower the barriers to starting a business. First, urban markets are denser, they have larger market bases that make it easier for entrepreneurs to reach economies of scale, and they simply reduce the risk of demand shortages (Naudé et al., 2008). Second, urban areas offer better access to formal institutions, including financial services, regulatory agencies,

business development services, and a legal system that can help to register a business, enforce contracts, and obtain credit (Gebreeyesus & Iizuka, 2012).

In their study on the rural non-farm enterprises in six African countries, including Ethiopia, Naudé et al. (2008) noted that rural businesses tend to be small and seasonal and have a bias towards subsistence and not growth due to market limitations and weak institutional support in rural settings. Such trends suggest that entrepreneurship in rural areas is largely necessitated by need and risk diversification. Gebreeyesus and Iizuka (2012) analyzed the institutional setting facing entrepreneurs in Ethiopia. The above findings conform to general knowledge about the significant role that agglomeration economies, which include markets, institutions, and networks, play in increasing the success of entrepreneurship in developing nations.

2.5.2 H2: The use of ATM services positively affects the decision to start a business among households

Automated teller machines (ATMs) are a fundamental element of contemporary financial infrastructure, significantly affecting transaction costs and liquidity management for aspiring enterprises. From a transaction cost perspective, ATMs substantially reduce the time and monetary costs associated with accessing cash, making deposits, and checking account balances by removing dependence on bank branches with limited operating hours (Schaner, 2017). From the standpoint of financial inclusion theory, ATMs expand the functional reach of formal banking systems by enabling households in areas with sparse branch coverage to maintain bank accounts and accumulate savings that can be mobilized for productive investment (Asongu & Odhiambo, 2020).

2.5.3 H3: Use of online banking positively influences the likelihood of starting a business

The online (internet) banking channel is a growing digital platform through which entrepreneurs are able to minimize time lag and transportation costs, thus removing the obstacles that hinder the process of creating a business. Within transaction cost economics theory, online banking allows entrepreneurs to observe whether suppliers are paid, make transactions, check account balance, and even maintain multiple accounts online in an effective way, reducing the reliance on physical bank branches and minimizing opportunity costs (Agbeve et al., 2025).

Nevertheless, there are useful insights provided within other streams of literature in this regard. In terms of adopting fintech services in Sub-Saharan Africa, studies show that entrepreneurs may be able to benefit from such technologies for their business operations provided that sufficient digital literacy and infrastructures are present (Asongu & Odhiambo, 2020). As such, in their research, the authors found that the penetration level of mobile money was positively associated with innovation effects on firm creation and development in Sub-Saharan countries.

2.5.4 H4: Mobile banking usage positively affects entrepreneurial start-up decisions

From a theoretical perspective, mobile financial services lower several constraints on entrepreneurship simultaneously. By enabling payments, transfers, and balance inquiries via mobile phones, they sharply reduce transaction and travel costs while minimizing reliance on cash-based transactions (Asongu & Odhiambo, 2020). These platforms also

enhance working capital management through real-time transaction records and rapid payment capabilities—features that are especially valuable for small firms operating with narrow margins. Demirgüç-Kunt et al. (2022) documented that the rapid expansion of mobile money in Africa and its association with greater financial inclusion among youth, women, and rural populations—groups with substantial but traditionally untapped entrepreneurial potential. Regarding the Ethiopian financial landscape, the introduction and rapid expansion of services such as Telebirr and M PESA suggest a growing role for mobile banking in supporting household entrepreneurship. Although the 2018–2019 data capture mobile banking at an early stage of diffusion (8.1 percent usage), both theoretical mechanisms and regional evidence point to a positive relationship between mobile financial services and entrepreneurial start-up decisions as adoption and digital capabilities deepen.

2.5.5 H5: Access to agent banking services increases the probability of starting a business

According to Mashizha et al. (2024) and Asongu and Odhiambo (2020), agent banking attempts to address some principal obstacles to financial inclusion by solving the problem of spatial mismatch between the financial services and the potential customer base through transaction cost theory. Specifically, by limiting time and travel expenses associated with visiting financial institutions, agent banking creates more incentives for people to use formal banks, especially in the rural and peri-urban areas of Ethiopia, where there are fewer branches. As a result, entrepreneurs gain the ability to handle their cash flow management, make payments to suppliers, and collect revenues, thus improving their chances to accumulate their startup capital. Aside from cost reduction, it may be assumed that, as local agents, the staff members of these institutions become more reliable individuals and, therefore, ease any psychological barriers to using the services provided. Moreover, as the literature on financial inclusion states, these institutions are highly effective in offering financial services without expensive infrastructure.

This argument is proven empirically in Sub-Saharan Africa. Namely, Mashizha et al. (2024) state that SMEs use agent banking to compensate for the sparse banking network to obtain better transaction management. The same trend appears in mobile money agents operating in Kenya, according to which financial inclusion rates and entrepreneurship rates grow along with agent concentration. In relation to Ethiopia, it can be stated that although only 1.6% of the population uses agent banking as of 2018-2019, the government aims to increase access.

2.5.6 H6: Participation in interest-free banking positively influences business start-ups

Interest-free (Islamic) banking provides an alternate financial system rooted in Sharia rules prohibiting interest but allowing for profit-sharing, collateral-based financing, and risk-sharing. In theory, interest-free banking could stimulate entrepreneurship through a number of means. First, it broadens access to financial services by including populations who stay away from mainstream banking because of their faith or ethics, thus raising the share of households that have access to financial services (Imam & Kpodar, 2016). Second, since interest-free loans are tied to financial instruments like Mudaraba (profit-sharing), Musharaka (partnership), and Murabaha (cost-plus financing) and involve risk-sharing, interest-free banks should lower moral hazards and adverse selection issues common to regular lending systems (Imam & Kpodar, 2016). Third, since interest-free financial instruments are collateralized, this would allow entrepreneurs who own valuable assets but cannot provide traditional types of collateral to obtain financing

more easily. Finally, interest-free banking, being associated with ethical and participative approaches to financing, could lower psychological barriers that may prevent believers from looking for outside funding because they would prefer to use informal financial services or self-finance. According to financial inclusion theory, interest-free financial services provided in accordance with certain culture or religion could broaden access and use among excluded individuals (Abor et al., 2018).

2.5.7 H7: Greater distance from a financial institution reduces the likelihood of starting a business

Transaction cost theory is the primary theoretical framework for analyzing the relationship between physical distance and financial institutions. In particular, physical distance increases the time, financial, and opportunity costs of accessing financial services, including opening an account, depositing and withdrawing money, requesting loans, and seeking financial advice (Naudé et al., 2008). The high costs are especially detrimental to potential entrepreneurs since they undertake many financial transactions while having limited time for household and business-related work. Furthermore, increased physical distance increases the cost of information acquisition and monitoring processes, thus making it harder for financial institutions to evaluate the creditworthiness of customers and for entrepreneurs to build trust with loan officers, resulting in restricted access to business credit. The spatial-institutional theory also holds that the proximity of financial institutions is often correlated with the proximity of other market institutions and infrastructure, causing additional challenges for people living far from such facilities (Gebreeyesus & Iizuka, 2012; Naudé et al., 2008). Physical distance can also constrain the amount of knowledge on the market, business connections, and examples of entrepreneurship, making it less likely for individuals to have sufficient skills and interest to start a new venture. Financial inclusion theory claims that physical access continues to be a crucial factor in accessing financial services, despite technological advances in finance, since many services, such as loans and business consultations, require face-to-face interaction (Asongu & Odhiambo, 2020).

3 Methodology

3.1 Research Design

In this study, a quantitative cross-sectional research design is employed to investigate the potential relationship between access to financial services and the propensity for enterprise formation in Ethiopia. Additionally, a secondary dataset is used that is provided by the World Bank, allowing for representative data on demographics and behaviour of households, as well as their entrepreneurial and financial habits, providing an apt framework, as it enables one to quantitatively determine some of the impacts of specified financial services on enterprise formation.

3.2 Data Source and Sampling

This research applies data collected through the Ethiopia Socioeconomic Survey conducted by the World Bank in partnership with the Central Statistical Agency (CSA). The survey, conducted in 2018-2019, provides data on a total of 6,770 sampled households, including rural and urban areas of all study regions in Ethiopia. To be more descriptive,

this survey applied a stratified sampling procedure that is quite representative of a national, regional, and urban/rural stratification of Ethiopia. Additionally, after purifying this data by eliminating responses that lacked completion or had inconsistencies, this research applied a total of 6,770 observations from the final cleaned dataset. In addition, the dataset is appropriate for this research because it encompasses a large number of variables regarding household information, financial accessibility, and enterprise operations.

3.3 Variables and Measurement

3.3.1 Dependent Variable

Entrepreneurship (BUS_START): A binary variable coded 1 if the household reported starting a new business during the reference period and 0 otherwise.

The present paper follows a specific conceptualization of the concept of entrepreneurship, which is defined as the creation of new ventures. Although the importance of the concept of entrepreneurship is widely recognized, considering it as a complex concept that embraces the creation of opportunity, value, and innovation, the creation of new ventures is one of the more concrete aspects of the concept, especially in the context of the economies of developing countries, where the creation of formal enterprises is considered crucial for the development of the economy (Ratten, 2023).

3.3.2 Independent Variables

The main explanatory variables measure access to various financial services, each represented as binary indicators, are listed in the table below:

Table 2: Variables of the Study

Variable	Description	Expected Sign
ATM	1 = Household uses automated teller machines; 0 = otherwise	+
Online Banking (OB)	1 = Uses online banking services; 0 = otherwise	+
Mobile Banking (MB)	1 = Uses mobile banking or mobile money services; 0 = otherwise	+
Agent Banking (AB)	1 = Uses agent or correspondent banking services; 0 = otherwise	+
Interest-Free Banking (IFB)	1 = Uses Islamic or interest-free banking services; 0 = otherwise	+
Distance to Financial Institution (DIST)	Distance (in kilometers) to the nearest financial institution	–

3.3.3 Control Variables

To isolate the effects of financial services, several control variables were incorporated:

- Gender (1 = male, 0 = female)
- Age (years)
- Education (years of formal schooling)
- Household size (number of members)
- Residence (1 = urban, 0 = rural)
- Household income (annual total income in Ethiopian Birr)

3.4 Model Specification

Given the binary nature of the dependent variable, the study uses a binary logistic regression model to estimate the probability that a household starts a business as a function of its access to financial services and other control factors. The model is expressed as:

$$\text{logit}(P_i) = \ln\left(\frac{P_i}{1-P_i}\right) = \beta_0 + \beta_1 ATM_i + \beta_2 OB_i + \beta_3 MB_i + \beta_4 AB_i + \beta_5 IFB_i + \beta_6 DIST_i + \gamma X_i + \varepsilon_i \quad (1)$$

Where:

- P_i = Probability that household i starts a business,
- X_i = Vector of control variables,
- ε_i = Random error term.

The coefficients (β) represent the change in the log-odds of business start-up for a one-unit change in the explanatory variable. Odds ratios are reported for interpretability.

3.5 Data Analysis Procedures

Data analysis was conducted with the help of the SPSS software package version 27, with the inclusion of descriptive statistics, followed by cross-tabulations and chi-squared tests to observe the early relationships between variables of financial access for entrepreneurs. The hypothesis testing was conducted with binary logistic regression, with the inclusion of Hosmer and Lemeshow Goodness-of-Fit Test, Nagelkerke's Pseudo R^2, Classification Accuracy, as well as Variance Inflation Factor tests to assess multicollinearity among the variables involved, with all VIFs ranging below 2.5, suggesting the absence of serious multicollinearity problems. The analysis uses the 1%, 5%, or 10% significance levels.

4 Results of the Study

4.1 Descriptive Analysis Results

Table 3 above summarizes the main variables of the study, derived from 6,770 households. From the table, it is evident that approximately 11.2 percent of Ethiopian households operated a non-agricultural enterprise, while only 4.2 percent used online banking. Mobile banking and interest-free banking usage stood at 8.1 percent and 8.0 percent, respectively, whereas agent banking was the least utilized service (1.6 percent). These patterns highlight substantial disparities in the adoption of financial innovations across households.

Table 4 presents the bivariate correlations between household entrepreneurship and the other financial service indicators. The findings indicate that a significant relationship exists between entrepreneurship and most indicators for accessing finance, except online banking. The proportion of households involved in business activities remained higher among those making use of ATM, 29.4% compared to non-users, 20.1%. The result is

Table 3: Descriptive Statistics of Key Variables ($N = 6,744$)

No.	Variable	Description	Category	Frequency	Percent
1	Entrepreneurship	Household owns a non-agricultural business	Yes	758	11.2
			No	5,986	88.8
2	ATM/ Debit Card Use	Household used ATM or debit card in the past 12 months	Yes	1,428	21.2
			No	5,316	78.8
3	Online Banking Use	Household used online banking services	Yes	284	4.2
			No	6,460	95.8
4	Mobile Banking Use	Household used mobile banking or mobile money	Yes	545	8.1
			No	6,199	91.9
5	Agent Banking Use	Household used agent/correspondent banking	Yes	106	1.6
			No	6,638	98.4
6	Interest-Free Banking Use	Household used Islamic or interest-free banking services	Yes	541	8.0
			No	6,203	92.0

Source: Author's computation from the 2018–2019 Ethiopia Socioeconomic Survey (World Bank).

Table 4: Crosstabulation of Entrepreneurship and Financial Access Variables ($N = 6,744$)

No.	Financial Service	% of HH owning a business (users)	% of HH owning a business (non-users)	Pearson χ^2	p-value	Sig.
1.	ATM Card	29.4%	20.1%	34.78	0.000	***
2.	Online Banking	5.3%	4.1%	2.41	0.121	n.s.
3.	Mobile Banking	11.1%	7.7%	10.35	0.001	**
4.	Agent Banking	2.5%	1.5%	4.82	0.028	*
5.	Interest-Free Banking	13.9%	7.3%	39.34	0.000	***

Note: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$;
Author's computation from the 2018–2019 Ethiopia Socioeconomic Survey (World Bank).

significant as indicated by the value of the chi-square statistic, $\chi^2 = 34.78$, p < 0.01, suggesting that having easy access to banking services promotes management of savings, as well as trade, required for starting a business. Similarly, mobile banking account holders were also significantly more likely to have a business than those without accounts, 11.1% compared to 7.7% respectively, $\chi^2 = 10.35$, p < 0.01. This result also supports the point that mobile-operated finance services help start a small-scale business, as long as the service provides a convenient means of making payments. Agent banking showed a positive, though weaker, relationship ($\chi^2 = 4.82$, significance p < 0.05), suggesting the positive effects of proximity finance on accessibility. The importance of culturally tolerant, religion-considerate financial services appears underscored in interest-free banking, as it showed the strongest relationship result ($\chi^2 = 39.34$, significance p < 0.01), as it significantly showed a near doubling propensity of owning a business amidst those families utilizing said services, from 13.9% to 7.3%. On the other hand, online banking had no significant relationship ($\chi^2 = 2.41$, p = 0.121), which depicts the fact that online banking in Ethiopia is in its rudimentary stages.

In Conclusion, based on the crosstab results, it appears as though accessibility in the form of mechanisms, such as agent banking and interest-free banking, as opposed to

technology-driven mechanisms, has a much more important role to play in encouraging entrepreneurship. All these findings agree with the views of Elouaourti and Ibourk (2024) and Akram and Sanyal (2022), on the fact that the success of financial inclusion does not only rely on technology, but on inclusiveness as well as cultural adaptation.

4.2 Inferential Results

The binary logistic regression analysis was used to explore how access to various financial services and residence are related to the propensity to own or establish a non-agricultural enterprise in Ethiopia. The dependent variable was business ownership by households (1 = owns or has started a business, 0 = not owning or having started a business). In contrast, the independent variables were represented by ATM/debit card use, online banking use, mobile banking use, agent banking use, interest-free banking use, distance to the nearest financial institution, and residence (urban or rural).

4.2.1 Model Fit and Diagnostics

The Omnibus test results of the analysis show that the model is significant with $\chi^2 = 208.97$, df = 7, and p < 0.001. This implies that it is significant to include all variables because it jointly increases the model compared with the null model. The Nagelkerke R^2 = 0.061 implies that this model can jointly explain about 6.1% of business ownership variance. Despite this relatively low value for pseudo-R-squared, it is acceptable for a big dataset with socioeconomic variables.

The Hosmer and Lemeshow test showed that $\chi^2 = 13.89$ (p = 0.085), which is good because p > 0.05. The model's classification accuracy is 88.8%, which is correct because it predicted nearly nine out of ten household outcomes.

4.2.2 Interpretation of Results

Table 5: Results of Binary Logistic Regression Analysis

Variables	B	Sig.	Exp(B)	Interpretation
ATM Card	-0.043	0.681	0.958	No significant effect on business ownership.
Online Banking	0.293	0.207	1.340	Positive but not statistically significant.
Mobile Banking	0.038	0.823	1.038	No meaningful relationship detected.
Agent Banking	-0.170	0.585	0.843	Not significant; low usage may limit effect.
Interest-Free Banking	-0.512	0.000	0.599	Significant negative association ($p < 0.01$).
Distance to Financial Institution	-0.002	0.040	0.998	Significant ($p < 0.05$); longer distances reduce business ownership.
Residence (Urban = 1)	1.049	0.000	2.856	Strong positive effect; urban households are nearly 2.9× more likely to start a business.

Source: Author's computation from the 2018–2019 Ethiopia Socioeconomic Survey (World Bank).

The data analysis in Table 5 shows that living in an urban area or being close to financial institutions increases one's chances of owning a business in Ethiopia. Households living in an urban area are 2.86 times more inclined to establish or possess a non-agricultural enterprise compared to rural households (p < 0.01). Also, the small but significant negative effect confirms that financial proximity continues to serve as an important determinant.

In contrast to expectations, interest-free (Islamic) banking had a statistically significant but negative coefficient (Exp(B) = 0.599, $p < 0.01$), which suggests that those who use these services are less likely to own a non-agricultural business enterprise. This result could illustrate a selection issue wherein those who are budgetarily risk-averse prefer interest-free savings but are less involved with other business ventures. It could also demonstrate that Islamic banks in Ethiopia are not yet fully involved with financial services that are focused on business, but are more involved with savings.

The other variables that make up financial access—mobile money services, online services, and agents—were not statistically significant. It can thus be observed that access to digital or transactional financial services does not necessarily lead to increased participation in entrepreneurship. Low financial literacy, poor business credit integration, or being in the infancy stage of a digital finance environment might hamper these.

Regarding use of ATM services, the crosstabulation analysis revealed a positive correlation between variable it and the dependent variable. However, the binary logistic regression revealed that use of ATM services was not statistically significant to the dependent variable after controlling for other variables. This shows that the initial bivariate relationship may have been influenced by other variables or by the collective contribution of the predictors. This justification works for Interest-Free Banking, which has significant negative association the dependent variable.

5 Discussions and Implications

5.1 Overview of Key Findings

The findings offer an insight into the effect that various types of financial inclusion may have on small business entrepreneurship in Ethiopia. They also show that urban residence and financial institutions' proximity are key predictors with regard to household businesses' ownership; however, Islamic banking is significant with a negative coefficient. However, the outcome has shown that digital banking services such as internet banking, mobile banking, and agent banking are significant with positive coefficients that are statistically insignificant.

5.2 Comparison with Previous Studies

The results are in line with the existing evidence that highlights financial inclusion promotes entrepreneurial activities and that the availability of credit and saving services is sufficient (Ayyagari et al., 2021; Beck et al., 2008). But the insignificant impact of digital financial services, such as mobile and internet banking, is supported by those studies that argue that technology cannot lead to financial inclusion without the intervention of financial literacy (Elouaourti & Ibourk, 2024).

The negative impact of interest-free banking on entrepreneurship fails to conform to some hypotheses but confirms that of Akram and Sanyal (2022), who found that Islamic banking in Ethiopia has been unexplored and mainly focuses on savings. This might be the reason that people utilizing such banking are less involved in entrepreneurial activities. The positive but insignificant impact of mobile and agent banking facilities is supported by Wiqar et al. (2022), who concluded that, though there has been growth in financial literacy and digital banking. Financial inclusion during the COVID-19 era in India was still impeded by the level of usage.

5.3 Theoretical Implications

This research yielded important contributions to the burgeoning literature on financial inclusion and entrepreneurship, particularly as they relate to low-income countries, by articulating two crucial insights emerging out of theoretical frameworks.

Firstly, proximity-based accessibility or distance and urban versus rural residence, continues to play a paramount role in driving the results associated with financial inclusion, even amidst digitization progress. This confirms the spatial-institutional theory that suggests proximity to financial institutions is vital to fully engage with entrepreneurial activities.

Second, the results show that the contextual and cultural factors represented by the structure of interest-free banks can have a mediator effect between financial inclusion and entrepreneurship. The implications are that financial inclusion, as a homogeneous concept, should not be universally applied but require adaptation according to the particular context.

5.4 Policy and Practical Implications

Some key policy implications are as follows:

- **Enhance physical and agent-based financial infrastructure** - the strong role of proximity and the limited role of technology suggest that Ethiopia should continue to focus on agent banking and micro-branches as a part of its strategy toward financial inclusion.
- **Enhance financial literacy with a business perspective** - the limited impact of ATM, online, and mobile banking capabilities on entrepreneurship suggests a lack of competence among users to fully integrate technology into their entrepreneurial activities. The entrepreneurial potential of financial access can be enhanced by specialized financial education initiatives focused on budgeting, credit, and account management technology.
- **Develop and diversify interest-free financial services** - The negative implication of interest-free banking hints at the necessity to re-engineer the delivery of Islamic banking services related to funding small-scale as well as micro-enterprises, as opposed to saving deposits. Such customized schemes could draw ethically conscious entrepreneurs into the purview of Sharia-compliant banking services.
- **Utilize linkages between urban and rural households** - the urban household advantage in entrepreneurship highlights the significance of infrastructure, market access, and network economies. Financial integration initiatives between rural and urban areas, including shared service platforms or lending schemes, may help eliminate this gap.

6 Conclusion and Recommendations

6.1 Conclusion

The purpose of this paper is to investigate the relationship between financial access and small business entrepreneurship, focusing on Ethiopia, using data from the 2018-2019 Ethiopia Socioeconomic Survey of the World Bank. While financial access is improving, its potential as a driver for entrepreneurship remains mixed and different across types and

geography. Among the factors that most strongly predict entrepreneurship, irrespective of either urban or rural settings, were residence in an urban area and distance to financial institutions.

Interestingly, interest-free or interest-free banking presented a strong negative correlation with entrepreneurship, implying that, as of now, approaches adopted by Islamic banking institutions in Ethiopia are perhaps not fully developed to favor entrepreneurship. Other financial options, including ATM, internet, mobile, and agent banking, presented a statistically insignificant positive relationship with entrepreneurship, possibly due to a lack of utilization depth, illiteracy, and limited infrastructure, respectively.

The results show that financial inclusion by itself is not a guarantee for entrepreneurship. The effectiveness of this strategy is tied to the applicable context, availability, and pertinence to the economic reality faced by entrepreneurs.

Although the analysis relies on the 2018-2019 Ethiopia Socioeconomic Survey data, it is critical to note that there have been major changes in the country's financial environment. The most notable changes are the accelerated expansion of mobile money services, particularly the growth of Telebirr services; the emergence of new market players, such as Safaricom Ethiopia and its product M-PESA; the expansion of agent banking; the introduction of the Ethiopian Instant Payment System; the development of Digital ID; and the robustness of the policy environment, as captured by the Second National Financial Inclusion Strategy. In comparison to the 2018–2019 timeframe, these advancements are probably going to have increased the role of digital financial services like the Internet, agent banking, and mobile banking in small business operations. In this respect, although the analysis provides useful insights into the country's financial inclusion landscape, the current financial system is likely to produce stronger positive correlations between financial services and household entrepreneurship. It is recommended that future studies, which rely on more recent data, be conducted to capture these major developments.

6.2 Recommendations

Based on the results, the following are proposed policies and practical recommendations:

- **Enhance the coverage and operational effectiveness of financial infrastructure** - an increase in the number of rural banks, agents, and mobile agents may alleviate location disparities, hence promoting entrepreneurship in areas with little banking service coverage. The strategy may focus on targeting the rural population by establishing cooperatives or making use of microfinance agents.
- **Financial literacy lessons should be incorporated with entrepreneurship courses** - public institutions, NGOs, and financial service providers should offer training that facilitates a link between financial literacy and enterprise development, including savings, investments, risk, and the use of digital finance.
- **Improving the interest-free banking system to facilitate enterprise funding** - reform Islamic banking to support enterprise finance - the interest-free banking services offered should advance to a level that involves providing financing tools related to Murabaha, Mudaraba, or Ijara, which are suitable for small and micro-enterprises. Such an approach will help harmonize religious financing with entrepreneurial development.
- **Create an inclusive digital finance ecosystem** - E-platforms should be complemented by investment in infrastructure and illiteracy campaigns so that technology becomes a facilitator, rather than just an emblem, of inclusion.

- **Foster interorganizational engagement** - there is a need for collaboration between the National Bank of Ethiopia, the Ministry of Innovation and Technology, and other private financial institutions to support those initiatives that bring innovation, literacy, and financial entrepreneurship as a result of technology growth.

7 Limitations and Directions for Future Research

The research is constrained by its dependency solely on a series of secondary, cross-sectional datasets, making a clear cause-and-effect chain impossible to establish. The inclusion of dummy variables to capture financial service availability could further mask the degree or quality of utilization involved either. Moving into the future, longitudinal or hybrid study approaches will allow the behavioural patterns, or even a difference based on varying levels of financial literacy, to be ascertained, establishing a two-way link between digitized financial services and enterprise development. Adding gender dynamics and geographic subsets could further enhance insights into inclusion-entrepreneurial linkages.

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Data Availability

Data can be made available on the behavior of the request

Declaration of interests' statement

The author declare no competing interests.

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Systematic Review

Systematic Review of E-commerce Adoption Barriers among SMEs in Africa

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Abstract

Digitalization facilitates more efficient communication and operations between firms, provided that businesses adopt and effectively utilize digital technologies. In developing countries, particularly in Africa, SMEs are facing significant challenges in e-commerce adoption. The studies conducted on e-commerce adoption in Africa are inadequate and fragmented with country-specific studies. This study used Technological-Organizational-Environmental factors framework and analyzed 22 peer-reviewed articles published from 2015 to 2024. The findings revealed that limited digital literacy and inadequate ICT infrastructure are the most significant technological factors affecting e-commerce adoption. Among organizational factors, top management support and commitment play a crucial role, while legal and regulatory factors, as well as security and privacy concerns, are key environmental factors influencing e-commerce adoption among SMEs in Africa. Thus, a collaborative approach involving various stakeholders in each country is essential for facilitating successful e-commerce adoption.

1 Introduction

The wave of the fourth industrialization brought about the digitalization of various sectors with significant changes in manufacturing with the help of information and communication technologies (Sarbu, 2021). The technological changes and digitalization are highly affecting the interaction of people and their daily movements including their trade activities (Gorenšek & Kohont, 2019). In the African context, the African Union has recognized and designed digital strategy for Africa named as "Digital Transformation Strategy for Africa (2020-2030)" to harness the benefits of digital revolution by appropriately utilizing digital strategy (African Union, 2020).

