Impact of Digital Financial Inclusion on Rural Revitalization in Tanzania

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

Review Article

ABSTRACT

Technology has changed the financial industry through digitization, pushing financial services to be included. A sustainable rural economy has been developed due to the expansion of digital financial inclusion, which also significantly contributes to the revitalization of rural communities. This paper analyzes the theoretical connotations and mechanisms related to the study of the impact of digital inclusive of finance on rural revitalization in Tanzania; it empirically investigates the relationship between digital inclusive finance and rural revival by combining data at a national level in Tanzania. This study shows that digital inclusive finance can effectively promote the development of rural revitalization. By employing a time series model to measure the relationship between the digital inclusion of finance and rural revitalization. However, due limitations such as data unavailability of most years due to the nature of the context being new in Tanzania and Africa as well; this paper highly recommends the development of rural digital infrastructure, enhancing the digitalization of inclusive finance with the aid of digital technologies, expanding the breadth and depth of digital inclusive finance services in rural areas, especially in economically underdeveloped regions, to promote the comprehensive and high-quality development of rural areas effectively.

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1. INTRODUCTION

Digital technology has played an essential role in rural economic development through the advancement of science and technology; the adaptation of financial inclusion in rural areas through digitalization is still not sustainable, especially in developing countries like Tanzania. Within the context of the digitalization of financial services and financial technology, to fully implement rural revitalization strategies in rural Tanzania, bridge the gap between rural-urban areas, rural financial inclusion, rural industrial revival and rural living standards, this paper investigates the role of digital inclusion of finance on rural revitalization in Tanzania.

Access to finance is frequently identified as a critical aspect in long-term poverty alleviation, yet expanding access to the poor remains a significant barrier. Agriculture is the backbone of Tanzania's economy. According to the world bank report, despite its low productivity in 2021, GDP increased by 4.90%, up from 4.8% in 2020 [1] . Representing the future of finance, digital financial inclusion has gradually become one of the fundamental driving forces in promoting high-quality economic development.

On the one hand, digital inclusive of finance plays an essential role towards poverty alleviation and broadly encourages rural revitalization. Today, small and medium sized businesses (SMEs) are known for their widespread use of mobile technology, high levels of connection, ubiquitous computing, and contactless technologies, which give customers new ways to shop [2]. Agriculture modernization will be applied by utilizing IoT data analytics in the agricultural industry [3] to meet the rising food demand and boost the amount and quality of crop production from crop fields.

Members of the Alliance for Financial Inclusion reaffirmed the urgency and significance of financial inclusion at the Global Policy Forum (GPF) 2011—held in Rivera Maya Mexico. They acknowledge the critical role that financial inclusion policy plays in bringing stability and integrity, in combating poverty, and in fostering inclusive economic growth in developing and emerging nations. The Declaration emphasized the value of peer-to-peer learning and knowledge sharing among financial regulators and legislators in order to support the creation and execution of creative and pertinent policy solutions. Tanzania promised to use mobile banking and other measures to increase the percentage of its people with financial access to 50% by 2015. It was also among the first nations to sign the Maya Declaration [4].

It is shattering the constraints of conventional inclusive finance. On the other end, it has enabled Financial institutions to play their role in providing better financial services to rural areas, farmers, and small and micro enterprises. Digital inclusion of finance in Tanzania is majorly associated with gender disparities. Mobile phone money services have played a significant role in increasing access to the digitization of formal financial services in Tanzania, with considerable success in adopting M-PESA a mobile money service first launched in Kenya.

A National Financial Inclusion Framework was established in Tanzania with the bold objective of granting access to more than half of the population by 2016. Compared to a sub-Saharan African average of 24 percent, only 17 percent of Tanzanians had access to formal financial services accounts as of 2012. Nearly 43% of people actively use mobile money services, up from 63 to 90 per cent of the population nationwide between September 2012 and September 2013. Along with achieving 50% account ownership by 2016, the national framework seeks to reach 50% regular usage, 25% of individuals with formal savings accounts holding at least two weeks' worth of income, and 25% of adults with electronic personal financial records [5].

Rural revitalization goes hand in hand with poverty alleviation, and Tanzania has achieved significant strides in increasing usage and access to financial services. The percentage of residents in urban regions who live 5 kilometers or less from financial services has increased. About 78 percent of people reside in rural areas and are 5 kilometers away from financial service providers. In 2009, 55% of people could not access financial services. User's expectations might not be met if there is a demand-supply imbalance, regardless of steps taken to increase access to formal financial services. Tanzania is still gender-neutral when it comes to the inclusion of financial services, and gender disparities in

financial inclusion undermine women's crucial contribution to the reduction of poverty and economic advancement [6].

Asian Development Bank (2017) states that digital financing is increasingly regarded as increasing access to financial services and promoting financial inclusion [7]. Digitization has made it possible for people in poverty to interact with suppliers of financial services. The digital financial sector has demonstrated that expanding financial inclusion is a success. The HBS 2017-2018 RESULTS SHOWS 8% poor population resides in rural areas showing an increase of 84.1% in the 2011 - 2012 survey. This research is essential as it enriches the role of digital financial inclusion towards the total revitalization of rural and eradicating poverty at the country level in Tanzania [8].

According to Global Financial Inclusion (Global Findex) Database 2017, financial inclusion is essential to eradicate poverty and achieve inclusive economic growth. Little was known regarding the degree of financial inclusion and how some groups, including the underprivileged, women, and residents of rural areas, were shut out of official financial systems [9]. Digital finance has overcome the time and spatial limitations of traditional finance. It increases service coverage, deepens user engagement, and lowers transaction and operational costs. In previous research, financial progress has been found to enhance environmental quality and the standard of living, especially in rural areas.

Tanzania has an expanding network of businesses that accept payments made with mobile money from various mobile network operator (MNO) wallets and bank accounts; hence, it has a vibrant (DFS) digital financial services market with enormous potential for financial inclusion. Therefore, looking into the core mechanisms and development of digital financial inclusion on rural revitalization at a country level in Tanzania is crucial.

Rural finance is essential for reviving pastoral resources, fostering the industrialization and scale of agricultural output, and achieving agricultural modernization since it is a vital component of the structural transformation of the agricultural supply side. Currently, rural areas in Tanzania experience issues with financing and expensive financing for agriculture because of the relative use of the traditional inefficient rural financial system, which severely limits the scale and production efficiency of agricultural production and the growth rate of the rural economy.

