NATIONAL DEFENCE UNIVERSITY-KENYA

MASTER OF ARTS IN NATIONAL SECURITY AND STRATEGY

FINANCIAL INCLUSION AND ECONOMIC SECURITY OF EAST AFRICAN COMMUNITY STATES

STUDENT NAME: PETER MISIANI KERAGE
REG NUMBER: ND601/0042/2022

SUPERVISOR: DR ZEDEKIA SIDHA

A Research Thesis submitted in partial fulfillment for the Degree of Master of Arts in National Security and Strategy May 2023

DECLARATION

I, Peter Kerage hereby declare that this research project is my original work and has not been presented for a degree in any other University.

Signed…… Date……..

Mr. Peter Kerage

This project has been submitted for examination with my approval as University Supervisor.

Signed…….. Date…….

Dr. Zedekia Sidha

National Defence University (NDU-K)

DEDICATION

This work is dedicated to my family for their love, understanding, encouragement and support. Thank you and God bless you.

ACKNOWLEDGEMENT

I wish to express my gratitude to all those who contributed to the successful completion of this study. Special thanks to my supervisor Dr. Zedekia Sidha for his unwavering support and constructive criticism as he guided me through the creation of this thesis inspired me to go the extra mile. His invaluable scholarly comments, guidance and support that greatly shaped my research work.

ABSTRACT

Financial inclusion is a key pillar for financial deepening which a necessary condition for promoting national security and inclusive economic growth. Using panel data for the years 2012 to 2021, this paper explored the interplay between financial inclusion and economic security of East African Community (EAC) States. Three financial inclusion dimensions were considered, namely, usage, penetration, and availability dimensions. Furthermore, the researcher developed a composite financial inclusion index to assess the overall influence of financial inclusion components on economic security. Inflation rate, trade openness and population growth rate were incorporated in the models as control variables. Data was collected from the World Development Indicators (WDI) of the World Bank and the Financial Access Survey (FAS) of the International Monetary Fund (IMF). Three countries (Rwanda, Uganda, and Kenya) were selected based on availability of consistent representative data. The study employed the Generalized Method of Moments (GMM) as a data analysis model. The study established that availability dimension of financial inclusion, usage dimension of financial inclusion and composite dimension of financial inclusion significantly and positively impact economic security while penetration dimension of financial inclusion improves economic security but not significantly. Furthermore, the number of bank branches, ATMs, mobile money agent outlets, mobile money transactions, outstanding deposits and moderate inflation significantly foster economic security. Findings for mobile money accounts and bank deposit accounts weaken economic security. It is recommended that EAC governments must champion for financial inclusion in their quest to combat terrorism and other criminal activities that potentially arise from financial exclusion; increase the number of credit reference bureaus (CRBs) in subregion to deal with information asymmetry and establishment of a National Commission on Financial Inclusion under the National Treasury (NT) to synchronize financial inclusion-related laws, rules, programs, and initiatives.

TABLE OF CONTENTS

LIST OF TABLES

ABBREVIATIONS AND ACRONYMS

AFI	Alliance for financial Inclusion
ATM	Automated Teller Machine
CBs	Commercial Banks
CLRM	Classical Linear Regression Model
CR	Credit Risk
FBs	Forex Bureaus
FSD	Financial Sector Deepening
G-20	Great- 20 Countries
GDP	Gross Domestic Product
GFDD	Global Financial Development Database
GPFI	Global Partnership of Financial Inclusion
IMF	International Monetary Fund
MDGs	Millennium Development Goals

CHAPTER ONE

1.0 INTRODUCTION

Financial inclusion fosters inclusive growth, economic development, and financial diversification. In practice, it has the potential to increase poor people's access to financial services, hence lowering poverty and economic disparity. As a result, policymakers worldwide have pushed financial inclusion as a significant policy priority. With this significant global attention, it is important to evaluate the effects of financial inclusion of economic security of East African Community states and advise policy direction.

1.1 Background to the Study

A well-functioning financial system serves a significant catalyst for economic growth and development. A financial system that is inclusive allows for widespread access to adequate financial services that are likely to help the disadvantaged and other marginalized groups. The World Bank[1] defines financial inclusion as a "process which leads to ease of access, availability, and usage of the formal financial services for all members of the economy."

National security is a continuum demarcated by a dichotomy of 'state security' and 'human security'. The UNDP report of 1994 on Human Development (HDR) provided a bleak prediction that led to the conceptualization of this dichotomy. The framing of this dichotomy follows a sobering prognosis by the "1994 Human Development Report (HDR) of the United Nations Development Program (UNDP)." The report asserts that "for far too long, the idea of security has

[1] World Bank (2021a). "Financial inclusion, https://www.worldbank.org/en/topic/financialinclusion/overview"

been viewed narrowly as the defence of a state or country against threats originating outside of its borders, with military strength as the primary focus."[2]

Today's security studies, however, have experienced a significant paradigm shift and expansion from state centric security to include other securities that were not previously considered to be of security strategy relevance. In the expanded definition of security that today encompasses all spheres of society, including the economic, political, social, environmental, and military, the individual is increasingly considered as the reference point for security. Barry Buzan defines security as "freedom from military, economic, political, environmental and societal threats." The conventional state-centric definition of national security has given way to one that is more inclusive and emphasizes human security. This makes the term national security "interdisciplinary, encompassing aspects of politics, economics, socio-culture, technology, the environment, and the military." [3]

One of the most crucial aspects of national security is economic security, whether it is seen through the lens of state centrism or human security. It encompasses a wide range of topics, from the provision of essentials for human survival to the country's national economic development agenda. Buzan avers that economic security is necessary for military security since it establishes a nation's resource capacity. Economic security is used as a barometer to measure the general security of the state. Karl Marx came to the conclusion that the economy served as the cornerstone upon which the rest of society is built.[4]

---

[2] "United Nations Development Program, Human Development Report 1994, New York, Oxford University Press, 1994."
[3] Buzan, B. (2008). "People, States and Fear. An Agenda for International Security Studies in the Post-Cold War Era. 1st Edition 1981, 2nd Edition. Harvester Wheatsheaf, 1991 and 2008"
[4] Hernandez R (2014): "The Relationship of Monetary Policy to National Security. *Bangko Sentralng Pilipinas, the central bank of the Philippines Economic Newsletter*. Available at https://www.bsp.gov.ph/Media_And_Research/Publications/EN14-01.pdf"AQ

Economic security implies to a nation's capacity to maintain the levels of welfare and government authority that are considered to be acceptable. In order to promote inclusive and sustained economic growth, financial inclusion is consequently essential. Financial inclusion programs are any initiatives that provide all demographic groups with formal financial services that are available, inexpensive, and accessible. Numerous groups of people have traditionally been excluded from the official financial system.

The East African Community (EAC) countries have had tremendous economic growth during the past decade with the Gross Domestic Product (GDP) growing at an average rate of 6% annually.[5] However, a number of security issues, including numerous terrorist attacks, showed that the sub-strong region's economic growth had not yet produced shared prosperity and better living conditions for the majority of people. A key component of inclusive development is financial inclusion, but East African countries have lagged behind in this area. Financial inclusion is widely considered as a key engine for economic growth as well as enhanced economic security, of concern, however, has been understanding the extent to which economic security is shaped by including households and communities financially. Facilitating seamlessly affordable economic exchanges has been argued to be a direct benefit of rising financial inclusion.[6] The World Bank considers financial inclusion as both an alternative to credit growth and a means of sharing the gains from economic growth.

Understanding growth dynamics, on the one hand, and economic security, on the other hand, has meant going beyond drivers of output growth in the naïve growth models to interrogate how finance in general lubricates growth engine. Beginning with Adam Smith's argument that

[5] World Bank Global Economic Prospects Report 2022
[6]World Bank (2021a). "Financial inclusion, https://www.worldbank.org/en/topic/financialinclusion/overview"

self-interest was the force behind much of the evident growth through Schumpeter's creative destruction and consideration of growth as an outcome of purposed financing to recent calls for increased financial inclusion while combating financing of criminal activities and illicit financial flows, understanding the inclusion-to-growth nexus is important. Amidst these calls, however, financial services have not been accessible to all. Demirgüç-Kunt & Klapper[7] revealed that Africa's growth stagnation was an outcome of many enterprises being unbanked. This then meant that such firms could not access formal finance. Even then, there has been tremendous improvements in enhancing financial services accessibility, penetration, and usage. Recent developments in mobile money and mobile banking have served as a boost to the financial sector.

Various World Bank Enterprise Surveys (WBES) reveal that credit uptake within Africa stands at an average 34% with the Global Findex indicating that only one in 4 adults owned a formal account in 2012. Demirgüç-Kunt & Klapper argued that limited reach due to banking services sparsity and inadequate documentation hindered account ownership in formal financial institutions. This is largely attributable to an underdeveloped financial sector. Even then, as Cámara and Tuesta[8] indicated, account ownership potentially overestimates financial inclusion since an individual may have multiple accounts. Besides, the average enterprise in Africa faces minor to moderate financing challenges which potentially interfere with productive activities, engagement in commerce, and foreign trade. An overlooked issue, however, is that financial inclusivity could both offset and be an outcome of economic development.[9]

[7] Demirgüç-Kunt, Asli, and Leora Klapper. "*Financial Inclusion in Africa: An Overview*. Policy Research Working Papers. The World Bank, 2012. https://doi.org/10.1596/1813-9450-6088."
[8] Cámara, Noelia, and David Tuesta. "Measuring Financial Inclusion: A Muldimensional Index." SSRN Scholarly Paper. Rochester, NY, September 22, 2014. https://doi.org/10.2139/ssrn.2634616.
[9] Sarma, Mandira, and Jesim Pais. "Financial Inclusion and Development." "*Journal of International Development* 23, no. 5 (2011): 613–28. https://doi.org/10.1002/jid.1698."

Studies on how financial inclusion and economic security interact are widely available in literature. While some of these studies have established a substantial positive association between financial inclusion and economic growth, other studies have found a negative impact of financial inclusion on economic growth. Sharma and Kukreja[10] and Demirgüç-Kunt, Klapper and Singer[11] argued that the realization of inclusive growth hinged inclusive finance. That is, societies would reap the benefits of growth inclusively only when the poorest members are able to access financial services for the purposes of investment, consumption, or saving.

Although financial inclusion features prominently on the developmental agenda, Cámara and Tuesta argued that debate is meaningful when usage of financial services is seen as an outcome of increased inclusion as opposed to measuring inclusion using usage. That is, financial services usage coevolves with other socio-economic dynamics. High levels of human development, on one hand, induces high uptake of financial services. Legal frameworks, such as mandatory bank accounts for all adults, on the other hand, need not necessarily imply that all account owners are benefiting from the ownership. Thus, financial inclusion must be understood as characteristic of situations in which exclusion is minimal whereas access and usage is maximum. Ozili[12], nevertheless, contend that individuals, especially the poor, exclude themselves voluntarily.

In Europe, by comparing the original and new European Union (EU) member states, Huang et al.[13] demonstrated that there is a favorable linkage between financial inclusion and economic

[10] Sharma, Dr Anupama, and Sumita Kukreja. "An Analytical Study: Relevance of Financial Inclusion For Developing Nations" 2, no. 6 (2013): 15–20.

[11] Demirgüç-Kunt, Asli, and Dorothe Singer. "Financial Inclusion and Inclusive Growth: A Review of Recent Empirical Evidence." SSRN Scholarly Paper. Rochester, NY, April 25, 2017. https://papers.ssrn.com/abstract=2958542.