Digitalization has become an essential driver of business growth and competitiveness, influencing organizational processes, communication, and internationalization strategies

(Truant et al., 2021). Researches indicate that digital technologies contributes to the efficiency and effectiveness of operation of firms and their performance, although adoption remains uneven across regions (Kotiranta et al., 2024; Truant et al., 2021). With the implementation of digitalization, SMEs has got freedom of entry into global trade and compete at international level by overcoming the traditional barriers (Telukdarie et al., 2023). One of the major areas where digital transformation has had a significant impact is e-commerce whereby it is driven by technological advancements and evolving consumer preferences (Sharma et al., 2023). According to Ardito et al. (2021), digitalization is facilitating efficient communication and increased business interaction between firms. However, such business communication is largely affected by the resources, capacities and capabilities to accept digital technologies (Estensoro et al., 2022).

Goyal and Morgan (2023) indicated that the level of readiness to accept and adopt e-commerce in developing countries is very low when compared with the developed economies. Such variation occurred due to the effects of poor infrastructure, low level of digital literacy and lack of access to digital payment platforms by the firms. However, researchers like Tempest (2020) did not agree with such findings, justifying that despite the challenges, the socio-geographical spread of Africa is suitable for the implementation of digital technologies like e-commerce. The policymakers in Africa are currently focusing on the expansion and the practical use of online platforms whereby individuals and firms are selling their products online which is showing the huge potential of e-commerce adoption in the region (Tempest, 2020). The e-commerce infrastructure of the most African countries is weak; the lack of e-commerce platforms, mobile payments and logistics and transportation problems are constraints to the adoption of e-commerce (Muchie et al., 2024). The lack of awareness of the advantages of e-commerce and the reluctance towards utilization of e-commerce technology has affected SMEs businesses which indirectly affect their contribution to the economy in developing countries (Aremu & Arfan, 2023).

The use of Technological-Organizational-Environmental (TOE) framework has received great attention after Tornatzky and Fleischer (1990) developed the framework. Academic research papers and studies have employed this framework in their analysis of factors affecting the adoption of technology. Such studies considered the main TOE framework dimensions including technological, organizational and environmental dimensions while adopting technologies. Without a robust digital infrastructure in place, SMEs will continue to face significant challenges when adopting e-commerce solutions (Anshari & Almunawar, 2022; Morris et al., 2022). Moreover, the environmental dimensions are the external factors that influences the technology adoption of firms. These factors include consumer behavior, peer competition and the regulatory related factors (Alraja et al., 2020; El-Haddadeh et al., 2021; Hashimy et al., 2023; Loo et al., 2025; Maroufkhani et al., 2020; Nugroho et al., 2017; Salma, 2020; Tiwari et al., 2023; Zhong & Moon, 2023).

According to Sun et al. (2024) and Su et al. (2023), the TOE framework helps examine the challenges of adoption of e-commerce among SMEs by incorporating its dimensions of TOE in such research fields. In lieu of this fact, our study employed the TOE model which helps frame the barriers of e-commerce adoption among SMEs in Africa. Using this framework, technological factors such as internet connectivity, ICT infrastructure, electronic payment methods as well as organizational dimensions were assessed which comprised of management support, innovation cultures, digital training, and employee skills. Moreover, external scenarios such as competitions, security and privacy as well as legal and e-commerce regulations were assessed using the TOE framework.

Some of the previous studies conducted in Africa described a broad range of factors affecting the e-commerce adoption that were categorized as inadequate financial requirement, peer and competitive pressures, security issues and limitations related to infrastructures (Almunawar et al., 2022; Joseph, 2019; Minayo Amugune & Oduor, 2024). Despite the special insights provided by previous studies, their findings remained frag-

mented and focused only on e-commerce adoption of specific countries in Africa and in some cases factors affecting the adoption has been addressed. Thus, this does not give the clear and relevant evidence across African countries. In addition, the lack of systematic analysis of the prior studies by integrating the barriers hindering the e-commerce adoption has limited usability of data and information among policy makers, business owners and managers as well as stakeholders (Ocloo et al., 2020).

The organization of the paper follows the structure. The next section presents the objectives of the study whereby the specific aims of the study were addressed. Section 3 describes the methodological approach of the study is presented giving detail explanation of the methods and techniques used to conduct the study. Section 4 is all about the result of the study which presents the detail of study findings. Finally, the conclusion and recommendations of the study are presented along with the future research directions.

2 Objectives of the Study

With the growing integration of digitalization in business operations, e-commerce in particular is recognized as a crucial tool for enhancing SME competitiveness. This enables more efficient communication, process optimization, and competitive advantage among business firms (Truant et al., 2021). However, evidences of the factors associated with the e-commerce adoption in Africa remained fragmented and inconsistent. Most existing studies focused on individual countries or specific industries, which makes it difficult to build a clear, region-wide understanding. In addition, there is lack of comprehensive study involving systematic literature review that brought together and evaluated the challenges of e-commerce adoption among African SMEs that are using a common analytical framework. The absence of consolidated evidence weakens the basis of policy decision and strategic plan with respect to e-commerce adoption.

Therefore, this study systematically reviewed prior research works to consolidate the dispersed findings and develop a comprehensive evidences on the barriers that SMEs are facing while adopting e-commerce in Africa. The main aim of the study is to identify the key barriers arising from technological, organizational, and environmental dimensions that are influencing the e-commerce adoption in Africa. In addition, this study generates evidence-based insights for policymakers, researchers, and other stakeholders. It, thus, examine the technological factors including internet connectivity, technological infrastructures, and electronic payment systems; organizational factors including management support, digital skills, training and finally the environmental factors such as competition, security and privacy concerns, and legal and e-commerce regulations.

3 Research Methodology

This study employed systematic review of literatures to synthesize scientific evidence in answering the research questions and designed to examine the barriers of e-commerce adoption among SMEs in Africa. The authors identified, extracted, analyzed, and synthesized the findings of the previous studies to gain comprehensive and detailed understanding of the investigated domain during the review process (Van Dinter et al., 2021). The authors preferred this method to provide compiled information and a big pictures for policy makers and practitioners to base their decisions on evidence (Bangdiwala, 2024). This study was conducted by analyzing various studies while conducting the systematic review focusing on e-commerce adoption. The systematic literature review was thus applied to systematically identify, select and analyze the research articles retrieved from the ScienceDirect research database on the specific area of e-commerce adoption among

SMEs in Africa. This review is intended to examine the barriers of e-commerce adoption among SMEs with African context. The study enables policy makers, business owners or managers and academicians to make fruitful decisions with respect to e-commerce adoption (Ardito et al., 2021; Tolstoy et al., 2021).

3.1 Data Sources

This study used an internationally recognized research database, ScienceDirect, as its data source which is Scopus-indexed and also provides high-quality and scientifically accepted research papers and articles. In addition, to obtain the relevant research papers for this systematic review, the search terms were selected depending on the title of the study, 'Systematic Review of E-commerce Adoption Barriers among SMEs in Africa', with the study objective of examining the barriers of e-commerce adoption in Africa.

3.2 Inclusion and Exclusion Criteria

While undertaking this study, it is important to set criteria for the inclusion and exclusion that helps focus on relevant data and information. The study identified and used the journal articles that are related to this study and has a detailed description of the barriers of e-commerce adoption in Africa. As it is crucial to set inclusion and exclusion criteria for the data extraction and to use the data for the study, the authors have considered research articles specifically conducted on e-commerce adoption among SMEs in Africa and published at ScienceDirect scientific research database. Apart from this, the research articles conducted on developing countries were included to get additional data and information on the area of concern. The study included research articles published from 2015 to 2024 to provide more recent knowledge of e-commerce.

On the other hand, this study excluded research articles published before 2015, unpublished researches, case reports, discussions, editorials and others to make the study more scientific, academic and attractive. Moreover, the authors excluded the studies that are not written in the English language and do not have full texts to be used for the review of literatures. As far as the systematic review is aimed at assessing barriers of e-commerce adoption in Africa, the authors used the papers done specifically on Africa or African countries and developing countries that discuss the subject area in the context of Africa. Finally, research articles that did not have full content were excluded.

This study considered the journal articles published from 2015 to 2024 using the search terms based on Boolean operators and phrase search prepared for this purpose depending on the title of the study. Among the Boolean operators, this study used AND and OR and developed a clear and unambiguous grouping of search terms as (barriers) AND ("e-commerce adoption" OR electronic commerce adoption") AND ("SMEs" OR "small and medium enterprises") AND (Africa OR developing countries) to retrieve relevant research articles. The date of the last search was conducted on October 25, 2025.

3.3 Bias and Quality Assessment

The authors have tried to minimize the different types of bias arising from the data sampling and the data itself. The scope and design bias was addressed by carefully collecting data on e-commerce adoption in Africa focusing on the challenges that SMEs are currently facing. This was undertaken through extensive consideration of the objectives of the study. On the other hand, location bias was handled by including only the

peer-reviewed articles that were conducted on Africa or African countries or developing countries.

Moreover, the selection bias, which may occur during review, was minimized since the review was done by the three authors, including the corresponding author and the other two co-authors. This ensured a common and multidimensional understanding of the study contents among different authors. Thus, to handle the bias associated with the weighting of evidence, the study employed CASP (Critical Appraisal Skills Programme) to assess the quality and risk of bias associated with qualitative studies. It, thus, provides a simple and structured framework. The CASP tool contained 10 questions that are relevant to the studies and data included. The summary of the CASP questions was conducted for all the 22 selected studies as shown in Annex 1 and the summary of the CASP score and quality ratings is presented in Table 1.

Table 1: CASP (Critical Appraisal Skills Programme) Checklist

No.	Citation	Country/Region	Study Design	CASP Score (Out of 10)	Quality Rating
1	Faiz et al. (2024)	Indonesia	Partial least square structural equation modeling, artificial neural network (ANN)	8	High Quality
2	Gaglio et al. (2022)	South Africa	Two-Stage Least Squares Regression Model	7	Moderate Quality
3	Peter et al. (2023)	Nigeria, Uganda, Kenya, and South Africa	Focused group discussion method	7	Moderate Quality
4	Dahbi and Benmoussa (2019)	Morocco	Case study research method	8	High Quality
5	Hussain et al. (2020)	Pakistan	Partial least square structural equation modeling	8	High Quality
6	Zhao et al. (2024)	China	Partial least square structural equation modeling	8	High Quality
7	Salah and Ayyash (2024)	Palestine	Partial least square structural equation modeling	8	High Quality
8	Singh and Sahu (2022)	Ethiopia	Descriptive statistical analysis	8	High Quality
9	Gupta et al. (2023)	Not indicated	Integrated two-phase decision-making model	7	Moderate Quality
10	Menaouer et al. (2021)	Algeria	Descriptive statistics	4	Low Quality
11	Yadav et al. (2022)	Developing countries	Fuzzy DEMATEL approach	8	High Quality
12	Xiao et al. (2024)	Developing countries	Two-factor fixed effects model	8	High Quality
13	Awotunde et al. (2022)	Nigeria	SEM and ANFIS approach	8	High Quality
14	Singh et al. (2016)	Ethiopia	Survey (online)	8	High Quality

Continued on next page

Table 1 – continued from previous page

No.	Citation	Country/Region	Study Design	CASP Score (Out of 10)	Quality Rating
15	Ayawei et al. (2023)	South African and Nigerian	Partial least squares structural equation model	8	High Quality
16	Kabanda and Brown (2017)	Tanzania	Interpretivist framework	4	Low Quality
17	Badran (2021)	Egypt	Analytical framework	3	Low Quality
18	Morsi (2023)	Egypt	Analytic hierarchy process (AHP)	8	High Quality
19	Kabanda and Matsinhe (2019)	Mozambique	Thematic cross-case analysis	4	Low Quality
20	Adel (2024)	Africa, Asia, Latin America	General Methods of Moments (GMM) model	8	High Quality
21	Akintoye et al. (2022)	Nigeria	Exploratory research method	3	Low Quality
22	Kabo-Bah and Bannor (2025)	Ghana	Inverse probability weighted regression adjustment (IPWRA)	8	High Quality

CASP score and quality ratings: 8–10 => High quality; 6-7 => Moderate quality; 0-5 => Low quality
Source: Derived from CASP (2018)

Table 1 shows that out of the 22 studies included in the systematic literature study, 14 studies had High Quality scores, above 8 points out of 10, implying that these studies meet most or all of the key methodological and criteria of the CASP checklist. On the other hand, 5 studies have shown Low Quality rating with cumulative of less than 5 out of 10, which shows limited methodological rigor and insufficient data reporting.

In addition to the CASP checklist, this study employed a Fleiss' kappa (k) to validate inter-rater reliability among the three authors while selecting journal articles. Fleiss' kappa (k) is a chance-corrected statistic designed for the measurement of agreement among more than two raters using categories (Moons & Vandervieren, 2025). This tool was selected because it provides well-established method for assessing agreement among more than two raters when compared to Cohen's kappa (Dumas et al., 2022; Fleiss, 1971). Thus, the authors identified 561 journal articles based on the criteria set during data extraction and used Fleiss kappa k-statistics to screen the studies for inclusion in the analysis. Based on the detail of Fleiss' kappa (k), the total number of ratings was 1,683 (561*3) with 977 "Include" ratings, and 706 "Exclude" ratings. Thus, as shown in Table 2, the calculated value of k was 0.6242, indicating substantial agreement among the authors and a high level of consistency in inclusion and exclusion decisions beyond chance.

3.4 Data Extraction and Search Terms

The authors conducted data extraction and completed in October 2025. They searched the research articles from the ScienceDirect research database using advanced search, where the terms were linked with Boolean operators "AND" and "OR". The study used the search terms: (challenges) AND ("e-commerce adoption" OR "electronic commerce adoption") AND ("SMEs" OR "small and medium enterprises") AND (Africa OR "developing countries"), entered in the field 'Find articles with these terms' in ScienceDirect database. In general, 609 research articles were found from the database from 2015 to 2024. Among these, 561 journal articles were selected for extraction after removing duplicates, and excluded 172 with no full documents and remained with 389 papers.

Table 2: Summary of Fleiss' kappa (k)

Summary of Fleiss' kappa (k)	
Number of studies (N)	561
Number of reviewers (n)	3
Number of Include	977
Number of Exclude	706
Overall agreement ($\bar{P}$)	0.816993464
p_include	0.580510992
p_exclude	0.419489008
Expected agreement ($\bar{P}_e$)	0.51296404
Fleiss' Kappa (κ)	0.624244305

Source: Author Analysis, 2026

Moreover, the search result excluded journal articles not relevant to the title of the study or contains only one or two search terms in the title. The studies that are not conducted in Africa, any African countries or developing countries including Africa were also excluded. Using these search terms, 275 journal articles were excluded and only 114 studies were included. After thoroughly reading abstracts and findings, 76 studies were excluded since they did not mention e-commerce adoption, SMEs, Africa or African countries. Thus, 38 research articles were evaluated for full text content analysis and relevancy of the research sections and thus 22 final studies were included in this systematic research, as shown in Figure 1.

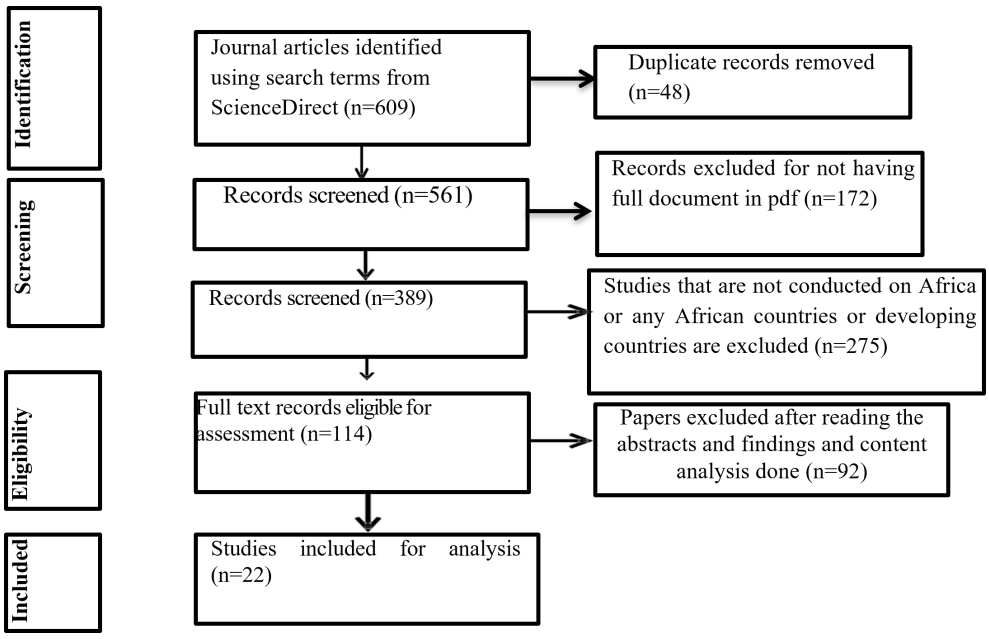

Figure 1: PRISMA flowchart

3.5 Data Analysis

In this systematic literature review, thematic data analysis was used to identify the challenges associated with e-commerce adoption among SMEs in Africa. Thematic analysis was conducted due to its simplicity in analyzing patterns or themes of e-commerce adoption challenges (Naeem et al., 2023). This study aims at identifying the challenges of e-commerce adoption among SMEs in Africa. When conducting the thematic analysis,

all the identified journal articles were read, and the findings of each paper were summarized in table format. After summarizing the findings, the authors manually grouped each challenge identified by the studies. The findings of each study were then compiled and categorized into technological, organizational and environmental factors using the TOE framework.

4 Results

4.1 Technological Factors

Technological factors are among the critical challenges in any technology adoption process, including e-commerce. Dahbi and Benmoussa (2019) argued that business leaders often prefer traditional ways of doing business over adopting new technologies. This implies that the intentions and interests of company owners and business managers determine how such factors are addressed. Accordingly, the lack of employee soft skills and knowledge of e-commerce significantly affects companies during e-commerce adoption. Apart from the employee digital skills, customers' lack of technological knowledge highly affects the adoption process (Dahbi & Benmoussa, 2019). Similarly, Salah and Ayyash (2024) argued that customers' technological savviness strongly affects e-commerce adoption among SMEs, because individuals with higher technological interest can more easily use of e-commerce platforms. This finding emphasizes on the importance of tech-savviness in facilitating adoption of e-commerce by SMEs in Palestinian.

Moreover, Singh and Sahu (2022) focused on the lack of ICT infrastructure stating that e-commerce adoption is based on the development of digital technology and ICT infrastructure including internet connectivity. In addition, technological infrastructure is not an end by itself but must be supported by digital literacy, as well as computer knowledge. The low digital literacy, lack of IT expertise, and gaps in computer knowledge make e-commerce adoption difficult for SMEs to operate, and sustain e-commerce (Awotunde et al., 2022; Kabanda & Brown, 2017; Singh & Sahu, 2022). Singh et al. (2016) conducted a study on Ethiopian apparel manufacturing and indicated that the lack of e-commerce infrastructure primarily prevents consumers from shopping online for apparel product. In addition, Xiao et al. (2024) revealed that high illiteracy contribute to low level of technology adoption implying that literacy is the fundamental factor for the technology adoption. Improving SMEs' digital literacy and their accessibility to technology is thus very important for creating a base for extensive use of e-commerce. The limited experience of SMEs with digital communication and technologies also shows a negative effect on the direct online sales (Gaglio et al., 2022).

4.2 Organizational Factors

The TOE framework clearly highlights the importance of organizational factors in technology adoption. Among these, Ayawei et al. (2023) showed that organizational culture with (p-value = 0.041) is significantly and positively related to e-commerce adoption by business to business SMEs, as organizational culture sets boundaries in which organizational activities may occur. E-commerce, as a key organizational activity, is influenced by the established norms, operational practices, and cultural values shaped by the firm's culture. A digital culture that embraces technology and innovation is particularly critical for SMEs (Badran, 2021; Faiz et al., 2024). The study by Faiz et al. (2024) further justified that digital culture has substantial effect on the adoption of e-commerce by SMEs' when compared to other variables. The firms with strong digital culture can integrate new technologies into their plans, use flexible governance structures, and make digital

platforms that can change as needed (Salah & Ayyash, 2024). This is reinforced by the top management support which is a major factor in technology adoption.

Quantitative study conducted by Hussain et al. (2020) and Badran (2021) confirmed that top management support has significant positive effect (beta = 0.358; $p < 0.05$) on the adoption of e-commerce and its utilization. This implies that with the low level of top management engagement, the firms unable to successfully adopt e-commerce and this will be a critical barrier. The top management decision determine whether SMEs implement and enhance services through e-commerce adoption (Awotunde et al., 2022; Yadav et al., 2022). Dahbi and Benmoussa (2019) further explained that most employees are unaware of e-commerce, relying on traditional methods, which highlights crucial role of management direction. The quality of information, systems and services highly influences consumers' preference to adopt e-commerce (Adel, 2024; Zhao et al., 2024).

4.3 Environmental Factors

The SMEs face several barriers that must be addressed to ensure business success including data privacy and security, market conditions and competition (Gupta et al., 2023). Moreover, competitive pressure and pressure from customers and suppliers significantly affects the e-commerce adoption among SMEs (Ayawei et al., 2023; Dahbi & Benmoussa, 2019; Hussain et al., 2020; Salah & Ayyash, 2024). The studies conducted on Moroccan SMEs indicated that competitive pressure is not a determinant, as current competition among SMEs does not significantly affect their market shares (Faiz et al., 2024; Kabanda & Matsinhe, 2019; Kabo-Bah & Bannor, 2025).

The environmental factors such as legal frameworks, government regulations, policies and security issues are the major factors affecting e-commerce adoption (Akintoye et al., 2022; Singh & Sahu, 2022). The regulatory inconsistencies across different regions hinder adoption, while security and privacy issues significantly affect customers from online purchases (Kabanda & Brown, 2017; Singh et al., 2016). In addition, poor connectivity and customer trust are currently affecting the e-commerce adoption in Nigeria (Akintoye et al., 2022). This is in opposite of the study done by Xiao et al. (2024) and Morsi (2023) which shown that the higher perceived privacy and security risks hinder the adoption of digital technologies, underscoring that apprehensions about data protection and system security act as substantial barriers to technological adoption. Most importantly, security and safety, and legal factors are significantly affecting the adoption of appropriate technology and new technologies among African manufacturing SMEs. In their study of drop shipping in e-commerce, Menaouer et al. (2021) and Peter et al. (2023) argued that e-commerce is partially implemented due to lack of personal data protection and inadequate information about the provider, warranty guarantees, and consumers' legal rights.

This study identified and examined the barriers of e-commerce adoption using TOE framework tracing the studies conducted in Africa. Accordingly, the dominant factors of technological dimensions are identified as inadequate digital literacy and inadequate knowledge of digital skills among employees of SMEs. Among the 22 studies selected for analysis, this study revealed that 12 (twelve) studies have indicated that issues related with digital skills and digital literacy as well as related trainings are significantly affecting the e-commerce adoption in Africa. These factors are also persistently recurring in the studies conducted by different scholars throughout the period 2015 - 2024. In addition, among the organizational factors indicated in different studies, top management support and management commitment were addressed 5 times and this shows that management support and commitment is affecting the e-commerce adoption (Table 3).

Table 3: Summary of Dominant Factors (Frequency, trends of TOE factors)

Category	Dominant Factors	Frequency (Studies)	Example Citations
Technological	Digital literacy, digital skills	High (12/22)	Faiz et al. (2024); Gaglio et al. (2022); Singh and Sahu (2022); Xiao et al. (2024); Badran (2021); Adel (2024); Ayawei et al. (2023); Morsi (2023); Dahbi and Benmoussa (2019); Gupta et al. (2023); Awotunde et al. (2022); Singh et al. (2016)
Organizational	Top management support and commitment	Low (5/22)	Faiz et al. (2024); Hussain et al. (2020); Yadav et al. (2022); Awotunde et al. (2022); Kabanda and Matsinhe (2019)
Environmental	Legal & Regulations factors; privacy and security issues	Low (6/22)	Peter et al. (2023); Singh and Sahu (2022); Xiao et al. (2024); Akintoye et al. (2022); Singh et al. (2016); Kabanda and Matsinhe (2019)

Source: Authors Compilation, 2026

5 Conclusions

This study investigated the e-commerce adoption among SMEs in Africa with the dynamics of analyzing the technological, organizational, and environmental factors hindering e-commerce adoption. The evaluation was conducted using the TOE framework. Apart from technological readiness, SMEs' decisions to adopt e-commerce depend on broader factors including capacity, capability, and e-commerce skills. Among such factors, technological barriers highly affect e-commerce adoption by SMEs in Africa. Inadequate technological infrastructure and low digital skills are found to be the most important technological factors that affect the adoption and effective use of e-commerce among SMEs in Africa. Thus, such technological factors bring about structural barriers that hinder SMEs from adopting e-commerce.

On the other hand, among the organizational factors of TOE, managerial support has emerged as the most decisive determinant of e-commerce adoption. The top managers of SMEs that are equipped with a strong digital culture prioritize innovation, encourage digital experimentation, and allocate resources for technology adoption like e-commerce. Moreover, the environmental factors such as strong legal and regulatory conditions, high levels of security issues and peer competition influence e-commerce adoption. In general, successful e-commerce adoption involves the integration of all factors of TOE dimensions. A coordinated, multi-level strategy is required to strengthen e-commerce adoption among SMEs. The business owners along with their business managers should focus on enhancing digital literacy for their staff and create awareness for customers.

In addition, SME owners should strengthen a digital culture and improve IT capabilities to sustain e-commerce adoption and utilization. Above all, governments and intergovernmental organizations working for the continent of Africa including the African Union should give attention to adjusting regulatory frameworks, strengthening security and consumer protection mechanisms. Finally, the digital ecosystem players such as telecom providers, financial institutions and digital platforms should be included in e-commerce

adoption. In this regard, Ministries of Science, Technology and Innovations in African countries as well as similar ministries which share the same role should discharge their responsibility of promoting intra-African integration in e-commerce and digital trade. This can be mainly achieved through a wider participation of SMEs in the national, regional and international e-commerce adoption especially in cross-border trade activities.

6 Theoretical and Policy Implications

6.1 Theoretical Implications

With the use of TOE framework, this study validates the understanding of the barriers to e-commerce adoption including the technological, organizational, and environmental factors that are given priority by the researchers and academicians. This study has emphasized on technological capabilities such as digital literacy and skills were remained the major barriers of e-commerce adoption among SMEs. In terms of organizational dimensions of TOE framework, this study has given more focus to the management support and commitment towards e-commerce adoption by SMEs in Africa. Among the environmental dimensions of TOE framework, the legal and regulatory framework has limited the capacity of SMEs to adopt e-commerce for their businesses.

6.2 Policy Implications

The findings of the study indicate the roles of policy makers in shaping the digital capacity and skill development for SME owners, managers and employees in advancing the e-commerce adoption in Africa. In addition, government bodies play a crucial role in facilitating legal and regulatory frameworks that are supportive for e-commerce adoption among SMEs. The government has the capacity of creating a favorable legal, regulatory, and secure environment that can strengthen firms' confidence in adopting and integrating e-commerce into their business operations thereby improving their business performance. In this sense, enabling the environment that promotes SMEs' sustainable adoption of e-commerce can be greatly supported by cooperation between government agencies, businesses, and digital service providers.