This paper focuses on the role of digital inclusive finance in promoting rural revitalization by taking Tanzania as an example and providing practical and possible development recommendations. First, this paper focuses on the integration development of inclusive finance and analyze it from the perspective of rural revitalization while improving the quality of inclusive finance and expanding the breadth of usage of digital financial services. Second, in terms of research objects, unlike other research papers on digital inclusive of finance focusing on provincial and regional levels, this paper focuses on Tanzania as a whole, making the development proposal more targeted.

This study examines the digital inclusion of finance in Tanzania and its relationship with rural revitalization, whether or not Tanzania can achieve rural revitalization through digital inclusion of finance. The researcher proposed to investigate the impacts of digital inclusion of finance on rural revitalization; specifically, on the following objectives are aimed to;

- Analyze the mechanisms of developing digital financial inclusion on rural revitalization in Tanzania.
- Investigates impacts of digital inclusion of finance on rural revitalization.
- Relationship between digital inclusion of finance and farmer's usage in rural Tanzania.

Africa must develop its agriculture and the surrounding rural economy; if done correctly, it would generate the necessary number of jobs, prosperity, inclusion, food security, crisis resilience, and social and political stability. Therefore, we must inevitably strive to develop a new modern, integrated and coordinated development of inclusive finance that will create rural revitalization. The innovation of inclusive finance is highly cross-integrated with the development of contemporary society. Setting up financial services is required for organizations that promote rural revitalization work, economic divisions dedicated to rural revitalization, and other institutions. Moreover, effective poverty reduction and coordination of rural revitalization efforts must be made. The ability to coordinate rural revitalization efforts must be substantially improved [10].

Expanding the scope of development and improving the quality of inclusive economic growth can be achieved by bridging the gap between digital inclusion of finance and promoting integration and coordinated development in rural areas in a particular subject. This study's primary aim is to analyze the role of digital inclusive finance on rural revitalization in Tanzania. Consequently, the objectives operationalized from the main aim entail Determining specific mechanisms that underlie digital inclusive finance's role in rural revitalization. To ascertain farmers' willingness to adopt and use digital financial inclusion services.

Therefore, this paper aims to answer the nature of these questions upon completion and provides suggestions and measures addressed to achieve rural revitalization in Tanzania. this paper seeks to evaluate the systematic study of these questions from a theoretical level and help to enrich the connotation of the study of the impacts of inclusive digital finance on rural revitalization in Tanzania and yield the results. According to a report by the World Bank, Tanzania has maintained stable economic growth as it achieved a middle-low economy status in 2022 [1]. Therefore this paper focus on Tanzania because; Tanzania's current president swore on march 19, 2021 to effectively support Tanzania 2025 development visions [11] which include:

1) enhancing science, technology, and innovation capability in rural areas and the country.
2) Strengthen social development and poverty reduction measures to increase inclusive economic growth.
3) productive potential enhance for young people, women, and persons with disabilities
4) Ensure access to domestic revenue and good management of public spending to support the nation's financial development.

Therefore, the paper highlights the impact of digital inclusion of finance for rural revitalization. Additionally, there's little research on rural revitalization and digital inclusion of finance. Therefore, this paper aims to be a stepping stone for researchers back at home Additionally, this plays a role towards policymakers and management of companies or institutions using digital inclusive finance, thus could refer to the practical implications and making strategic decisions to combat future challenges to revitalize rural communities fully. Inclusive

finance services such as mobile payment options against physical cash, this paper highlights the significance of digital inclusion of finance in Tanzania, using data from the World Bank Global Findex [12].

This paper helps to bring light to the rural population, explains the main advantages of incorporating financial inclusion into the nation's economy as a whole, highlights the risks and actions required to achieve rural revitalization in Tanzania and enables the government to bridge the gap between rural and urban areas. Besides, this research will explore barriers representing the problems facing the rural communities adopting digital inclusive of finance for their daily retail transactions and what significant improvements should be assumed to bridge the gap.

2. LITERATURE REVIEW

2.1. Rural Revitalization

Financial development considerably contributed to rural revitalization; there was a threshold impact, and the promotion effect grew as rural per capita disposable income improve [13].

2.2. Digital Inclusion of Finance

Digital inclusive finance has been characterized as the digital access to and usage of legal services by underserved and excluded populations due to the widespread popularity of M-Pesa, a mobile payment system in Kenya and Tanzania. The evolution of financial inclusion has reached a point where digital financial inclusion emphasizes the significance of ICT in extending the scope and deepening the reach of financial services after varying stages of microcredit, microfinance, and financial inclusion [14].

Mandira Sarma refers to the procedures used to create the UN human development index, which uses financial services accessibility, bank penetration, and use as the primary indicators to compare various nations, the basic financial status of Pratt & Whitney Despite the growth of the study object and content, there is still little coverage, especially in cutting-edge digital finance Commercializing smallholder agriculture and expanding access to financing need digital technologies[15].

According to an m-banking (mobile banking) awareness and usage study, most of Kenya's

smallholder farmers use the technology to acquire financing for agriculturally related operations.

According to Kirui, m-banking gives smallholder farmers access to investment capital for buying high-quality seeds, farm equipment, fertilizer, and pesticides, which boosts output and income [16]. Grossman and Tarazi discovered that digital finance could help Kenyan farmers raise their income by easing payments and smoothing consumption [17]. Based on an empirical investigation of India's developing economy, Dahiya and Kumar discovered that digital financial inclusion could lessen income inequality in rural areas [18].

To promote consumption, particularly for low-income individuals residing in third- and fourth-tier cities, digital finance primarily encourages household consumption through transmission channels such as improving convenience, improving information transparency, enriching the use of funds, and increasing a sense of security [19]. According to Nagarajan and Meyer (2006), "The new rural finance paradigm is premised on the fact that rural people are bankable [20]."

Michael Chibba (2009) states, "Financial Inclusion is an inclusive development and poverty reduction strategy that manifests as part of the emerging FI-PR-MDG nexus. However, given the current global crises, the need to scale up Financial Inclusion is perhaps more important as a complementary and incremental approach to meet the MDGs than at any other time in recent history [21].

Raghuram G. Rajan (2009), "A Hundred Small Steps-Report of the Committee on Financial Sector Reforms" Financial Inclusion, broadly defined, refers to universal access to a wide range of financial services at a reasonable cost. These include banking products and other financial services such as insurance and equity products [22].