[12] Ozili, Peterson K. "Impact of Digital Finance on Financial Inclusion and Stability." *Borsa Istanbul Review* 18, no. 4 (December 1, 2018): 329–40. https://doi.org/10.1016/j.bir.2017.12.003.

[13] "Huang, R., Kale, S., Paramati, S. R., & Taghizadeh-Hesary, F. (2021). The impact of financial inclusion and trade openness on economic development in the European Union. In S. C. Park, C.-J. Kim, F. Taghizadeh-Hesary, &

advancement. In Asia, Singh and Stakey found a link between the financial inclusion index and economic growth that was positive. Makina and Walle[14] studied how financial inclusion affected 42 African states' economic expansion applying the system GMM dynamic panel data estimator and demonstrated a beneficial relationship between financial inclusion and economic growth. Ifediora et al[15] discovered that Sub-Saharan Africa's economic growth was significantly impacted by financial inclusion (SSA).

Within the East African region, only a handful of research interrogated economic security and financial inclusion side-by-side. These researches include Thomi & Mose[16] which concluded that economic growth fostered financial accessibility in Tanzania, Uganda, and Kenya. According to G-20 leaders, financial services accessibility among the poor enables them to overcome core developmental challenges. Tracking progress, assessing impact, identifying challenges, and suggesting policy directions to deepen financial inclusion, however, remains varied in scope. From previous research, consensus was conspicuously absent on the financial inclusion-to-growth nexus.

Despite these arrays of studies demonstrating the positive influence of financial inclusion on economic growth, some researchers have established the opposite hypothesis. The opponents draw the conclusion that a number of problems, including a weak financial system, subpar financial instruments, and inadequate policymaking, hinder the positive impact of finance on

P. Sirivunnabood (Eds.), Economic Integration in Asia and Europe: Lessons and Policies (pp. 641–664). Asian Development Bank Institute."

[14] "Makina, D., & Walle, Y. M. (2019). Financial inclusion and economic growth: Evidence from a panel of selected African countries. Extending Financial Inclusion in Africa, 9, 193–210. https://doi.org/10.1016/B978- 0-12-814164-9.00009-8"

[15] "Ifediora, C., Offor, K.O, Eze, E.F., Takon,S.M., Ageme, A.E., Ibe, G.I., Onwumere, J.U.J. (2022) Financial inclusion and its impact on economic growth: Empirical evidence from subSaharan Africa, Cogent Economics & Finance"

[16] "Thomi & Mose (2021): Financial Inclusion in East Africa: Does Economic Growth Matter? Journal of Economics, Management and Trade. 27(2): 1-8, 2021; Article no. JEMT.68331 ISSN: 2456-9216"

growth.[17] In view of conflicting findings from earlier empirical research, this study was undertaken to ascertain whether financial inclusion significantly contributes to a country's economic growth. When creating a composite financial inclusion index, mobile money-related indicators were taken into consideration. According to the author's knowledge, this is the first empirical study to use mobile money as a measure of financial inclusion in the sub-region.

1.2 Statement of the Research Problem

Extreme poverty remains persistently high in EAC with 44.2% of the population living below poverty line of 1.90 U.S. dollars per day. This means that over 134 million East Africans are in extreme poverty, most of whom are in rural areas. According to the World Bank global indicators, this figure has been climbing in recent years. Theory and empirical evidence predict financial inclusion fosters inclusive economic growth and leads to reduction in poverty and income inequality from increased access to financial services. This warrants a systematic examination of the relationship between financial inclusion and economic security in EAC countries.

With the expansion of the East African states, policy formulation, coordination and implementation have to conform the new expanded and expanding Community as a single unit. Similarly economic, and other indicators and measures of development including financial inclusion will increasingly be developed and adopted at the sub-regional to gauge both improvements of the people's well-being and the development and ultimate security of the economies of member state.

[17] "Bakar, H. & Sulong, Z. (2018). The Role of Financial Inclusion on Economic Growth: Theoretical and Empirical Literature Review Analysis. Journal of Business and Financial Affairs, 7(4)."

1.3 Research Questions

i. What is the effect of availability of financial services on economic security of EAC States?
ii. What is the effect of penetration of financial services on economic security of EAC States?
iii. What is the effect of usage of financial services on economic security of EAC States?

1.4 Study Objectives

1.4.1 General Objective

The general objective of this study was to investigate the effect of financial inclusion on economic security EAC States.

1.4.2 Specific Objectives

This study was guided by the following specific objectives:

i. To determine the effect of availability of financial services on economic security of EAC states.
ii. To analyze the effect of penetration of financial services on economic security of EAC states.
iii. To determine the effect of usage of financial services on economic security of EAC states.

1.5 Literature Review

This section reviewed relevant theories and previous research to gain an informed opinion of the issue at hand. In understanding the financial inclusion-economic security nexus, it is equally to explain what explains economic security as well as what shapes financial inclusion.

1.5.1 Theoretical Literature Review

This section discusses the theoretical principles that underpin the research. The concept of economic security and financial inclusivity enjoys widespread debate in scholarly circles. This is evidenced by the great theoretical debates that have been espoused about this concept. At the centre of their contributions rest various theories and hypotheses which inform financial inclusion's effect on economic security.

1.5.1.1 The Theory of Financial Liberalisation

McKinnon[18] and Shaw[19] considered economic development as an outcome of financial liberalization. The theory advocated for financial liberalization to increase money demand through two main channels: firstly, through supply induced demand and secondly creation of a conducive environment in the economy. They perceived that financial liberalization would be achievable when backed by economic growth. With economic growth, both financial inclusion and financial deepening will be achieved since monetization of the economy will be attained[20]. Auerbach and Siddiki[21] argued that removal of impediments to financial liberalization and integrating markets is the cornerstone for economic security.

1.5.1.2 Inclusive Growth Theory

Within emerging markets, poverty reduction is inevitably a consequence of an all-encompassing growth. Growth is inclusive when it uplifts a great majority of the poor. For this to happen, the growth agenda must be participatory enough regardless of whether the poverty being

[18] "McKinnon, R.I., 1973. Money and Capital in Economic Development. Brookings Institution, Washington, DC."
[19] "Shaw ES. Financial deepening in economic development. New York: Oxford University Press; 1973."
[20] "World Bank. Banking the poor: Measuring bank access in 54 countries. Washington DC: World Bank; 2008."
[21] Auerbach and Siddiki (2004): Financial Liberalisation and Economic Development: An Assessment. Kingston University

combatted is relative or absolute. Growth and financial inclusion are interwoven via social inclusion such that all individuals and households are brought on board (Woolcock, 2013). Following Sen (1981), therefore, financial accessibility is a means of bridging social inequalities, and subsequently fostering economic security.

1.5.1.3 Bagehot Model

Bagehot[22] argued that economic productivity rises in financial development. This then meant that financial underdevelopment would inevitably stifle economic security. According to Demigul – Kunt and Levine[23], the pace of growth is dependent on how accessible financial services are. Following Bagehot[24], therefore, financial stability without accessibility is not enough in fostering economic security. Sparatt and Stephen[25] adds the institutional composition of the financial sector to the blend on growth enhancers by arguing that competition creates entrepreneurial opportunities geared towards the pursuit of financial inclusion. Serrao et al.[26] contextualized financial accessibility within the demand-supply dynamics in arguing that financial inaccessibility not only distorted the price mechanism but also held back growth of economies.

[22] Bagehot, w., (1973). "A description of money market. Lombard street, London UK. Banerjee, A.., Duflo, E., Glennerster, R., & Kinnan, C., (2013). The miracle of microfinance? Evidence from a randomized evaluation. MIT bureau for research and economic analysis of development working paper".

[23] Demirguc- Kunt, T. Beck, & P. Honohan, (2008) Finance for all Policies and Pitfalls in expanding access. World Bank Policy Research report Washingto

[24] Bagehot, w., (1973). "A description of money market. Lombard street, London UK. Banerjee, A.., Duflo, E., Glennerster, R., & Kinnan, C., (2013). The miracle of microfinance? Evidence from a randomized evaluation. MIT bureau for research and economic analysis of development working paper."

[25] Sparatt & Stephen (2013), Financial Regulation in low-income countries. Banking Growth with stability (5th Edition). London: Prentice Hall

[26] Serrao, M., Sequeira, A., & Hans, V., "Designing a Methodology to Investigate Accessibility and Impact of Financial Inclusion (March 18, 2012).

1.5.2 Empirical Literature Review

1.5.2.1 Financial Inclusion and Economic Security

Extant research on economic security and financial inclusion indicates absence of harmony. For a start, extant research alongside documented evidence hinted at financial inclusion being shaped by various factors. In Zimbabwe, the logit and probit estimate in Sanderson, Mutandwa, and Roux[27] revealed that chances of financial inclusion declined significantly in distance to the nearest mobile money agent or ATM. According to Sanderson, Mutandwa and Roux, distance erodes the indirect benefits accrued from financial inclusion. Sanderson, Mutandwa and Roux never presented descriptive statistics, and hence it was almost impossible to comment on the suitability of the models employed.

In North-East India, logit estimates in Bhanot, Bapat and Bera[28] indicated insignificant declines in financial inclusion probability for nearness to a bank exceeding 3kilometers. Bhanot, Bapat and Bera further revealed that financial inclusion probability significantly declined when post offices were more than 3kilometers away. According to Bhanot, Bapat and Bera, needs of rural populace were met by postal services, and hence inclusion of the rural poor depended largely on their proximity to post offices. A shortcoming in Bhanot, Bapat and Bera is the omission of the multi-dimensional nature of financial inclusion. That is, nearness to a post office or a bank is not adequate in explaining financial inclusion. Education may matter in shaping the uptake of financial services.

[27] Sanderson, Abel, Learnmore Mutandwa, and Pierre Le Roux. "A Review of Determinants of Financial Inclusion." *International Journal of Economics and Financial Issues* 8, no. 3 (2018): 1–8.
[28] Bhanot, Disha, Varadraj Bapat, and Sasadhar Bera. "Studying Financial Inclusion in North-east India." Edited by Sharyn Rundle Thiele and Cheryl Leo. *International Journal of Bank Marketing* 30, no. 6

In 148 countries, the ordinary least squares (OLS) estimates in Demirgüç-Kunt and Klapper[29] suggested that formal account uptake rises significantly in growth of per capita GDP. Disaggregating the economies, nevertheless, suggested that formal account uptake was high in low-income economies relative to lower middle-income counterparts. Uptake of formal saving accounts, on the other hand, rose across county classification with uptake being highest among high-income countries. Similarly, probit estimates in Demirgüç-Kunt and Klapper suggested that account ownership probability significant rose up the wealth quintile in each country classification. Demirgüç-Kunt and Klapper argued that, within developing countries, account ownership disproportionately tilted in favor of the rich such that the chances of account ownership among the poor were almost half those for the rich. Income inequality was, however, considered to be not sufficient in explaining the observed financial inclusion differences among countries. Demirgüç-Kunt and Klapper, for instance, argue that trust plays a role in shaping financial inclusion.