7 Future Research Recommendations

The analysis of this study depended mainly on secondary data using existing research articles on e-commerce adoption among SMEs in Africa which are obtained from published research articles. However, the lack of high-quality articles focusing on Africa or developing countries has limited the scope of the study to only focus on the barriers of e-commerce adoption among SMEs. In addition, most researches were published in local journals with low scientific acceptance and have constrained the authors to focus on a limited area of e-commerce adoption. The future researchers may consider using primary and secondary data to conduct empirical analysis of the barriers of e-commerce adoption among SMEs in Africa. In addition, future studies would better use firm-level data collected through surveys and interviews, employing both quantitative and qualitative research approaches. This would help to show the multidimensional nature of e-commerce adoption by SMEs and give clearer understanding of TOE factors and establish a cause-effect relationship among the dependent and independent variables.

Moreover, future research should give focus on comparative analysis of e-commerce adoption among different regions of Africa to identify similarities and differences on adoption levels, factors affecting e-commerce adoption and SMEs' responses to adopting e-commerce. Furthermore, there is still a huge gap in research findings based on sector-specific analysis and SMEs' business performance before and after the adoption of e-commerce. Thus, future studies are highly encouraged to include topics such as 'Impact of E-commerce Adoption on SME Business Performances in Africa or any country in Africa', 'Comparative Analysis of E-commerce Adoption in Africa with specific to Regional compartments', and also 'The Role E-commerce Adoption in Manufacturing Sectors and Export Performance of SMEs' to enable policy makers in the process of decision-making process.

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Data Availability

Data can be made available on the behavior of the request

Declaration of interests' statement

The author declare no competing interests.

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Research Article

Effectiveness of Road Transportation Strategies and Accessibility in the Sidama National Region, Ethiopia: A Multilevel Analysis

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KEYWORDS: Road Transport and Logistics Services; Accessibility; Multilevel Regression; Sustainable Development Goals; Ethiopia

Abstract

The study examines the effectiveness of the road transport services strategies using service reliability, accessibility, and system integration indicators and multilevel modeling to capture both individual and kebele-level variations in the Sidama Region, Ethiopia. A cross-sectional survey was conducted with 379 households to measure perceptions of service reliability characterized by availability, accessibility, affordability, and integration in the sample kebeles in the study area. Data indices are composed of 32 Likert-scale items, and a multilevel linear model described for clustering at the kebele level (ICC = 0.538). The results showed that service availability (β = 0.42, $p < 0.001$), accessibility to essential services (β = 0.36, $p < 0.001$), and integration and efficiency (β = 0.31, p = 0.001) are the strongest predictors of perceived transport services' effectiveness. The income of respondents positively influenced the perceptions of respondents, while household size presented limited effects. The substantial variation in kebele level was observed, which implies the importance of logistics infrastructure and institutionalization and governance at localized interventions. The findings advocate optimizing availability, access, and service coverage and system integrity; consolidating modal integration to users' satisfaction; and progressing toward Sustainable Development Goals, particularly SDG 9, SDG 10, and SDG 11. The study significantly contributes empirical evidence and a validated multi-dimensional framework to transport strategies in developing and localized service-oriented interventions over transport planning and equitable services provision.

1 Introduction

Road transport is pivotal to bringing about socio-economic development across both high-income and developing countries. Transport strategies such as infrastructure expansion, service integration, and regulatory frameworks play a central role in shaping the

outcomes of services' quality and accessibility (Du et al., 2022; Khan & Khan, 2022). Focusing on inclusive infrastructure, equitable access to services, and endorsing sustainable settlements, the effectiveness of integrated transport systems is critical for supporting local development strategies and realizing the sustainable development goals (SDGs), SDG 9, SDG 10, and SDG 11, which (Butkus et al., 2023; Kaiser & Barstow, 2022).

Efficient and integrated transport services uplift competence to address the needs for mobility (Alola et al., 2025; Khan & Khan, 2022). Improving reliability and access to all modes of transport services is critical to sustaining transport services ("Dynamic linkages between transport, logistics, foreign direct Investment, and economic growth: Empirical evidence from developing countries," 2020; Ngyah & Ngusulugh, 2021; Onokala & Olajide, 2020). However, the service system remains uneven and ineffective. Therefore, it fails to meet the needs of the community in many low- and middle-income countries (LMICs), markedly across Sub-Saharan Africa. Asher and Novosad (2020) argued that more than one billion people globally lack essential services, highlighting determined infrastructure shortages and service gaps.

The United Nations, in its sustainable development goals, includes the development of resilient, inclusive, and sustainable infrastructure, particularly in the transport sector (United Nations, 2024). Recent studies underline that sustainable transport systems require an integrated multimodal approach supported by data-driven evaluation frameworks (Nitwal et al., 2025; Zhang et al., 2024). However, challenges are pertained to such as infrastructure gaps, weak institutional coordination, and inequality in access persist, particularly in developing cities (Ngcobo et al., n.d.; Tazzie et al., 2025). These findings reinforce the need for coordinated transport strategies that align with SDG 10 and SDG 11 by promoting inclusive, efficient, and well-integrated transport systems.

The provision of transport services and its administration in many LMICs is characterized by fragmentation, limited access, and poor integration, which contribute to rising business costs and increased journey times, which exacerbates socio-economic inequalities (Kaiser & Barstow, 2022; Khan & Khan, 2022; Netirith & Ji, 2022). Weak institutional frameworks limited multimodal integration, and overall ineffectiveness hindered mobility, economic opportunities, and social inclusion (Alola et al., 2025; United Nations Economic Commission for Africa, 2022). Hence, improving network integration, service quality, and operational efficiency is critical to enhance mobility, decrease transport costs, and foster regional development.

To improve transportation service in Ethiopia, the national Road Sector Development Program (RSDP) has made significant investments in infrastructure expansion, with road transport accounting for 90% of passengers and freight services in the country (Ministry of Transport, 2020). To translate this effort into equitable service delivery, there are bottlenecks, including uneven access, weak multimodal integration, and fragmented regulatory and institutional coordination (Ethiopian Roads Administration, 2023; Ministry of Transport, 2020). As Alemayehu and Delina (2024) explained, weak regulatory mechanisms continue to determine reliability, competitiveness, and overall system performance. This demands that the provision of affordable, reliable, inclusive, and demand-driven transport services does not meet its goal and demand for interventions that integrate infrastructure, operations, and governance.

In Sidama National Regional State (NRS), road transport services management is facing the problem of reaching an integrated system of road-based mobility and goods distribution across urban and rural areas. This includes passenger transport services as well as freight and logistics services. Passenger transport services referring to formal public transport modes such as public buses, minibuses, and three-wheeled vehicles (commonly known as Bajaj). While these services are behind mobility for work, education, healthcare access, trade, and social interaction, thereby contributing to socio-economic integration

and accessibility. Therefore, commuters' services are directly contributing to community satisfaction aligned with SDG 9, SDG 10, and SDG 11.

The institutional mandates of governance of transport services in the Sidama NRS are structured around public regulatory bodies and privately owned transport service operators (unpublished regional proclamation, 2020). The transport and road development bureau (BoTRD) is a government authority responsible for transport policy implementation at the Sidama NRS. The bureau offers services such as licensing, regulating operators, route and fare allocation, regulation, coordination, and monitoring compliance with service standards. Private Sector Operators (PSOs) provide services commenced by private actors, with registered private-owned bus operators' associations, minibus and taxi unions, and Bajaj operators. Privately owned transport operators and public authorities do not have integrated and coordinative approaches.

Previous studies were constrained to addressing the strategies to enhance transport service effectiveness that influence satisfying users' perceptions in Ethiopia. Takele et al. (2023) also argued that the urban bias deprives peripheral areas of equitable connectivity. Sisay (2024) added the emphasis that the urban bias and top-down decision-making in Ethiopian transport development aggravated the problem. Studies by Solomon et al. (2025) examined public transport in Addis Ababa through the lens of a centralized transport authority. In addition, national-level studies by Sisay (2024) often prioritize macroeconomic frameworks and high-volume infrastructure. As Girma (2023), mobility aspects in evolving regional cities are still not explored. The same scenario is behaving in the emerging regional state, Sidama NRS, due to the lack of attention given to addressing this problem.

The extent to which determinant factors, such as availability, accessibility, integration, and affordability, shape users' perceptions at the community level is not yet examined. These challenges rigorously limit access to progress toward SDGs 9 and 11. Therefore, the analysis of the study connects with transport accessibility theory ("Accessibility evaluation of land-use and transport strategies: review and research directions," 2004; W. G. Hansen, 1959) to explore transport service outcome indicators to perceived transport service effectiveness (PTSE), addressing the service delivery dimensions that span from individual users to kebeles to identify factors. Further, the findings are used to generate policy-relevant insight aimed at improving transport service provision and aligning user needs with broader development goals, particularly SDG 9, SDG 10, and SDG 11 in the Sidama National Regional State.

1.1 Theoretical and Empirical Background

1.1.1 Theoretical Foundation of Road Transport Service Effectiveness

The effectiveness of road transport services relies on the extent to which transport systems are reliable, affordable, and well-integrated with mobility. It enables users to access essential services and opportunities efficiently. In connection with accessibility theory (P. Hansen et al., n.d.), road transport services value a means to connect individuals to essential services. On the other hand, mobility theory (Sheller & Urry, 2006) underlines the role of both individual and collective mobility in facilitating access to opportunities and fostering social connections to support social and economic activities (Sheller & Urry, 2006). Mobility is defined as an integrated system that coordinates public and private transport that enables services to address users' demands .

Real-time connectivity is the modern engine of transport efficiency (Eltved et al., 2021). Enhancing access in urban and peri-urban mobility lowers travel costs (Medina-Tapia et

al., 2021). Transport effectiveness is a system that facilitates access and realizes integration, thereby strengthening public and private operations across all modes of transport services (Litman, 2007; Masrournejad et al., 2021). Accessibility is multidimensional and includes service availability, affordability, travel time, reliability, and spatial connectivity (Freiria et al., 2022). System integration refers to the coordination of modes, fares, information, and infrastructure to provide seamless mobility (Onokala & Olajide, 2020).

1.1.2 Empirical Evidence on Road Transport Service Effectiveness

Accessibility is referred to as a key benefit of transportation networks, with low accessibility associated with poverty, unemployment, and social marginalization (Adhvaryu & Mudhol, 2021; Malhotra et al., 2021). Transport cost is a major barrier for low-income households, limiting their ability to access transport services even when available (Mutiganda et al., 2023). Improvements in public transport systems show that better coverage and connectivity increase access to opportunities and improve social equity (Bocarejo & Urrego, 2022).

Improved service coverage, connectivity, and increased accessibility that incorporate both schedule- and frequency-based services represent a better passenger perception (Eltved et al., 2021). Mobility as a Service (MaaS) seeks an effective strategy to unify public and private transport services via a single application . Integrated transport systems (e.g., coordinated services, multimodal connections, and unified fare systems) improve outcomes of mobility by reducing fragmentation and increasing ease of travel (Mutiganda et al., 2023; Soares et al., 2022).

As mentioned by Cedillo-Campos et al. (2022) and Fobosi and Malima (2024), inadequate infrastructure and weak regulatory frameworks impede transport strategies that determine the effectiveness of service availability, accessibility, affordability, and system integration, particularly in LMICs. In Ethiopia, the difficulty arose from structural challenges, including inadequate infrastructure and weak regulatory frameworks that restrict the effectiveness of transport initiatives (Ministry of Transport, 2020). The road transport service effectiveness in regions like Sidama relies on contextual synthesis, aiming to blend high-tech data with low-tech inclusivity to address socioeconomic realities of rural accessibility.

2 Objectives

1. To assess household perceptions of the effectiveness of transport services strategies focusing on key drivers, such as availability, reliability, affordability, and connectivity.
2. To examine how multilevel contextual attributes and socio-demographic factors influence the perceived effectiveness of transport service, employing multilevel modeling.
3. To estimate the extent of the perceived transport service effectiveness in the geographic variation across kebeles and quantity between-kebele variation in perceived transport service effectiveness.
4. To provide relevant policy evidence for improving transport services provision and user-centered transport strategies in Sidama NRS.

3 Hypotheses

Hypothesis (H1): A higher level of perceived determinants of transport service, such as availability, reliability, affordability, connectivity, and system integration, positively influences perceived transport service effectiveness (PTSE).

Hypothesis (H2): Greater accessibility to essential services (education, healthcare, commerce, and employment) positively affects PTSE.

Hypothesis (H3): A higher household income level is positively associated with PTSE.

Hypothesis (H4): Travel-related factors (distance and trip frequency) significantly influence PTSE.

Hypothesis (H5): Socio-demographic-related characteristics (household size, occupation, and location) significantly affect PTSE.

4 Methods and Materials

4.1 Study Area Description

This study was carried out in Sidama Region, Ethiopia. The region emerged as a regional state in 2020 after a referendum. The capital, Hawassa, is situated 275 km south of Addis Ababa. The region covers 6,992.24 km^2 and lies between latitudes 6°14′ N and 7°18′ N, and longitudes 38°20′ E and 39°20′ E. It is bordered by the Oromia region, Gedeo zone, and Wolaita zone, with an average elevation of 2,068 meters. The region has various agro-ecological zones, including temperate Middle land (45.3%), Highland (27.2%), Lowland (24.2%), and alpine (3.4%). As of the plan and development bureau (2024) (unpublished report), the population is 4.8 million across 991,000 households, organized administratively into 30 woredas [1] (districts) and six city administrations (Hawassa administration with eight sub-cities), and a total of 658 kebeles[2]. Regarding the Infrastructure, 4,422.43 km of roads and 60 complete bridges, though poor road quality and connectivity remain issues, especially in remote areas (unpublished report). The spatial distribution of sampled administration is presented in Figure 1.

4.2 Research Design and Approach

This study applied a quantitative cross-sectional survey design to examine the effectiveness of transport service strategies in responding to commuter needs in the Sidama NRS. The analysis focuses on the perception of users on the transport services effectiveness (PTSE) through key predictors, such as services accessibility and operational-effectiveness dimensions on a household level. For the hierarchical structure data, a multi-level modeling framework is employed, where individual households (Level 1) are nested within kebeles (level 2). The approach helps the analysis to capture respondents who are within the same kebele and are likely to share similar contextual characteristics, such as transport infrastructure conditions, service availability, and local governance, which potentially lead to intra-group correlation. In this way, a two-level model is specified to estimate both

[1]Woreda: Refers to an administrative division after zones in Sidama NRS. They are responsible for delivering essential services and implementing national polices at community level.

[2]Kebele: The smallest administrative unit in Ethiopia, operate at the community level, handling local governance, civil registration, and grassroots service delivery.

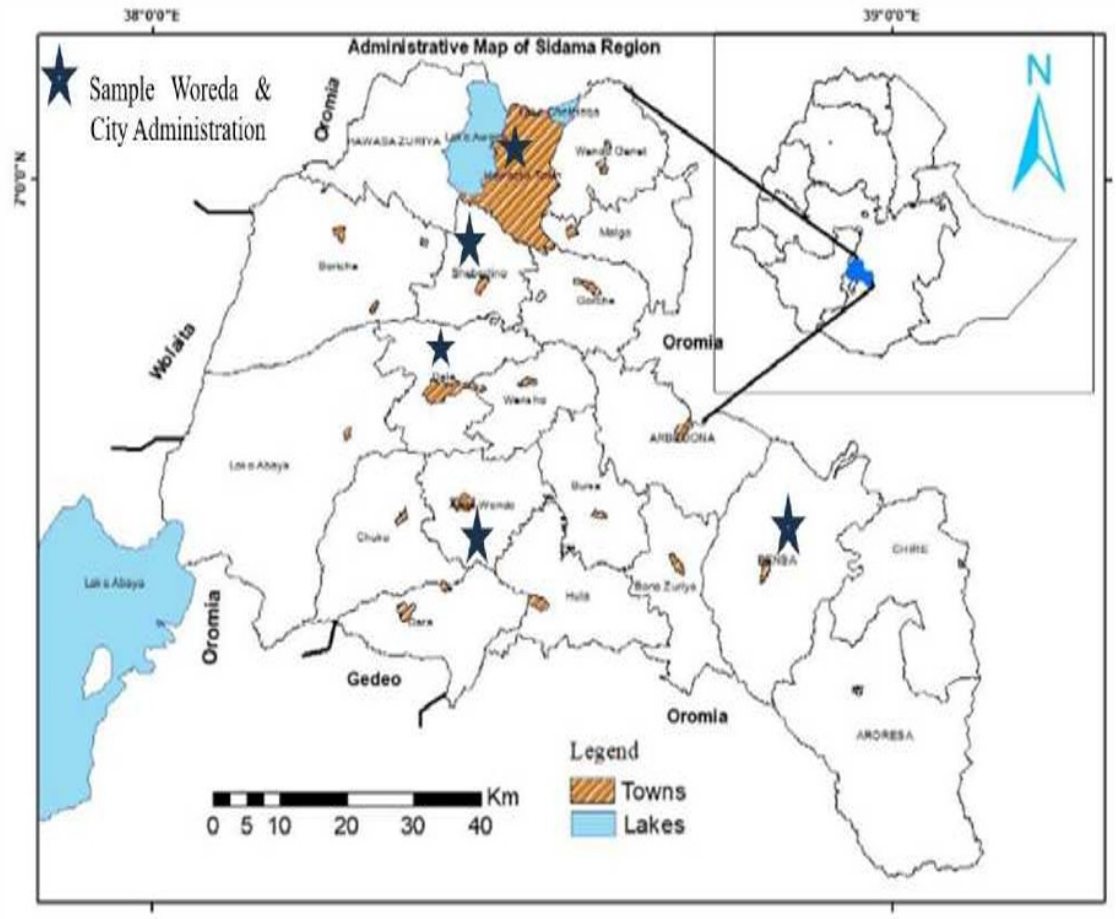

Figure 1: Map of the Study Area (Sidama National Regional State, Ethiopia)

individual-level determinants of PTSE and kebele- level variation is assessed using the intraclass correlation coefficient (ICC), while random intercepts are included to account for unobserved heterogeneity across kebeles. This hierarchical modeling approach ensures stronger and more reliable parameter estimates.

4.3 Data Collection Method

A structured questionnaire was administered to collect the information on these dimensions to compare respondents and kebeles across them. The household survey was managed by trained enumerators, and they were given two days of training to cover the study objectives, ethical procedures, content of the questionnaire, and exploitation of digital data collection tools. The questionnaire was coded using Kobo Toolbox and processed through face-to-face interviews using smart mobile devices (tablets/smartphones). The method was chosen because it improves data accuracy, reduces entry errors, and allows real-time consistency checks. The questionnaires were translated into local language during interviews to ensure clarity and comprehension. All participants were informed to obtain consent prior to the interview.

4.4 Sampling and Sample Size Determination

The target population comprises households residing in ten kebeles in the Sidama National Regional State (NRS). The regional state is purposely selected due to the Federal House of Representatives and the Regional Transport and Road Development Bureau (BoRTD) reports, which note these current structural challenges and advocate to see new solutions and take actions to improve road transportation quality and service effectiveness in the Sidama Region on April 20, 2024.

First, all five Zones were included in the study to ensure full geographic coverage in the region. Therefore, no sampling was applied at the zone level. Within each zone, a multistage random sampling procedure was implemented. First, woredas are selected from each zone, based on population size and number of kebeles they cover. Accordingly, one woreda (district) was selected from each Zone. Subsequently, two kebeles were randomly sampled from each selected woreda (district), resulting in a total of ten kebeles.

Within these kebeles, households were selected using proportional systematic random sampling based on the kebele household registry, with the help of the Kobo Toolbox. A total sample of 379 households was proportionally allocated from a population of 24,551 (Regional Development and Plan Bureau, 2024). Household members aged 18 and above were eligible to participate.

Sample size was calculated using Cochran's formula (Cochran, 1977) with a finite population adjustment. First, the initial sample size for an infinite population was calculated as:

$$n_0 = \frac{Z^2 p(1-p)}{e^2}$$

Where $Z = 1.96$ (95% confidence level), $p = 0.5$ (maximum variability), and $e = 0.05$ (margin of error). This gives:

$$n_0 = \frac{(1.96)^2 \times 0.5(1-0.5)}{(0.05)^2} = 384$$

Since the population is finite ($N = 24,551$), the adjusted sample size was computed using:

$$n = \frac{n_0}{1 + \frac{(n_0 - 1)}{N}} = 379$$

Thus, the final sample size is 379. A design effect (Deff) of 1.0 was assumed due to minimal intra-cluster correlation.

Survey data, which measures perceived strategy effectiveness, service availability, accessibility, reliability, affordability, comfort, and system integration, reflects how well road transport services meet the daily mobility needs of a diverse community. Data were collected using structured Likert-scale items. In addition, socio-demographic factors, such as occupation, income, and location were also collected to control individual-level perceptions.

4.5 Data Analysis Method

This study employed a multilevel modeling approach to account for the hierarchical structure of the data, where households are nested within kebeles, in order to investigate the effectiveness of the strategies in road transport service delivery. The approach enables the decomposition of total variance into within- and between-kebele components, thereby allowing the estimation of the intra-class correlation (ICC) and examination of how geographic context influences PTSE. The analysis investigates how the key transport service dimensions and accessibility factors shape household experience in PTSE, grounded in transport accessibility and mobility theory (W. G. Hansen, 1959; Sheller & Urry, 2006). The hierarchical nature of data, within the same kebele are likely to share similar contextual characteristics, such as infrastructure quality, service availability, and local governance, thus violating the independence assumptions of conventional regression models.

To address hierarchy data in structure, a two-level linear mixed-effects model with random intercepts was applied (Raudenbush & Bryk, 2002). This helps to establish a baseline to vary kebeles while estimating the fixed effects of key predictors, including service availability, accessibility to essential services, integration system efficiency, and sociodemographic characteristics. In this way, the dependent variable, PTSE, was constructed as a composite index derived from multiple Likert scale items capturing key dimensions, such as affordability, reliability, and accessibility, and user experiences. Therefore, the multilevel modeling approach provides more accurate parameter estimates and standard errors by explicitly accounting for clustering effects, thereby offering a strong framework for analyzing the determinants for transport service effectiveness in a geographically structured context.

4.5.1 Definitions of Variables

Table 1 presents the definitions, measurements, and levels of all variables that are further used in the analysis. The dependent variable is a composite index that is derived from multiple Likert scale items, while the independent variables are service availability and socio-demographic characteristic-related dimensions. However, a variable travel time was incorporated as a contextual variable using secondary data from the Ethiopian Roads Administration (Ethiopian Roads Administration, 2023), representing average travel duration (in minutes). Table 1 also differentiates between individual-level and kebele-level variables used in the multilevel modeling framework.

4.5.2 Model Specification

The general model is specified as follows:

$$Y_{ij} = \beta_0 + \sum \beta_k X_{kij} + u_j + \epsilon_{ij}$$

Where Y_{ij} denotes the perceived transport service effectiveness score for individual i in kebele j; X_{kij} stands for individual-level predictors (service quality, perceptions, and socio-demographic characteristics); u_j is the kebele level random intercept capturing unobserved contextual variation; and ϵ_{ij} is the individual level error term.

Prior to model estimation, descriptive statistics and graphical diagnostics, including histograms and Q-Q plots, were used to test normal distribution, revealing only minor deviations acceptable under large sample conditions. A stepwise approach was taken, starting

Table 1: Variable Definition and Measurements

Variable	Definition	Measurement	Level
PTSE (Dependent Variable)	Perceived effectiveness of transport availability, accessibility, affordability, and system integration	Composite index (32-Likert items, sum (32–152))	Individual
Service Availability	Extent to which transport services are available and meet user needs across time periods	Composite index	Individual
Accessibility to Essential Services	Ease of healthcare, education, employment, and other key services	Composite index	Individual
Integration and Efficiency	Degree of coordination between transport modes and system performance	Composite index	Individual
Socioeconomic Support	Extent to which transport services facilitate commerce and provide affordable fare options	Composite index	Individual
Comfort / User Experience	Quality of travel experience across transport modes	Composite index	Individual
Income Level	Annual household income of respondents	Continuous variable (Ethiopian Birr, ETB)	Individual
Education Level	Highest educational attainment of respondent	Categorical	Individual
Household Size	Number of individuals in the household	Continuous (count)	Individual
Travel Time	Travel time for daily activities (e.g., work, school)	Continuous (km or categorized distance ranges)	Average
Kebele (Cluster Variable)	Administrative unit representing geographic clustering of respondents	Categorical (kebele identifier)	Kebele
Kebele-Level Effects (Random Effect)	Unobserved contextual factors	Random intercept in multilevel model	Kebele

Source: Authors' Compilation based on Household Survey Data (2025)

with a null model to calculate the interclass correlation coefficient (ICC) to assess kebele-level variance. Subsequent models included individual-level predictors, with likelihood ratio tests for model adequacy. Statistical reliability was ensured by using standard errors clustered at the kebele level to address intra-group correlations and heteroscedasticity.

5 Analysis and Results

The results of the study are presented under five sections. The first section describes the socio-demographic characteristics of the respondent. The second section presents descriptive statistics of the PTSE index. The third section discusses the construction and measurement of the PTSE variable in an analysis; the fourth section examines the influence of service quality, travel behavior, and socio-demographic factors using a multilevel modeling approach. The last section explores geographic variation and outlines kebeles' policy implications for improving transport services provision in the Sidama region.

5.1 Descriptive Statistics

As shown in Table 2, descriptive statistics indicate moderate variation across service-related dimensions. The composite PTSE score ranges from 32 to 152, with a mean of 85.72 (SD = 25.25), reflecting a moderate level of variability among respondents in perceived transport service effectiveness. A mean score for service availability is 2.68; integration and efficiency mean scores are 2.65, reflecting potential gaps in service frequency, coordination, and system reliability. A mean score of 2.82 for accessibility shows below optimal levels, implying gaps in accessing essential services. A mean of 252,354 ETB (SD = 291,241) for household income indicates a significant economic variation among respondents. This may relate to perceptions of affordability and access to transport services. The average household size mean is 3.75 (SD = 1.56), ranging from 2 to 10 members, implying a moderate household size with considerable variation across respondents.

Travel time is referred as a contextual variable incorporated using secondary data from the Ethiopian Road Administration (Ethiopian Roads Administration, 2023) (unpublished report), representing average travel duration (in minutes) in rural and peri-urban areas. These results imply that transport services provide basic functionality; improvements are needed in service reliability, accessibility, and system integration to enhance perceived effectiveness.

Table 2: Descriptive Statistics

Variable	Mean	Std. Dev.	Min	Max
PTSE	85.72	25.25	0	152
Service Availability	2.68	1.06	1	5
Accessibility	2.82	1.16	1	5
Integration & Efficiency	2.65	1.03	1	5
Socioeconomic Support	3.02	1.23	1	5
Comfort / User Experience	2.70	1.10	1	5
Income (ETB/year)	252,354	291,241	100,000	2,500,000
Household Size	3.75	1.56	2	10
Travel Time	60	30	30	90

Source: Computed from household survey data ($N = 379$), 2025

5.2 Socio-Demographic Characteristics of the Respondents

Table 3 shows the result of the sample is male (71.2%), while females account for 28.2%, and 0.5% fall under unspecified categories. This implies participation differences rather than household headship. Likely, the age of respondents ranges from 18 to 78 years, with the majority (59.6%) falling within the economically active age group (30–45 years). Younger adults, ranging from 18 to 29 account for 17.2%; those aged between 46 and 60 represent 16.2%; and respondents above 60 years constitute about 7%. Therefore, the result indicates that the sample is composed of working-age individuals who are highly dependent on transport services.