According to the Fin scope (2017) survey, 12% more people live in rural areas within 5 miles of a financial access point. Within a 5-kilometre radius, mobile money agents constituted most of those providing financial services, with 55% working for multiple providers [23].
The fact that two-thirds of mapped bank agents are also mobile money agents demonstrates how standard the agent model is for providing financial services in Tanzania. Despite substantial advancements in connectivity and accessibility of digital financial services, Tanzania continues to fall short of its potential to utilize digital communication and technologies to promote economic growth, creation and providing services [24]. A new development paradigm for financial inclusion has been purchased because of the convergence of digital technologies and finance [25]. Guang Liu's (2021) Research on "Determinants and Mechanism of Digital Financial Inclusion Development: Based on Urban-Rural Differences." investigates the difference between urban and rural areas in the determinants and mechanisms of digital financial inclusion development [26].

Financial services customers, digital finance providers, governments, and the economy all gain from digital finance and financial inclusion, including increased access to financial services and finance among the poor, lowering the cost of financial intermediation for banks and Fintech providers. Rising aggregate government spending is necessary for poverty alleviation, especially in developing countries [27]. Hence this paper aims to bring light on the part of Tanzania and to examine the significance of digital financial inclusion in Tanzania's economy; whether it brings positive or negative consequences towards rural development, this paper aims to enrich this sector.

In conclusion, many researchers have focused on studying the rural economy and the financial demand and supply in the process of rural revitalization from their perspectives. Even fewer have studied it from the perspective of the development of inclusive digital finance, and even fewer have mitigated economic growth, social welfare, and quality of life to comprehensively consider the mechanism and evaluation of the impact of digital inclusive financial services on rural areas.

2.2.1 Digital inclusive finance promotes rural revitalization

According to research on "Revitalization of Rural Empowered by Inclusive Digital Finance," finance development can effectively improve rural development and empower rural revitalization. Still, due to limited financial support and innovation, the rural areas are challenged with accessing financial services and improving

the availability of financial assistance through the supply of financial services that can help reform and drive consumption to improve risk resilience, promote the local level and enhance inclusive development.

2.2.2 Digital Inclusion of Finance Alleviates Poverty

The reduction of poverty and the revitalization of rural areas are directly correlated. The question is, how effectively can rural revitalization alleviate poverty? The rural economy can be developed through the digital inclusion of financial services if well promoted. To guarantee that services will be offered over the long term, all financial services in the rural economy must be provided sustainably. However, for rural communities to benefit from access to finance, non-financial services frequently need to be provided in addition to financial services. The development of DIF enhances the income of rural residents, resulting in the income growth effect [28].

Promoting financial education, self-employment and agricultural extension services, or connections to local health groups can achieve rural residents' living standards; however, this positive effect is not sustainable. Lack of financial empowerment can increase the risk of over-indebtedness and put disadvantaged communities at even greater risk.

According to the Tanzania Mainland Household Budget Survey 2017-18, Key Indicators Report [29], Urban and rural demographic disparities are apparent on the Tanzanian mainland. 81% of the impoverished people live in rural areas, and 16.1% in other urban areas; therefore, there's a need to balance the rural-urban gap, as shown in Fig. 1.

Tanzania's number one objective in its list of sustainable development goals is to end poverty in all its displays [30]. Financial inclusion can significantly help farmers' incomes rise [31]. The growth of digital inclusive finance has considerably aided the modernization of the region's industrial structure and has a favorable overall impact on that modernization [32].

2.3 Empirical Review

2.3.1 Tanzania's efforts towards digital financial services

Tanzania's degree of financial inclusion has significantly increased during the past ten years. As shown in Figure 1, since 2009, the financial exclusion level has nearly decreased by half. These accomplishments result from the quick uptake and use of digital platforms that provide financial services, mobile money services, a permissive legislative environment, and significant private sector investments in distribution ecosystems and marketing. Notwithstanding these successes, there are still a lot of individuals who are financially excluded (28%) as shown in the figure above, primarily those who live in rural regions, smallholder farmers, young people, and women. Moreover, a significant discrepancy between market supply and demand for financial services has been noted.
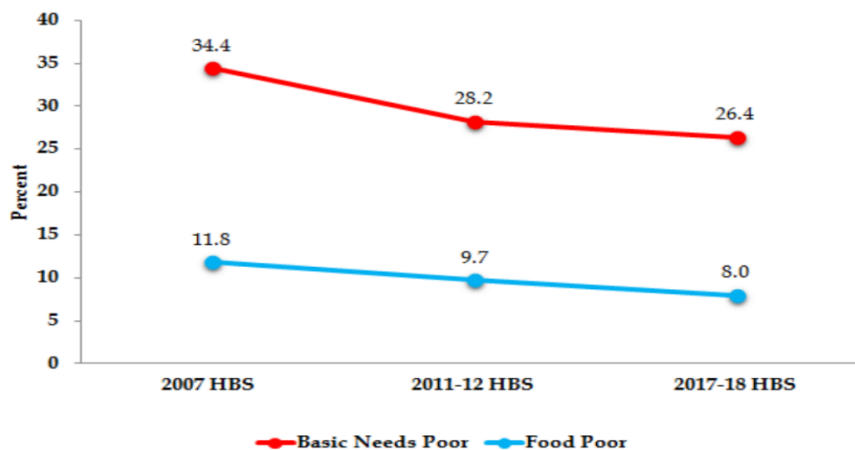

Fig. 1. Poverty trend, Tanzanian Mainland, 2007-2018
Source: 2017-2018 household budget survey

Tanzania has made great strides by investing in digital banking infrastructure and regulations. A National Financial Inclusion Framework was created to develop and implement innovation, address risks from digital adoption, and boost financial inclusion and resilience. The current President, Samia, emphasized promoting financial inclusion by discussing connectivity, digital IDs, interoperable and cost-effective payments, digital literacy, and data governance and privacy.

Coordination within the government and with the commercial sector can happen. Promoting a fintech ecosystem that supports finances is the final step, along with considering setting up an innovation office or sandbox to determine how to interact with the larger market formally.

The widespread use of digital inclusive services such as mobile electronic payment systems for commercial activities involving business-to-consumer or business-to-business entails systems with characteristics that range from globally accepted easy-to-use accompanied with the necessary level of security.

Over the past ten years, Tanzania has seen a considerable improvement in financial inclusion. The percentage of financially involved adults (aged 15+) climbed from 17% in 2011 to 52% last year, according to the most recent World Bank Global Findex (2021).To reach the 48% of individuals in the nation who are still unable to access formal financial services, including a gender disparity of 13 percentage points, there is still more work to be done [33], for consumers and SMEs and rural residents' ability to be able to carry out financial inclusion transactions at anytime and anywhere, which is the most distinct advantage of mobile e-payments as opposed to only e-payment systems for developing countries, like other new technologies financial inclusion services.