In Africa, the probit estimates in Zins and Weill[30] suggested that the inclinations towards credit, saving, or account ownership in a formal institution significantly rose up the wealth quintile. Despite the significant results, Zins and Weill offered no explanation as to why financial inclusion rose in wealth. In the dataset, moreover, 22.1% of the individuals had no savings. In Zin and Weill, these group of individuals was omitted. It is probable that individuals left out in the estimation were systematically related to those included. This potentially paves way for selection bias. In Zimbabwe, probit and logit estimates in Sanderson, Mutandwa and Roux[31] suggested significant increment in financial inclusion probability as income rose. It was, nevertheless, unclear why both

[29] Demirgüç-Kunt, Asli, and Leora Klapper. "Measuring Financial Inclusion: Explaining Variation in Use of Financial Services across and within Countries." *Brookings Papers on Economic Activity* 2013, no. 1 (2013)
[30] Zins, Alexandra, and Laurent Weill. "The Determinants of Financial Inclusion in Africa." *Review of Development Finance* 6, no. 1 (June 2016): 46–57. https://doi.org/10.1016/j.rdf.2016.05.001.
[31] Sanderson, Abel, Learnmore Mutandwa, and Pierre Le Roux. "A Review of Determinants of Financial Inclusion." *International Journal of Economics and Financial Issues* 8, no. 3 (2018): 1–8.

probit and logit models were estimated yet each specification is anchored on the distribution of the white noise term. Perhaps, Sanderson, Mutandwa and Roux could have investigated normality of the data for a better insights on model appropriateness.

In 123 countries, the probit estimates in Allen, Demirguc-Kunt, Klapper and Martinez Peria[32] suggested that account ownership probability rises significantly in age but turns around. It was not possible to establish how long it takes to for the effect to turn around since the quadratic term had a coefficient of -0.000 (3decimal places). The problem with utilizing the quadratic term is that it could be highly correlated with age. In Africa, the system GMM estimates in Morgan and Pontines[33] suggested that financial stability rises in financial inclusion and economic growth but declines significantly in per capita GDP. According to Morgan and Pontines, SMEs loans stabilize the financial sector as evidenced by reductions in default probability. It is, however, probable that debtor SMEs found little to no incentives towards defaulting. Besides, default risk could be an outcome of SMEs stability/ productivity such that highly productive SMEs would generate sufficient revenues to service debts, and hence low default probability. Less productive SMEs as well as those struggling with financial distress, on the other hand, would potentially default. Perhaps Morgan and Pontines would have incorporated these insights into the modeling.

Having set the context of what and how financial inclusion is shaped, attention is then directed to understanding economic security. This research treats economic security as an outcome of rising per capita GDP since stable economies as well as those whose citizens enjoy good quality life are less likely to evidence persistent criminal activities such as reckless robbery, financial

[32] Allen, Franklin, Asli Demirguc-Kunt, Leora Klapper, and Maria Soledad Martinez Peria. "The Foundations of Financial Inclusion: Understanding Ownership and Use of Formal Accounts." *Journal of Financial Intermediation* 27 (July 1, 2016): 1–30. https://doi.org/10.1016/j.jfi.2015.12.003.

[33] Morgan, Peter, and Victor Pontines. "Financial Stability and Financial Inclusion." SSRN Scholarly Paper. Rochester, NY, July 9, 2014. https://doi.org/10.2139/ssrn.2464018.

fraud, disregard to the rule of law, or rule of gangsters and racketeers. While at it, this research is cognizant to the fact that regardless of a country's development record, crises do occur. For instance, the Global Financial Crisis in the aftermath of the housing bubble in 2008-2009 affected financial accessibility, exposed vulnerable groups and communities to economic fragility while nearly crippling some economies. Recently, the coronavirus (COVID)-19 pandemic wreaked unimaginable havoc, crippling livelihoods while throwing multitudes into poverty, misery and suffering in addition to nearly crippling global and domestic financial markets. Besides, how financial inclusion affects economic growth could be tapered by crises. In less developed and developed countries, the system GMM estimates in Gehrung[34] indicated insignificant declines in ln per capita GDP during crisis periods.

In 168 countries, the difference generalized method of moments (GMM) estimates in Inoue & Hamori[35] revealed significant economic growth increments in financial inclusion. In 42 countries from Africa, the system GMM estimates in Makina and Walle[36] indicated that economic growth significantly rose in financial inclusion. In 23 countries from Asia, Van and Linh[37] demonstrated that economic development was reinforced by either automatic teller machines (ATMs) or bank branches. In 8 South Asian economies, the dynamic ordinary least squares (DOLS) and fully modified OLS (FOLS) estimates in Singh and Stakic[38] suggested that economic

[34] Gehrung, Marcel. "The ATM Around the Corner - How Financial Development, Access, and Integration Influence Economic Growth and Inequality." SSRN Scholarly Paper. Rochester, NY, November 23, 2020. https://doi.org/10.2139/ssrn.3595265.

[35] Inoue, T., & Hamori, S. (2019). "Financial inclusion and economic growth: Is banking breadth important for economic growth? In Financial inclusion, remittance inflows, and poverty reduction in developing countries: Evidence from empirical analyses (pp. 1–16). World Scientific Publishing. https://doi.org/10.1142/11231"

[36] Makina, D., & Walle, Y. M. (2019). "Financial inclusion and economic growth: Evidence from a panel of selected African countries. Extending Financial Inclusion in Africa, 9, 193–210. https://doi.org/10.1016/B978- 0-12-814164-9.00009-8"

[37] Van, D. T. T., & Linh, N. H. (2019). "The impacts of financial inclusion on economic development: Cases in Asian-Pacific countries. Comparative Economic Research, 22(1), 7–16. https://doi.org/10.2478/cer2019-0001"

[38] Singh, D., & Stakic, N. (2020). "Financial inclusion and economic growth nexus: Evidence from SAARC countries. South Asia Research, 41(1), 1–21. https:// doi.org/10.1177/0262728020964605"

growth rose significantly in financial inclusion in the long-run although it was evident that economic security and financial inclusion Granger-caused each other. In the EU, the FOLS and lag-distributed autoregressive (ARDL) estimates. In Tanzania, Uganda, and Kenya, the OLS and fixed effects (FE) estimates in Thomi & Mose[39] suggested that financial inclusion rose in economic growth.

The aforementioned factors are, nevertheless, not the only factors which affect financial inclusion or economic security. Other factors as will be explained later on include trade openness, school enrolment, inflation, and population growth. In the subsections beneath, inclusion dimensions are analysed deeper.89

1.5.2.2 Availability Dimension and Economic Security

Previous research including Sarma[40] proxy financial services availability by either outlets of mobile money agents, ATMs, or bank branches. Within 29 states in India, the FE and GMM estimates in Kumar[41] suggested that economic growth rose in bank branches. Within 22 SSA economies, the system GMM estimates in Ifediora et al.[42] suggested that economic growth significantly rose in financial services' availability. The findings, furthermore, suggested that economic growth rose in ATMs and bank branches.

[39] "Thomi & Mose (2021): Financial Inclusion in East Africa: Does Economic Growth Matter? Journal of Economics, Management and Trade. 27(2): 1-8, 2021; Article no. JEMT.68331 ISSN: 2456-9216"
[40] Sarma, M. (2016). "Measuring financial inclusion for Asian economies. In Financial inclusion in Asia. Palgrave Macmillan"
[41] Kumar, M.& Yadar, G. (2013) Liquidity risk management in bank, a conceptual framework. AIMA Journal of Management & Research,7(2),2-12.
[42] Ifediora, et al (2022) "Financial inclusion and its impact on economic growth: Empirical evidence from subSaharan Africa, Cogent Economics & Finance, 10:1, 2060551, DOI: 10.1080/23322039.2022.2060551"

In 27 markets in Europe, the system GMM estimates in Hasan, De Renzis and Schmiedel[43] suggested for the 1995-2009 period, revealed that ln per capita GDP rose significantly in ATMs as well as in points-of-sale (POS). According to Hasan, De Renzis and Schmiedel, continued uptake of POS machines and ATMs enhanced economic efficiency which consequently fostered growth of incomes per capita in Europe. Although the fixed effects (FE) estimates in Gehrung[44] revealed significant increments in ln per capita GDP as either bank branches or ATMs increased, the system GMM estimates suggested that ln per capita GDP declined significantly in previous period's ATMs and insignificantly in previous period's bank branches. According to Gehrung, financial liberalization bridged the inequality gap which subsequently spurred growth of output. A short-coming in Gehrung, however, was that the coefficient of lag ln per capita GDP exceeded 1. This was indicative of the problem of overshooting which went largely explained.

In Nigeria, the tests of independence in Jegede[45] indicated significant improvements in bank performance as ATM uptake rose. According to Jegede, fraud mitigation boosted ATMs efficiency which then translated into better bank performance. Jegede, nevertheless, utilized convenience sampling which raises serious problems as far as hypotheses are better tested using random sampling techniques. It appears evident that Jegede shunned away from rigorous methodological endeavor which is quite a massive blow to evidence-based inferencing. Besides, the conclusions and recommendations made were not backed up by hypothesis testing. For instance, the only hypothesis tested was that bank performance was not significantly affected by

[43] Hasan, Iftekhar, Tania De Renzis, and Heiko Schmiedel. "Retail Payments and Economic Growth." SSRN Scholarly Paper. Rochester, NY, April 20, 2012. https://doi.org/10.2139/ssrn.2100651.
[44] Gehrung, Marcel. "The ATM Around the Corner - How Financial Development, Access, and Integration Influence Economic Growth and Inequality." SSRN Scholarly Paper. Rochester, NY, November 23, 2020. https://doi.org/10.2139/ssrn.3595265.
[45] C.A., Jegede. "Effects of Automated Teller Machine on the Performance of Nigerian Banks." *American Journal of Applied Mathematics and Statistics* 2, no. 1 (February 5, 2014): 40–46. https://doi.org/10.12691/ajams-2-1-7.

ATMs; yet Jegede proceeded to argue that the problem on the ground was unauthorized electronic withdrawals and other frauds pitying ATM uptake.

In India, the vector error correction (VAR) model estimates in Sharma[46] suggested that ln GDP per capita significantly rose in financial accessibility (as well as ATMs for every 0.1million adults or 1000 kilometers, bank branches for every 1/10 million adults or 1000 kilometers), two years prior but insignificantly declined in financial accessibility (as well as ATMs for every 1/10 million adults or 1000 kilometers, bank branches for every 1/10 million adults or 1000 kilometers) a year prior. Causation checks suggested that causality originated from financial accessibility to GDP growth, and not the other way round. According to Sharma, greater financial accessibility raised efficiency in fund allocation which then bolstered capital accumulation; capital in turn fostered growth of output. It was, however, not clear whether shocks to financial accessibility could have ramifications on output growth. Perhaps, Sharma could have executed an impulse response function (IRF) for additional insights. Besides, the coefficients of the first two lags of ln GDP per capita were negative. Suggestive in this is that there could have been an error in model specification since these coefficients are naturally expected to be positive.

In eight Middle East and North Africa (MENA) economies, the GMM and generalized least squares (GLS) estimates in Neaime and Gaysset[47] suggested that poverty growth insignificantly rose in ATMs but insignificantly declined in bank branches for every 100000 adults. In MENA countries, the system GMM estimates in Emara and Said[48] indicated that for the

[46] Sharma, Dipasha. "Nexus between Financial Inclusion and Economic Growth: Evidence from the Emerging Indian Economy." *Journal of Financial Economic Policy* 8, no. 1 (January 1, 2016): 13–36. https://doi.org/10.1108/JFEP-01-2015-0004.