Regarding the status of education, 32.2% of respondents hold a diploma or higher education, while 21.4% completed secondary education (9–12). However, 17.4% of respondents have no formal education. This indicates variation in educational attainment that may influence perception of service quality. Household income shows substantial variation, with a mean annual income of 252,354.21 ETB ranging from 100,000 ETB to 2,500,000 ETB (SD = 291,240.79). This dispersion indicates significant economic heterogeneity among respondents. This supports analyzing differences in perceived affordability, accessibility, and equity in transport services. Therefore, data captures a socially and

economically diverse population and strengthens the findings to capture varied experiences with PTSE.

Table 3: Socio-Demographic Characteristics of Respondents ($N = 379$)

Variable	Category	Frequency (N)	Percentage (%)
Gender	Male	270	71.2
	Female	107	28.2
	Other/Unspecified	2	0.5
Age Group	18–29	65	17.2
	30–45	226	59.6
	46–60	61	16.2
	> 60	27	7.0
Education Level	Diploma and above	122	32.2
	Secondary school (9–12)	81	21.4
	Uneducated	66	17.4
	Senior secondary (7–8)	45	11.9
	TVET (1–4)	34	9.0
	Primary (1–6)	31	8.2
Income (ETB/year)	**Metric**	**Value**	
	Mean (approx.)	252,354.21	
	Minimum	100,000	
	Maximum	2,500,000	
	Std. Deviation	291,241.00	

Source: Computed from household survey data ($N = 379$)

5.2.1 Distribution of PTSE

Table 4 presents distributional properties of the composite of PTSE scores. This index ranges from 0 to 152, reflecting substantial variability in respondents' perceptions, which has a mean of 85.72 (SD = 25.25) and a median of 86.00. This result indicates a symmetric distribution. The interquartile range ranges from 65 to 104, suggesting moderate dispersion, without evidence of floor or ceiling effects. Skewness (0.009) is negligible. While kurtosis (2.48) was slightly below the normal benchmark, which suggests minor deviation from normality and supports the suitability of the data for parametric analysis. A 95% confidence interval for the mean is [83.17, 88.27] (SE = 1.29), indicating a precise estimate of a population mean. These properties confirm that the PTSE index is continuous, symmetric, and suitable for parametric analysis.

Table 4: Distributional property of PTSE Score

Statistic	Value	Interpretation
Mean	85.72	Moderately high perceived effectiveness
Median (p50)	86.00	Close to mean; symmetric distribution
Min – Max	0 – 152	Wide variation in responses
Standard Deviation	25.25	Substantial variability
Skewness	0.009	Symmetric
Kurtosis	2.48	Mild deviation from normality
IQR (p25–p75)	65–104	Moderate dispersion
95% CI (Mean)	83.17–88.27	Precise estimate

Source: Computed by the author using `tabstat` in Stata 18 from household survey data ($N = 379$), 2025

5.3 Effectiveness of PTSE in the Study Area

A composite index for the dependent variable (PTSE) was constructed with data derived from 32 Likert-scale items across six thematic dimensions: service effectiveness, service availability, accessibility to essential services, socio-economic support, comfort and user experience, system integration, and efficiency. Each item was measured through a five-point scale, yielding a total index score ranging from 32 to 152.

The composite index is generated using the row-total procedure in Stata, which sums responses across all items to produce a continuous variable. The approach suggesting that aggregated Likert scale items can be treated as approximately interval-level data for parametric analysis establishes methodological guidance (Norman, 2010). The index helps to measure households' perceived transport system effectiveness in meeting daily mobility needs.

As presented in Table 5, the survey items represent key services outcomes dimensions, including accessibility, reliability, affordability, and user experience. These indicators form the basis for a composite index and subsequent regression analysis. Specifically, the index reflects service performance across different items of the day; accessibility to essential services such as health care, education, and employment; economic support (e.g., fare equity and commerce facilitation); comfort across transport modes; and the level of coordination and integration within the transport system.

Therefore, the constructed index provides a comprehensive and multidimensional measure of perceived PTSE across urban and peri-urban residents.

Table 5: Thematic Grouping for Transportation Effectiveness

Theme	Variables
Service Effectiveness	Morning, afternoon, evening commuter effectiveness; timeliness effectiveness; private bus effectiveness; public bus effectiveness; taxi commute effectiveness
Service Availability	Accessibility, service frequency, and alignment with user needs
Access to Essential Services	Access to healthcare (public/private), education (public/private), and work-related travel
Socioeconomic Support	Commerce support (public/private/taxi); fare equity (public/private/taxi)
Comfort / User Experience	Comfort levels in public buses, private buses, and taxis
Integration & Efficiency	Public-private coordination, system integration reliability, reduced waiting time, real-time information, customer feedback mechanisms

Source: Survey Instrument and Variable Coding (2025)

5.4 Normality Assessment

Figures 3-4 present the histogram with normal curve, Kernel Density Plot, and Q-Q Plot for PTSE index. Visual inspection highlights a symmetric and bell-shaped distribution, with only minor deviations in the tails. Visual inspection of plots suggests a symmetric, bell-shaped distribution of the PTSE index, with minor tail deviations. Despite a significant Shapiro–Wilk test ($p < 0.01$) due to the large sample size, the normality assumption is deemed satisfied for OLS estimation.

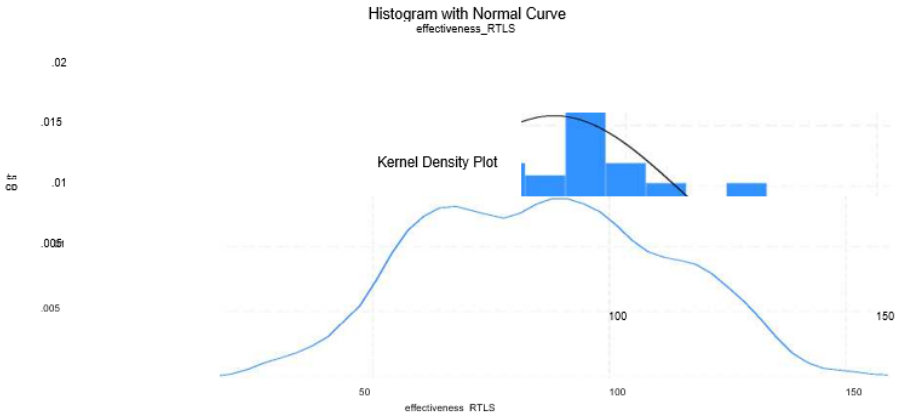

Figure 2: Figure 2: Histogram of PTSE Score (with Normal Curve) Source: Computed from household survey data (N = 379)

The Shapiro-Wilk test (Table 6) indicates a statistically significant departure from normality ($W = 0.988$, $p = 0.0028$). However, given the large sample size ($N = 379$), such tests are known to be extremely sensitive to minor deviations from normality.

Table 6: Shapiro–Wilk Test for Normality of PTSE Score

Variable	Obs	W	V	z	Prob > z
PTSE	379	0.98778	3.214	2.772	0.00279

Source: Computed from household survey ($N = 379$), 2025.

Source: Computed from household survey data (N = 379)

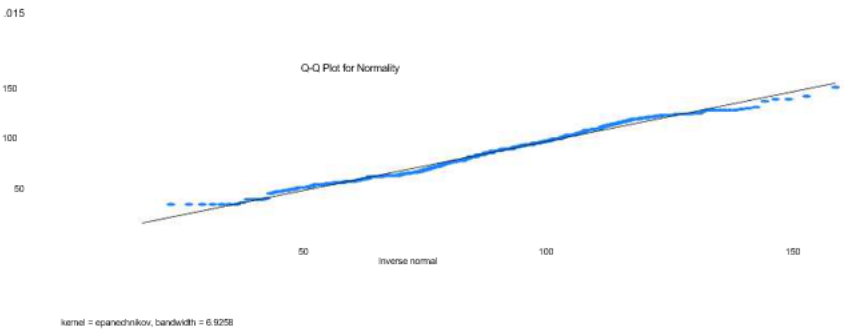

Figure 3: Figure 3: Kernel Density Plot of PTSE Source: Computed from household survey data (N = 379)

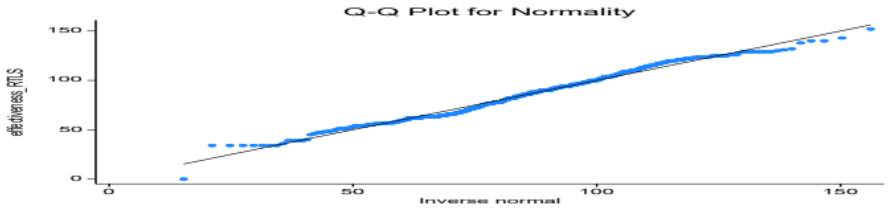

Figure 4: Figure 4: Q-Q Plot for PTSE Source: Computed from household survey data (N = 379)

As shown in Table 7, another test for normality was done based on skewness and kurtosis. The result showed skewness is not significant (p = 0.9403), while kurtosis is statistically significant (p = 0.0078), resulting in a significant joint test (p = 0.00322). This suggests that the distribution is symmetric but exhibits mild deviation in tail behavior. Therefore, graphical diagnostics indicate normal distribution. Thus, normality assumption is considered sufficiently satisfied for OLS regression analysis.

Table 7: Skewness and Kurtosis Test for Normality

Variable	Obs	Pr (skewness)	Pr (kurtosis)	Joint test	
				Adj chi^2 (2)	Prob $>$ chi^2
PTSE	379	0.9403	0.0078	6.87	0.0322

Source: Computed from household survey ($N = 379$), 2025

5.4.1 Model Choice and Intraclass Correlation Coefficient (ICC) Analysis

As presented in Table 8, a multilevel ordinary least squares (OLS) regression model analyzes the effects of key determinants of transport service and socio-demographic factors on the PTSE, considering the hierarchical data structure of households within kebeles. A two-level linear mixed effects model with a random intercept was utilized to account for this structure. Multilevel modeling improves upon single-level regression by considering clustering effects, yielding accurate standard errors, and enabling the estimation of fixed and random effects at hierarchical levels.

The analysis of the null model estimating the intraclass correlation coefficient (ICC) revealed that about 54% of the variance in PTSE is due to differences between kebeles (ICC = 0.54, SE = 0.116; 95% CI: 0.318–0.745). Clustering effect supports the adoption of a

multilevel modeling approach, emphasizing kebele-level contextual factors. Likely, the Likelihood ratio tests confirmed that the multilevel model fits the data significantly better than a single-level model ($p < 0.001$). As a result, robust standard errors clustered at the kebele level were applied, ensuring valid statistical results. Diagnostic checks indicated no major violations of assumptions concerning linearity, multicollinearity, or homoscedasticity, affirming the model's good fit and reliability for further analysis.

Table 8: Multilevel OLS Regression Results for PTSE

Fixed Effects	**Coefficient**	**SE**	**p-value**
Intercepts	42.15	4.32	< 0.001
Service availability	0.42	0.05	< 0.001
Accessibility to essential services	0.36	0.06	< 0.001
Integration and efficiency	0.31	0.08	0.001
Income level	0.27	0.09	0.003
Education	0.08	0.07	0.256
Household size	-0.06	0.05	0.232
Travel time	-0.11	0.06	0.068
Random Effect	**Variance**	**SD**	
Kebele_ID (Intercept)	292.40	17.10	
Residual (within kebele)	248.80	15.70	

Source: Computed from household survey ($N = 379$), 2025

5.4.2 Model Justification and Validation

The multilevel OLS regression model accounts for the continuous dependent variable and significant clustering at the kebele level. It applies diagnostic checks to affirm that key OLS assumptions, including linearity, homoscedasticity, and the absence of influential outliers, are satisfied. The hierarchical data, nesting households (Level 1) within kebeles (Level 2), which share transport services and infrastructure, challenge traditional regression assumptions. Individual and kebele-level factors affect perceived transport service effectiveness. Multilevel modeling estimates intra-class correlation (ICC) and quantifies perceived effectiveness differences across kebeles while providing reliable parameter estimates by addressing clustering and accommodating both fixed and random effects. The ICC was computed from the variance components of the null (empty) model as:

$$ICC = \frac{\hat{\sigma}^2_{between}}{\hat{\sigma}^2_{between} + \hat{\sigma}^2_{within}}$$

Substituting the estimated variance components:

$$ICC = \frac{292.41}{292.41 + 248.80} = \frac{292.41}{541.21} \approx 0.54$$

This indicates that 54% of the total variance in PTSE is attributable to differences between kebeles, while the remaining 46% is due to within-kebele (household-level) variation. The substantial clustering effect justifies the use of multilevel modeling.

To improve the strength of the statistical inference, it was adjusted using cluster-robust estimators at the kebele level to account for potential intra-cluster correlation and standard errors. This adjustment is important in hierarchical data structures, where observations within some kebele may not be independent. The standard errors accordingly

correct the model, providing more reliable statistical inferences and reducing the risk of biased significance estimates (Colin Cameron & Miller, 2015; Wooldridge, 2023).

5.5 Multilevel Analysis of the PTSE

As demonstrated in Table 5, the determinants of PTSE in the multilevel model show both individual-level and contextual (kebele level) factors influencing PTSE. The intraclass correlation coefficient (ICC = 54%) confirms that a substantial proportion of the total variance is attributable to differences across kebeles. Therefore, the finding indicates the localized infrastructure conditions, service provision disparities, service provision, and governance effectiveness in shaping transportation outcomes.

5.5.1 Service Quality and Accessibility Factors

Service availability is a variable that emerges as the strongest predictor ($\beta = 0.42$, p < 0.001), indicating that frequent and reliable transport services significantly enhance perceived effectiveness. The accessibility ($\beta = 0.36$, p < 0.001), which is access to essential services, shows a strong positive effect. This highlights the critical role of transport systems enabling access to healthcare, education, and business activities. Integration and efficiency ($\beta = 0.31$, p = 0.001) also significantly improve perceived effectiveness by reducing travel time and enhancing system coordination.

5.5.2 Socio-Economic Characteristics

Household income is a significant socio-economic predictor ($\beta = 0.27$, p = 0.003), suggesting higher-income households perceive better transport effectiveness. In contrast, education ($\beta = 0.08$, p = 0.256) and household size ($\beta = -0.06$, p = 0.232) do not significantly impact perception of transport service effectiveness.

5.5.3 Effect of Travel Time

Travel time shows a negative but statistically marginal relationship ($\beta = -0.11$, p = 0.068), suggesting longer travel duration reduces perceived effectiveness. Although the effect of travel time is not at conventional levels of statistical significance. This result should therefore be interpreted with caution. From the policy perspective, the high ICC underlines strong spatial variations across kebeles, supporting the need for place-based transport interventions focusing on service frequency improvement, accessibility expansion, and integration of transport modes.

From a development perspective, improved transport service and accessibility promote inclusive mobility, boost economic productivity, and help to reduce inequalities, aligning with key global development goals such as SDG 11.2 which emphasizes access to safe, affordable, and sustainable transport systems; SDG 9 which focuses on building resilient infrastructure; and SDG 10 aimed at reducing inequalities.

To sum up, from a development perspective, improved transport service and accessibility promote inclusive mobility, boost economic productivity, and help to reduce inequalities, aligning with key global development goals such as SDG 11.2 which emphasizes access to safe, affordable, and sustainable transport systems; SDG 9 which focuses on building resilient infrastructure; and SDG 10 aimed at reducing inequalities.

5.6 Hypotheses Testing

This study examined the hypotheses supposed about the determinants of the PTSE. Each hypothesis is evaluated using the variable(s) contained in the multilevel regression model.

Hypothesis (H1) was testing the impact of PTSE. Drivers of transport service were operationalized using important dimensions such as service availability and system integration/efficiency. Results indicate that both service availability ($\beta = 0.42$, p < 0.001) and system integration/efficiency ($\beta = 0.31$, p = 0.001) have a favorable and statistically significant effect on PTSE. These findings suggest that improved service coverage and better coordination across transport modes enhance users' perception of transport effectiveness. Therefore, hypothesis H1 is supported.

Hypothesis (H2) is access to essential transport services (e.g., education, healthcare, commerce, and work) is positively associated with the strategy of the PTSE. The result confirms that accessibility to essential transport services ($\beta = 0.36$, p < 0.001) proved a significant positive relation with perceived strategy effectiveness. This variable is important in facilitating social and economic inclusion, as improved access directly enhances perceived performance. This hypothesis is supported by the results.

Hypothesis (H3) is that affordability and income level are the positive effects of income, but the absence of direct affordability metrics suggests that perceived effectiveness is linked to a reduced financial burden of transport costs. Higher income indicates a stronger link with area, as high-income households live in places with better services. Future research should disentangle this by including direct cost-to-income ratios.

Hypothesis (H4) is about travel-related behaviors, such as travel time sensitivity, frequency, and purpose of travel, significantly influencing perceptions of strategy effectiveness. Travel time ($\beta = -0.11$, p = 0.068) was found to be marginally significant and negatively related to perceived effectiveness. This suggests that some travel-related factors require further investigation. This hypothesis is partially supported.

Hypothesis (H5) examines whether socio-demographic characteristics (e.g., location, occupation, and household structure) significantly shaped PTSE. The results indicate that income level ($\beta = 0.27$, p = 0.003) remains a key predictor reinforcing its role as a key socioeconomic control variable, whereas household size (p = 0.232) was not significant. This indicates that household size shows limited influence, and economic capacity continues to play a dominant role in shaping PTSE. This hypothesis is partially supported.

6 Findings and Discussion

6.1 Findings

The results showed service availability, accessibility, and system integration across transport modes are the primary predictors of PTSE. Multilevel modeling further revealed the substantial clustering of responses at the kebele level (ICC = 0.54), explaining that more than half of the variation in perceived effectiveness arises from structural and service differences between kebeles rather than individual-level characteristics. This implies the critical role of spatial and infrastructure disparities in shaping transport service outcomes.

Access to essential services such as health, education, and administrative services positively influences the PTSE. System integration across public, private, and informal transport modes enhances perceived effectiveness through coordinated scheduling and con-

nectivity. Furthermore, a household with high income correlates with greater PTSE, whereas household size does not have significant effect.

6.2 Discussion

The empirical findings of the study about the PTSE provide clear evidence that is strongly shaped by service quality, availability, accessibility to essential services, system integration, and household socioeconomic characteristics in Sidama region.

6.2.1 Service Availability

The result confirmed that service availability is a fundamental part of the transport services. It notes that enhanced service availability positively influences users' perceptions of reliability and satisfaction, corroborated by recent empirical research (Malhotra et al., 2021). In contrast, limited service availability hinders access to essential services, worsening spatial inequality and contributing to transport disadvantage and social exclusion, as evidenced by studies (Muttaqin, Herwangi, et al., 2021; Poku-Boansi, Asibey, et al., 2024).

6.2.2 Accessibility as a Key Predictor

In this study, accessibility was identified as both a transport provision and a key performance indicator that affects the perceived effectiveness of transportation strategies for commuters. The findings suggest that households with better access to transportation report higher satisfaction, indicating that transport systems are assessed by their capability to connect users to essential services such as healthcare, education, and employment. The empirical evidence supported that improved mobility enhances access to essential services, social inclusion, and opportunities in economic activities, particularly in low- and middle-income contexts (Fobosi & Malima, 2024; Ramírez-Saiz et al., 2025). This result is also supported by results from LMICs (Bwire & Ntamwiza, 2025; Ramírez-Saiz et al., 2025; Tao et al., 2024). In the Sidama Region, access to essential services should be prioritized to reduce spatial inequalities and foster equitable development, especially in underserved kebeles.

6.2.3 Integration and Operational Efficiency

Integration and operational efficiency significantly impact the integration across public, private, and informal operators. In this way, it can enhance the coordination of the transport services that enables reduced fragmentation, particularly in underserved areas. The result is also supported with empirical evidence from Olowosegun, Moyo, et al. (2021) and Rakhmatullah et al. (2024). Challenges continue with weak modal integration, which is leading to increased travel times and costs in the Sidama region. Strengthening institutional coordination, developing better interchanges, and encouraging private sector involvement are essential for enhancing transport performance and user satisfaction.

6.2.4 Socioeconomic Factors

In the study, socioeconomic status, particularly household income, was positively associated with the perceived effectiveness of the transport services strategies. The result

showed that affordability constraints disproportionately affect lower-income households. However, another demographic factor, household size, showed insignificant influence, suggesting that improvements in service delivery are likely to benefit a broad range of commuters regardless of socioeconomic background. Household income was positively associated with PTSE, reflecting affordability constraints among low-income users, while household size had inadequate predictive power, suggesting that advances in service delivery would benefit commuters across socioeconomic groups.

6.2.5 Policy-Linked Implications

The finding also aligned with the policy of Minister of Transport and Logistics (MoTL) (Ministry of Transport, 2020). The result highlighted that fragmented regulation, outdated and aging vehicles, and insufficient terminal capacity are primary challenges in Sidama NRS. Therefore, integrated and coordinated resources use is vital to enhance service reliability and accessibility in passenger transport in Sidama NRS. In addition, developing integrated infrastructure, intelligent transport system solutions, and modernization of transportation can solve service quality. Further, expanding road networks, promoting sustainable transport modes, and supporting community participation enhance mobility and economic inclusion for commuters' transport (Litman, 2007).

6.2.6 Implications for SDGs

The study found that availability, accessibility, and integration directly support the attainment of SDGs 9, 10, and 11, by promoting inclusive and sustainable infrastructure (SDG 9), reducing spatial and socioeconomic inequalities (SDG 10), and supporting sustainable urban and rural mobility (SDG 11). In addition, place-based interventions that enhance equity, efficiency, and sustainability in Sidama NRS transport system should be given attention to addressing the variations among the kebele-level users.

In sum, the findings indicate that expanding transport services to underserved kebeles, enhancing availability, accessibility to essential services, and improving operational integration across transport modes represent the most effective levers for improving public satisfaction with PTSE strategies. Therefore, combine infrastructure investment with strengthened operational management, such as fare regulation, service standardization, and multimodal coordination seeking policy responses. Place-based interventions, which promote inclusive mobility, thereby accelerating progress toward SDGs 9 (industry, innovation, and infrastructure), 10 (reduced inequalities), and 11 (sustainable cities and communities) should be guided by kebele level to reduce variation and spatial inequalities.

7 Conclusion

The study analyzed PTSE on predictors such as service availability, accessibility, and system integration dimensions, while geographic variations at the kebele level are being considered. Key findings confirmed that PTSE is influenced by core dimensions of service delivery, including availability, accessibility to essential services, and system integration. The drivers of transport service and accessibility factors exert a stronger influence on perceived effectiveness than most socio-demographic characteristics, while household income shows a significant positive association, household size does not. Improving service provision generates broad benefits, but affordability constraints remain relevant for lower-income households.

The findings from the statistical data show that substantial geographic disparities in perceived effectiveness explained it at the kebele level (ICC ≈ 0.54). This indicates that the importance of localized infrastructure conditions, service availability, and institutional performance approaches that shape transport outcomes and uniform policy is insufficient to address spatial inequalities in service provision. Therefore, strengthening the side of provision and shifting governance strategies to decentralized and responsive are critical to improving the PTSE dimension such as enhancing service delivery, particularly in underserved areas, strengthening access to essential services, and improving coordination among transport modes and operators in the region.

Therefore, the study contributes empirical evidence by a multilevel modeling to capture both individual perceptions and spatial heterogeneity in transport service effectiveness, while the findings support the relevance of transport services in advancing broader development priorities, such as SDG 9, SDG 10, and SDG 11.

8 Recommendations

1. The data indicated that the high intra-class correlation (ICC) (54%) suggests substantial heterogeneity between kebeles, implying uniform regional approaches are insufficient. Regional authorities should execute decentralized and kebele-specific transport planning, emphasizing poorly performing areas through targeted investments in feeder roads, local route expansion, and service frequency increases to promote availability.
2. Since access to essential services (health, education, and markets) is a key driver of perceived effectiveness, transport planning should be beyond infrastructure expansion toward operational improvement. This should include developing systematic route scheduling systems, especially in peri-urban and underserved kebeles with the greatest reliability gaps.
3. The institutional and sectoral responsible body, particularly BoTRD, should advocate for a new funding approach that prioritizes equity-focused service expansion while ensuring that marginalized kebeles have adequate route coverage and service frequency; furthermore, it should be made to support robust and sustainable transportation systems, such as integration-enhancing infrastructure (e.g., multimodal hubs) and regulations that increase service reliability over time.
4. Regional governments should develop new formal coordination frameworks that include public, commercial, and informal transportation providers through unified scheduling platforms, shared terminals, standardized fare systems, and regulatory norms, which improve first- and last-mile connections while minimizing system fragmentation.
5. Regional government should conduct timely reviews on the transport services strategies, considering factors such as cost-to-income ratios, trip time, and accessibility to allow for evidence-based adjustments to kebele-level transportation initiatives.
6. A structured monitor and evaluation systems should be developed to track key performance indicators such as accessibility, reliability, service frequency, and user satisfaction to incorporate systems for collecting and integrating commuter feedback, ensuring that transportation policies stay responsive to changing user demands and mobility patterns.

9 Contribution of the Study

This study provides new empirical data on the efficiency of transport strategies in a developing economy and, particularly, a local community for the community and development

practitioners.

In addition, it offers a new approach that highlights the importance of combining multilevel modeling for policy-relevant transport studies. Furthermore, the study offers empirical evidence that is derived from comprehension of SDGs 9, 10, and 11, analyzing them in concerns of whether they are met with their ultimate goal of service efficacy and inclusion.

This study has limitations in terms of, such as, the fact that it is based on self-reported perceptions and it is restricted to the Sidama Region. Also, it does not explicitly evaluate availability and accessibility of the transport service efficacy. Future research should investigate the long-term effects of infrastructure expenditures and expand to other geographical contexts to validate and generalize findings.

10 Ethical Considerations

The study adhered to strict ethical guidelines, and the Hawassa University College of Business and Economics Research Ethics Committee formally approved the study (Protocol No. 1; Approval: CBE_RTT-87/2024; issued December 11, 2024). In this accord, the participants were oriented and gave their written or verbal agreement to data collectors after being fully informed about the purpose of the study and their rights of the study. To guarantee proper community reactions, confidentiality and anonymity were maintained, while local customs and cultural sensitivity were honored.

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Data Availability

Data can be made available on the behavior of the request

Declaration of interests' statement

The author declare no competing interests.

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Research Article

Drivers of Inflation in Sub-Saharan African Countries: A System Generalized Moment Method

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Abstract

The aim of this research is to establish the causes of inflation in Sub-Saharan African (SSA) countries through the use of the demand-pull theory and the cost push theory of inflation as the theoretical framework and the system generalized method as the analytical framework. Panel data for 36 SSA countries covering 34 years was used. The result of the descriptive analysis indicated that the rate of inflation follows the money supply rate in SSA countries while periods of high economic growth had relatively low levels of inflation rates. On the other hand, the result of the regression analysis indicated that factors like money supply, population growth, and last year's price positively relate to inflation while economic growth, government spending, and exchange rates negatively relate to inflation in SSA countries. These findings provide evidence for both the quantity theory of money and the demand-pull theory of inflation. To curb inflation in SSA countries, it is necessary to promote economic growth. A tight monetary policy helps to manage the levels of short-run inflation by restricting aggregate demand, whereas productive government spending helps to manage the inflation levels in the long run owing to the gains made in productivity. Inflation can thus be managed effectively by adopting a well-balanced strategy.