2.3.2 The impact of digital inclusive finance on rural revitalization

Digital inclusive finance can assist especially small market economies, businesses, and rural industries in getting financing loans by mitigating the "long-tail impact" in the financing process [34]. By making it possible for services like Farmers' Low-Cost Digital Insurance. In Tanzania, farming has always been a risky endeavor. The diligent farmers who grow many vital foods that feed their nation and the rest of

the globe have continuously operated their businesses on a limited budget, with hardly any funds for seeds and other supplies, with little to no security in harvesting is successful.

To lessen the financial burden of the inclement climate on these farmers, efforts to reach out to the rural areas, especially to farmers, should be implemented with an affordable, digital insurance service. Specifically, through the channels of economic effectiveness, urban and rural structure, green ecological development, the harmony of people's livelihoods, and innovative development potential, digital inclusive of finance plays a significant and beneficial role in promoting high-quality rural development [35].

Traditional financial services have benefited from technological innovation, such as the introduction of new digital financial services like online loans. These services directly target socially vulnerable groups and improve transaction frequency and convenience in remote locations, as well as the possibility of saving and the ability of small- and medium-sized businesses to access bank credit. Digital inclusion of finance has widened township government financing channels based on its inclusive qualities so that money can be used to improve rural people's livelihoods over time and foster harmony.

The traditional types of financial products and service modes have been altered by the digital inclusion of finance, which has also promoted the modernization and upgrading of rural businesses, provided financial support for enterprise innovation and R&D, and enhanced rural areas' innovation. Digital inclusive finance can encourage the creation of county enterprises through improved financing and mobile payment [36]. Deepen local advantages, build a mobile financial network system, and promote industrial integration.

2.4 Challenges Facing Digital Inclusion of Finance in Tanzania

Challenges such as financial exclusion resonate with the digital inclusion of finance in Tanzania. According to the national bureau of statistics survey, Tanzania has a population of 61,741,120 million. Women occupy majorities of the people, but women are still the most excluded in terms of financial inclusion. Today, small and medium-sized businesses (SMEs) are known for their widespread use of mobile technology, high levels

of connection, ubiquitous computing, and contactless technologies, which give customers new ways to shop [2].

Countries especially developing counties like Tanzania must adhere to a multi-stage process of digital financial inclusion customers especially those in the rural areas aren't expected to migrate from a cash environment to a digital economy in a blink of a night. Regardless the gradual development in the use of digital financial services Tanzania is still behind in comparison to the use of the services and its economy in general. The connectivity in the poor and rural areas in Tanzania need a sustainable communications infrastructure to enable customers and mobile agents to communicate with the provider's transaction authorization system through a mobile phone or other digital interface.
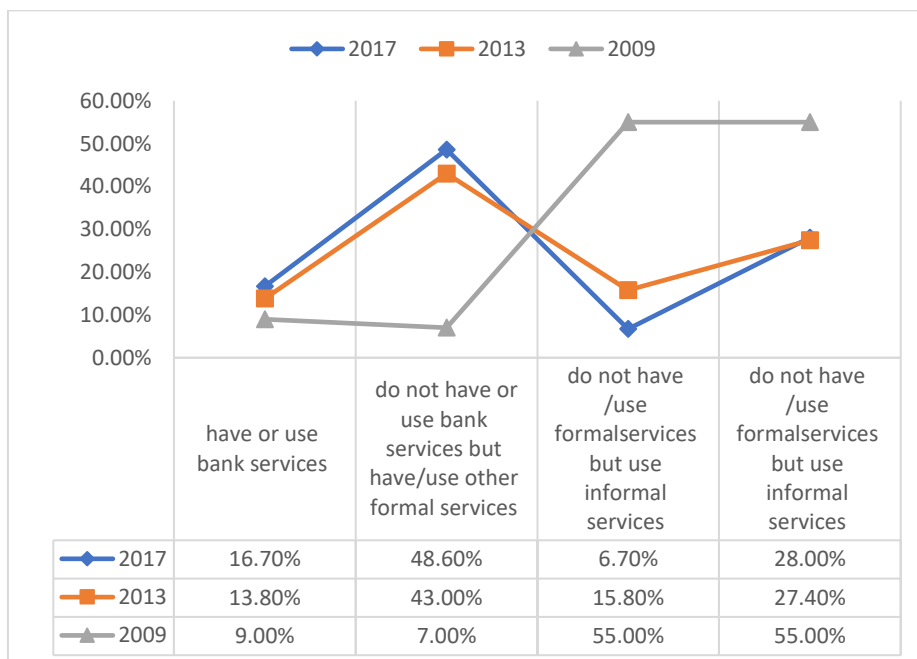
Mobile penetration in developing countries has gradually Increased evident from M-Pesa in Tanzania and Kenya over the last decade and these networks are projected to grow steadily in coming years. Domestic remote payments have led mobile money systems products, serving more than million active customers. Through this penetration, Tanzania can adopt and implement risks isolation posed by payments. Policymakers can utilize the assets of non-banks, such as mobile operators and fast-moving goods

companies, to extend digital financial services networks into poor and rural communities creating an environment for Rural revitalization development.

3. THEORETICAL MECHANISM

world bank publication based on the G20 Global Partnership for Financial Inclusion (GPFI) Issues paper (2014) stated, "Digital financial services and cutting-edge technologies can offer a comparative advantage, particularly for expanding outreach to unbanked/remote regions and lowering the cost of financial intermediation", Remittances and financial inclusion play a crucial role in enhancing the development of rural communities' livelihoods [37].

With the rapid development of digital money, every citizen in both urban and rural areas can benefit equally from scientific and technological progress. Traditional financial development frequently ignores the financial demands of rural areas and vulnerable individuals, causing farmers to face funding issues. Additionally, it gives financial assistance in selecting agricultural production modes; therefore, digital finance is the critical path to rural revitalization, and the inclusive effect of digital finance plays a vital role in realizing the advanced development of rural areas.

	have or use bank services	do not have or use bank services but have/use other formal services	do not have /use formalservices but use informal services	do not have /use formalservices but use informal services
2017	16.70%	48.60%	6.70%	28.00%
2013	13.80%	43.00%	15.80%	27.40%
2009	9.00%	7.00%	55.00%	55.00%

Fig. 2. Access and Usage of Financial Service
Source: Fin scope, Tanzania

Millions of low-income consumers are switching from strictly cash-based to formal financial services. Economic growth and stability are advantages of this development, both for the customers and the economies in which they and their families live [38].