[47] Neaime, Simon, and Isabelle Gaysset. "Financial Inclusion and Stability in MENA: Evidence from Poverty and Inequality." *Finance Research Letters* 24 (March 1, 2018): 230–37. https://doi.org/10.1016/j.frl.2017.09.007.

[48] Emara, Noha, and Ayah El Said. "Financial Inclusion and Economic Growth: The Role of Governance in Selected MENA Countries." *International Review of Economics & Finance* 75 (September 1, 2021): 34–54. https://doi.org/10.1016/j.iref.2021.03.014.

1990-2018 period, financial accessibility significantly raised GDP per capita. In 124 countries, fixed effects (FE) estimates in Van, Vo, Nguyen, and Vo[49] suggested that economic growth significantly rose in financial inclusion index in the full sample as well in low-income countries. Among lower and upper-middle-income countries, however, economic growth rose insignificantly in financial inclusion while among high-income-economies, growth actually insignificantly declined. In the full sample, economic growth rose significantly in ATMs and bank branches.

Growth also significantly rose in bank branches among low-income-economies. There was, however, no clear justification for including both per capita GDP for the previous year and the per capita GDP in 2004 in the same regression. Besides, the findings were not discussed holistically. For the 2004-2016 period in 33 developing economies, the two-step and one-step system GMM estimates in Ain, Sabir and Asghar[50] revealed that per capita GDP significantly rose in bank branches. The two-step system GMM suggested that ATMs significantly raised per capita GDP. This was attributed to bank branches expansion connecting a greater number of people to credit markets which subsequently raised productivity. For the 2003-2015 period, in Nigeria, the OLS estimates in Ireokwu, Eke and Abel[51] revealed that real GDP rose significantly in ln ATM transactions and ln rural bank deposits while bank loans advanced to rural populace insignificantly reduced real GDP. Ireokwu, Eke and Abel argued that commercial banks mobilized deposits which were later extended to the people in form of loans. This then led to real GDP increments.

[49] Van, Loan Thi-Hong, Anh The Vo, Nhan Thien Nguyen, and Duc Hong Vo. "Financial Inclusion and Economic GROWTH: An International Evidence." *Emerging Markets Finance and Trade* 57, no. 1 (January 2, 2021): 239–63. https://doi.org/10.1080/1540496X.2019.1697672.

[50] Ain, Noor ul, Samina Sabir, and Nabila Asghar. "Financial Inclusion and Economic Growth: Empirical Evidence from Selected Developing Economies." *Review of Economics and Development Studies* 6, no. 1 (September 30, 2020): 179–203. https://doi.org/10.47067/reads.v6i1.195.

[51] Ireokwu, Napoleon, Ugo Eke, and Ogechukwu Abel. "Impact of Financial Inclusion on Economic Growth of Nigeria." *International Journal of Sustainable Development* 12, no. 2 (August 2019): 46–58.

Deposits, loans and ATM transactions are, on their own, not adequate measures of financial inclusion. This is, nevertheless, pardonable since the authors only reviewed 10 related researches with the review being disappointingly narrow. A suggestion could have been that the authors dedicate their time towards rigorous research. In 42 countries, the pooled OLS, 2SLS, and GMM estimates in Ozturk and Ullah[52] suggested that economic growth rose significantly in digital financial inclusion over the 2007-2009 period. For the 2011-2017 period in 22 countries with the sub-Saharan Africa, the VECM estimates in Thaddeus, Ngong and Manasseh[53] suggested that economic growth insignificantly declined in mobile money agent outlets growth but rose insignificantly in both ATMs and bank branches. In Italy, the stochastic frontier analysis (SFA) estimates in Bernini and Brighi[54] suggested that bank branch expansion significantly raised technical inefficiency. Suggestive in this is that as banks spread out through creation of branches rather than subsidiaries, inefficiency arose. It is, however, possible that inefficiency arose tighter regulations or overregulation. Bernini and Brighi, nevertheless, did not control for regulatory quality.

In Italy, stochastic frontier analysis (SFA) estimates in Bernini and Brighi[55] suggested that economic growth of the locality significantly declined in both bank branches and per capita bank branches while significantly rising in per branch ATMs. According to Bernini and Brighi, branching required additional outlay of capital as well as in capturing local markets. This then led

[52] Ozturk, Ilhan, and Sana Ullah. "Does Digital Financial Inclusion Matter for Economic Growth and Environmental Sustainability in OBRI Economies? An Empirical Analysis." *Resources, Conservation and Recycling* 185 (October 1, 2022): 106489. https://doi.org/10.1016/j.resconrec.2022.106489.
[53] Thaddues, Kesuh Jude, Ngong, Chi Aloysius, and Manasseh, Charles O. "Digital Financial Inclusion and Economic Growth: Evidence from Sub-Saharan Africa (2011-2017)". *The International Journal of Business & Management 8, no. 4 (April 2020).*
[54] Bernini, Cristina, and Paola Brighi. "Bank Branches Expansion, Efficiency and Local Economic Growth." *Regional Studies* 52, no. 10 (October 3, 2018): 1332–45. https://doi.org/10.1080/00343404.2017.1380304.
[55] Bernini, Cristina, and Paola Brighi. "Bank Branches Expansion, Efficiency and Local Economic Growth." *Regional Studies* 52, no. 10 (October 3, 2018): 1332–45. https://doi.org/10.1080/00343404.2017.1380304.

to inefficiency hence the decline in local economy's growth. In the United States, the fixed effects estimates in Jayaratne and Strahan[56] suggested that lifting bank branching restrictions significantly raised the growth of American states. According to Jayaratne and Strahan, bank branching restrictions created inefficiencies which previously credit accessibility; their removal consequently opened up states for credit accessibility which then fostered the growth of states.

For the 1995-2003 period in 27 provinces in China, the system GMM estimates in Cheng and Degryse[57] suggested that bank deposits insignificantly reduced per capita GDP growth; upon controlling for non-bank deposits, bank deposits insignificantly raised per capita GDP growth. A shortcoming in Cheng and Degryse, however, is that the one-step system GMM estimates reported negative coefficient of initial per capita GDP. This is contrary to theoretical predictions. Perhaps, Cheng and Degryse could have repeated the estimations without initial per capita GDP. In Nigeria, Babajide, Adegboye and Omankhanlen[58] documented that total factor productivity significantly declined in the previous year's bank deposits.

In emerging markets, the GMM estimates in Kim[59] indicated that financial inclusion reduced income inequality significantly which subsequently raised economic growth significantly. For the 2003-2010 period in Islamic States, the Wald test in Abduh and Omar[60] revealed that

[56] Jayaratne, J., and P. E. Strahan. "The Finance-Growth Nexus: Evidence from Bank Branch Deregulation." *The Quarterly Journal of Economics* 111, no. 3 (August 1, 1996): 639–70. https://doi.org/10.2307/2946668.
[57] Cheng, Xiaoqiang, and Hans Degryse. "The Impact of Bank and Non-Bank Financial Institutions on Local Economic Growth in China." *Journal of Financial Services Research* 37, no. 2 (June 1, 2010): 179–99. https://doi.org/10.1007/s10693-009-0077-4.
[58] Babajide, Abiola A, Folasade B Adegboye, and Alexander E Omankhanlen. "Financial Inclusion and Economic Growth in Nigeria" 5, no. 3 (2015).
[59] Kim, Jong-Hee. "A Study on the Effect of Financial Inclusion on the Relationship Between Income Inequality and Economic Growth." *Emerging Markets Finance and Trade* 52, no. 2 (February 2016): 498–512. https://doi.org/10.1080/1540496X.2016.1110467.
[60] Abduh, Muhamad, and Omar Mohd Azmi. "Islamic Banking and Economic Growth: The Indonesian Experience. *International Journal of Islamic and Middle Eastern Finance and Management* 5, no. 1 (January 1, 2012): 35–47. https://doi.org/10.1108/17538391211216811."

financial inclusion Granger-caused output growth. In the autoregressive-distributed lag (ARDL) model, the estimates suggested that GDP per capita growth rose significantly in financial inclusion. The adjustment parameter suggested that short-run deviations got smaller and smaller towards the long-run at the rate of 18.4% per month. According to Abduh and Omar, financial development fostered financial inclusion which subsequently sustained output growth. In 55 Islamic States, the difference GMM estimates in Kim, Yu and Hassan[61] indicated that per capita GDP significantly grew in ATMs growth, bank branch expansion, deposits growth, and growth of borrowers.

For the 1995-2003 period in 27 provinces in China, the system GMM estimates in Cheng and Degryse[62] suggested that bank credit significantly raised per capita GDP growth; similar results were found when controlling for non-bank credit. A shortcoming in Cheng and Degryse, however, is that the one-step system GMM estimates reported negative coefficient of initial per capita GDP. This is contrary to theoretical predictions. Perhaps, Cheng and Degryse could have repeated the estimations without initial per capita GDP.

Ifediora et al[63] used a composite index of financial inclusion with a system Generalized Method of Moments. The penetration, availability, and usage dimensions were used in the index's development. According to the study, availability and penetration have a statistically significant and positive influence on economic growth, whereas usage has a small but significant impact on economic growth in SSA. Furthermore, bank branches and ATMs have a positive and significant impact on economic growth, whereas deposit accounts and outstanding loans only marginally

[61] Kim et al. "Financial Inclusion and Economic Growth in OIC Countries." "*Research in International Business and Finance* 43 (January 1, 2018)"
[62] Cheng, Xiaoqiang, and Hans Degryse. "The Impact of Bank and Non-Bank Financial Institutions on Local Economic Growth in China." *Journal of Financial Services Research* 37, no. 2 (June 1, 2010)
[63] Ifediora, et al (2022). "Financial inclusion and its impact on economic growth: Empirical evidence from sub-Saharan Africa. *Cogent Economics & Finance* 10, no. 1 (2022): 2060551."

support economic growth, and outstanding deposits have a negative impact on economic growth. Similarly, mobile money indicators research from 2012 to 2018 revealed that mobile money agents reduce economic growth while mobile money accounts and mobile money accounts increase economic growth. Similarly, Adedokun and Aga[64] use a composite index, and the results are identical to Ifediora et al. Pooled Mean Group and Mean Group/ARDL estimations are used by Olayungbo and Quadri (2019), and the results are consistent with the two studies. According to all of the studies, financial inclusion has a positive impact on economic growth. Ratnawati[65] also employs dimensions in the index generation process.

However, Bernini and Brighi[66] argued that product diversification, rather than branch growth, increased a bank's economic output. According to the research, expanding lowers efficiency, which is aggravated by increasing the distance between headquarters and branches. Any benefit gained from being a part of a larger bank is offset by branch growth. Local banks that are efficient and have more loan availability benefit the local economy; nevertheless, structural changes in banks, such as branch expansion, have a detrimental impact on local economic growth.