1 Introduction

Price changes that lead to inflation occur in the majority of economies but represent a problem for emerging agrarian economies (Abderrahim & Laourari, 2022). In contrast to developed economies, where price changes, or inflation, is stable and predictable, inflation in developing agrarian economies is more volatile due to various reasons (Anderl & Caporale, 2023). Thus, a study into the causes of inflation in developing economies would be useful in order to devise monetary, fiscal, and foreign exchange policies to help stabilize these economies.

Inflation in developing countries has been classified into four types namely; structural causes, demand-pull, cost-push, and institutional causes (Ferreira et al., 2024). Demand-pull inflation is characterized by an excessive level of aggregate demand than the productive capacity of the economy. The excess demand in the economy arises as a result of

rapid economic growth, expansionary fiscal policies, and excessive money supply growth (Jackson et al., 2023). On the other hand, cost-push inflation is characterized by rising costs of production such as increases in the price of oil, imports, and currency devaluation in developing nations (Kinlaw et al., 2022). However, structural factors include poor supply chain efficiency, inadequate infrastructure, agriculture dependency, and exporting of raw materials in developing countries. This makes the economies to experience inflation due to supply shortages (Kinlaw et al., 2022). Nonetheless, institutional factors such as corrupt governance and ineffective policymaking will make it difficult for the measures of controlling inflation to be effective.

In addition, the causes of inflation in emerging nations may be broadly classified into external and internal causes. Among these, the external causes are the price of oil and food, changes in exchange rates, tight monetary policy in advanced nations, natural catastrophes, and conflicts, whereas the internal causes are an excess domestic money supply, budget deficit, subsidies, supply side constraints, dependence on agriculture, poor infrastructure, inefficiency and corruption in the government, high population growth rates, and urbanization (Kuma & Gata, 2023). In short, it can be concluded that inflation in developing countries is a multi-dimensional problem, which is affected not only by external but also internal factors. The external factors including the rise in the price of commodities, changes in exchange rates, and geopolitical events tend to make the problem worse at times, whereas internal factors have a great deal of importance in terms of their impacts.

The issue of inflation is not only tied to economic stability but also amplifies socioeconomic issues such as decreased purchasing power, increased income disparities, and ineffective anti-poverty strategies (Kinlaw et al., 2022). Therefore, coping with the inflation problem in developing nations requires a comprehensive understanding of various factors influencing it and customized and multi-dimensional policies (Tolasa et al., 2022). Given the ongoing inflation issue in developing nations and its negative influence on economic stability and social well-being, further analysis of factors and sustainable solutions should be considered. However, the combination of both internal and external forces highlights the necessity for a detailed and context-specific approach towards the management of inflation problems in developing nations. In this research work, an attempt is made to understand the causes behind inflation problems in the SSA nations through the use of panel data and system generalized method of moments as the major method of data analysis. The rest of this paper is structured in the following manner. The second section provides a detailed literature review of the topic; the third one presents the methods used in this study; the fourth section addresses the results and discussion.

2 LITERATURE AND HYPOTHESIS DEVELOPMENT

Some of the theories regarding the factors behind the development of inflation include classical theory, Keynesian theory, Monetarist theory, and Mundell Fleming theory. Classical theory on inflation holds that the factor responsible for causing inflation is too much money in circulation. Conversely, the Keynesians hold that inflation is a result of spending by the government. Likewise, the monetarists argue that monetary expansion is the cause of inflation, whereas according to the Mundell-Fleming theory, depreciation of exchange rates results in imported inflation.

First, classical economics posits that the total production of goods and services within an economy is influenced by the volume of labor, land, and capital. Hence, as the volumes of labor, land, and capital increase, there will be a corresponding increase in production levels. Nevertheless, the classical school posits that inflation is a situation that occurs when the money supply grows faster than production. Second, according to the Keynesians,

the positively sloped aggregate supply curve illustrates the linkage between inflation and economic growth. The positive aggregate supply curve indicates that demand shock influences prices and production levels (Dornbusch et al., 1996). Therefore, the linkage between the aggregate demand and supply curve indicates that there is a positive linkage between inflation and economic growth. Inflation theory by the Keynesians states that excess aggregate demand is the primary factor responsible for inflation at home. Demand-pull inflation happens because of an excess aggregate demand. According to economics, the aggregate demand is defined as the sum of private investments, private consumption, expenditures by the government, and net exports. The demand-pull theory of inflation was introduced by Keynes in 1936, and it suggested that inflation happens due to excess demand. Keynes argued that the solution to rapid price increases would be to adopt measures that reduce aggregate demand.

Thirdly, the quantity theory of monetarism postulates that in the long run, economic output depends on variations in the real variables (Friedman & Schwartz, 1963). According to the quantity theory of monetarism (Milton Friedman, 1969), the relationship between the quantity of money (M), price level (P), transaction (T), and the velocity of money (V) is as below.

$$MV = PT \tag{1}$$

According to equation (1), money flows through the economy smoothly while the labor force is fully employed in the economy. In relation to the theory above, if the government uses the expansionary monetary policy, then in the long term, it will affect the general price level but not the production of goods and services or even the GDP. Therefore, according to the above equation, expanding the money supply in an economy does not influence its output in the long run. According to the theory, inflation will thus have no effect in the long run on an economy since the real GDP remains unchanged. Mundell (1960) argues that a devalued currency of a nation, especially in a poor and a small developing economy that depends highly on imports of various items such as capital goods, consumer goods, fuel and raw materials, may cause budget deficit, increased rate of inflation and imbalance of payments in the economy.

There is a type of inflation called the cost push inflation. Cost push inflation happens due to increases in the cost of production hence leading to price increases for the produced goods. There are two ways through which the depreciation of currency could lead to inflation. First, currency depreciation causes the price of imported products to increase hence increasing prices locally. Second, currency depreciation causes increases in the price of imported products which are used in the production process hence increasing the cost of production. Studies have shown that there are many factors that could cause inflation in agrarian economies which depend on importing and whose supply is low. These factors include monetary supply, growth of the economy, depreciation of currency, and high imports.

Some studies have examined what causes inflation in SSA countries and established that exchange rate and money supply are usually the major causes. Studies conducted by Abderrahim and Laourari (2022) and Anderl and Caporale (2023), for instance, using nonlinear autoregressive distributed lag models have concluded this. Jackson et al. (2023) in examining Sierra Leone identified GDP, money supply, exchange rate, and lending interest rates as the important determinants. According to Kinlaw et al. (2022), another determinant of inflation in emerging countries is government expenditure. In Ethiopia, Kuma and Gata (2023) using a panel model determined that exchange rate, money supply, and population are the important predictors of inflation.

Tolasa et al. (2022) and Maitah et al. (2024) used time series analysis and ARDL to analyze the sources of inflation in Ethiopia, and they observed that the most common sources include exchange rates, money supply, population, GDP, imports, and interest on loans. According to Ujkani and Gara (2023), the primary source of inflation in emerging markets is money supply. In Europe, Erdoğan et al. (2020) found out that currency depreciation and the money supply are some of the major sources of inflation. Similarly, Demeke and Tenaw (2021) applied ARDL to Ethiopia and found out that money supply and GDP are some of the sources of inflation. On the other hand, in Kuwait, Al-Mutairi et al. (2020) used a multiple linear regression model and observed that imports and money supply influence inflation positively.

Furthermore, Okoye et al. (2019) identified that exchange rate, budget deficit, money supply, and economic growth are all considered as the determinants of inflation. According to Kahssay (2017), the determinants of inflation in Ethiopia were analyzed using ordinary least square estimation and it was identified that the major determinants of inflation are money supply and gross domestic product. Likewise, according to Salma (2021) and Wudu (2020), the factors such as money supply, foreign direct investment, and trade balance have a positive impact on inflation. Similarly, it was also found by Olamide et al. (2022) and Islam et al. (2017) that the exchange rate has a negative impact on inflation.

Although many studies have examined inflation dynamics in SSA, the present research contributes significantly to the literature by taking into account an aspect that has been largely overlooked by other researchers. Two main differences are evident between the present analysis and previous literature on inflation in the SSA region. First, whereas previous studies have relied on static panel regressions and/or Ordinary Least Square estimation methods, the present research utilizes System Generalized Method of Moments estimation methods, a method that accounts for both endogeneity and persistence problems common in analyzing inflation dynamics. Second, the current study examines not only monetary indicators but also structural factors.

According to the theoretical and empirical study mentioned above, the following six factors serve as independent variables in this study: the lagged consumer price index, the GDP, money supply (MS), the official exchange rate (EXR), government spending (G) and the total population measured in millions (POP). Money supply represents all the physical cash present in circulation within the economy and all cash stored in both checking and savings accounts. Rapidly growing levels of money supply compared to the actual production of goods and services in an economy may trigger inflation since there will be too much money available relative to the number of goods, leading companies to increase the price of their products. Past studies have shown that money supply is positively associated with inflation rates, as was proven by the work of researchers like Abderrahim and Laourari (2022) and Anderl and Caporale (2023).

2.1 H_1: Broad money supply (MS) is positively related with inflation in Sub-Saharan Africa countries.

This hypothesis is primarily justified based on the classical theory and the monetarist theory which postulate that excessive money supply causes increases in the overall price levels.

The relationship between exchange rate and inflation is complex due to the ability of the exchange rate to affect demand and supply through international business, transport, expectations, financial activities, and production among others. In case the currency of a country depreciates, the price level of imported goods and services rises, increasing the general prices in the economy. There have been conflicting findings regarding the

effect of exchange rates on inflation because different research studies produced varying findings based on their methodologies. For example, Jackson et al. (2023) and Kuma and Gata (2023) revealed that there was a positive relationship between exchange rate and inflation, whereas Olamide et al. (2022) and Islam et al. (2017) found an indirect relationship between currency depreciation and inflation. Research studies carried out by Feyisa (2024), Tolasa et al. (2022) and Maitah et al. (2024) on causes of inflation found a positive and significant relationship between exchange rate and inflation.

2.2 H_2: Exchange rate depreciation and inflation are positively related in Sub-Saharan African countries.

Inflation is caused by an increase in price levels when there is depreciation in the exchange rate according to the Mundell-Fleming Model, thus resulting in imported inflation.

Expenditure by the government serves as an anti-inflation policy when it is utilized in productive investments such as infrastructure, agriculture, education, and production-oriented sectors which help increase the production capability of the economy. It is through increased production capabilities and reduced cost of production that the expenditure becomes an effective tool for stabilizing prices in the economy. However, if government expenditure increases aggregate demand faster than the production capabilities of the economy, then it serves to increase inflation, particularly when financed through borrowing and creation of money.

2.3 H_3: Government spending is hypothesized to exhibit a negative relationship with inflation in the Sub-Saharan African countries whenever such spending is towards productive activities like construction, agriculture, education, and manufacturing.

There was evidence of inconsistency in the relationship between economic growth and inflation in developing countries. For example, according to Olamide et al. (2022) and Demeke and Tenaw (2021), there was an inverse relationship between economic growth and inflation whereas studies by Kahssay (2017) and Okoye et al. (2019) indicated a positive relationship between economic growth and inflation in developing countries. Economic growth can stimulate inflation due to demand-pull and cost-push effects. In simple words, economic growth stimulates inflation through a demand-pull effect since it increases investments and expenditures of consumers and the government whereas economic growth increases inflation by stimulating cost-push effect because the rise in production leads to an increase in labor costs, shortage of resources, fuel costs, and electricity costs. However, economic growth can reduce inflation pressure through an increase in production supply, efficiency, productivity, and production diversity (Kinlaw et al., 2022).

2.4 H_4: Economic growth is negatively related to inflation in Sub-Saharan Africa countries.

This hypothesis is mainly justified based on the quantity theory of money.

Population growth is likely to increase inflation in the developing world (Ayanaw & Belay, 2024). A large rate of population growth may lead to demand-pull inflation when the supply of products and services fails to match the demands. Furthermore, an increase

in the population rate may cause congestion in urban areas, hence causing the demand for houses and transportation facilities, among others, to go up. In addition, a rise in the population will make it more difficult for natural resources like land and water to be available, hence leading to cost-push inflation (Broniatowska, 2018; Lubbock et al., 2022; Sisay et al., 2022; Weiske, 2019).

2.5 H_5: Population growth is hypothesized to affect inflation positively in SSA countries by increasing aggregate demand for goods and services beyond production capability.

Previous Price Level Positively Influences the Inflation Rate of the Present Time Due to the Influence of Previous Price Levels in Relation to the Cost Structure, Pricing Policy, and Inflationary Expectations. As a result of previous price levels, people become more expectant about rising prices and motivate businesses to charge higher prices along with increased salary expectations by employees, which leads to a high inflation rate (Blanchard, 2017; Mankiw, 2019). Empirical evidence reveals that lagged price levels are a significant determinant of the inflation rate; particularly, inflation inertia exists in developing countries (Gujarati & Porter, 2009).

2.6 H_6: Lagged value of inflation is positively related with current inflation in SSA countries.

This hypothesis implies that previous inflation levels positively influence current inflation rates.

3 DATA AND METHODS

3.1 Data

The data used in this study consisted of a panel dataset for 43 African countries between 1990 and 2023. This was mainly informed by the availability of data on the variables that were used in the study. Data on Consumer Price Index (CPI), Gross Domestic Product (GDP), Money Supply (MS), Government Expenditure (G), Exchange Rate (EXR), and Population (POP) were sourced from the World Development Indicators database. In addition, GDP, money supply, and government expenditure were all in current US dollars, while the exchange rate was a ratio of the local currency to US dollars.

3.2 System Generalized Method of Moments

Some of these theories include Classical Theory of Inflation, Keynesian Theory of Inflation, Monetarist Theory of Inflation, and Mundell Fleming Theory of Inflation. By incorporating additional elements thought to be responsible for inflation, the following Dynamic Panel Data Econometric Model was created.

$$LCPI_{it} = \beta_0 + \beta_1 LCPI_{it-1} + \beta_2 LGDP_{it} + \beta_3 LMS_{it} + \beta_4 G_{it} + \beta_5 LEXR_{it} + \beta_6 LPOP_{it} + \alpha_i + U_{it} \quad (2)$$

For example, in the equation (2), t is a symbol used to represent time, where t ranges from 1990 to 2023 in this research, and i is the number of countries in Sub-Saharan Africa. If we apply the ordinary least squares estimation approach to equation (2), it will produce biased results due to endogeneity. The reason being that the independent variable can have a relation with the error term. This concept was initially identified by Arellano and Bond (1991). In the same way, application of static panel regression models like fixed effect and random effect approaches can also cause biased estimations. To solve the endogeneity problem, we can either employ instrumental variables (IV) technique or two stages least square (2SLS) techniques. These techniques would provide unbiased results provided that the number of instruments is less than the number of regressors.

GMM is an estimation method that yields unbiased estimates that are efficient. GMM estimation method is applied to short panels when T is less than 25 and N exceeds 25. Some of the issues addressed using GMM include measurement error, lagged dependent variable, missing variable, non-exogeneity of the regressor, fixed effect, heteroskedasticity, and autocorrelation. GMM estimation method involves the use of internal and external instruments. There are two major methods under GMM, namely difference GMM and system GMM. To address the correlation between the lagged dependent variable $\Delta LCPI_{it-1}$ and ΔU_{it}, the first difference GMM uses two-period and three-period lagged values of the outcome variables as instruments for $\Delta LCPI_{it-1}$ as shown in equation (3).

$$\Delta LCPI_{it} = \beta_1 \Delta LCPI_{it-1} + \beta_2 \Delta LGDP_{it} + \beta_3 \Delta LMS_{it} + \beta_4 \Delta LG_{it} + \beta_5 \Delta LEXR_{it} + \beta_6 \Delta LPOP_{it} + \Delta U_{it} \quad (3)$$

Nevertheless, the lagged values of the instruments might not work well on the first differences of the regressors in the case of short panel data (Blundell & Bond, 1998). In this regard, the first-difference GMM transforms the dataset by taking out the previous value of a particular variable from its current value, hence resulting in loss of information. Fortunately, such losses can be compensated by employing the system GMM, which restores the lost information by re-transforming the dataset differently by subtracting the mean value of all variables. In other words, the system GMM consists of two equations: the level and the first difference. Following the methodology set forth by Arellano & Bover (1995) and Blundell & Bond (1998), the system GMM estimators used in this research can be derived using a system of equations.

$$LCPI_{it} = \beta_0 + \beta_1 LCPI_{it-1} + \beta_2 LGDP_{it} + \beta_3 LMS_{it} + \beta_4 G_{it} + \beta_5 LEXR_{it} + \beta_6 LPOP_{it} + \alpha_i + U_{it} \quad (4)$$

$$\Delta LCPI_{it} = \beta_1 \Delta LCPI_{it-1} + \beta_2 \Delta LGDP_{it} + \beta_3 \Delta LMS_{it} + \beta_4 \Delta LG_{it} + \beta_5 \Delta LEXR_{it} + \beta_6 \Delta LPOP_{it} + \Delta U_{it} \quad (5)$$

Therefore, the system GMM estimation method involves estimating equations (4) and (5) together, using two different sets of instruments. These instruments are divided into two groups: $Z_i = Z_D + Z_L$, Z_D which are used for the first difference model, and Z_L, which are used for the level model.

Variables and Measurements

The dependent variable for this study is inflation, which is determined through the Consumer Price Index (CPI_{it}). CPI_{it} reflects the changes in prices of goods and services bought by consumers and is usually used as an index for inflation. In the regression analysis, the logarithm of the CPI_{it} ($LCPI_{it}$) is used. It is because the use of the log stabilizes variance and makes it possible to interpret the coefficients in elasticities form. The past value of the CPI_{it} ($LCPI_{it-1}$) will be used as one of the independent variables to reflect inflation inertia.

Another explanatory variable, GDP_{it}, is used to indicate the degree of economic activity. It is recorded in real terms and logged, referred to as $LGDP_{it}$. As predicted by quantity theory of money, output growth might lead to price decrease. Money supply (MS_{it}) also plays a significant role in explaining inflation and is indicated by broad money supply that comprises currency, demand deposits, and quasi-money. It is recorded in log terms, denoted by LMS_{it}. Monetarist theory suggests that an increase in money supply results in excess liquidity, leading to higher aggregate demand and thus inflation.

Government expenditure (G_{it}) is included in the model in order to show the impact of fiscal policy on inflation. Government expenditure is computed as total government expenditure and is input into the model in log form. The impact of government expenditure on the levels of inflation will be reducing in case the expenditure was done in productive areas like agriculture, infrastructural development, and industries, which will help to improve the supply of commodities. In other cases, the effect would be increasing inflation, whereby the level of expenditure will cause the aggregate demand to grow beyond the country's production capacity. The official exchange rate (EXR_{it}), computed as the number of Ethiopian Birr per US dollar, is also included in log form ($LEXR_{it}$). An increase in exchange rate devaluation will raise the cost of production inputs and hence imported inflation. The variable of population (POP_{it}) is included as an explanatory variable and is expressed in terms of millions. The natural log of the population ($LPOP_{it}$) is included in the model. An increasing population implies higher demands on goods and services, thus creating inflationary pressures where there is no corresponding increase in production.

Table 1: Description of Variables, Measurement and Expected Hypotheses

Variables	Description	Expected Relations	Citations	Data Sources
$LCPI_{it}$	Consumer Price Index			
$LGDP_{it}$	Gross Domestic Product in Millions of US dollar	$-$	Demeke and Tenaw (2021), Kinlaw et al. (2022), and Olamide et al. (2022)	World Development Indicator
LMS_{it}	Broad Money Supply in Millions of US dollar	$+$	Abderrahim and Laourari (2022) and Anderl and Caporale (2023)	
LG_{it}	Government Spending in Millions of US dollar	$\pm$	Keynes (1936), Kinlaw et al. (2022), and Maitah et al. (2024)	
$LEXR_{it}$	Exchange Rate (Birr/dollar)	$+$	Feyisa (2024), Maitah et al. (2024), and Tolasa et al. (2022)	
$LPOP_{it}$	Population in Millions of people	$+$	Ayanaw and Belay (2024), Lubbock et al. (2022), Sisay et al. (2022), and Weiske (2019)	
$LCPI_{it-1}$	Lagged Consumer Price Index	$+$	Blanchard (2017), Gujarati and Porter (2009), and Mankiw (2019)	

Source: Author compilation based on literature (2025)

4 RESULTS AND DISCUSSION

Sub-Saharan African countries have experienced high inflation rates in the past ten years which have had an impact on production, social wellbeing, and economic welfare. The average inflation rates for the three Sub-Saharan African countries, namely Zimbabwe, South Sudan, and Ethiopia, were 127.93%, 73.32%, and 17.77%, respectively, from 2013 to 2023. Inflation in Sub-Saharan African countries can be attributed to different aspects including demand, supply, and structural aspects, among others (Caselli & Roitman, 2019). Emerging economies, especially in Sub-Saharan Africa, are known to exhibit the following characteristics: low agricultural productivity, high reliance on imports, rapid population growth and urbanization, budget deficits, corruption, and inefficiencies (Bjornlund et al., 2020; Boz et al., 2022).

Table 2: Top Eight Sub-Saharan African Countries with the highest inflation rates

Years	Zimbabwe	South Sudan	Ethiopia	Angola	Malawi	Ghana	Sierra Leone	Nigeria
2013	1.63	-2.74	8.07	8.78	28.28	11.67	5.52	8.50
2014	-0.21	4.25	7.40	7.30	23.78	15.49	4.64	8.05
2015	-2.41	52.99	9.57	9.16	21.86	17.15	6.69	9.01
2016	-1.56	346.05	6.63	30.69	21.73	17.46	10.89	15.70
2017	0.91	213.00	10.69	29.84	11.54	12.37	18.22	16.50
2018	10.61	83.40	13.83	19.63	9.22	9.84	16.03	12.09
2019	255.29	49.29	15.81	17.08	9.38	7.14	14.81	11.40
2020	557.21	23.98	20.35	22.28	8.64	9.89	13.45	13.25
2021	98.55	30.23	26.79	25.77	9.34	9.98	11.87	16.95
2022	193.40	-3.21	33.94	21.36	20.84	31.71	27.21	18.85
2023	667.36	40.20	30.22	13.64	30.30	37.53	47.72	24.66
Mean	127.93	73.32	17.77	17.41	16.52	14.40	14.11	13.70

Source: Author's Computation (2025)

Monetary policy ease, government budget deficit, currency rate movement, dependence on imports, rapid population growth, economic growth, and price expectation are among the factors that may lead to inflation in emerging economies (Jackson et al., 2023). Exchange rate movement is likely to be important in affecting inflation in economies that depend on imports and have supply constraints. For instance, ten countries in Sub-Saharan Africa have adopted floating currency regimes, which include South Africa, Ghana, Nigeria, Zambia, Uganda, Kenya, Tanzania, Ethiopia, Malawi, and Rwanda. Table 1 suggests that four of these countries have very high levels of inflation, including Ethiopia, Malawi, Ghana, and Nigeria. Many empirical studies in the past have shown that exchange rate pass-through to inflation is larger in economies with flexible floating and managed floating currencies (Gita et al., 2020; Kabundi & Mlachila, 2019; Nachega et al., 2024). For small economies that depend on imports and have limited supplies, tight monetary policies should be sustained over a long period of time to offset inflation due to depreciated currencies (Andersson & Li, 2019).

The Quantity Theory of Money states that inflation is fundamentally a monetary phenomenon. The theory proposes that if the money supply in the economy increases faster than the output, then inflation is bound to occur. In this theory, the relationship between the money supply and the rate of inflation is assumed to be directly proportional such that if the money supply increases by one percent, then so does the inflation rate. In Figure 1 below, the relationship between the rise in the inflation rate in Sub-Saharan Africa and the growth of the money supply from 2013 to 2023 can be seen. Generally, governments in Sub-Saharan Africa tend to print more money so as to fund their budget deficit and increase total expenditure. Despite good intentions on the part of the politicians, managing the rate of inflation in most African countries proves to be quite challenging.

In the case of developing nations, the impact of the COVID-19 crisis was characterized by a reduction in economic activity, for which government support came in the form of direct transfers, subsidies, and other forms of expenditure. In Sub-Saharan Africa, governments engaged in an expansionary monetary policy strategy that facilitated higher expenditure. As seen from Figure 1, there is a direct correlation between the money supply growth and the growth of inflation in the SSA nations in 2020. Such evidence can be used to confirm the quantity theory of money and the monetary theory of inflation, according to which money supply and inflation are directly correlated. The average annual growth rate of money supply in Sub-Saharan Africa ranged from 12.47% to 35.19%, and average annual inflation grew from 5.86% to 18.05%.

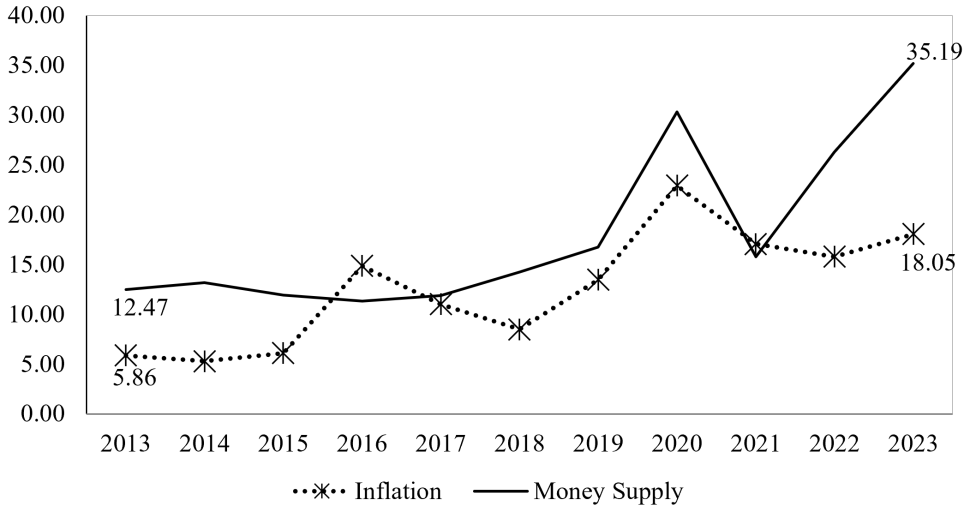

Figure 1: Trend of Average Growth of Money Supply and Inflation in Sub Saharan Africa

Moreover, different views exist about the relationship between economic growth and inflation in both theory and empirical research. Economic growth may create demand-pull inflation through the promotion of consumer expenditure, government expenditure, and easy money policies. Conversely, economic growth could lower the level of inflation through the creation of supply push factors such as more supply, productivity, efficiency, and diversification of production. As shown in Figure 2, during the years under review, a relatively higher average annual economic growth was observed when compared with relatively lower average annual inflation rate of those SSA countries.

Moreover, according to Figure 2 below, it can be observed that during the outbreak of Coronavirus disease in the Sub-Saharan African region in 2020, the annual average inflation rate was highest, while the average annual economic growth was lowest. This simply implies that by ensuring economic growth through increasing efficiency and productivity, as well as increasing the diversity of the goods, there will be reduced inflation, which is one of the most persistent challenges facing Sub-Saharan Africa.