This paper analyzes the theoretical mechanism of the influence of digital inclusion of finance on the development of rural areas; it considers the effects of the adaptation of digital financial services that will impact the lives of the rural residents and their activities as well as their source of income. Emphasis is put on technological innovation and agriculture modernization by realizing the farmer's contribution to rural revitalization through digital inclusive of finance. Digital inclusive finance has proven to impact efficiently and effectively rural areas through digitalization that has powered technological innovation. There's no significant linear relationship between the development of digital inclusive finance and rural revitalization, mainly because rural areas have low human capital and a majority of the population is middle-aged and elderly groups.

Digital inclusion of finance has become a hot trend; it increases the availability of funds for rural communities, farmers, and entrepreneurs and stimulates regional economic development, moving towards a revitalized rural society. The local areas can attract outstanding talents for entrepreneurship and lender employment and financial knowledge to youth and women and use them to improve the financial services system in the rural areas and enhance financial inclusion.

3.1 Hypothesis Development

According to IMF(2017), AFDB(2017) [7], and the world bank statistical analysis report showed that Tanzania has a better economy compared to those of neighboring countries like Kenya and Uganda, with a leading GDP of 6.8% regardless of these massive results Tanzania falls short in terms of financial inclusion compared to its neighboring countries, as different researches have outlined the positive relationship between digital financial inclusion and economic growth thus its vital for Tanzania to take a role and invest in the sector so as, to promote a strong economy hence hypothesis is formulated respectively [7].

Tanzania is still a developing country aiming to achieve a cashless society, and improving the digital sector is part of Tanzania's development agenda. With mobile payment being farmers' most prominent form of inclusion, there's been a linkage between people, service convenience, privacy and security, and perceived easiness. The study proposes the following hypothesis;

(1) H1a: There is a positive relationship between farmers and the digital inclusion of financial services.
(2) H1b: There is a negative relationship between farmers and the digital inclusion of financial services.
(3) H2: Digital financial inclusion development can significantly contribute to rural revitalization.
(4) H3: Rural regeneration will hinder by digital financial inclusion in the short term but will benefit from it in the long run.

Digital inclusive finance helps to create a new pattern of industrial prosperity, slows down and improves the shortcomings of traditional finance in terms of service cost and scope, and provides more financial support for industrial development. It also effectively promotes rural industry integration, contact, and excellent prospects for upgrading the industrial value chain [39]. Through three channels—increasing farmer income, fostering urbanization, and enhancing financial development—digital inclusive finance raises the degree of cultural consumption of rural communities [40].

Due to cost-profit considerations, financial institutions often ignore rural areas; consequently, expanding digital inclusive finance can provide clients in remote locations with simple and effective services. The main objectives of digital inclusive finance include making it easier for rural and remote areas to access specialized financial services by improving targeted financial products and increasing the number of service outlets. The range of available financial assistance should be widened and deepened. We encourage the expansion of investment in rural regions, which in turn fuels the economic growth of such areas by raising rural savings and building rural capital.

Digital inclusion of finance helps minimize the entry barrier for traditional financial services, mitigate the effects of rural areas and agricultural financial exclusion, fix flaws in the financing, and offer better financial help for rural industrial development; therefore, digital inclusion encourages the total makeover of rural areas.

Digital inclusion promotes good governance for the local governments in rural areas. It provides the rural household with safe credits and secure insurance, boosting the life stability of rural households, on the one hand, digital inclusive of finance.

4. MODEL SETTING

Digitalization has played a massive role in transforming the financial industry and can promote the transition to a low-carbon economy by advancing innovation and entrepreneurship. According to the financial sector, digital inclusion in finance significantly contributes to employment. Financial inclusion fosters enterprise development, reduces the urban-rural divide, increases women's economic participation, and benefits small market economies (SMEs)."

First, we study the impact of digital financial inclusion of finance on rural revitalization through different dimensions; on the one hand, digital inclusion of finance proves to have a positive relationship with education, especially in the small market economy.

According to research on the impact of entrepreneurial behaviors, entrepreneurial decisions among farmers could be strongly influenced by digital financial inclusion and multidimensional education [41]. The effectiveness of consolidating and expanding poverty alleviation must be strengthened, and the rural revitalization plan must be successfully linked to properly implement the strategy [42]. First, this paper studies the impact of digital inclusive finance on rural revitalization. Considering the availability of data, the specific measurement model is designated as follows

$$RURAL_i = \alpha_0 + \beta_1 DIFI_i + \sum \beta_k CONTROL_i + \varepsilon_i \quad (1)$$

The explanatory variable (RV) represents the level of rural revitalization, (DIFI) represents the level of digital inclusive finance, (CONTROL) is the control variable, and ε_i is the random disturbance term. Considering data availability, this paper uses a time series data model to investigate the role of digital inclusion in finance in Tanzania.

Through rural revitalization, there is a great potential to build vibrant rural areas that can attract and retain rural residents in employment,

education, and good health. The wave of urbanization that is evident in various nations has increased the urgency of bridging the social-economic and quality-of-life divide between urban and rural areas while also addressing urgent problems like youth unemployment and climate change through the promotion of green finance and agricultural modernization, heavily involving digital inclusion of financial services complete rural redevelopment is possible. Addressing these problems now rather than seeking to diminish their effects later on is much more cost-effective. The promise that rural revitalization makes to begin eliminating global inequities and give the world's most marginalized people a chance to live happy, healthy lives is more significant.

4.1 Variable Setting

4.1.1 Rural Revitalization Development Index (RURAL)

Beginning with the distinction of rural revitalization, the index system of rural revitalization development level is based on research findings of the comprehensive evaluation of rural revitalization strategy, based on the principles of comprehensiveness, systematisms, comparability, and representativeness of index selection, and considering the availability of data on rural revitalization in Tanzania this Paper constructs an evaluation index system for Rural Revitalization in Tanzania using (Meng) methods of rural revival index which was created based on evaluation index system for Rural Revitalization in Western China, including five primary indexes and 6 secondary indexes from five dimensions prosperous industry, ecological livability, efficient governance, and affluent living. The specific evaluation index system is shown in Table 1.