According to Sofi and Zamir[67], ATMs have a beneficial but not statistically significant influence on the Indian economy. In 31 nations, empirical data from Sethi and Acharya[68] show a positive and long-run relationship between financial inclusion and economic progress. Furthermore, the authors argue that an improvement in financial infrastructure, such as increased

[64] Adedokun, M. W., & Ağa, M. (2021). *"Financial inclusion: A pathway to economic growth in Sub-Saharan economies. International Journal of Finance and Economics*, 1–17. https://doi.org/10.1002/ijfe.2559"
[65] Ratnawati, Kusuma. "The impact of financial inclusion on economic growth, poverty, income inequality, and financial stability in Asia." *The Journal of Asian Finance, Economics and Business* 7, no. 10 (2020): 73-85.
[66] Bernini, Cristina, and Paola Brighi. "Bank Branches Expansion, Efficiency and Local Economic Growth." *Regional Studies* 52, no. 10 (October 3, 2018): 1332–45. https://doi.org/10.1080/00343404.2017.1380304.
[67] Sofi, Zubair, and M. Nasir Zamir. "The impact of financial inclusion on the economic growth of India: An empirical analysis." *Journal of Commerce and Accounting Research* 8, no. 3 (2019).
[68] Sethi, Dinabandhu, and Debashis Acharya. "Financial inclusion and economic growth linkage: Some cross-country evidence." *Journal of Financial Economic Policy* (2018).

access to banking services such as ATMs and bank offices, might boost economic growth. According to the authors, more banking usage among consumers leads to greater savings for investment, which creates more production in the economy. According to the conclusions of Myovella et al[69], technology in less developed countries has greater space for progress than in developed countries.

Mishra and Bvuma[70] investigate the link between Mobile Money Banking and Financial Inclusion. The paper examined the relationship between mobile money banking and financial inclusion in developing countries. The research methods employed in the article were inconspicuous, and the approach included a desktop research strategy based on a thorough literature evaluation. According to the findings, using mobile money allows the underprivileged to be included. Fabregas and Yokossi[71] evaluate the impact of mobile money availability on Kenyan economic activity. The study combines data from the mobile agent network's early development in Kenya with a local-level indicator of economic success proxied by the intensity of nocturnal lights. The research shows that availability to mobile money services improved local economic activity and that these benefits increased with time by leveraging the heterogeneity in regions that got access to mobile money services at various times and the high resolution of the data. The benefits are more obvious in places that were formerly more affluent, metropolitan, and well-connected to infrastructure. These findings demonstrate that mobile money accounts can

[69] Myovella, Godwin, Mehmet Karacuka, and Justus Haucap. "Digitalization and economic growth: A comparative analysis of Sub-Saharan Africa and OECD economies." *Telecommunications Policy* 44, no. 2 (2020): 101856.
[70] Mishra, R., and S. Bvuma. "Conceptualising the Relationship between Mobile Money Banking and Financial Inclusion to Support Sustained Economic Growth." *African Journal of Public Affairs* 13, no. 1 (2022): 54-78.
[71] Fabregas, Raissa, and Tite Yokossi. "Mobile money and economic activity: Evidence from Kenya." *The World Bank Economic Review* 36, no. 3 (2022): 734-756.

supplement, rather than just replace, other payment options that enable people to connect, trade, and allocate investments within their networks thus stimulating growth.

Nan[72] studies mobile money and socioeconomic growth in SSA. According to the author, mobile money has been widely accepted in locations where substantial segments of the people have been financially disenfranchised. The study investigates the theoretical and empirical linkages between mobile money and socioeconomic growth in the researchers' quest. The author contends that widespread use of mobile money yields more societal benefits. According to the findings of the Difference-in-Differences research, widespread mobile money has a favourable influence on a country's economic growth. Furthermore, the data reveals that the usage of mobile money is increasing.

Museba[73] investigates the impact of mobile money in Uganda using a case study technique and a survey questionnaire. According to the report, mobile device penetration increases the acceptance of mobile money and the desire to access financial goods, particularly among the unbanked population. According to the report, this has resulted in the simplicity of access to financial services and made it easier for the unbanked to become financially included: those at the bottom of the pyramid. According to the report, mobile money has a beneficial influence on the sustainable development objectives of Gender Equality (SDG5), Decent Work and Economic Growth (SDG8), Financial Inclusion (SDG10), and Reduce Inequalities (SDG10).

[72] Nan, Wenxiu Vince. "Mobile money and socioeconomic development: A cross-country investigation in Sub-Saharan Africa. *Journal of International Technology and Information Management* 27, no. 4 (2019): 36-65."
[73] Museba, Tapiwanashe James, Edmore Ranganai, and Gianfranco Gianfrate. "Customer perception of adoption and use of digital financial services and mobile money services in Uganda." *Journal of Enterprising Communities: People and Places in the Global Economy* (2021).

Lashitew et al[74] discover that ATM saturation decreases the distribution and acceptance of mobile money accounts in their effort to explain the spreading of mobile money technologies. Furthermore, the findings imply that having a bank account has little influence on the distribution of money. Concentration on the banking industry, on the other hand, has a negative and marginally significant influence on mobile money accounts. This meant that the banking sector's concentration might smother the launch of innovative mobile services.

Ahmad et al[75] investigate African development through the use of mobile money as a financial tool. The researcher used taxonomic, descriptive, and analytical methodologies to assess the current level of knowledge in the field. The authors use Mpesa in Kenya as a standard example to examine how mobile technology contributes to growth. Mobile phone subscriptions were employed in the study to assess financial inclusion. As a control variable, the population is utilised. According to the data, mobile money increased economic development. However, population had a negligible impact on progress.

Initially, mobile devices were intended for communication purpose only. However, with the technology advancement, more and more has been realized from the device through the penetration of internet services. Financial innovation has become a key innovation tool under the mobile devices. This has led to the digitalization of currency. Mobile money is an alternative mode of banking for the unbanked population; the larger financially excluded populace; thus, it is not surprising that its expansion and easy access positively affects financial sector growth in the SSA

[74] Lashitew, Addisu A., Rob van Tulder, and Yann Liasse. "Mobile phones for financial inclusion: What explains the diffusion of mobile money innovations?" *Research Policy* 48, no. 5 (2019): 1201-1215.
[75] Ahmad, Ahmad Hassan, Christopher Green, and Fei Jiang. "Mobile money, financial inclusion and development: A review with reference to African experience." *Journal of Economic Surveys* 34, no. 4 (2020): 753-792.

region. Ahassan et al[76] used the partial least squares (PLS) model to investigate the influence of financial innovation via mobile devices on economic growth in Sub-Saharan Africa (SSA) from 2011 to 2018. According to the data, the development of mobile money has a substantial influence on economic growth. The dependent variable in the study was GDP per capita, which is a measure of economic growth. To name a few, significant positive Pearson correlations were discovered between mobile money activities and financial development as well as GDP, demonstrating that the rise of mobile money activities, such as the number of agents and volume of transactions, has an effect on economic development in Sub-Saharan Africa. The author argues in favour of mobile money encouraging growth, however the mobile money system facilitates the pooling of capital and its onward effective allocation to productive sectors, thus promoting and enhancing innovative development in the region.

Kasseeah and Ragoobur[77] investigated the significance of mobile money in Mauritius. Aside from financial inclusion, the study concludes that mobile money plays an important role in improving the business climate. According to the authors, Mauritius' high degree of financial development stimulates the usage of mobile money, which helps to make transactions faster, more cost-effective, and more efficient. Mobile money services may, in essence, act as a business-facilitating tool, encouraging investment and making conducting business in Mauritius easier. The economic growth is then affected by the spillover effects.

[76] Ahassan, Tijani Forgor, Tatiana Blokhina, and Julie Ahou Kouadio. "Financial Innovation: The Impact of Mobile Money on Innovative Economic Growth." In *Proceeding of the International Science and Technology Conference" FarEastCon 2020"*, pp. 27-38. Springer, Singapore, 2021.
[77] Kasseeah, Harshana, and V. E. R. E. N. A. Tandrayen-Ragoobur. "Mobile money in an emerging small island economy." *ARPN Journal of Science and Technology* 2, no. 5 (2012): 454-461.

Myeni et al[78] look at whether mobile money encourages financial inclusion in Eswatini. This study makes use of data from the 2014 nationally representative FinScope Consumer Survey for Eswatini. To reduce the likelihood of selection bias related with mobile money use and bank account ownership, the authors employ a quasi-experimental technique in propensity score matching (PSM) with bootstrapped standard errors. As a sensitivity check, the authors compute the average treatment effect (ATE) using kernel-based matching techniques and estimate a multilevel model that takes into consideration the data's hierarchical structure. According to the findings, higher education, entrepreneurship, being female, an improvement in job condition in the previous year, and residing in an urban area or the Lubombo region all favorably increase the likelihood of using mobile money. In addition, the results also show that individuals who use mobile money are 19% more likely to own a bank account at a formal financial institution with a higher probability estimate observed amongst rural residents. The researchers hint that making withdrawals available through the ATMs by mobile means is making the mobile money agent outlets within the proximity of ATMs meaningless.

Oyewole et al[79] investigate the link between Electronic Payment Systems and Economic Growth. A multivariate regression model is used in the investigation. ATMs and cheque transactions were the indicators evaluated in the model under Cash penetration variables. Furthermore, interest rate is employed as a control variable with the other variables. 'Technological innovation has given an efficient and effective payment method free of the 'cash and carry syndrome,' says the author. Specifically, an electronic payment system provides a channel through

[78] Myeni, Siphesihle, Marshall Makate, and Nyasha Mahonye. "Does mobile money promote financial inclusion in Eswatini?." *International Journal of Social Economics* 47, no. 6 (2020): 693-709.
[79] Oyewole, Oginni Simon, Jibreel Gambo, Mohammed Abba, and Michael Ezekiel Onuh. "Electronic payment system and economic growth: a review of transition to cashless economy in Nigeria." *International Journal of Scientific Engineering and Technology* 2, no. 9 (2013): 913-918.

which economic exchanges can take place without the need for the transacting parties to visit physical banks.' Data from a 7-year period was analysed using OLS and TSLS algorithms (2005-2012). The results show a substantial positive association between the e-payment system and economic growth as measured by real GDP per capita. Only ATMs was found to positively contribute to economic growth while other e-payment channels, cheque transaction, contributed negatively.

Motsatsi[80] examined banking sector innovation and economic growth in Botswana using quarterly time series data from 2006 to 2014. The Autoregressive Distributed Lag (ARDL) model is used by the author to evaluate the influence of technology innovation (Automated Teller Machines (ATMs) and Electronic Funds Transfer at Point of Sale (EFTPOS), as well as business innovation (bank deposits and credit to private sector). Inflation, trade, and interest rates are macroeconomic factors that influence economic growth. According to the findings, technical and business innovation characteristics have a beneficial effect on economic growth. ATMs have a favorable and statistically significant effect in both the short and long term. Trade openness and total bank deposits boosted growth significantly. However, interest and inflation rates hampered economic growth. According to the findings, the researcher recommended that, policies aimed at promoting more distribution and nationwide spread of ATMs and EFTPOS more particularly in rural areas where they are scarce would boost the growth of the economy.

Sindani and Buchichi[81] used the Quantitative comparative approach to investigate the influence of financial sector deepening on Kenyan economic development. The researcher utilized

[80] Motsatsi, Johane Moilwa. "Financial sector innovation and economic growth in the context of Botswana." *Int J Econ Financ* 8, no. 6 (2016): 291-300.
[81] Sindani, Moses, and A. N. Buchichi. "The impact of financial sector deepening on economic growth in Kenya." (2013).

44 different banks. The results of the selected sample revealed that ATMs and total deposits greatly boosted growth. ATMs are positive, and overall deposits are comparable. Employees are a negative control variable. The total number of workers, on the other hand, revealed that an increase in the number of employees diminished the advantages of economic growth.