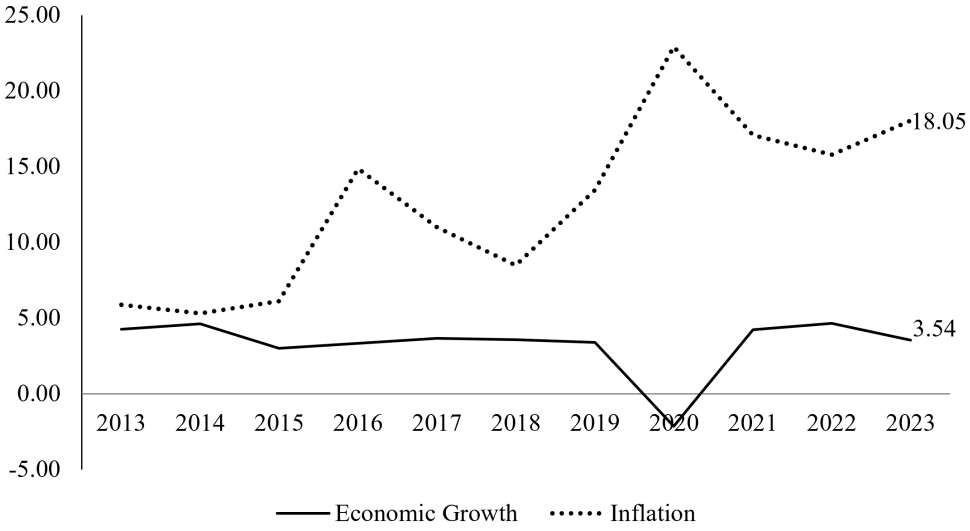

Figure 2: Trends of Average Economic Growth and Inflation in Sub-Saharan Africa

4.1 Regression Result

To avoid any spurious associations, it is important to check whether the time series are stationary or not. To check for stationarity of variables, LLC (Levin Lin Chu) test was performed and whether variables are non-stationary or not was examined. If a variable is found to have a unit root, then the same LLC test was applied to see whether differencing once makes it stationary or not, as seen in Table 2. It is clear from Table 2 that all the variables are non-stationary at level except government expenditure, which is of order I (1). In view of these results, it can be said that the LLC test proves that all variables are stationary at level except government expenditure. Hence, government expenditure is considered as the independent variable in the regression after differencing once.

The application of diagnostic tests for cointegration and cross-sectional dependence in panel data econometrics is critical towards guaranteeing the stability of the parameter estimates used. While cointegration tests provide crucial information in terms of identification of long run equilibria within non-stationary panels, their relevance to the estimation method of system generalized methods of moments (System GMM) is not very high. This is due to the fact that the System GMM estimation approach is based on small T, large N panel sets, whereby the short time series does not allow for any formal cointegration tests, and internal instruments are used in the estimation process to counteract the issue of endogeneity. For cross-sectional dependency, the Pesaran CD test was used to investigate if there were any correlations between shocks in one cross-sectional unit to others. As can be seen from table 6, the results reveal strong dependence in the sample, considering that the CD statistic has a high value (CD = 31.986) with a significant probability level of (p=0.000) and a correlation coefficient of 0.383. In order to reduce the problem of bias and inconsistency caused by such dependencies, year fixed effects will be used as explanatory variables.

The results of estimation using the generalized moment method (SGMM) are illustrated in Table 3 below. The F-statistic has been proved statistically significant at the 1 percent level of significance, showing that at least one variable has a significant influence on inflation. From the results of diagnostic tests, it can be seen that the tests relevant to the system generalized moment method are appropriate for the estimation (Roodman, 2009). The number of groups (36) exceeds the number of instruments (35).

Table 3: Levin Lin Chu (LLC) Stationarity Test Result

Logarithm of variables	Data at level		Data at First Difference	
	Test Statistics	P-value	Test Statistics	P-value
Price Level, CPI	-6.3520***	0.000		
Money Supply, MS	-5.4799***	0.000		
Gross Domestic Product, GDP	8.4573***	0.000		
Exchange Rate, EXR	-6.5746	0.000		
Government Spending, G	0.9808	0.8367	-12.1754***	0.000
Population	-9.5880***	0.000		

Source: Authors' computation (2025)

Regarding the specification test for the system generalized moment method, the Arellano-Bond test for second-order autocorrelation did not reject the null hypothesis of no autocorrelation in the residuals, as the chi-square probability exceeded 5%. In the same vein, the Hansen test for the validity of all instruments also have not rejected the null hypothesis regarding the exogeneity of all instruments as a group as presented in Table 3. Besides, the lagged values of the consumer price index, money supply, and population are positively and significantly affecting inflation in SSA countries. On the other hand, economic growth, government expenditure, and the official exchange rate are negatively and significantly associated with inflation in Sub-Saharan African countries. The positive value in the year coefficient implies that the yearly growth in inflation is 1.78%.

As shown in Table 3, last year's inflation influences the current year's price level because of the statistically significant positive coefficient for the one-period lagged value of the consumer price index at 1%. This implies that the inflation rate has an auto-regressive characteristic during the observed period with the past inflation rate playing a critical role in determining the current inflation rate. In this case, if there is a 1% increase in the last year's inflation rate, the current inflation rate will increase by 0.731%. The link between money supply and inflation is fundamental in any discussion about inflation theory and practice. According to the theory of quantity of money, there is bound to be inflation if there is an increase in the money supply and no increase in economic production. In other words, inflation is the disparity between the growth of money supply and economic production. As can be observed from Table 3 below, the coefficient of broad money supply is positive and statistically significant at 1%, which means there is a positive relationship between the two variables, as indicated by QTM and classical monetary theories.

According to classical monetary theory, there exists a high level of correlation between money supply and inflation such that the money supply is the key determinant of inflation. As can be observed from the regression results in Table 3, it is evident that a one percentage change in the broad money supply causes an increase in inflation by 0.2626%, which is significant at 1%. Similarly, previous literature has shown a positive and statistically significant relationship between money supply and inflation in developing economies (Demeke & Tenaw, 2021; Maitah et al., 2024; Tolasa et al., 2022; Ujkani & Gara, 2023). The positive relationship between money supply and inflation was also established by the research works conducted by Wudu (2020) and Salma (2021). On the other hand, Salim et al. (2021) showed a negative and significant relationship between the two variables.

The economic growth rate affects inflation in the economy in two different ways: demand-side and supply-side effects. Depending on which side dominates, the effect on inflation will be different. The economic growth rate impacts inflation through demand side through higher consumer spending, higher government expenditures, and through adopting expansionary monetary policy measures. On the other hand, it impacts inflation

Table 4: Estimation Results of the two-step Generalized Moment Method (SGMM)

F(7, 35) = 11117.90 Number of groups = 36
Prob>F = 0.000 Number of Instruments = 35

Natural Logarithms of Independent Variables	Two-step system Generalized Moment Method			
	Coefficient	Std. Error	t-Value	p-value
Lagged CPI	0.7308***	0.0215	33.95	0.000
GDP	-0.2658**	0.1265	-2.10	0.043
Exchange Rate	-0.2106*	0.1109	-1.90	0.066
Money Supply	0.2626***	0.0659	3.98	0.000
Population	0.4837**	0.1797	2.69	0.011
Government Spending	-0.2255**	0.1042	-2.16	0.037
Years	0.0178*	0.0091	1.94	0.060
Constant	-34.4615**	16.7293	-2.06	0.047

Arellano and Bond test for second-order autocorrelation:
Arellano-Bond test for AR (1): Z=-2.01 Prob>Z= 0.045
Arellano-Bond test for AR (2): Z= -0.68 Prob>Z= 0.498

Hansen and Sargan Test for the validity of all instruments as a group:
Sargan test of over identification restriction: $\chi^2(24) = 30.84$ Prob> χ^2= 0.278
Hansen test of over identification restriction: $\chi^2(24) = 29.75$ Prob> χ^2=0.325

Cross-sectional Dependency (CD) Test:
Pesaran's test of Cross-sectional Independence =31.986, Probability=0.000
Average absolute value of the off-diagonal elements=0.383

Note: ***, **, and * are statistical significance at 1, 5, and 10 percent level respectively.

Source: Author's Computation (2025)

through supply side through increased goods and service supply, efficiency, production, and diversification. However, while the demand side causes an increase in the inflation rate, the supply side acts to reduce the inflation rate. From Table 3 below, the coefficient for the economic growth rate is negative and statistically significant at 5% level. To be more specific, economic growth by 1% has been found to result in an average reduction in inflation by 0.2658% in Sub-Saharan Africa, all other things being equal. In previous studies, varying results have been obtained on the relationship between economic growth and inflation. For instance, according to the study by Olamide et al. (2022) and Demeke and Tenaw (2021), there is a negative and significant relationship between economic growth and inflation, while according to Kahssay (2017), Gita et al. (2020), Okoye et al. (2019), Tolasa et al. (2022), and Maitah et al. (2024), there exists a positive and significant association. This implies that economic growth by way of productivity, efficiency, and advancement in technology can reduce inflation in developing economies.

In this case, the coefficient of the exchange rate is negative and statistically significant at a 10 percent level of significance. It shows that on an average, 1 percent fall in the value of the exchange rate results in 0.211 percent decline in the inflation rates for sub-Saharan African countries. There are different theoretical as well as empirical approaches regarding the relationship between the effects of exchange rate devaluation and the inflation rate. On one hand, exchange rate devaluation may worsen inflation because it makes expensive for the country to buy industrial products from the international market, especially if the country has less foreign currency. On the other hand, exchange rate devaluation reduces inflation. The effectiveness of exchange rate depreciation in controlling inflation depends on the economic composition of the country, the policy

environment, and the commitment of the government and central bank towards dealing with the issues of exchange rate depreciation. According to Olamide et al. (2022) and Islam et al. (2017), there is a significant negative correlation between exchange rate depreciation and inflation. In addition, the negative correlation between exchange rate and inflation could be explained by the exchange rate pass-through effect, which refers to the reduction in price that results from the appreciation of the exchange rate, leading to reduced prices for foreign products and commodities in the local economy.

Population growth may enhance aggregate demand in supply-constrained countries by raising consumption, government spending, and urbanization. Population growth may even affect supply through labor and innovations. The population growth coefficient, as indicated in Table 3, is positive and statistically significant at the 5% significance level. This shows that population growth in supply-constrained developing nations usually causes inflation, largely because of the increased demand for goods and services. Increased population growth causes inflation because of the high demand for goods and services (Al-Mutairi et al., 2020; Ayanaw & Belay, 2024; Maitah et al., 2024; Salma, 2021; Wudu, 2020). Where supply of products/services is not able to cater to the level of demand, demand pull inflation might arise. Moreover, population increase leads to higher concentration of individuals in cities, creating more need for housing, transport services, and utilities. Population increase might also create shortages of resources like land and water, thereby causing cost push inflation (Broniatowska, 2018; Lubbock et al., 2022; Sisay et al., 2022; Weiske, 2019).

5 CONCLUSION

The inflationary forces originate from either demand, supply, or structural factors. Demand-pull inflation emanates from excessive consumer spending, government spending, and lax monetary policies while supply-induced inflation emanates from rising production costs. The causes of structural inflation include poor production efficiency, inelasticity of the supply side, disruptions in supply chains, and poor infrastructure development. Moreover, external factors such as global commodity prices, fluctuations in exchange rates, and political instability impact inflation in developing countries, which rely heavily on imports. The study was guided by the demand-pull, cost-push, and structural inflation theories while employing the system generalized moment technique as the analytical framework for identifying the sources of inflation in the Sub-Saharan African countries. In addition, the study considered panel data from 36 Sub-Saharan African countries over a period of 34 years from 1990 to 2023.

From the study, it is evident that the factors such as the money supply, price expectations, and population growth have a positive effect on inflation, whereas economic growth, currency depreciation, and government expenditure have a negative impact on inflation within the region under investigation. It is crucial for governments in Sub-Saharan Africa to consider expenditures that contribute to the improvement of economic productivity through import substitution, and at the same time, encourage economic growth. Stringent monetary policies should be put in place as well since this finding supports the quantity theory of money and the monetarist theory of inflation. Since there are several factors behind inflation that differ from economy to economy, it becomes necessary for one to adopt an approach that combines the best of monetary management along with some measures that can ensure economic stability in the Sub-Saharan region both in the short run and the long run. It was found by the study that population growth had a very strong positive correlation with inflation in Sub-Saharan Africa. In such a case, population management can be achieved by educating women, family planning, and creating jobs, among others.

However, despite giving valuable insight into the causes of inflation in Sub-Saharan

African countries, this study has several weaknesses. For instance, the analysis was concentrated mostly on macroeconomic variables while ignoring other equally important factors that may play an essential role in explaining inflation dynamics in SSA countries, such as political instability, quality of institutions, external shocks, environmental changes, and global prices for commodities. Moreover, differences in data availability and quality among various countries can have an effect on the results obtained from the regression analysis. Furthermore, using aggregated data to conduct a study on panel can distort unique features of individual SSA countries. Thus, future research may focus on integrating institutional and external sector variables into the analysis, applying regional comparisons of individual countries, and conducting studies with different econometric methods.

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Data Availability

Data can be made available on the behavior of the request

Declaration of interests' statement

The author declare no competing interests.

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Research Article

Innovation Financing of Ethiopian Tech Start-ups: Challenges and Opportunities from a Survey Study

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KEYWORDS: Ethiopia; Tech startups; innovation financing; financing challenges; multinomial logistic regression

Abstract

This study intended to identify the challenges and opportunities of innovation financing among tech startups in Ethiopia. The study further analyzed the association between financing mechanisms used and perceived financing mechanism challenges, factors influencing financing mechanism selection. The study employed descriptive and correlational survey design using a quantitative approach. Data were collected from 138 tech startups out of 227 eligible tech startups identified from the Ministry of Innovation and Technology through purposive sampling techniques. The collected data were analyzed using descriptive statistics, Chi-square tests, and multinomial logistic regression analysis through SPSS software. The findings revealed that the major innovation financing challenges reported by respondents which include limited access to debt, non-dilutive and equity financing. The study also identified opportunities such as enhancing financial literacy, expanding collaboration among stakeholders and Leveraging the 2025 Ethiopian Startup Proclamation to Overcome Regulatory Barriers. The Chi-square analysis shows all the p-value exceeds the standard threshold of 0.05 indicating there is no statistically significant association exists between financing mechanisms usage and reported financing mechanisms challenges. On the other hand, the multinomial logistic regression results of the overall model were statistically significant (χ^2 = 27.590, df = 12, p = 0.006) and showed prior use of a financing type significantly increases the likelihood of choosing that same type, while perceived challenges do not have a significant effect. The study suggests to utilize various alternative source of financing like traditional informal financing options, enhancing stakeholder collaboration, importance of coordinated efforts among stakeholders and creating supportive regulatory frameworks to improve startup financing accessibility. The study contributes to understanding of Ethiopia's tech startup ecosystem and provides empirical evidence.

1 Introduction

Startups are described as the "driving force of economic and technological change in the modern world" (Wetzel & Eiche, 2024). They are considered "critical engines of innovation, entrepreneurship, and economic growth" within their respective ecosystems (Dekker et al., 2026). Tech-Startup also plays a critical role in innovation and in fostering the growth of developing countries. According to Yeboah (2023) startups in developing countries face some unique challenges, like not having enough resources, infrastructure and support from institutions, which can make it hard for them to get financing and be successful. However, the quest of supporting the economy and contribute to regional as well as worldwide problems tech startups must get sufficient finance that can help them solve their day today operational problem remains intact. Jean (2024) defined Financial constraints as the limitations on an organization's ability to access or allocate financial resources effectively. On the other hand, Lee and Jung (2024) highlights financial constraints can be understood as any limitation that reduces the availability of investment opportunities for firms. Obtaining funding from investors or financial institutions can be difficult specially for startups in high-risk (Jean, 2024). Firms face financing constraints due to difficulties in accessing external finance as well as insufficient internal funds (Santos & Cincera, 2022). As to Jean (2024) limited financial constraint can hinder product development, market entry, and scalability. These constraints also can arise from both internal and factors, such as cash flow limitations and restricted access to capital markets (Lee & Jung, 2024). Some studies suggest that financial constraints may encourage firms to become more efficient and selective in their investment decisions, potentially leading to better allocation of resources (Hahn et al., 2019).

As startup sector is growing quickly in Africa Kato (2025) confirms Africa's "promising youthful population" is a primary driver of the region's innovation potential and the necessity for a robust startup sector. Similarly, significant upward trend in the Ethiopian startup and small business landscape is a recent phenomenon. According to Meressa (2022) micro- and small-enterprise (MSE) development has moved to the top of the Ethiopian government's agenda as a vital instrument for economic growth. However, Financing has also become a crucial factor in determining the extent of their success (Sukachova et al., 2025). As Saleem and Atiq (2023) cited though it is vital for entrepreneurship in the growth of an economy startup financing is the least focused area of research especially in the developing countries. According to Lambert and Deyganto (2025) approximately 45% of surveyed small business in Ethiopia have access to formal financial services, indicating a substantial financing gap. In Ethiopia specifically, little is known about the challenges and alternative solutions that this tech startups take to solve their funding problem and prior studies have not adequately examined the primary challenges of innovation financing mechanisms that can solve the funding challenges tech startups face. The existing body of literature on startup financing in Ethiopia is fragmented. Most of the literature related to this study title found as reports, blogs, policy briefs, media articles which lacks empirical analysis and theoretical grounding. Moreover, there is lack of peer-reviewed studies published in reputable academic journals and the existing academic research tends to focus on broader issues such as small and medium enterprise (SME) financing or innovation systems in general. As a result, areas of financial constraints related to tech startups remain underexplored. Therefore, this study tries to fill this gap by providing a comprehensive and empirically grounded analysis of the financing challenges and opportunities of innovation financing mechanisms for Ethiopian tech startups, grounded in established theoretical frameworks and supported by primary data.

Tech startups take bigger risks, grow faster, and need a different kind of financing like equity investment, angel funding, and non-dilutive options like grants or competitions. However, relevant research not done adequately to show the challenges tech startups face in Ethiopia. What we still do not fully understand is also how these financing mechanisms used by tech start-ups along with the challenges they face and which financing options they end up choosing to grow their revenue? Therefore, our study seeks to an-

swer the following key research question: "What are the challenges and opportunities Ethiopian tech startups encounter when trying to secure funding and how the financing types used and reported challenges influence the financing type selection?".

The study aimed to identify challenges and opportunities of innovation financing that Ethiopian tech startups face. It further seeks to determine the statistical association between the financing mechanisms used and the specific financing mechanisms challenges reported, while also investigating how the financing mechanisms used and associated financing mechanism challenges reported influence the selection of financing mechanisms that leads tech startups to revenue growth.

This study gives practical insights for multiple stakeholders in Ethiopia's tech startup ecosystem. It shows the challenges and opportunities of innovation financing for tech startups in Ethiopia, financial literacy matters for growth, support policymakers in designing more effective startup and innovation financing policies, provides hard numbers of founders struggling with regulatory red tape most of them still relying on self financing to get funding, and also can be considered as an additional empirical literature contribution for innovation financing in Ethiopia.

The rest of the paper is organized as follows. The literature review and hypothesis development section explain existing evidence on the challenges and opportunities of innovation financing, presents the theoretical foundations of the study, and develops the research hypotheses. The methods section describes the study population, sample size, variable definitions, and model specification. The results section also presents the findings from the data analysis, including the chi-square tests, multinomial regression analysis, and hypothesis testing results. The discussion section interprets the findings in relation to the existing literature and highlights the opportunities for innovation financing in Ethiopia emerging from the study results. The manuscript concludes by summarizing the key findings and their implications.

2 Literature and Hypothesis Development

Lambert and Deyganto (2025) noted the importance of tech startup financing to foster industrial growth, raising productivity, and enhancing competitiveness in developing countries like Ethiopia. Meressa (2022) on the other hand stated financial constraints as one of critical Bottleneck in Ethiopia and many tech startups fail to secure sufficient funding. According to Hussain (2024) also mentioned as emphasis should be given for funding requirements which underline need for ongoing financial support to sustain operations and growth. As to Hussain (2024) Innovation can be financed through various financing mechanisms that are available for the startups during the different stages of their life cycle. Figure 1 below shows how the study classified the financing types as external and internal based upon the level of growth of the startups from the first stage of the firm life cycle to the final stages.

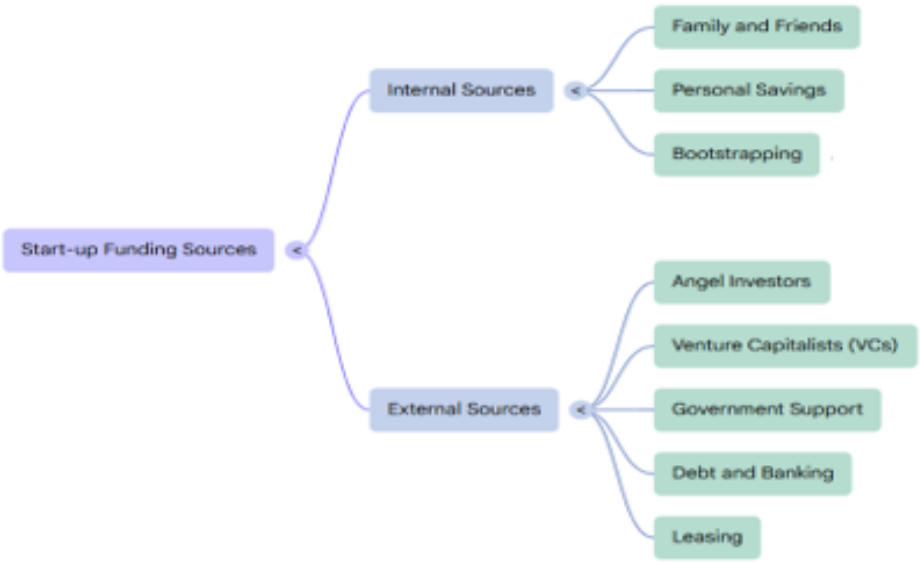

Figure 1: Startup Funding Sources as to Hussain (2024) Source (Author)

Vandenberg et al. (2020) also illustrated, as depicted in Figure 2 below, the various financing sources utilized by tech startups throughout different stages of their lifecycle.

Table 1: Comparison of Funding Sources by Stage, Advantages, Risks, and Usage

Source	Stage	Advantage	Risks/LIMITS	Usage*
Savings	Early	Availability; no screening by bank	Limited	Substantial
Family and Friends	Early	Availability; no screening by bank	Uncertainty about amount and repayment	Substantial
Salary from Other Job	Early	Continuous stream	Relatively small	Substantial
Prize Money	Early	Full fungibility	Relatively small amounts and hard to win	Limited
Company Revenues	Early-late	Possibly continuous stream	Revenues not invested in profitable business	Limited
Government Grants or Loans	Early	Full fungibility	Often small amounts	Limited
Angel Investor	Early	Access to potentially large pool of capital	Difficult to find	Very limited
Crowdfunding	Early-late	Relatively inexpensive	Uncertain response	Very limited
Banks	Early-late	Usually large amounts of capital available	Thorough screening; possibly onerous and restricted use of capital	Limited
Venture Capital	Early-late	Access to potentially large pool of capital	Participation in ownership	Very limited

2.1 Challenges and Opportunities of Innovation Financing (Review of Existing Evidence)

Though studies highlight several ways of obtaining funding tech startups companies face significant barriers to get finance and run their business smoothly. For instance, Vandenberg et al. (2020) stated transforming an innovative idea into a successful business is not easy and is constrained by limited access to finance, Sulillari (2023) noted funding is a critical factor in determining the success or failure of a start-up. They also stated it is the reason why many companies cannot survive for an extended period and why many great business ideas fail. According to Meressa (2022) business experience, size, financial reporting, and business plan preparation are the primary determinants of access to credit and Simba et al. (2024) observed that although pledging collateral serves as an effective mechanism for banks and lending institutions to assure themselves of future value, the criteria used to assess credit applications remain problematic.

Yeboah (2023) identified various barriers that limit entrepreneurs' access to finance. These are limited collateral, lack of financial literacy, inadequate credit information, high interest rates, and stringent loan requirements. Sulillari (2023) also identified lacking personal savings, lacking the experience needed, not knowing the amount of money that the business needs, not choosing the right funding source, fundraising fatigue, Economic conditions, leadership issues, Competition, not having a scalable business model and Risk perception as major barriers. There are also multiple Empirical Evidence from similar studies that have been identified and mentioned as Financing Challenges, Opportunities, Usage & Mechanism Selection shows in the Table1 below.

Table 2: Financing Challenges and Opportunities (Empirical Evidence from Similar Studies)

Authors	Key Findings on Financing Challenges, Opportunities, Usage & Mechanism Selection
Lambert and Deyganto (2025)	Limited market access, low financial literacy and poor recordkeeping are identified as key challenges and internal competencies are found to be more critical for accessing finance.
Panitkulpong et al. (2024)	Challenges: Platform quality, characteristics, and social influence are critical for investor trust. Social Influence is the most significant factor influencing investment decisions. Opportunities: Equity crowdfunding democratizes access to capital and reduces information asymmetry.
Lee and Jung (2024)	Financing constraints are negatively associated with product innovation. Strong R&D human capital positively moderates the relationship, helping firms overcome financial constraints. R&D human capital did not significantly impact R&D intensity.
Ahmed (2025)	Challenges: Lack of enabling regulation, investor protection concerns.
Lange et al. (2024)	Business Angels provide critical value-added services (expertise, networks, mentorship) beyond financial capital, bridging the funding gap between founders and Venture Capitals. In addition, Business Angels funding positively influences startup survival, and BA networks significantly facilitate funding through social capital and reduced information asymmetry.
Romero Alvarez et al. (2026)	Emerging channels (crowdfunding, supply chain finance) show potential but require more research. Bank credits are critical but their effectiveness depends on technological capacity. Self-financing follows pecking order logic. External equity/VC plays a crucial role for high-tech SMEs.

Continued on next page

Table 2 – Continued from previous page

Authors	Key Findings on Financing Challenges, Opportunities, Usage & Mechanism Selection
Dekker et al. (2026)	Venture debt availability reduces early-stage equity but significantly enhances late-stage investments, reallocating capital across the lifecycle.
Sukachova et al. (2025)	VC provides essential mentorship/networks while crowdfunding validates ideas, especially in transition economies.
Firszt (2025)	Reward and donation crowdfunding align well with startup needs and perform better than traditional bank loans in early stages.
Dey (2024)	Revenue based financing fills a unique gap between traditional debt and VC by utilizing data-driven analysis for non-dilutive funding.
Saleem and Atiq (2023)	Major challenges include unrealistic requirements from providers, such as high collateral and high equity sharing.
Giaretta and Chesini (2021)	Unregulated fintech's are more likely to obtain long-term debt; asset structure and ownership significantly impact access.
S. Singh and Subrahmanya (2021)	The amount raised is significantly influenced by entrepreneur characteristics and growth metrics, varying by stage.
Santos and Cincera (2022)	Being an innovative firm increases the probability of being financially constrained by 21–32%.
Garg and Shivam (2017)	Internal planning failures as a primary financing challenge, specifically the underestimation of start-up costs and miscalculating break-even points.
Hai et al. (2022)	An "innovation trap" where the "liability of newness" forces firms to spend more on marketing and complementary assets than they earn in initial profits.
Hahn et al. (2019)	The non-rival nature of technological knowledge discourages investment because firms cannot easily keep innovations secret.
Vandenberg et al. (2020)	Shortage of "patient capital" for tech startups producing physical goods (like agri-tech), Investors prefer capital-efficient software ventures over those requiring long testing and certification cycles.
Yeboah (2023)	Limited financial literacy and a lack of credible credit information infrastructure as the primary barriers to unlocking finance in developing countries.
Source: Authors	

Sulillari (2023) noted start-ups may have to deal with many of these financing challenges simultaneously, not one at a time, which makes the funding process extremely challenging and difficult to succeed in. Despite the above financing challenges, several opportunities exist for improving innovation financing and overcoming the challenges. According to Sulillari (2023) start-ups can try to overcome the financing challenges using different strategies. Networking, social media exposure, finding the best funding option and best business model are some to mention. Similarly, Yeboah (2023) highlighted factors that facilitate access to finance for entrepreneurs. These include supportive government policies, the presence of specialized financial institutions, and the use of financial technologies are some to mention.