4.1.2 Digital Inclusive Finance Development Index (DIFI)

The limitations of traditional inclusive finance were broken with the introduction of "digital inclusive finance" at the G20 conference in 2016. Thanks to the digital industrial service platform, financial institutions can better meet the needs of decentralized and small funds, realize the sinking and diversity of service objects, and provide practical assistance for financing rural small and micro enterprises and farmers. Digital inclusive finance was formally introduced by the G20

digital Pratt & Whitney senior principles of finance, published in 2016, and offers the most extensive data to date to demonstrate the development of digital finance. Therefore, this research paper uses the G20 Financial Inclusion Indicators, and three financial inclusion measures are measured in a set of 58 indicators selected [2011-2022] years was selected respectively, depending on the data availability.
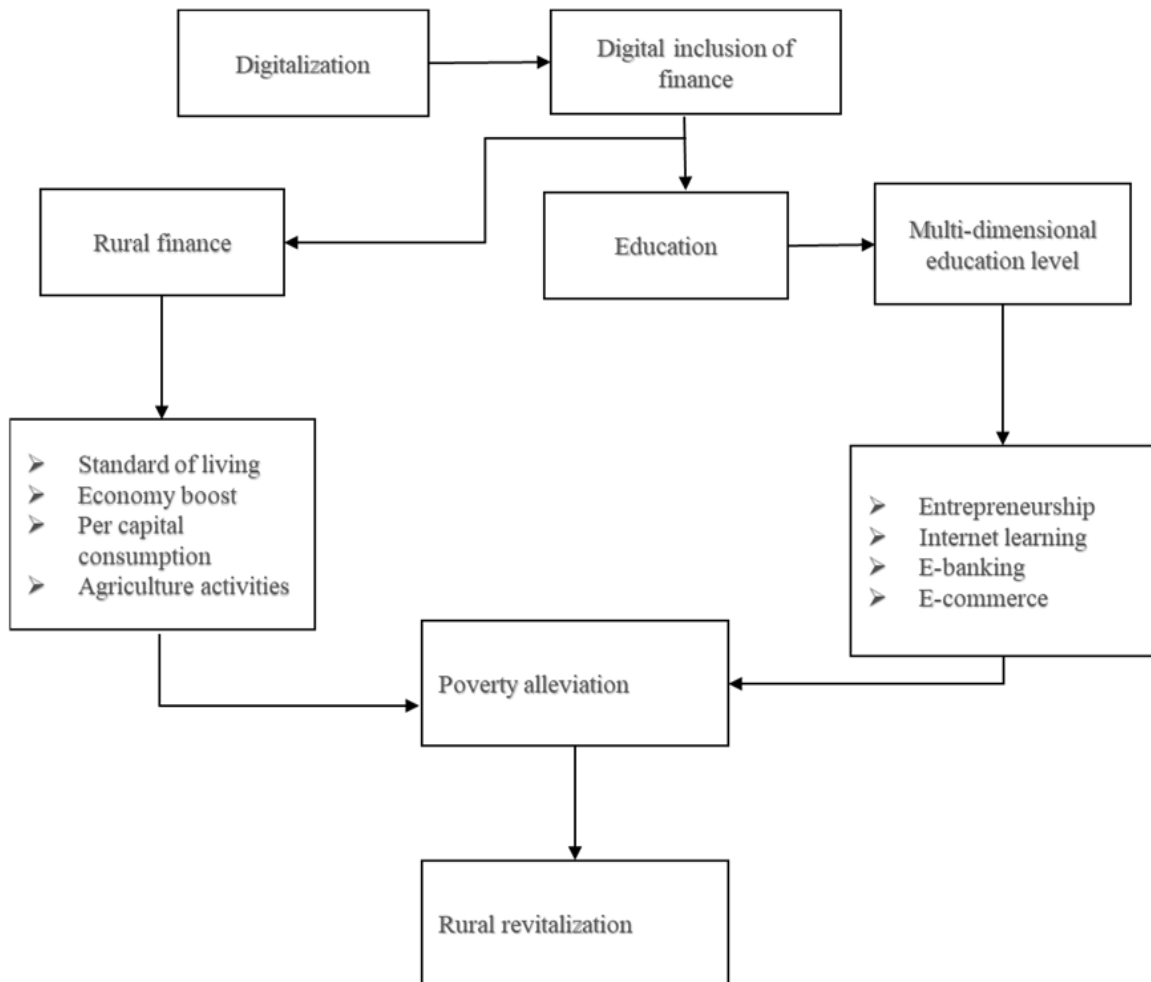

Fig. 3. Analysis on the role digital inclusive finance's role in rural revitalization

Table 1. Rural revitalization index evaluation system

Primary index	Secondary index	Index interpretation
Industry prosperity	Rural production benefit	Per capita gross value of agriculture, forestry, animal husbandry and fishery.
Ecologically livable	Natural ecological situation	Agricultural nitrous oxide emissions (thousand metric tons of CO2 equivalent)
Rural civilization	Education level	Literacy rate
	Cultural and consumption level	The proportion of expenditure on education
Effective Governance	The gap between urban and rural areas	No available data
Affluent life	Income level	Households and NPISHs Final consumption expenditure per capita growth (annual %)

4.2 Control Variables

Regional economic development level (GDP**)**, Rural revitalization is more affected by the macroeconomic climate of each region; hence this article employs GDP represented by the percentage of the Annual Percentage Growth Rate based on Constant Local Currency, Fiscal Expenditure Level (GOV) measured by the credit to agriculture, forestry, and fishing in Tanzania is employed in this paper to measure the ratio of government financial spending on agriculture and private enterprises to GDP, indicating the amount of financial support rendered to the rural areas because financial support for rural regions aids in the successful execution of rural revitalization strategies.

This paper selects the degree of openness to the outside world (Open) expressed by the proportion of merchandized trade to the GDP per capita. Human capital level (HR), Without a high level of innovation, it is impossible to build digital inclusive finance or revitalize rural areas, and the amount of human capital affects the level of creation; as a result, this study employs the (Edu) and uses the number of students who at least completed primary, 25+ years in rural areas as a proportion of the total rural population. Lastly, this paper selects agricultural modernization (Arg) expressed as the proportion of rural electricity consumption.

4.3 Data Description

Regarding the selection of the sample, considering the availability of data, this paper selects Tanzania sample data for examination. (2011 – 2022) was used as the observation point to obtain relevant data at a country level. The data sources used in this paper are extracted from the world bank official database, the Tanzania national bureau of statistics (NBS), The International Monetary Fund official database (IMF) and the digital inclusive finance development index was extracted from the global Findex database for financial inclusion.

4.4 Data Analysis Plan

To test the correlation between digital inclusion of finance and rural revitalization. A time series data model was used and Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) unit root tests is used to conduct a test to test whether the data is stable; the var regression model

was conducted to check the relationship between the dependent variable and the independent variables as well predict the state of rural revitalization and digital inclusion of finance if it's vital in Tanzania or not. Lastly, descriptive statistics of the variables were presented and discussed accordingly.