Ozturk et al[82] examined the indirect impact of digital financial inclusion on environmental sustainability using pooled ordinary least squares (OLS), two-stage least squares (2SLS), and generalized method of moments (GMM) methodologies. According to the findings of the study, financial inclusion increased economic growth while decreasing environmental quality due to an increase in CO2 emissions as a result of the investments. The authors, on the other hand, urge policymakers in OBRI regions to establish policies that promote both financial inclusion and environmental sustainability in order to achieve both economic success and environmental sustainability.

Similarly, Liu et al[83] explored financial inclusion and its impact on economic-environmental performance, employing 2SLS and GMM techniques. Only the variable ATMS is positively significant in the economic growth model when using the 2SLS approach; however, when using the GMM technique, two components, ATMS and branches, are positively significant. Regardless of the estimating methods utilized, such as 2SLS and GMM, financial inclusion indicators showed a positive impact on CO2 emissions. These data show that, in general, financial inclusion raises CO2 emissions. Foreign aid provided a considerable boost to economic growth. According to the GMM calculations, the lag in economic growth remains significantly positive in

[82] Ozturk, Ilhan, and Sana Ullah. "Does digital financial inclusion matter for economic growth and environmental sustainability in OBRI economies? An empirical analysis." *Resources, Conservation and Recycling* 185 (2022): 106489.

[83] Liu, Dong, et al. "Financial inclusion and its influence on economic-environmental performance: demand and supply perspectives. *Environmental Science and Pollution Research* (2022): 1-10."

all four models. The effect of ATMs and bank branches was significantly positive for instance, a 1 percent increase in ATMs and bank branches stimulates economic growth by 0.026 percent and 0.221 percent, respectively. Similar to 2SLS findings, debit cards and credit cards have no significant impact on economic growth.

Ali et al[84] investigate the impact of the financial inclusion index on economic development. The statistics ranged from 2000 to 2016. The generalized method of moments (GMM), two-stage least squares (2SLS), panel vector autoregressive (VAR), and panel Granger causality tests were computed using panel data from 45 nations. According to the findings of dynamic panel estimations, the financial inclusion index considerably boosts growth. Granger causality research found a bi-directional connection between financial inclusion index indicators and economic development, as well as a unidirectional causality between the financial inclusion index and economic growth. ATMs, bank branches, and deposit accounts all had a considerable beneficial influence on GDP per capita. Trade openness, life insurance premiums, and per capita GDP all increased insignificantly. In contrast, inflation, population growth, unemployment rate, stifled economic growth. Finally, the data revealed that the financial inclusion index had a significant positive impact on economic growth in Islamic Development Bank member countries. The authors' recommendations were congruent with the findings, namely that governments should consider financial inclusion as a long-term economic growth driver. Furthermore, the Principal Component Analysis index formulation permits the orthogonal linear transformation of high-frequency indicators to aggregate and produce a single index to operationalize the study purpose.

[84] Ali, Jamshed, and Muhammad Arshad Khan. "Micro and Macro financial inclusion and their impacts on economic growth: Evidence from Asian economies with alternative approaches. *International Transaction Journal of Engineering, Management, & Applied Sciences & Technologies* 11, no. 5 (2020): 1-15."

Williams et al[85] used panel data analysis to evaluate the influence of financial inclusion on poverty reduction and economic growth in a developing economy from 2006 to 2015. The authors provide a framework for specifying log linear models. According to the regression results, the number of operational ATMs, bank branches, depositors, and government spending in three African nations were the most reliable predictors of financial inclusion on poverty reduction in a developing economy. A 1% rise in the ratio of active ATMs results in a 0.0082 percent gain in the gross domestic product and a reduction in poverty in emerging economies. According to one indication, the majority of ATMs in developing economies are outmoded and thus required a technological upgrade to have a significant impact in rural areas. As a result, the report advised that the government focus on poverty reduction through focusing on infrastructure development that will improve banking services.

Van et al[86] researched financial inclusion and economic growth in order to produce worldwide evidence. To completely quantify the extent of financial inclusion across nations, the authors used a multidimensional index of financial inclusion created from multiple metrics. Furthermore, the system GMM econometric approach is used to quantify the influence of financial inclusion on economic growth based on the index. This model has a number of advantages. 'This technique estimates a dynamic panel estimator utilizing lagged levels and lagged first-differences as an instrument for a system of equations including first-differences and levels, respectively. In addition to accounting for endogeneity, the GMM gives a more robust assessment of measurement

[85] Williams, Harley Tega. "Role of financial inclusion in economic growth and poverty reduction in a developing economy." (2017).

[86] Van, D. T. T., & Linh, N. H. (2019). “The impacts of financial inclusion on economic development: Cases in Asian-Pacific countries. *Comparative Economic Research*, 22(1), 7–16. https://doi.org/10.2478/cer2019-0001”

errors than the ordinary least squares (OLS). The findings revealed that measures aimed towards financial inclusion should be carefully implemented in the low-income countries.

Poor individuals, according to Gopalan and Rajan[87], are less exposed to the severe effects of poverty if they have more access to financial services. As a result, their per capita income and standard of life will rise, contributing to the country's overall economic growth. Iqbal et al[88] discovered that financial inclusion is developing as a new paradigm of economic growth that plays a significant part in pushing poverty out of the country when they examined the function of banks in financial inclusion in India. The authors investigated secondary data over a seven-year period using a multiple regression model. The study's findings revealed a favorable and substantial influence of the number of bank branches and credit deposit ratio on per capita GDP of the country, whereas an insignificant impact has been observed in case of ATMs growth on Indian GDP.

Gul et al[89] utilized a fixed effect technique to investigate financial inclusion from 1996 to 2015, and the study findings suggested that financial inclusion is positive and statistically significant to economic growth. The researchers employed ATMs, bank branches, life insurance premiums, and other factors as explanatory variables in the study. The 2SLS is used to solve the endogeneity problem. ATMs greatly restrict growth in Kenya, while bank branches and mobile money accounts significantly encouraged expansion, according to Oruo[90]. Interest rates profit from economic growth.

[87] Sarma, Mandira. "Measuring Financial Inclusion for Asian Economies. In *Financial Inclusion in Asia*, edited by Sasidaran Gopalan and Tomoo Kikuchi, 3–34. London: Palgrave Macmillan UK, 2016."
[88] Iqbal, Badar Alam, and Shaista Sami. "Role of banks in financial inclusion in India. *Contaduría y administración* 62, no. 2 (2017): 644-656."
[89] Gul, Faid, Muhammad Usman, and Muhammad Tariq Majeed. "Financial Inclusion and Economic growth: A global perspective." *Journal of Business & Economics* 10, no. 2 (2018): 133-152.
[90] Oruo, Julie. "The relationship between Financial Inclusion and GDP growth in Kenya. PhD diss., University of Nairobi, 2013."

Raza et al.[91] employ a five-year multiple regression analytic technique to determine the relationship between financial inclusion and growth. The study discovered a link between financial inclusion and economic progress. Individually, the number of bank accounts (per 1,000/100,000) has greatly increased economic growth. Bank branches and bank accounts had a comparable impact. On the contrary, the findings of automated teller machines per 1,000 km2 said differently. To boost economic development in Pakistan, the author suggested boosting the installation of bank accounts and bank branches.

Ajide et al[92] studied the effect of institutional infrastructures on the relationship between financial inclusion and growth in SSA. Using the PCA index and the System Generalized Method of Moments (GMM), the authors arrived at the following insightful results. First, while both physical access to ATMs and ICT-based financial inclusion initiatives have a limitless positive impact on SSA growth, only the former was determined to be significant. Second, economic, political, institutional, and general governances were identified to be institutional components that promote growth. Finally, low-income countries are catching up to high-income countries in terms of actual per capita income. According to the empirical evidence of certain negative net effects and modest marginal impacts, faults in financial markets are occasionally exploited to the harm of the poor. The study found that, for the most part, favorable effects on growth were found. The favorable benefits were linked to governance factors that supplemented financial inclusion in eliminating pecuniary limitations impeding loan access and distribution to the poor, which hampered growth. Controls are also utilized for inflation, political governance, regulatory quality,

[91] Raza et al. "Determining the nexus between financial inclusion and economic development in Pakistan. *Journal of Money Laundering Control* (2019)."
[92] Ajide, Kazeem B., Olorunfemi Y. Alimi, Simplice A. Asongu, and Ibrahim D. Raheem. "The role of institutional infrastructures in financial inclusion-growth relations: Evidence from SSA." *International Journal of Finance & Economics* 27, no. 1 (2022): 175-191.

and government effectiveness. In contrast, the findings indicated that inflation reduced growth. Eton et al[93] find more of the same outcomes in Uganda when it comes to financial inclusion and growth. Economic stimulus is motivated by inclusion in the studies described above.

Shobande and Lanre[94] use a set of estimators such as the Pooled OLS, Fixed Effect, Generalized Method of Moment, and Pairwise Granger Causality Tests to analyses whether financial inclusion is a growth catalyst for a panel of 57 African states from 2004 to 2015. The findings revealed that financial inclusion is a growth driver. The researcher recommended that Central Banks in the African region make efforts to bank the massive unbanked population. This would give the country more financial stability. Furthermore, the author emphasized that investment in education should be prioritized in order to increase the quality of human capital for Africa's long-term growth.

Higher financial innovation leads to higher savings. Azimova and Mollaahmetoglu[95] examine the impact of financial innovation on savings from 2005 to 2014. The study includes panel data. The fixed effects results revealed that ATMs and capital formation increased saves significantly. The researchers contended that the more an individual saved, the more investing opportunities he or she had in shifting economic conditions. Channeling idle savings into productive sectors increases the fund margins of households and entrepreneurs facing financial constraints.

[93] Eton, Marus, Uwonda Gilbert, Mwosi Fabian, Barigye Godfrey, and Patrick Ogwel Benard. "Financial Inclusion and Economic Growth in Uganda A case study of selected districts in Western Uganda." (2019).
[94] SHOBANDE, Olatunji A., and Ibrahim R. LANRE. "Do financial inclusion drive boom-bust cycles in Africa?." *Journal of Economics Bibliography* 5, no. 3 (2018): 159-174.
[95] Azimova, Tarana, and Ebubekir Mollaahmetoglu. "Innovation in financial markets and its impact on savings." *Journal of Business Economics and Finance* 6, no. 2 (2017): 147-154.

Ene and colleagues[96] investigate the Impact of Electronic Banking on Financial Inclusion in Nigeria. The total number of automated teller machines and point-of-sale devices in Nigeria were used as proxies for electronic banking, while the proportion of banked adults to total bankable adults in Nigeria was used as a proxy for financial inclusion. The authors used computer-based multiple regression analysis to conduct correlational and ex-post facto research approaches. It was discovered that automated teller machines have no substantial impact on financial inclusion in Nigeria, however point-of-sale systems do. According to the study's conclusions, deposit money institutions should minimize bottlenecks related with the use of their automated teller machines and seek to exceed customer expectations. In offering theoretical support, Bakar and Sulong[97] indicated that employing a multidimensional variable, i.e., including more related variables under the dimensions, is preferable in order to observe a better assessment of the influence of financial inclusion on economic growth.

Marcelin and colleagues[98] looked at financial inclusion, bank ownership, and economic success. Using data from 44 developing nations from 2004 to 2017, this study examines the macroeconomic impact of financial inclusion and bank ownership structure. Using GMM dynamic panel model estimates, ATMs and bank accounts increased per capita GDP considerably. Inflation, on the other hand, implied differently. The authors suggest in the paper that foreign bank participation increases financial sector efficiency, resulting in an increase in per capita GDP.