2.2 Theoretical Review

"The financing constraints theory is the study of the impact of financial frictions on the firm's investment" (Mansour & Chichti, 2011). It suggests that firms may struggle to grow when they cannot easily obtain external finance due to information asymmetry, agency conflicts, and strict collateral requirements imposed by lenders (Ioannidou et al., 2022).

Du and Nguyen (2022) extended this perspective by introducing the concept of cognitive financial constraints, which emphasizes that entrepreneurs' perceptions, attitudes toward risk, and reluctance to seek external finance may also hinder firm growth. In response to these constraints, tech startups typically follow the Pecking Order Theory. Tech startups prefer debt financing over equity to avoid ownership dilution when internal funds are insufficient. Prior empirical literature indicates that bank lending plays a crucial role in providing liquidity to firms, enabling them to finance operations and expand quickly. However, asymmetric information between borrowers and lenders, together with agency problems and limited collateral, leads to credit rationing and financing constraints (Ioannidou et al., 2022). Empirical studies further indicate that while bank loans can support firm growth, access to such financing is often restricted by collateral requirements and borrower opacity (Meressa, 2022; Santos & Cincera, 2022). Therefore, a startup's choice to use a specific financing type is inherently tied to the structural challenges of that mechanism, leading to our first hypothesis

H1: There is a significant association between financing type used (debt, equity, non-dilutive) and the corresponding financing type challenges.

There are three distinct tiers in which the firm uses different ways to finance itself and their financing preference according to Frank et al. (2020) explanation of the standard pecking order theory. Tier1 discuss the firm has enough internal resources to fund its needs, and it does not need external financing. Tier2 states internal cash flows are not sufficient to meet the firm's needs and it must close the financing deficit through external funds. Tier3 places the firm uses internal resources plus the full debt capacity plus some new external equity to fund itself. As cited on Frank et al. (2020) literature often implicitly assumes that all or at least most firms are in Tier2. These implies that a firm's historical path of financing shapes its operational capabilities and strategic choices. Since startups often begin with a restricted budget they require careful prioritization of expenses and activities to achieve the greatest impact (Jean, 2024).

Tech startups that have used specific funding types (debt, equity, or non-dilutive) previously might have been learnt on how to deploy these specific financial resources efficiently to scale operations, directly influencing which mechanism they perceive as the ultimate driver of their revenue growth. Similarly, a tech startup challenged by significant amount of interest or restricted by rigid grant or loan process may find those mechanisms ineffective for driving revenue and force them to look toward alternative financing mechanisms. Here, lesson learned could be an issue as to Jean (2024) there are startups failed due to mismanagement of resources and lack of market fit and due to poor financial planning and prioritizing rapid expansion over building a sustainable business model. These theoretical insights lead us to hypothesize as:

H2a: Previous financing usage (debt, equity, and non-dilutive financing) significantly influences startups' financing mechanism choice.

H2b: Financing challenges associated with debt, equity, and non-dilutive financing significantly influence startups' financing mechanism choice.

Therefore, According to Financing Constraint Theory and Pecking Order Theory, startups develop financing preferences based on their prior experiences with funding accessibility. Consequently, both financing usage and reported financing challenges are expected to influence which financing mechanisms startups perceive as most effective for driving revenue growth.

3 Methods

The study employed a descriptive and correlational survey design using a quantitative approach to explore the challenges and opportunities Ethiopian tech startups face. A multinomial logistic regression model was employed to examine the influence of financing usage and financing challenges on the perceived financing mechanisms driving startup revenue growth. Prior to regression analysis, a multiple response analysis was used to identify the primary challenges Ethiopian tech startups face, and chi-square tests were conducted to examine associations between financing mechanisms usage and financing mechanisms challenges.

To determine an appropriate sample size, the Yamane (1967) formula was applied. As cited in Ayinaddis (2022), the Yamane (1967) sample size formula based on a margin of error and population size is widely used in survey research and is specified as follows:

$$n = \frac{N}{1 + N(e)^2} \tag{1}$$

Where $N = 520$ and $e = 0.05$.

Tech startups that satisfied the inclusion criteria were chosen using a purposive sampling technique. The initial population of the study consisted of 520 lists from the Ministry of Innovation and Technology database; only those with available contact information (mobile or email), in formal registration status, and evidence of having received at least one form of financing were included. This resulted in a final sampling frame of 227 startups. This sampling approach may limit the generalizability of the findings, as startups without prior funding, informal enterprises, or those lacking accessible contact information were excluded.

Of these, 138 startups responded, representing a response rate of approximately 61%. This response rate is considered adequate as cited in Ayinaddis (2022), indicating a 50% response rate is adequate for statistical analysis and provides a reasonable basis for drawing conclusions about the broader population, while acknowledging the possibility of non-response bias. Because information from non-respondents was not available, non-response bias could not be assessed and remains a limitation of this study. Primary data was collected using Google Forms. A digital link to the survey questionnaire was sent to respondents via email and/or mobile devices. Volunteers were assigned to engage directly with the respondents to clarify the objective of the study, ensure the participant understood the significance of the research before completing the survey, enhance the response rate, and ensure data integrity.

A designed questionnaire with 35 items served as the data gathering tool. Respondent demographics, firm-level characteristics, financing mechanisms usage with corresponding amounts, and perceptions and experiences regarding financing, collaboration, challenges, and regulatory environment are the four primary sections the questionnaire comprised. The questionnaire also used a variety of measuring forms, including binary (Yes/No) questions, multiple-response items, continuous numerical entries (revenue and employment data), and Likert-scale items (ranging from "Very ineffective" to "Very effective"). The questionnaire was examined by peers to make sure it was relevant and clear, even if a formal pilot test was not carried out (See Appendix-A).

The study also employed multinomial logistic regression analysis to examine the influence of usage of financing mechanisms and financing challenges on startups' financing

mechanism choices. The dependent variable consisted of multiple unordered financing categories, namely loan financing, business plan competition financing, government grant financing, crowdfunding platform financing, and venture capital and angel investor financing. However, to address sparse data and unstable parameter estimates observed in the initial multinomial logistic regression, these financing categories were restructured into three conceptually meaningful groups (debt financing, equity financing, and non-dilutive financing). Non-dilutive financing was used as the reference category. As cited in Deh et al. (2025), multinomial logistic regression is a multivariate analysis model used when the dependent variable (Y) is a qualitative nominal variable with more than two categories. Accordingly, multinomial logistic regression was found to be appropriate for this study. Independent variables included debt financing utilization, debt financing challenges, equity financing utilization, equity financing challenges, non-dilutive financing utilization, and non-dilutive financing challenges. Pearson's chi-square test was also employed to examine the association between financing mechanism usage and perceived financing challenges since both variables were categorical.

Table 3: Variable Operationalization and Coding Scheme for Multinomial Logistic Regression

Survey Questionnaire	**Expected Response Options**	**Coding**	**Variable Role**	**Variable Type**
Has your startup used debt financing (e.g., bank loans) in the past three years (2022–2024)?	Yes, No	1 = Yes, 0 = No	Independent	Binary
Has your startup used equity financing (e.g., from angel investors or venture capitalists) in the past three years (2022–2024)?	Yes, No	1 = Yes, 0 = No	Independent	Binary
Has your startup used non-dilutive financing (e.g., your own fund, business plan competitions or grants) in the past three years (2022–2024)?	Yes, No	1 = Yes, 0 = No	Independent	Binary
What are the primary challenges your startup has encountered regarding financing mechanisms? (Select all that apply)	Debt, Equity, Non-dilutive	Since this is a "Select all that apply" question, each choice was treated as a separate binary dummy variable. Accordingly, Debt_Challenge (1 = Yes, 0 = No), Equity_Challenge (1 = Yes, 0 = No), or NonDilutive_Challenge (1 = Yes, 0 = No)	Independent	Binary
Which financing mechanism do you believe has been most effective in driving your revenue growth?	Loan Categorized as (Debt), (Venture capital and angel Investor; Crowdfunding Platform) Categorized as (Equity), (Business Plan competition; Government grant) Categorized as (Non-Dilutive)	Debt Financing = 1, Equity Financing = 2, Non-Dilutive Financing = 3	Dependent	Categorical

The multinomial logistic regression model is specified as:

$$\ln\left(\frac{P(Y=j)}{P(Y=\text{Non Dilutive Financing})}\right) = \beta_{0j} + \beta_{1j}\,\text{Debt\_Used} + \beta_{2j}\,\text{Debt\_Challenge} + \beta_{3j}\,\text{Equity\_Used} + \beta_{4j}\,\text{Equity\_Challenge} + \beta_{5j}\,\text{NonDilutive\_Used} + \beta_{6j}\,\text{NonDilutive\_Challenge}$$

Where:

- $P(Y=j)$ = Probability of selecting a financing mechanism that leads to revenue growth j
- $P(Y=$ Non-Dilutive Financing$)$ = Probability of selecting Non-Dilutive Financing (reference category)
- Debt_Used = Tech Startup firm has previously used debt financing (Binary)
- Debt_Challenge = Tech Startup firm faces challenges in obtaining debt financing (Binary)
- Equity_Used = Tech Startup firm has previously used Equity financing (Binary)
- Equity_Challenge = Tech Startup firm faces challenges in obtaining equity financing (Binary)
- NonDilutive_Used = Tech Startup firm has previously used Nondilutive financing (Binary)
- NonDilutive_Challenge = Tech Startup firm faces challenges in obtaining Nondilutive financing (Binary)
- β_0 = intercept term
- $\beta_{1j}, \beta_{2j}, \beta_{3j}, \beta_{4j}, \beta_{5j}, \beta_{6j}$ = log-odds coefficients for each predictor

A multinomial logistic regression model was estimated using maximum likelihood. The model compares each financing choice against the reference category (Non-Dilutive Financing).

4 Results

According to Kent State University Libraries (2026) when there is a list of potential answers presented in a multiple-choice question survey, and the respondent chooses all of the possibilities that apply to them, the researcher uses multiple response analysis. Hence, multiple response analysis was used to analyze the data.

4.1 Demographic Analysis of Tech Startups

The age distribution of respondents is presented in Table 3 below shows 77.5% (107 individuals) fall within the 26-40 age category. This was followed by the younger entrepreneurs (up to 25 years old) age group, which accounted for 15.9% of the respondents. Only a small proportion of respondents (6.5%) were aged 41-60. In this regard our survey results show that young and middle-aged workforce dominated the Ethiopian tech startup ecosystem.

Table 4: Demographic Analysis of Tech Startups

Category	Subcategory	Frequency	Percent	Valid Percent	Cumulative Percent
Age Category	Up to 25	22	15.9	15.9	15.9
	26-40	107	77.5	77.5	93.5
	41-60	9	6.5	6.5	100.0
	Total	**138**	**100.0**	**100.0**	
Gender	Female	16	11.6	11.6	11.6
	Male	122	88.4	88.4	100.0
	Total	**138**	**100.0**	**100.0**	
Marital Status	Divorced	2	1.4	1.4	1.4
	Married	50	36.2	36.2	37.7
	Single	86	62.3	62.3	100.0
	Total	**138**	**100.0**	**100.0**	
Education	Bachelor (University Degree)	86	62.3	62.3	62.3
	Certificate /Diploma	8	5.8	5.8	68.1
	High School	2	1.4	1.4	69.6
	Masters or above	41	29.7	29.7	99.3
	Primary school	1	0.7	0.7	100.0
	Total	**138**	**100.0**	**100.0**	
Sector	Agri Tech	18	13.0	13.0	13.0
	E-commerce	22	15.9	15.9	29.0
	Edtech	12	8.7	8.7	37.7
	Fintech	6	4.3	4.3	42.0
	Health Tech	3	2.2	2.2	44.2
	Manufacturing technology	10	7.2	7.2	51.4
	Other	8	5.8	5.8	57.2
	Software as a Service (SaaS)	59	42.8	42.8	100.0
	Total	**138**	**100.0**	**100.0**	

The results of gender distribution shows that significant gender disproportion within the tech startup sector which is 88.4% of respondents (122) were male, while 16 respondents (11.6%) were female. This disparity suggests gender-based barriers is highly reflected related to innovation financing mechanisms that may need to be studied further. Similarly, in terms of marital status, the majority of the respondents are single, accounting for 62.3% (86 respondents). Married individuals are 36.2% (50 respondents), and (1.4%) are divorced. The high percentage of single entrepreneurs indicate a higher risk tolerance within the ecosystem.

The educational profile of the respondents indicated in Table 2 above shows a highly qualified workforce, which is an opportunity for attracting better innovation financing. 62.3% of respondents hold a Bachelor's degree, and 29.7% possess a Master's degree or above. Combined, over 90% of the individuals in the startup ecosystem have university-level education. Other categories include Certificate/Diploma holders (5.8%), High School graduates (1.4%), and Primary school education (0.7%). Furthermore, the relatively high level of education among respondents suggests that they were capable of understanding existing financing mechanisms.

Software as a Service (SaaS) is the leading sector representing 42.8% of the startups regarding sector of tech startups shown in Table 2 above, the other respondents across E-commerce, Agri Tech, Edtech Manufacturing Technology, Fintech, Health Tech and Other sectors were distributed 15.9%, 13.0%, 8.7%, 7.2%, 4.3%, 2.2% and 5.8% respectively. This indicates that the study captured views from diverse sectors in which these startups

operate, with a strong lean toward software as a service based solutions.

4.2 Primary Challenges of Innovation Financing

Table 4 below shows the most significant challenge tech startups face is the limited access to debt financing, which impacts a substantial 68.8% of cases, making it the most frequently cited primary challenge. This is closely followed by difficulties in securing non-dilutive financing (56.5%), and equity financing (54.3%), which includes venture capital and angel investments. Over half of the respondents (52.9%) also identified regulatory barriers as a hindrance to funding, while 40.6% noted a lack of collaboration from stakeholders as a primary challenge. Here also, a significant knowledge gap exists as 42.0% of cases responded limited awareness of the different financing mechanisms availability.

Table 5: Primary Challenges of Innovation Financing

Primary Challenges	Responses		Percent of Cases
	N	Percent	
Limited access to debt financing (e.g., Loan)	95	21.6%	68.8%
Limited access to equity financing (e.g., Venture capital, angel investment)	75	17.0%	54.3%
Limited access to non-dilutive financing (e.g., grant, tax incentive, competition)	78	17.7%	56.5%
Regulatory barriers hindering access to funding	73	16.6%	52.9%
Limited collaboration from stakeholders	56	12.7%	40.6%
Limited Awareness in using different innovative financing mechanisms	58	13.2%	42.0%
Other	5	1.1%	3.6%
Total	**440**	**100.0%**	**318.8%**

4.3 Regulatory Burden

The respondents were also asked which regulatory burden affect them more specifically. Accordingly, Table 5 shows that government tax policies are perceived as the most significant regulatory burden, accounting for 37.8% of specific regulatory responses and affecting 71.0% of cases. Innovation and trade policies were also identified as major concerns, representing 27.4% and 19.3% of the responses respectively. The total percentage 187.7% which surpass 100% indicates that tech startups are typically affected by multiple regulatory categories simultaneously.

Table 6: Regulatory Burden

Government Tax and Regulations Affecting	Responses		Percent of Cases
	N	Percent	
Tax Policies	98	37.8%	71.0%
Innovation Policy	71	27.4%	51.4%
Environmental Regulations	31	12.0%	22.5%
Trade Policies	50	19.3%	36.2%
Other / General Administrative	9	3.5%	6.6%
Total	**259**	**100.0%**	**187.7%**

4.4 Collaboration among Stakeholders

According to the respondents' responses, although collaboration is common among startups, some still operate independently, which may reflect limited collaboration platforms or trust issues. The data in Table 6 below shows 64.5% (89 respondents) reported that they engage in collaboration while 35.5% (49 respondents) reported no collaboration. Only 34.8% of the total sample described their collaborations as either "Effective" (26.8%) or "Very Effective" (8.0%). This leaves a large portion of the population experiencing collaborations that are simply neutral (18.8%) or actively ineffective/very ineffective (10.8%).

Table 7: Collaboration and Financing Mechanism Frequencies

Category	Response/Type	Frequency	Percent	Valid Percent	Cumulative Percent
Collaboration	No	49	35.5	35.5	35.5
	Yes	89	64.5	64.5	100.0
	Total	**138**	**100.0**	**100.0**	
Collaboration Effectiveness	[Missing/No]	49	35.5	35.5	35.5
	Effective	37	26.8	26.8	62.3
	Ineffective	6	4.3	4.3	66.7
	Neutral	26	18.8	18.8	85.5
	Very Effective	11	8.0	8.0	93.5
	Very Ineffective	9	6.5	6.5	100.0
	Total	**138**	**100.0**	**100.0**	
Financing Mechanisms	Business Plan Competition	49	35.5	35.5	35.5
	Crowd Funding Platform	5	3.6	3.6	39.1
	Government Grant	15	10.9	10.9	50.0
	Loan	27	19.6	19.6	69.6
	Venture Capital and Angels	42	30.4	30.4	100.0
	Total	**138**	**100.0**	**100.0**	

4.5 Financing Mechanisms Used

As we can see from the Table 7 below the Business Plan Competitions are the most frequently used mechanism at 35.5%, followed closely by Venture Capital and Angel Investors Financing at 30.4%. Crowdfunding utilized by only 3.6% of respondents which shows the underdevelopment of the platform in the country. 19.6% of the survey respondent also indicated they are highly struggling to get traditional debt in order to solve their financing problem.

4.6 Strategies used to overcome financing challenges

The data in Table 8 below shows strategies used to overcome financing challenges which also reveals a culture of using own money. The most significant finding is the dominance of "Self" strategies, utilized by a substantial 71.7% of cases. This strongly indicates barriers in accessing formal funding sources is one of the primary challenges, innovation financing ecosystem is underdeveloped and external financiers are risk-averse. While 34.1% tech startups try to leverage Government strategies and 33.3% pursue Equity options, these figures are notably higher than the remaining 18.1% of Loan and 2.9% of Other strategies used to overcome the financing challenges. The cumulative total of 160.1% for "Percent

Table 8: Collaboration and Financing Mechanism Frequencies

Category	Response/Type	Frequency	Percent	Valid Percent	Cumulative Percent
Collaboration	No	49	35.5	35.5	35.5
	Yes	89	64.5	64.5	100.0
	Total	**138**	**100.0**	**100.0**	
Collaboration Effectiveness	[Missing/No]	49	35.5	35.5	35.5
	Effective	37	26.8	26.8	62.3
	Ineffective	6	4.3	4.3	66.7
	Neutral	26	18.8	18.8	85.5
	Very Effective	11	8.0	8.0	93.5
	Very Ineffective	9	6.5	6.5	100.0
	Total	**138**	**100.0**	**100.0**	
Financing Mechanisms	Business Plan Competition	49	35.5	35.5	35.5
	Crowd Funding Platform	5	3.6	3.6	39.1
	Government Grant	15	10.9	10.9	50.0
	Loan	27	19.6	19.6	69.6
	Venture Capital and Angels	42	30.4	30.4	100.0
	Total	**138**	**100.0**	**100.0**	

of Cases" suggests a varied survival approach, where the startups cannot rely on a single solution and must use fragmented resources across multiple channels.

Table 9: Strategies Used to Overcome Financing Challenges

Strategies Used to Overcome The Challenges	Responses		Percent of Cases
	N	Percent	
GOVERNMENT	47	21.3%	34.1%
SELF	99	44.8%	71.7%
EQUITY	46	20.8%	33.3%
LOAN	25	11.3%	18.1%
OTHER	4	1.8%	2.9%
Total	**221**	**100.0%**	**160.1%**

4.7 Chi-Square Test

Adeniran (2018) stated the Chi-Square distribution is a theoretical or mathematical distribution which has wide applicability in statistical analysis. This test has been widely used in entrepreneurship and innovation finance research to examine relationships between categorical variables. For instance, Narayan et al. (2019) applied chi-square tests and demonstrated that there is not enough evidence to suggest an association between level of development of startup and the stages of funding. Accordingly, to test whether there is a statistically significant association between debt used vs debt challenges, equity used vs equity challenges, and non-dilutive used vs non-dilutive challenges a chi-square test of independence was performed and Table 9 summarizes the result of the test.

All expected cell counts were greater than 5, indicating that the assumptions of the chi-square test were satisfied. Since all the p-value exceeds the standard threshold of 0.05 there is no statistically significant association exists between debt financing usage and debt financing challenges ($\chi^2 = 0.178$, $p = 0.673$), equity financing usage and equity

Table 10: Summary of Chi-Square Test between Financing Type Used vs. Financing Challenges

Metric	Debt Used vs. Debt Challenges	Equity Used vs. Equity Challenges	Non-Dilutive Used vs. Non-Dilutive Challenges
Pearson Chi-Square (χ^2)	0.178	0.288	0.098
Degrees of Freedom (df)	1	1	1
p-value	0.673	0.592	0.754

financing challenges ($\chi^2 = 0.288$, $p = 0.592$), as well as non-dilutive financing usage and non-dilutive financing challenges ($\chi^2 = 0.098$, $p = 0.754$).

4.8 Multinomial Logistic Regression Result

A multinomial logistic regression was performed to model the choice among three financing mechanisms: Debt Financing, Equity Financing, and Non-Dilutive Financing (the latter served as the reference category). The predictors were six dichotomous variables indicating whether the firm had previously used each financing type and whether it faced challenges in obtaining that type (1 = yes, 0 = no). Firms that had not used debt before (Debt_Used = 0) were less likely to choose debt over non-dilutive financing than firms with prior debt experience ($B = -1.259$, $SE = 0.556$, Wald $\chi^2(1) = 5.123$, $p = 0.024$). The odds ratio (Exp(B) = 0.284) indicates that the odds of selecting debt financing were 71.6% lower for non-users of debt compared to previous users (95% Confidence Interval [0.095, 0.845]). In simple terms, Startups without prior debt financing experience are less likely to select debt financing. All other predictors in the debt financing versus non-dilutive financing comparison were not statistically significant at the 5% significance level. These included Debt_Challenge ($p = 0.076$), Equity_Used ($p = 0.221$), Equity_Challenge ($p = 0.509$), NonDilutive_Used ($p = 0.071$), and NonDilutive_Challenge ($p = 0.589$).

Table 10 also shows a similar pattern for equity financing. Prior use of equity was the only significant predictor. Firms that had not used equity before (Equity_Used = 0) were substantially less likely to choose equity over non-dilutive financing ($B = -1.365$, $SE = 0.568$, Wald $\chi^2(1) = 5.773$, $p = 0.016$). The odds ratio (Exp(B) = 0.255) suggests a 74.5% reduction in the odds of choosing equity for firms without prior equity experience (95% Confidence Interval [0.084, 0.778]). No other variable reached statistical significance: Debt_Used ($p = 0.556$), Debt_Challenge ($p = 0.363$), Equity_Challenge ($p = 0.114$), NonDilutive_Used ($p = 0.727$), and NonDilutive_Challenge ($p = 0.925$).

Furthermore, the multinomial logistic regression results of the overall model were statistically significant ($\chi^2 = 27.590$, $df = 12$, $p = 0.006$) and showed that prior use of a financing type significantly increases the likelihood of choosing that same type, while perceived challenges do not have a significant effect.

4.9 Hypothesis Testing Results

H2a was partially supported. The results indicate that prior debt and equity financing usage significantly influence startups' financing mechanism choice, whereas prior non-dilutive financing usage does not show a statistically significant effect. H2b was not supported, as none of the financing challenge variables (debt, equity, and non-dilutive) significantly affect financing mechanism selection.

Table 11: Multinomial Logistic Regression Results

Financing Mechanism Choice		B	Std. Error	Wald	Sig.	Exp(B)	95% Confidence Interval	
							Lower Bound	Upper Bound
Debt Financing	Intercept	.658	.873	.568	.451			
	[Debt_Used=0]	-1.259	.556	5.123	.024	.284	.095	.845
	[Debt_Used=1]	0[b]						
	[Debt_Challenge=0]	-1.172	.660	3.156	.076	.310	.085	1.129
	[Debt_Challenge=1]	0[b]						
	[Equity_Used=0]	-.847	.692	1.497	.221	.429	.110	1.665
	[Equity_Used=1]	0[b]						
	[Equity_Challenge=0]	.637	.965	.436	.509	1.891	.285	12.533
	[Equity_Challenge=1]	0[b]						
	[NonDilutive_Used=0]	.891	.494	3.249	.071	2.438	.925	6.424
	[NonDilutive_Used=1]	0[b]						
	[NonDilutive_Challenge=0]	-.528	.978	.291	.589	.590	.087	4.008
	[NonDilutive_Challenge=1]	0[b]						
Equity Financing	Intercept	.997	.770	1.674	.196			
	[Debt_Used=0]	.346	.588	.346	.556	1.414	.446	4.480
	[Debt_Used=1]	0[b]						
	[Debt_Challenge=0]	.546	.600	.828	.363	1.727	.532	5.601
	[Debt_Challenge=1]	0[b]						
	[Equity_Used=0]	-1.365	.568	5.773	.016	.255	.084	.778
	[Equity_Used=1]	0[b]						
	[Equity_Challenge=0]	-1.249	.789	2.505	.114	.287	.061	1.347
	[Equity_Challenge=1]	0[b]						
	[NonDilutive_Used=0]	.145	.415	.122	.727	1.156	.513	2.604
	[NonDilutive_Used=1]	0[b]						
	[NonDilutive_Challenge=0]	-.066	.706	.009	.925	.936	.235	3.731
	[NonDilutive_Challenge=1]	0[b]						

Note. a. The reference category is: NonDilutive Financing.
b. This parameter is set to zero because it is redundant.

5 Discussion

The survey results show that tech startups in Ethiopia face several financing challenges at once. This is reflected by the high cumulative percentage (318.8%) which indicates that the majority of startups are struggling with multiple major obstacles simultaneously.

The demographic analysis indicates that the ecosystem is dominated by young and middle-aged entrepreneurs, particularly those between the ages of 26 and 40 years. This suggests that tech innovation-driven entrepreneurship in Ethiopia is largely being led by technologically adaptive individuals which is in line with Manyonyi and Shavdia (2024) a report which offers the broader narrative of how a young, tech-savvy populace is transforming the East African entrepreneurial landscape. The findings also revealed a substantial gender imbalance within the tech startup sector, where male respondents accounted for 88.4% of the participants while female respondents represented only 11.6%. This indicate the existence of structural and socio-economic barriers that limit women's participation in technology-based entrepreneurial activities. As evidence Pareek and Bagrecha (2018) mentioned women entrepreneurs face significant financial challenges due to investor perceptions that women-led businesses are riskier.

The dominance of male entrepreneurs in the sector could also influence access to innovation financing, as women-owned startups may face additional challenges such as limited professional networks, lower investor confidence, restricted access to collateral, and lower exposure to financial information and mentorship opportunities. Therefore,

the result implies that gender disparities remain an important concern in the innovation financing landscape and may require targeted policy and institutional support to improve inclusiveness.