5. DATA ANALYSIS

5.1 Descriptive Statistics

As shown in the table below, descriptive statistics was conducted, and the values for the chosen variables for Mean, Standard deviation (SD), Minimum (Min), Median, Maximum (Max) are shown respectively and, the number of observations is 12, respectively. The mean, standard deviation, minimum, median and maximum of government governance represented by gov are higher than the other variables shown in table 2 below**.**

5.2 Simple Regression Analysis

Simple regression without considering the nature of the time series, * means significant at a confidence level of 0.1, ** indicates significant at a confidence level of 0.05, *** indicates significant at a confidence level of 0.01, t values in parentheses, positive correlation negative correlated negative correlation, results shows that digital inclusion of finance (DIFI) has a significant positive effect on Rural Revitalization. Whereas other variables show a significant negative relationship with rural revitalization, as shown in the table below, the same reason can be obtained from the analysis of other control variables.

5.3. Unit Root Test

The unit root test is conducted to test whether the data is stable; the null hypothesis is the existence of a unit root. As shown on table 4 below, rural revitalization, (rural), p=0.1263, is greater than 0.1, thus is not significant. Therefore, we cannot reject the null hypothesis. the following table summarizes the root test for all variables (ADF and PP methods were used to conduct the tests, and the results were consistent). According to the results, Only DIFI and OPEN reject the null hypothesis, and all other variables need to be differentiated. After the differentiation, a second unit root test was conducted, respectively**.**

Table 2. Descriptive statistics

VarName	Obs	Mean	SD	Min	Median	Max
rural	12	26.700	0.988	24.977	26.644	28.742
difi	12	2.394	0.131	2.051	2.450	2.459
edu	12	88.915	10.165	64.791	89.008	98.366
lngdp	12	24.672	0.204	24.269	24.667	24.939
arg	12	13.825	7.942	1.735	16.866	21.953
open	12	29.817	7.794	23.088	25.961	44.822
gov	12	559.281	74.433	461.900	544.050	672.800

Table 3. Simple regression analysis result

	rural
difi	3.1524*
	(2.2087)
edu	-0.0629***
	(-4.0544)
lngdp	-6.4334***
	(-6.0807)
arg	-0.1375***
	(-4.3183)
open	-0.3501***
	(-7.5124)
gov	-0.0045
	(-1.8698)
_cons	198.3154***
	(7.9975)
N	12
adj. R^2	0.956

t statistics in parentheses* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table 4. The Unit Root Test

	ADF		PP	
	Test statistic	P-value	Test statistic	P-value
rural	-2.457	0.126	-2.468	0.124
difi	-4.965	0.000	-7.661	0.000
edu	-1.472	0.547	-1.260	0.647
lngdp	-2.519	0.111	-2.620	0.089
arg	-1.080	0.723	-1.089	0.720
open	-2.938	0.041	-3.210	0.019
gov	-1.000	0.753	-0.942	0.774

Table 5. Unit Root Test

	ADF		PP	
	Test statistic	P-value	Test statistic	P-value
drural	-3.205	0.020	-3.237	0.018
dedu	-6.125	0.000	-5.672	0.000
d2lngdp	-3.626	0.005	-3.708	0.004
darg	-3.711	0.004	-3.694	0.004
dgov	-3.782	0.003	-3.768	0.003

Table 6. Dickey-Fuller Model

	Test Statistic	Dickey-Fuller critical value		
		1%	5%	10%
z(t)	-2.232	-2.660	-1.950	-1.660

Table 7. Var regression model

	drural
L2.drural	2.0990***
	(1.8e+12)
L2.difi	523.9515***
	(1.7e+12)
L2.dedu	1.0142***
	(2.0e+12)
L2.d2lngdp	-40.3098***
	(-2.7e+12)
L2.darg	2.5534***
	(1.9e+12)
L2.open	-0.7378***
	(-1.8e+12)
L2.dgov	0.0233***
	(1.4e+12)
_cons	-1.3e+03***
	(-1.7e+12)

*t statistics in parentheses * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$*

After conducting a second unit root test, the results concluded (ADF and PP methods were used). The results as shown in Table 5 below the ADF and PP tests conducted after the differentiation show that only lngdp (p=0.005) passes the unit root test after the second-order difference.

5.4 Dickey Fuller Model

Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) unit root tests are used at each series level form and first difference. The cointegration is tested to test whether there is a long-term stable relationship between the variables, ordinary least squares were used to estimate the residual sequence method. The ADF method was later applied to test the residual sequence to observe whether it is a stationary sequence and if the residual sequence is stable. The long-term cointegration relationship between the variables exists. If the residual is not stable, then the long-term cointegration relationship between the variables does not exist.

As can be seen from Table 6 below respectively, z=-2.232 and is between -2.66 and -1.95, so the null hypothesis is rejected, the residual sequence is stable, and the long-term cointegration relationship between variables exists.

5.5 Vector Auto Regression Model (VAR)

The var regression model was conducted to check the relationship between the dependent and independent variables. Without considering the nature of the time series, * means significant at a confidence level of 0.1, ** indicates significant at a confidence level of 0.05, *** indicates significant at a confidence level of 0.01, and t values in parentheses, positive correlation, negative correlated negative correlation, results show that digital inclusion of finance (DIFI) is significantly positive, indicating that digital inclusion is vital for rural revitalization achievement.

The regression coefficient of agriculture modernization (arg) is significantly positive, indicating that agriculture modernization is needed for rural revitalization. The regression coefficient of government governance (gov) is significantly positive, indicating that good governance in rural areas is conducive to rural revitalization.

However, the regional economic development level (GDP) is significantly negative, indicating that economic development is not conducive to promoting rural revitalization, as shown in the

table above, the degree of openness to the outside world (OPEN) is significantly negative, indicating that it is not conducive to promoting rural revitalization.

6. CONCLUSION AND RECOMMENDA-TIONS

6.1 Conclusion

Rural Revitalization is a primary development strategy and cannot exist without financial backing. Traditional financial services, however, encounter numerous obstacles, making it challenging to accurately promote direct access to cash from diverse financing entities in rural areas. Rural revitalization can use financial technology to deal with rural economic issues. This study empirically examines the link between digital inclusive finance and rural revitalization development, concludes that it is possible to effectively implement a rural revitalization plan with the help of digital inclusive finance.