[96] Ene, Emeka E., Gabriel O. Abba, and Gideon F. Fatokun. "The impact of electronic banking on financial inclusion in Nigeria." *American Journal of Industrial and Business Management* 9, no. 6 (2019): 1409-1422.
[97] Bakar, H. & Sulong, Z. (2018). "The Role of Financial Inclusion on Economic Growth: Theoretical and Empirical Literature Review Analysis". *Journal of Business and Financial Affairs,* 7(4)
[98] Marcelin, Isaac, Aklesso YG Egbendewe, Djoulassi K. Oloufade, and Wei Sun. "Financial inclusion, bank ownership, and economy performance: Evidence from developing countries." *Finance Research Letters* 46 (2022): 102322.

Yakubu et al[99] use the pooled estimated generalized least squares (EGLS) approach to examine the moderating impacts of financial openness on growth eight years back from 2017. Financial inclusion index (derived from ATMs, bank branches, and outstanding loans) had a positive substantial influence on economic growth in the ten Economic Community of West African States (ECOWAS) nations, according to the findings. In addition, while inflation dampens growth, trade openness and foreign direct investment greatly boost economic growth in ECOWAS. Furthermore, the financial PCA index considerably increased economic growth.

Maune et al[100] employ financial services, information and communication technology, and mobile network factors as proxies for financial inclusion in capturing the depth and breadth of financial inclusion in Zimbabwe. GDP is a measure of economic growth. Despite Zimbabwe's economic woes from 2011 to 2017, the data showed that financial inclusion increased GDP considerably. In order to stimulate free market financial sector growth and economic development, the author advocated for pro-financial inclusion and pro-free market financial sector development policies in Zimbabwe. Furthermore, as explanatory factors, active accounts, adult loans, branch accounts, ATM transactions, deposits, Internet access, and mobile transactions all had a favorable effect on economic growth.

China's quick development of computerized monetary consideration over the most recent couple of years has emphatically increased the availability and reasonableness of monetary administrations, transcendently serving previously monetarily prohibited individuals, and

[99] Yakubu, Ibrahim Nandom, and Alhassan Bunyaminu. "Financial Inclusion and Economic Growth in West Africa: The Moderating Effect of Financial Openness." (2021): 155-164.
[100] Maune, Alexander, Ephraim Matanda, and Justice Mundonde. "Does financial inclusion cause economic growth in Zimbabwe? An empirical investigation." *Acta Universitatis Danubius. Œconomica* 16, no. 1 (2020).

decidedly adds to higher financial development. Ahmad et al[101] looks at the effect of computerized monetary incorporation and human resources on China's commonplace financial development. The review acquainted new aspects with intermediary computerized monetary consideration in light of expansiveness of inclusion, profundity of utilization, and digitalization level. The observational discoveries show that computerized monetary incorporation and human resources fundamentally influence China's commonplace financial development. In light of this study's discoveries, the authors suggest interest in human resources improvement and, simultaneously, overhauling computerized monetary consideration to accomplish higher financial development.

Khan et al[102] examined the impact of monetary consideration on monetary supportability, monetary effectiveness, GDP, and human advancement with regards to G20 countries. The creators utilized yearly information of 15 created and arising economies from 2004 to 2017. Besides, the creators used a solitary file for monetary consideration, monetary maintainability, and monetary proficiency by utilizing head composite investigation (PCA). The creator utilized ATMs bank offices and remarkable advances to gauge for monetary incorporation. The results of the board stationarity test affirmed the ARDL model for both the long and short runs. Similarly, the discoveries of the ARDL showed no relationship between monetary consideration and monetary maintainability in the short run, be that as it may, over the long haul, comprehensive money showed a huge effect on manageability. In like manner, the ARDL showed that monetary consideration affects effectiveness in the short run, while it decidedly impacted monetary productivity over the long haul. The consequences of the ARDL finance showed no impact on neediness in the short run, however a huge impact in lengthy run. Essentially, the ARDL Model 4

[101] Ahmad, et al. "Digital financial inclusion and economic growth: Provincial data analysis of China." *China Economic Journal* 14, no. 3 (2021): 291-310.
[102] Khan, et al. "Effects of Financial Inclusion on Economic Growth, Poverty, Sustainability, and Financial Efficiency: Evidence from the G20 Countries. *Sustainability* 14, no. 19 (2022): 12688."

additionally introduced no relationship among Gross domestic product and comprehensive money in the short run, while it showed huge connections over the long haul. Besides, the results of the GMM showed a huge effect of comprehensive money on monetary security, and these outcomes were like the GMM between monetary consideration and monetary proficiency. The GMM model demonstrated that comprehensive money fundamentally affects destitution and monetary development, individually. Populace development and exchange receptiveness impacted monetary execution.

Kim et al[103] investigated financial inclusion in OIC countries and its impact on growth. The authors employed panel data from 55 OIC nations to estimate dynamic panel estimates, panel VAR, IRFs, and panel Granger causality tests in order to provide multilateral findings. Based on the results of dynamic panel estimations, the researcher's findings suggested that financial inclusion has a positive impact on economic growth. The panel Granger causality tests demonstrated that the IFRs results from the panel VAR analysis had similar effects on economic growth and that financial inclusion and economic growth have reciprocal causalities. As a result, it is acceptable to argue that financial inclusion benefits economic growth in OIC nations. To handle this issue, Arellano and Bond[104] suggested a generalized method of moments (GMM) method that estimated a dynamic panel model, which can remove the auto correlation of the error term and reduce the correlation between endogenous variables and the error term. Additionally, the authors used inflation, population growth, trade openness, and unemployment as control

[103] Kim, et al. "Financial inclusion and economic growth in OIC countries. *Research in International Business and Finance* 43 (2018): 1-14."
[104] Arellano, Manuel, and Stephen Bond. "Some Tests of Specification for Panel Data: Monte Carlo Evidence and an Application to Employment Equations." *The Review of Economic Studies* 58, no. 2 (April 1991): 277. https://doi.org/10.2307/2297968.

variables. Their results indicated that inflation had a detrimental effect on growth. However, in addressing inclusivity, ATMs and the deposit accounts significantly rose the GDP per capita.

In evaluating whether monetary consideration spikes development in India, Lenka and Sharma[105] utilized yearly time series information from 1980 to 2014. The creator utilizes information on number of store and credit account from booked business banks in relation to 1,000 grown-ups, number of bank offices with respect to 1,000 grown-ups, and number of bank workers as the proportion of bank offices, measures of stores and credits as proportion of Gross domestic product gathered from Fundamental Factual Returns, RBI as illustrative factors. Other macroeconomic controls like expansion, all out exchange, all out optional school enlistment (as an intermediary for human resources) and government consumption were likewise utilized in the examination. The creators utilized a Central Part Examination (PCA) to develop a monetary consideration file which estimated the monetary access in the Indian economy. The record fundamentally rose development in India. In like manner, exchange receptiveness, human resources and government consumption altogether rose monetary development. In any case, expansion smothered depleted the advantages of development. what's more, Utilizing the Autoregressive Dispersed Slack (ARDL) and Blunder Revision Model (ECM), the review tracks down a positive effect of monetary consideration on financial development both over the long haul and short run.

Bakang[106] assesses the impacts of monetary developing on financial development in kenya. The creator demonstrated that business bank stores significantly affect Gross domestic product.

[105] Lenka, Sanjaya Kumar, and Ruchi Sharma. "Does financial inclusion spur economic growth in India?." *The Journal of Developing Areas* 51, no. 3 (2017): 215-228.
[106] Bakang, Marlyse Linda Ngo. "Effects of financial deepening on economic growth in Kenya." *International journal of business and commerce* 4, no. 7 (2015): 1-50.

The creator prescribed in this manner to build up existing arrangements that will urge the general population to set aside more cash with business banks. Expanding the financing cost paid to contributors on their stores for instance, will instigate individuals to save more. What's more, the review suggests the strengthening of monetary incorporation arrangements through expanded admittance and utilization of formal financial administrations while diminishing banks exchange costs. This will urge more individuals to take part in financial exercises, to acquire and contribute more.

Ali and Khan[107] researched micro and macro financial inclusion and its effects on economic growth in Asian nations. This study is unique in that the author divides the financial indexes into macro and micro. The dynamic factor model suggested that the micro financial inclusion index was found to considerably increase economic growth with the two separate indices. Despite the fact that macro financial inclusion was minimal, its size in enhancing growth was relatively low in comparison to the micro index. These figures cover the years 1995 to 2017. Individual indicators show that bank branches, borrower accounts, and deposit accounts have a considerable beneficial influence on economic growth, whereas financial system deposits and insurance premiums have relatively minor impact. Furthermore, the macroeconomic factors had different impacts. Trade openness had a positive significant effect while inflation, unemployment, and population had a negative significant effect on economic growth.

Tuesta et al[108] found that financial inclusion drivers span many categories in Argentina. For example, the authors emphasize that a person's degree of education, income, and age may all

[107] Ali, Jamshed, and Muhammad Arshad Khan. "Micro and Macro financial inclusion and their impacts on economic growth: Evidence from Asian economies with alternative approaches." *International Transaction Journal of Engineering, Management, & Applied Sciences & Technologies* 11, no. 5 (2020): 1-15.
[108] Tuesta, David, Gloria Sorensen, Adriana Haring, and Noelia Camara. "Financial inclusion and its determinants: the case of Argentina." *Madrid: BBVA Research* (2015).

reflect whether or not a person has access to financial goods such as accounts, credit, and debit cards. Furthermore, financial exclusion is connected to an individual's income and age. In Kenya, for example, one must be eighteen years old to open a bank account or a cell account using a sim card. Baza and Rao[109] established in Ethiopia that deposit accounts, loan accounts, bank branches, branch density, ATMs, and retail payment instrument penetration promoted financial inclusion. It is significant to stretch, notwithstanding, that in the objective of monetary consideration, factors that might add to prohibition ought to be completely analyzed. For instance, in research that found an adverse impact of populace on monetary consideration, suppositions might be made that on the off chance that the review didn't use the grown-up populace, a conceivable clarification that remains is that a greater extent of the populace is either jobless or of a more youthful age.

In India, Jisha and Varghese[110] endeavored to evaluate the ongoing status of monetary consideration on the advancement of Indian economy. The creator put into thought the quantity of bank offices, ATMs, utilization of charge card and credit to quantify for monetary incorporation. The review results demonstrated that banks zeroed in more in the foundation of the monetary items in the provincial regions that saw an expansion in the utilization of the Mastercard and the charge cards. With the populace in the Indian economy, the outcome of the discoveries demonstrated that monetary consideration was a critical driver of financial development. Anyway, the creators recommended that to acquire products of monetary incorporation, there was still space to expand the extension for monetary consideration.

[109] Baza, Andualem Ufo, and K. Sambasiva Rao. "Financial inclusion in Ethiopia." *International Journal of Economics and Finance* 9, no. 4 (2017): 191-201.
[110] JishaJoseph, Ms, and Titto Varghese. "Role of financial inclusion in the development of Indian economy." *growth* 5, no. 11 (2014).

Availability has been the critical conversation about arrangement producers around the world with an expect to spike development through monetary incorporation. Shylaja and Shiva[111] contend that monetary Consideration guarantees that poor and weak segments of the general public, get an open door, to take part in the formal monetary framework, which diminishes financial imbalance and advances financial development. The creators laid out that monetary consideration through utilization and openness battles destitution and over the long haul is a critical instrument for development. The utilization aspect in the review demonstrated a critical effect on development.