The educational profile of respondents demonstrates that the Ethiopian tech startup ecosystem comprises an educated tech entrepreneur, with more than 90% of respondents having university-level education. This finding may indicate that lack of human capital is not the primary obstacle to innovation financing. The concentration of startups in the Software-as-a-Service (SaaS) sector also reflects the country's ongoing digital transformation and the relatively lower capital requirements of software-based ventures compared to hardware-intensive industries.

Another important finding of the study was the limited access to debt financing among startups. Many respondents indicated that obtaining loans from formal financial institutions remains difficult, mainly because startups often lack physical collateral and stable financial records. This finding is consistent with previous studies that describe startups as high-risk borrowers within traditional lending systems (Saleem & Atiq, 2023; A. Singh, 2024). The result may also suggest that existing lending practices are not well suited for innovation-driven businesses, particularly those relying more on knowledge and intangible assets than fixed property. Similar concerns were raised by Lee and Jung (2024) and Lambert and Deyganto (2025), who noted that weak credit evaluation systems and risk-averse banking practices continue to limit startup financing opportunities.

Beyond debt financing, another key challenge identified in this study was limited access to non-dilutive funding. This may be linked to the complexity of regulatory procedures, which can make it difficult for startups to secure such support (Cooper et al., 2022). In addition, Okunnuga et al. (2024) noted that many startups struggle to obtain additional funding needed to sustain operations and support expansion once government incentives come to an end. Similarly, Sulillari (2023) emphasized that startups are often required to clearly differentiate themselves and demonstrate strong competitiveness in order to attract non-dilutive financial support.

The other challenge is equity financing which shows the under development of such financing mechanism in Ethiopia. Previous study of Pallathadka (2022) states the investor's response towards the startup's ecosystem can be slow and tired sometimes. One possible reason could be as to Adwani (2020) they often fail to meet the unique needs of new and growing businesses which is also consistent with A. Singh (2024) that highlighted difficulty of getting money from venture capitalists and angel investors who are risk averse in unpredictable markets. As to Hussain (2024) the angel investing is not also without its challenges as they also asses the viability of start-ups, scrutinize business models, market potential, and the competency of the leadership team. This suggests that the absence of structured equity instruments in Ethiopian startups remains a binding constraint.

Regulatory barriers were also identified as one of constraints affecting startup financing. This is in line with Sukachova et al. (2025) who stated the idea of political instability and economy makes venture capital rare. Adwani (2020) also strengthened unclear or fragmented regulations can hinder the development of new funding mechanisms. Tax policy also emerged as the most significant burden which is similar to A. Singh (2024) that explicitly identifies tax and regulation as a primary financial burden for startups in emerging markets.

The study further revealed that although collaboration exists among stakeholders, its effectiveness remains limited. While a majority of respondents indicated that they engage in collaboration, only a relatively small proportion considered such collaboration effective or very effective. This may indicate weak networking systems among startups, investors, universities, government institutions, and incubators. In this regard Lange et al. (2024)

stated the importance of startup culture and ecosystem collaboration in facilitating access to startup capital.

The analysis of financing mechanisms utilization shows that Ethiopian tech startups utilize more business plan competitions than equity financing or traditional bank loans. This is in line with Lazopoulos (2025) that mentioned prize winnings from pitch competitions serve as a non-traditional, ad hoc funding route for entrepreneurs facing systemic barriers to institutional capital. As to Garg and Shivam (2017) the business Plan competition indicates whether a startup idea is feasible and has the potential to generate an adequate return on investment and similarly readiness of Investors such as (banks, venture capitals, and angels), considering the business plan is a primary criterion for evaluation.

On the other hand, the low utilization of crowdfunding platforms suggests that digital financing mechanisms are still underdeveloped in Ethiopia. This is supported by A. Singh (2024) by stating crowdfunding's presence is still fairly constrained in emerging markets.

The study also reveals that dominant strategy used to overcome financing challenges are self-financing. This heavy reliance on internal funds suggests either a lack of accessible external financing options or a deliberate preference for avoiding debt or external partners. This is in line with Lia Nurina and Napiajo (2026) which stated stronger internal funds significantly reduce the likelihood of external financing, while financing deficits increase the probability of using both debt and equity. Fred-Sawo et al. (2025) mentioned as this also strengthens the Pecking Order that states firms prefer internal financing to debt, and debt to equity, due to information asymmetry and potential loss of control. Contrary to this Garg and Shivam (2017) found majority of the entrepreneurs prefer venture capital round over any other round as it is the only chance of finding so many people willing to invest in their idea. Therefore, Policymakers can consider strengthening external financing options to reduce over-dependence on personal funds, which can limit long-term investment capacity.

The application of the chi-square test in this study resulted as there is no statistically significant association between the use of specific financing mechanisms and the challenges associated with them. The findings indicate that utilizing specific financing mechanisms are not significantly influenced by whether access to those mechanisms are perceived as challenging. In other words, the tech startups may continue using debt, equity, or non-dilutive financing despite experiencing associated constraints. According to Ioannidou et al. (2022), when organizations encounter strong financing problems, they tend to face a lack of financing access and slow growth potential. However, the above results show that startups could use strategies to cope with their financing problems rather than avoid financing mechanisms that are considered hard. The findings are consistent with prior empirical studies showing that financing challenges are widespread across startup ecosystems. For example, Du and Nguyen (2022) indicated that due to information asymmetry and limited financial credibility startups frequently face financing constraints regardless of financing type. Similarly, Adwani (2020) found that startups continue utilizing debt and equity financing despite high financing barriers because alternative funding opportunities remain limited in developing entrepreneurial ecosystems.

The result also supports the concept of the Pecking Order Theory we used in our theoretical review. According to this theory, firms adopt funding alternatives in the order of availability and necessity (Lia Nurina & Napiajo, 2026; Myers & Majluf, 1984). This means that despite the difficulties associated with accessing external finances, technology startups may resort to these funding sources since internal financing is insufficient for innovation. From a policy perspective, the findings suggest that increasing the amount of financing available to startups alone may not fully solve startup financing challenges. There is also a need to improve the overall financing environment. The finding in general indicates, tech startups who used grants or business plan competition may face limited funding size, one-time support, delays and continued funding gaps. On the other hand,

Startups who did not use them may face access barriers, competition and lack of information. The result also suggests that usage of specific financing option regardless of the difficulties involved in Ethiopian startups ecosystem may continue due to the absence of viable alternative financing mechanisms.

On the other hand, multinomial logistic regression was also done to see why startups choose certain types of funding. The findings revealed financing utilization variables have a stronger influence on financing mechanism choice than perceived financing challenges. The results offer two main insights. The most robust finding is that past use of a financing instrument strongly predicts its future selection over nondilutive alternatives. Firms that had previously used debt were about 3.5 times more likely (1 / 0.284) to choose debt again rather than grants or subsidies. The same pattern holds for equity: prior users were nearly four times more likely to opt for equity over nondilutive financing.

This result aligns with the pecking order theory (Myers & Majluf, 1984), which suggests that managers prefer financing sources they are familiar with and that entail lower information costs. Once a firm has established a relationship with debt providers or equity investors, the transaction costs and informational asymmetries decrease, making that channel more attractive than unfamiliar non-dilutive options. Moreover, Herrmann et al. (2024) found that nascent ventures follow a "follow-the-money" process where initial financing sources shape subsequent choices, creating a persistent trajectory. Our findings extend this idea by showing that even when non-dilutive financing (e.g., grants) is available and carries no ownership cost, firms still gravitate toward what they already know.

None of the challenge variables (debt challenge, equity challenge, non-dilutive challenge) significantly affected the financing decision. This is surprising, as one might expect that firms facing difficulties obtaining a certain type of financing would switch to another. However, the non-significant results may reflect a few possibilities:

- The binary "challenge" variable (0/1) might not capture the severity or persistence of difficulties.
- Selection effect: Firms that have never used a financing type may not be aware of potential challenges, or they may avoid that type precisely because they anticipate challenges – a tendency that would already be reflected in the "used" variable.
- Non-dilutive financing (grants, subsidies) is often scarce, competitive, or subject to specific eligibility criteria. Firms may perceive it as less reliable, so they default to debt or equity regardless of challenges with those instruments. Kaur and Singh (2024) investigated MSME entrepreneurs and noted that hesitancy toward new financing alternatives often overrides the effect of constraints – a behavioral inertia that explains why challenges alone do not alter choices. Furthermore, the reference category itself – non-dilutive financing – may be perceived as less reliable or more time-consuming to obtain, even when no explicit "challenge" is reported. Grants and subsidies often involve competitive applications, lengthy reviews, and compliance requirements that are not captured by a simple yes/no challenge indicator.

For practitioners and policymakers, the results imply that building initial experience with a financing type is critical. Incubators or development banks that wish to promote non-dilutive financing may need to facilitate "first time" usage, because without prior exposure, firms are unlikely to switch from familiar debt/equity paths.

Limitations of this study include the dichotomous nature of the predictors, the relatively small sample (reflected in wide confidence intervals for some odds ratios), and the lack of control for firm size, industry, or profitability. Future research should use continuous measures of challenge severity and longitudinal designs to establish causality.

In conclusion, the startup firms tend to keep using the same type of financing they used before or it will likely use it again. Challenges alone do not influence this inertia. The findings support a hybrid view of capital structure one that blends pecking order behavior with path dependence.

5.1 Opportunities of Innovation Financing in Ethiopia

The demographic and sectoral characteristics of the sampled startups revealed opportunities. The concentration of startups in Software as a Service sectors generally require lower fixed investment and allow startups to generate revenue faster than manufacturing-oriented businesses. This finding aligns with S. Singh and Subrahmanya (2021), who argued that service-based technology startups are more adaptable and attractive to investors because of their relatively lower operational risk. The (11.6%) of female participation was found to be relatively low which indicates an opportunity for expanding financial inclusion and entrepreneurial support initiatives. Previous studies suggest that gender diversity can contribute positively to startup performance when adequate support mechanisms are available.

Our study further revealed 42% of tech startups owners have lack of awareness on new ways of raising finance. Similar to such problem A. Singh (2024) reported one of the biggest challenges that many startup founders face especially in emerging markets is knowledge of funding opportunities. However, this tech startups lack of knowledge creates an opportunity of creating financial literacy for founders. Previous studies support studies like A. Singh (2024) reported enlarging the financial literacy of existing businessmen and enhancing the credit information infrastructure can very much enhance financing awareness. This gives other tech startups to focus on improving their financial knowledge by spending time on learning how to use alternative funding options.

In our study the 34.8% response which indicate collaborations effectiveness creates an opportunity for startups to build high-impact strategic alliances with stakeholders. According to Jean (2024) Collaborating with established companies, suppliers, or service providers can reduce costs and provide access to expertise, infrastructure, or distribution channels. Partnerships also help share risks and create synergies for mutual growth.

The other challenge identified in the current study and reported by 52.9% of respondents is regulatory barriers. This is in line with Tshehla and Mangquku (2025) who highlighted that current administrative requirements are protracted, ambiguous, and poorly articulated leading many to quit fundraising. The existence of such problem may help the government to review its policy and it implies if tech startups obey the rules and use available government support systems properly they may find it easier to get finance.

Furthermore, using own money or bootstrapping strategies were utilized by 71.7% tech startups. It is in line with Gerba and Viswanadham (2016) which revealed own personal saving is most frequently used sources to raise startup capital for sample small business enterprises in Ethiopia. In contrast A. Singh (2024) argue as most start-up use friends and family funding which is mostly limited and is not appropriate for expansion. In our context, the contradiction indicates tech startups can adopt flexible financing strategy to use both internal and external funding source that balance business control, sustainability and growth opportunity to their objectives.

Our study also revealed that Business Plan Competitions are currently the most used mechanism (35.5%). On the other hand, 10.9% respondent reported government grant utilization which may indicates the underutilization or complexity of the scheme. As to A. Singh (2024) complex regulatory systems, high costs of compliance and unfriendly tax policies burden operations and discourage investment. Therefore, opportunity to look

for underutilized government grants or tax incentives can be utilized by startups here too. Cooper et al. (2022) supported the usage of government grants by stating grants reduce financial risk through easing liquidity constraints and lowering dependence on external debt or equity financing. Hence, better utilization of government grant and tax incentives may provide tech startups in Ethiopia with additional financial resource. This in turn implies government shall develop more accessible and transparent system. Furthermore, Ethiopia has approved startup proclamation No. 1396/2025. This newly approved proclamation of startups main purpose is to boost economic growth by offering strong legal protections, financial incentives, easier and faster administrative processes in which tech startups can also utilize it as a good opportunity to solve their financial scarcity.

Finally, as Adwani (2020) suggested Innovative models like peer-to-peer lending, revenue-based financing, and venture debt have emerged as viable alternatives. So, tech startups in Ethiopia can utilize various alternative source of financing to expand opportunities derived from identified problem in this study. Digital tools like fintech platforms and blockchain has also revolutionized the way startups engage with investors. Though context matters in determining how well financial systems grow, the success of new ways of financing and financial innovations depends on how well they fit into the system where startups operate, especially in less developed countries like Ethiopia as these opportunities do not work the same everywhere. As to Gerba and Viswanadham (2016) noted using Iquib and Idir which are traditional informal financing options can be considered as sources of finance to solve the financial burden of tech startups in Ethiopia.

6 Conclusion

This study explored challenges and opportunities related to innovation financing and examined how financing usage and financing challenges influence the financing mechanism choices of tech startups. The findings showed that limited access to debt, equity, financing, non-dilutive financing, tax related regulatory barriers, financial literacy gap and limited collaboration with stakeholders remain some of the biggest challenges facing tech startups in Ethiopia. At the same time, the study identified important opportunities for improving the innovation financing environment, particularly through strengthening financial literacy, encouraging stronger collaboration among stakeholders, and taking advantage of Ethiopia's 2025 Startup Proclamation to reduce regulatory barriers and improve access to finance.

The chi-square results showed that there was no statistically significant association between the financing mechanism usage and financing challenges. On the other hand, the multinomial logistic regression findings showed prior use of a financing type (debt or equity) significantly increases the likelihood of choosing that same type over non-dilutive financing, while perceived challenges do not have a significant effect.

Moreover, majority of tech-startups used their own money to overcome financing challenges they faced. Previous studies show in developing countries the problem of financing constraints for tech startups can be addressed through a combination of alternative financing mechanisms and stronger government policy support which in turn collectively reduce dependence on a single financing mechanism selection and enhance access to innovation financing. The findings in general indicate the importance of coordinated efforts among stakeholders to strengthen the innovation financing ecosystem in Ethiopia.

Our paper add value to the subject area already out there, but we have to admit some limitation. First, there could be response overlap since there are multiple response questions in which respondent can answer more than one answer. Second, the findings rely entirely on self-reported responses from startup founders, which may introduce recall

bias where participants might overstate successes or underreport challenges. Third, the sample of 138 startups, while adequate for analysis, may not fully represent the entire Ethiopian tech ecosystem or those that could not be reached due to unavailability of their contact address and formal registration. Fourth, the gender imbalance of the respondents shows 88.4% of the participants were male. This may affect the generalizability of the findings to female startup founders and entrepreneurs. Finally, because this study focuses exclusively on Ethiopia, the findings may not be directly generalizable to other African countries with different policy environments, investor landscapes, or levels of ecosystem maturity. Therefore, readers should interpret the results with these caveats in mind. More research using in-depth interviews could shed light on the deeper reasons behind the quantitative patterns found here. Additionally, 88.4% of respondents in this study were male, future studies can make a deliberate effort to include more women-led startups to understand whether their financing challenges, opportunities, and mechanism selection differ significantly from their male counterparts.

Funding

No external funding was received.

Declaration

Data availability

All data necessary for reproducing the results of this study will be provided upon request.

Ethical Approval and Informed Consent

All procedures were performed with sufficient understanding and within appropriate ethical standards as per the guidelines of the institutional review board and with the Helsinki Declaration of 1964 and its later amendments. The list of registered tech startups has been provided by the Ministry of Innovation and Technology (MinT) by presenting data gathering authorization letter written by the university dated September 2, 2024. Data collection was conducted between April 11 and July 21, 2025. Ethical approval was obtained retrospectively from the Institutional Review Board on February 13, 2026, due to the minimal-risk nature of the study. The IRB reviewed and approved the use of previously collected data, confirming that the study met ethical standards. All data were anonymized, and the Institutional Review Board (IRB) categorized the study as the non-interventional trial, which included an anonymous online survey. The Ethical Review Board of Adama Science and Technology University's (ASTU) College of Humanities and Social Science approved the study, with Approval No. CoHSS/RTTC/34/2026.

The study team and the corresponding author collected the data via google form. To acquire informed consent from each participant a two-step procedure was used. An initial oral briefing was given over the phone to confirm participant eligibility and outline the goals of the study. A digital link to the survey questionnaire was also sent to respondents via email or mobile device after this verbal agreement. Submission and voluntary completion of the digital survey instrument was also served as confirmation of the second step of consent. The goal of the study and data confidentiality described in survey's first page. By opting not to finish the form or by shutting off the interface before the final submission, participants exercised their right to withdraw. The final analysis included data from individuals who actively clicked "Submit" ($n = 138$).

Conflict of Interests

The authors declare no conflicts of interest.

Declaration of interests' statement

The author declare no competing interests.

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Author's Guideline

African Journal of Economics and Business Research (AJEBR),

College of Business and Economics, Hawassa University

(Revised, December 2024)

The author must ensure that the work submitted for AJEBR must be original, previously unpublished, and not under consideration for publication elsewhere. In other words, the article should not be published in another publication and is not being submitted simultaneously to another journal.

Style and Format

Contributors should consider the following requirements in order to prepare their manuscript for submission to the AJEBR.

Title page of the manuscript

The following should appear on the title page:

The full title of the manuscript

The title should be short, not more than 15 words, attractive and straightforward directed at the general reader. Contributors are encouraged to avoid lengthy names and complicated ideas from their titles. Abbreviations and symbols should not be used - in a title.

The name (s), full address, and institutional affiliation of the authors (s)

The author (s) of a manuscript should give his/her/their full name (s). To give due acknowledgment to all authors contributing to the work, those who have contributed to the research should be listed as co-authors. Upon submission of the manuscript, the corresponding author attests to the fact that those named as co-authors have agreed to its submission for publication and accepts the responsibility for having properly included all (and only) co-authors. If there is a difference in the level of contribution of the co-authors, the corresponding author should provide a statement

specifying the contribution of each co-author. Besides, the corresponding author signs a copyright license on behalf of all co-authors.

The title page should also include the academic and/or other professional affiliations and the complete mailing address of the author(s). Affiliations should be indicated at the bottom of the title page with an asterisk if it is a single author and by numerical superscripts against each name if more than one author.

Abstract

The abstract should summarize the content of the paper. It should provide a clear and precise description of what the study is about including the problem, objective, method, major findings, conclusion, and recommendations. Do not make references nor display equations and abbreviations in the abstract. The abstract should not exceed 250 words including key words. It should be italicized, written in single line space, ten font size.

Keywords

The keywords should be placed under the abstract. About 3 to 6 keywords or phrases related to the study can be stated in alphabetical order, separated by a comma.

Introduction

The introduction section should explain the nature of the problem, previous related works on the topic, and the purpose and contribution/s of the paper. Hence, this introduction section may also contain theoretical and empirical evidence in order to put the major problem or topic of the study into context, show existing knowledge gaps in the area, derive objectives, and emphasize major contributions of the study.

Material and methods

Description of the Study Area and Population

It is optional based on the nature and type of the study. Hence, it is not mandatory for all contributions (in some disciplines such as anthropology, authors may use the last one or two paragraphs of the introduction section under the description of the study area, population, and even duration of their study). This section under the description of the study area may contain a brief explanation about the location of the study area, physical setting, climate, population, social, economic, and cultural aspects of the study area. Map of the study area can also be included; if the author believes it is important.

Methods

The research methods used for the study should be stated in this section. This section includes research design, sampling techniques, tools for data collection, methods of data collection, and methods of data analysis.

Results and Discussion

This section includes the results or findings of the study supported by discussion. It contains data presentation, data interpretation and/or discussion substantiating the result of the study with other relevant literature, theory, and empirical evidence. Authors may use narrations, descriptions, tables, graphs, charts, statistical models, formulas, etc., to write this section depending on the type of data and research approach employed in their study. In this section, authors are expected to show their unique and/or new contributions to knowledge by comparing their findings with existing literature.

Conclusion and Recommendations

This section includes the conclusion and recommendations. The conclusion statement should include major conclusive ideas of the paper. However, do not replicate the abstract within the conclusion section. The conclusion may magnify major findings of the study and its implication as well as the importance of the work for practical application of knowledge and extension of ideas. Recommendations (though not always mandatory for all disciplines) of the study should be stated following the conclusion with brief statements. The recommendation may deal on suggestions of remedial options for intervention by concerned bodies to manage investigated issues within the study.

Acknowledgments

Acknowledgments appear in a separate paragraph after conclusion section, but before the references, and should be as brief as possible. All sources of funding should also be declared for articles published from funded projects.

References and citation of notes

This section deals with in-text citation and referencing techniques that should be applied under social science, business, and economics research.

In-text Citation

Social Sciences, business, and economics dominantly follow the American Psychological Association (APA) style of referencing. Ensure

that every reference cited in the text is also present on the reference list (and vice versa). Personal communications are not recommended on the reference list but maybe mentioned in the text and indicated in footnotes. Citation of a reference as 'in press' implies that the item has been accepted for publication. Direct quotations should be as short as possible and should be reproduced exactly in all details (spelling, punctuation and paragraphing) as the original. Short quotations (four or less than four lines) should run in to the text and enclosed in quotation marks. Similarly, long quotations (five or more than five lines) should be set off from the text in a separate paragraph indented (five spaces from the left) and single-spaced between lines. Quotation- marks are omitted.

References should be cited in the text as follows:

- Use et al. when citing a work by more than three authors.

Example: The nexus between environment and development, as Rony et al. (2016) states that…

- The letters a, b, c, and so on should be used to distinguish citations of different works by the same author/s in the same year.

Example: FAO (2010b) recommends that…

- Only the first name of Ethiopian authors should be cited in the text.

Example: Demel Teketay should be cited as (Demel, 2016)

- Essential notes should be indicated by consecutive superscript numbers in the text and in the footnotes.
- ▪ Authors of all references cited in the text and other supporting materials should be listed alphabetically in a section entitled References.
- ▪ Ethiopian names should be written in full in the References, and the order should be: first (given) name followed by third name.
- ▪ Honorific titles such as Prof., Dr., W/ro, W/rt, Ato, Mr. Mrs. Commander, etc. should be avoided in citation and references.

Reference Style

A reference list must be included using the following information as a guide. Only cited text references are included. All references must be arranged in alphabetical order.

The references should be arranged alphabetically by the author's last name (for all authors except Ethiopian authors) then chronologically per author. Publications by the same author in the same year should be listed by year followed by the letters a. b. c. etc. (e.g. 2002a. 2002b, 2002c.). Some examples of referencing for different published and unpublished sources are illustrated below:

Journal Article References

Author (s), year of publication (in parenthesis), title of the article (sentence case), full name of Journal (in italic), volume, issue number (in parenthesis), and page numbers in full separated from volume number with a colon. Where page numbers are not known, articles should be cited by DOI (Digital Object Identifier).

Examples:

Gemedo Dalle., Brigitte, L., and Isselstein, J. (2005). Plant Biodiversity and Ethnobotany of Borana Pastoralists in Southern Oromia, Ethiopia. Economic Botany, 59(1): 43-65

Tamire Geda and Mengistu Seyoum. (2013). Zooplankton community grazing rates in a small crater Lake: Lake Kuriftu, Ethiopia. SINET: Ethiopian Journal of Science 36(1): 118.

Book(s) References

Author (s), year of publication (in parenthesis), the title of the book (italic), publisher, and place of publication (city/town)

Examples:

Perrott, E. (1982). Effective Teaching: A Practical Guide to Improve your Teaching.
Longman Inc: New York.

Nair, P. K. R. (1993). An Introduction to Agroforestry. Kluwer Academic Publishers: London.

Proceedings References

Author(s), year of publication (in parenthesis), title of the publication in italics, name of the proceedings (bold font), pages, place (city/town, country)

Examples:

Sebsebe Demisse and Edwards, S. (2006). The Diversity of Vegetation Types, Agricultural Systems and Their Crops in Ethiopia. Proceedings of the Workshop on Facilitating the Implementation and Adoption of Intergrated Pest Management

(IPM) in Ethiopia, pp 92-107, Melkassa Agricultural Research Center, Melkassa, Ethiopia

Eshetu Derso, Teame Geberzgi and Girma Adugna (2000). Significance of minor diseases of Coffee arabica in Ethiopia. In: Proceedings of the Workshop on Control of Coffee Berry Disease (CBD) in Ethiopia, pp. 35-46, Addis Ababa, Ethiopia.

Thesis References

Author(s), year of publication (in parenthesis), title of the thesis, type (M.A., MSc. MPhil or PhD), University, Country

Example:

Mwavu, E. N. (2007). Human Impact, Plant Communities, Diversity and Regeneration in Budongo Forest Reserve, North-western Uganda. University of the Witwatersrand, Johannesburg.

Web References

The full URL and the date the reference was last accessed should be provided. Any further information, if known (e.g., DOI, author names, dates, reference to a source publication, etc.), should also be given.

Example:

Toni, R.L. and Culvert, L.L. (2003). Safer Hospital Stay and Reducing Hospital-Born

Infections. Health Scout News. http://www.healthscout.com, (accessed January 9, 2010).

Other Important Rules

Length of an Article

Manuscript should not exceed 8,000 words, including references and the abstract. The abstract should be provided in a separate page.

Use the following formats for manuscript submission.

Heading

The headings and sub-headings starting with "1. Introduction", appears in upper and lower case letters and should be set in bold and aligned flush left. All headings from the Introduction to Acknowledgements are numbered sequentially using 1, 2, 3, etc. Subheadings are numbered 1.1, 1.2, etc. If a subsection must be further divided, the numbers 1.1.1, 1.1.2, etc. will be used.

The font size for the heading is 11 points bold face and subsections with

11 points and not bold. Do not underline any of the headers, or add dashes, colons, etc.

Indentations and equations

The first paragraph under each heading or subheading should be flush left, and subsequent paragraphs should have a five-space indentation. A colon is inserted before an equation is presented, but there is no punctuation following the equation. All equations are numbered and referred to in the text solely by a number enclosed in a round bracket (i.e., (3) reads as "equation 3"). Ensure that any miscellaneous numbering system you use in your paper cannot be confused with a reference [4] or an equation (3) designation.

Tables and figures

To ensure a high-quality product, diagrams and lettering must be either computer-drafted or drawn using India ink.

1. **Tables**
    - Tables and graphs should be of reproducible quality. They should include only comprehensive captions and not duplicate material presented in the text. Moreover, they should be given short titles, and properly labeled, and carefully drawn. All sources should be placed under the table. Furthermore, each table must have a caption at the top and fully showing the content with the table numbered in Arabic numbers (i.e., Table 1, Table 2, etc.).

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    - Figures should contain numerals as captions at the bottom of or below the figure. Figure numerals and colon should be in bold, and the caption in the normal case. Each figure must be fully cited if taken from another source, and referred to in the body of the article. Colored figures shall be used only if it is very important.

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