It can be determined through the control variables such as regional economic development level and human capital level agriculture modernization. It can be found that rural revitalization development needs the support of a good economic development environment. Modernizing the agricultural sector provides a vital route to industrialization and economic transformation. In order to ensure that far-flung and challenging-to-reach communities are not left behind, it is crucial to revitalize rural areas. Table 7 demonstrates that agriculture modernization (arg) is significantly beneficial, indicating that rural revival can be accomplished by agriculture modernization.

According to Tanzania's 2008–2014 farm–household survey, labor productivity increased progressively as a result of a decline in labor intensity. Farmers are more inclined to engage in labor and land markets. Increased agricultural productivity allows for greater surplus production, enables farmers and rural households to demand goods and services, circulates money in their communities, and strengthens the non-farm economy, which in turn helps to better promote rural areas economies and facilitate rural revitalization.

However, the regional economic development level (GDP) shows a significantly negative, relationship with rural revitalization, if there's a decline in economic development then the

country will be faced with economy imbalance which will hinder the development of rural areas indicating that economic development is not conducive to promoting rural revitalization. The government must put in place policies that will equalize the flow of revenue between urban and rural areas.

According to 2019 data on Tanzania's labor force, 65.09 percent of the country's workforce comes from the agricultural sector. Since the majority of the labor force is drawn from rural areas where agriculture is the primary economic and social activity, it is necessary to allocate investments in these areas. The degree of openness to the outside world represented by merchandized goods shows a significantly negative relationship with rural revitalization and digital inclusive of finance, its regression coefficient is -0.7378.

According to various reports and studies, between 2011–12 and 2015–16, Tanzania experienced a significant widening of its trade deficit as a result of a decline in exports, indicating that the country's agriculture sector is sustainable but the country's area of trade has a deficit, meaning there is a trade imbalance between the amount of goods exported and imported in the country.

In 2021, Tanzania recorded a trade balance of $-1.85B, a 191.96% increase from 2020. There should be more policies implemented to balance the trade while successfully promoting digital financial services like cross-border trade through e-commerce platforms to increase the trade imbalance as the situation was brought on by a decline in gold prices and traditional export of agricultural products. Considering the pillars of financial inclusion such as connectivity, technology as well as education which has shown a positive significant relationship with rural revitalization its regression coefficient is 1.0142. Digital inclusion isn't just about internet access, it's about the ability to use it thus education is vital for achieving total rural revitalization as well as development of the rural economy.

6.2 Recommendations

Based on the above evidence, this study suggests the following:

First, to further activate the endogenous power of rural development, strengthen the institutional

mechanism of digital inclusive finance. The laws, rules, and regulations governing digital inclusive finance should be maintained and improved at all levels. More investment should be allocated in the rural areas by building more infrastructure in rural areas; encouragement should be put on developing this type of financing to boost rural development within the context of rural revitalization.

Second, the government should promote financial knowledge to the rural population and urge the rural population to use the digital inclusion of finance services, which will not only improve their lives in general but also increase their income. The general use of digital inclusion of financial services promotes education also promotes poverty alleviation, as shown from the results conducted in this research paper. Developing rural supply chain finance, accelerates the development of rural financial technology infrastructure, and actively bolstering financial technology in agriculture as an outcome of supporting rural revitalization through advanced technologies that supports financial services.

Additionally, it may enhance talent and team building, increase personal information protection, prevent financial risk, and actively promote rural revival and development. More focus should be placed on balancing urban and rural growth and reducing the gap between urban and rural new infrastructure investment as the sector grows.

Thirdly, to fully support rural revitalization, strengthen and change and model innovation of digital inclusive of finance in different aspects of rural development, including industrial prosperity, ecological livability, rural style civilization, effective governance, and wealthy living. On the one hand, digital finance inclusion is needed to promote rural households effectively. The tension between commercial bank policy requirements and profitability can be better resolved by machine learning technology, which can also lessen the need for financial institutions to expand their networks and improve commercial banks capacity for risk management

However, regardless of the results drawn above, the government of Tanzania has yet to make efforts toward rural revitalization, evident from the lack of data and information on the agenda in the country; hence this paper suggests that the government should invest in research center and

take other developed developing countries like China which and create a sustainable channel of digital inclusion of finance as well as rural revitalization.

Moreover since 2012 the bank of Tanzania (BOT) published guidelines for agency banking in the country which enables banks to utilize small businesses and entrepreneurs to become an agent to the bank with ability to collect deposits, allow withdraws, facilitate transfers and open account, by facilitating capital investments and financing especially to small holder farmers and supporting their crop production, provide more credit to micro-enterprises financial literacy and business knowledge such as startups to farmers and youth living in the rural areas and empowering not only men but female youth and old population with knowledge they need to adopt and utilize their finances through digital services and elaborate them on the benefits of improvising the digital financial services.

Most people in the rural areas still use the traditional means which is cost effective but carries various risks such as robbery and theft, digital services offer security and investments which can better promote their business elevate their finances and life in general, digital financial services bares risks bout all in all benefits their local business and promote their finances, evident from the rural areas in china and other countries.

Lastly, the government should abandon the old means and look forward to promoting rural revitalization for rural areas development to achieve a society empowered by fintech Developing rural supply chain finance, accelerating the development of rural financial technology infrastructure, and actively boosting the use of financial technology in agriculture are all possible outcomes of supporting rural revitalization through machine learning technology financial services. Additionally, it may enhance talent team building, increase personal information protection, prevent financial risk, and actively promote rural revival and development.

LIMITATIONS

"Revitalization of Rural Empowered by Digital Inclusive Finance." As a new topic, with little to no available research on, this thesis was accompanied by various difficulties. First, due to data inefficiency the author collected data of various variables at a national level to conduct

empirical analysis, average value of data between two years method was used to fill up missing data. The data analysis in this thesis has only 12 observation which is due to limited availability of data. Second, digital inclusion of finance is still a new agenda in the country; therefore, not many research papers are available specifically on the context of digital inclusion finance in Tanzania. Most researches on the topic are centered on developed developing countries like China which has enough resources and enough data available.

Moreover, rural revitalization still has a long way to go before it is made an area of discussion in the country. lastly the main limitation of this paper as stated above is limited research context on the topic in Tanzania and Africa. With countries like China moving forward by implementing policies and strategies to tackle the poverty and completely transforming the rural areas into cashless moving from poverty alleviation to Rural revitalization, African countries can step forward and invest more in the agenda and take cases from successful countries to implement and emphasized on rural revitalization through digital inclusion of finance.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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