Innovation is determined by whether or not the present population adopts the new product. In certain circumstances, this might be beneficial in the long run. Bara et al[112] found a link between financial innovation and economic growth in the SADC region. The study found that financial innovation has a favorable association to economic growth in the long term for SADC using an Autoregressive Distributed Lag (ARDL) Model calculated using Pooled Mean Group and Dynamic Fixed Effects. Long-run estimates, on the other hand, indicate the presence of a weak link. Panel Granger causality tests show that there is no causation between financial innovation and growth in either the short or long term. The study used an Aghion, Howitt, and Mayer-Foulkes (AHM) model developed by Laeven, Levine and Michalopoulos[113]. The empirical estimations carried out in this study show that financial innovation generally has a weak positive effect on economic growth in the long run.

[111] Shylaja, H. N., and H. N. Prasad. "Measuring financial inclusion: The access and usage dimension. *Smart Journal of Business Management Studies* 14, no. 1 (2018): 1-10."
[112] Bara, Alex, Gift Mugano, and Pierre Le Roux. "Financial innovation and economic growth in the SADC. *African Journal of Science, Technology, Innovation and Development* 8, no. 5 (2016): 483-495."
[113] Laeven, Luc, Ross Levine, and Stelios Michalopoulos. "Financial innovation and endogenous growth. *Journal of Financial Intermediation* 24, no. 1 (2015): 1-24."

Government measures, such as regulatory organizations stepping in and taking a blow on financial institutions, in the long run affect the consumers of the ultimate financial product. Nguyen and Ha[114] used national data from 2008 to 2019 to study the empirical links between ASEAN nations' institutional quality and financial inclusion. Six governance metrics from the World Governance Index were used in the study to assess the influence of institutions on financial inclusion. The usage, availability, and penetration index are employed in the study of the PCA index. According to the system GMM results, the financial inclusion index greatly increased economic development in the presence of governance indicators e findings showed that the institutional quality in the ASEAN countries did not interfere with financial inclusion but fostered it hence growth. In addition, the regression analysis with the Generalized Moments method showed the positive impact of institutions and other control variables like GDP per capita, inflation, bank concentration, and human development index on financial inclusion

Bank branches

Notwithstanding having more outlets or bank offices, the financial product item offered by a bank truly matters. Bernini and Brighi[115] researched the impacts of branch network development and topographical methodologies on the expense effectiveness of Italian agreeable banks somewhere in the range of 2006 and 2013. The results demonstrated, with the exception of manages an account with a more differentiated item offering, development adversely affects effectiveness, which is exacerbated by expanded distance between the central command and branches. Any constructive outcome because of a bigger bank size is killed by the branch

[114] NGUYEN, Yen Hai Dang, and Dao Thieu Thi HA. "The effect of institutional quality on financial inclusion in ASEAN Countries." *The Journal of Asian Finance, Economics and Business* 8, no. 8 (2021): 421-431.
[115] Bernini, Cristina, and Paola Brighi. "Bank Branches Expansion, Efficiency and Local Economic Growth. *Regional Studies* 52, no. 10 (October 3, 2018): 1332–45. https://doi.org/10.1080/00343404.2017.1380304."

development. Proficient neighborhood banks and a bigger credit accessibility support the nearby economy, while a bank underlying change by a branch extension produces an adverse consequence with regards to neighborhood financial turn of events.

In India, Sharma[116] analyzed the nexus between monetary consideration and financial development. The specialist vector auto-regression (VAR) models and Granger causality test. Observational outcomes and conversation discoveries proposed that there is a positive relationship between monetary development and different elements of monetary consideration, explicitly banking penetration, availability and usage in terms of deposits. Granger causality examination uncovered a bi-directional causality between geographic effort and monetary turn of events and a unidirectional causality between the quantity of stores/credit records and GDP. Individual markers that included ATMs, bank stores and bank offices result essentially rose Gross domestic product per capita. As per the results, the creator contends out that monetary consideration assumes a vital part in fostering areas of strength for a productive monetary foundation, which works with the development of an economy.

When evaluating the impact of financial inclusion on economic growth, Babajide et al[117] used ordinary least squares regression in their investigation and discovered that bank branches, bank deposits, and capital per worker all increased considerably. However, rising interest rates harmed the economy. The researchers used the slow development model to conduct their investigation. The empirical result supported the concept even more since it revealed that financial inclusion considerably aided growth. In contrast to other research, the author contends that

[116] Sharma, Dipasha. "Nexus between Financial Inclusion and Economic Growth: Evidence from the Emerging Indian Economy. *Journal of Financial Economic Policy* 8, no. 1 (January 1, 2016): 13–36. https://doi.org/10.1108/JFEP-01-2015-0004."

[117] Babajide, et al. "Financial inclusion and economic growth in Nigeria. *International Journal of economics and financial issues* 5, no. 3 (2015): 629-637."

financial development occurs as a result of economic expansion rather than the other way around. For example, the authors argued that financial inclusion is a process that results in an increase in the number, quality, and efficiency of intermediary services. The author argues out that these generates local savings which increase productive investments in local business.

Zhang et al[118] explored the association between financial development and economic growth in Chinese cities. For dynamic panel data, the study used both classic cross-sectional regressions and first-differenced and system GMM estimators. According to the findings, most traditional metrics of financial development are favorably related with economic growth. The author proved that China's decisions after joining the WTO did not affect the economy in any way. According to the facts, China has done better than the government's theoretical projections about the country's poor financial development performance since entering the WTO. The dynamic panel study revealed that deposit accounts greatly stimulate growth. Control variables in the study such as the foreign direct investment and education indicated a positive influence on GDP per capita.

The quantity of bank offices in Nigeria adversely impacts monetary consideration. Mbutor and Ibrahim[119] yield discoveries showed an adverse impact of bank offices. In any case, the creators contend that the negative impact on the effect of financial inclusion Nigeria can be explained by the fact that when opening branches, banks seek benefits rather than financial inclusion, which is a strategy objective, so there are groups of branches that are underutilized while various areas are thought to be poor. n the study, two dimensions are considered for the study. This include the access dimension which include bank branches, ATMs while the usage dimension

[118] Zhang, Jin, Lanfang Wang, and Susheng Wang. "Financial development and economic growth: Recent evidence from China. *Journal of Comparative Economics* 40, no. 3 (2012): 393-412."
[119] Mbutor, O. Mbutor, and A. Uba Ibrahim. "The impact of financial inclusion on monetary policy in Nigeria. *Journal of Economics and International Finance* 5, no. 8 (2013): 318-326."

included the number of borrowers from commercial banks, and outstanding deposits. The results indicated that besides bank branches, ATMs and deposit accounts were significant. However, the exchange rate had a damaging impact to the economy.

Bist[120] researched the long-run connection between monetary turn of events and financial development utilizing board unit root and board cointegration investigation. The extent of the review covered 16 chose low-pay nations for the time of 20 years. The creator assessed the long-run relationship utilizing completely adjusted and dynamic OLS procedures. The outcomes in the review demonstrated a cross-sectional reliance across the nations. The Pedroni's panel cointegration investigation offered clear help for the speculation that there exists a long-run cointegrating connection between economic growth and financial development. The long-run panel gauges demonstrated that monetary advancement emphatically and fundamentally invigorated Gross domestic product per capita. To come by vigorous outcomes, the creator played out the time series investigation on the singular nations. The discoveries were like the panel results.

Kumar[121] investigated the factors that influence financial inclusion. Panel fixed effects and dynamic panel generalized methods of moments (GMM) approaches are used by the author. In addition, Kendall's index of rank concordance has been developed to assess for state convergence in attaining financial inclusion. The system GMM results showed that branch networks had a clear positive influence on financial inclusion. To summaries, the fixed effects model revealed that deposit accounts had a large positive influence whereas population had a significant negative effect. The findings of the system GMM were comparable with the findings of bank accounts, but

[120] Bist, Jagadish Prasad. "Financial development and economic growth: Evidence from a panel of 16 African and non-African low-income countries." *Cogent Economics & Finance* 6, no. 1 (2018): 1449780.
[121] Kumar, Nitin. "Financial inclusion and its determinants: evidence from India." *Journal of Financial Economic Policy* (2013).

suggested otherwise on population growth by indicating a little positive effect on financial inclusion. Similarly, Celerier and Matray[122] found that policies aimed at increasing financial inclusion for low-income people increase wealth.

Anwar et al[123] inspected the short run and long run of Indonesia Islamic bank (IIB) commitment to monetary development over the periods 2009-2019. IIB is viewed as which upheld by the biggest Muslim populace on the planet. Stores, funding and workplaces are intermediary to feature the connection between Islamic banks and Indonesia's monetary development the creator applied refined apparatuses in the examination that included, cointegration investigation, autoregressive appropriated slack (ARDL), vector blunder amendment model (VECM), fluctuation deteriorations (VDCs) and motivation reaction capabilities (IRFs) in analyzing the nexus. At last, the creator's results showed huge relationship in the short-run and long-run between IIB stores and workplaces and financial development. Besides, there is proof of a bidirectional connection between the Islamic bank and financial development. On the particular factors, complete stores, and all out supporting fundamentally rose per capita Gross domestic product in the short run while toddler stores showed a huge decrease over the long haul. Anyway, despite the fact that bank offices cultivated development in the review, its impact was irrelevant.

In a segment of selected MENA nations, Emara and Said[124] experimentally researches the connection between monetary consideration and financial development. A framework GMM dynamic board model method is utilized on yearly information for the period 1965-2016, utilizing

[122] Célerier, Claire, and Adrien Matray. "Bank-branch supply, financial inclusion, and wealth accumulation." *The Review of Financial Studies* 32, no. 12 (2019): 4767-4809.
[123] Anwar, Suhardi M., Junaidi Junaidi, Salju Salju, Ready Wicaksono, and Mispiyanti Mispiyanti. "Islamic bank contribution to Indonesian economic growth." *International Journal of Islamic and Middle Eastern Finance and Management* (2020).
[124] Emara, Noha, and Ayah El Said. "Financial inclusion and economic growth: The role of governance in selected MENA countries." *International Review of Economics & Finance* 75 (2021): 34-54.

various proportions of monetary consideration covering the families and the organizations admittance to back. Especially, the review utilizes pointers, for example, the quantity of financial balances, number of bank offices and ATMs (per 100,000 individuals), level of firms utilizing banks to back ventures, the level of firms utilizing bank credits to fund working capital, and the level of firms utilizing banks to fund speculations. The framework GMM results showed that monetary incorporation altogether rose Gross domestic product per capita. Monetary consideration estimated by the family's monetary access file essentially affects financial development in the MENA district, yet requires administrative and administrative systems with sponsorship of law and order, legal freedom, contract implementation, control of debasement, and political dependability. The impact firms' admittance to back is just critical within the sight serious areas of strength for of. The outcomes were immaterial for the overall monetary incorporation measure.

Guru and Yadav[125] involves the framework GMM in deciding the impact monetary improvement has on the financial development. Involving the panel information for the BRICS economies, the specialists utilized monetary advancement pointers both from banking area and securities exchange during 1993 to 2014. The system GMM results showed that the monetary profundity, CDR and CPS have fundamentally sure relationship with financial development. The macroeconomic factors utilized in the review incorporate PCI development, expansion, exports as percentage of Gross domestic product and the log of number of enrolments in secondary schooling. Exports encouraged development while inflation declined the per capita Gross domestic product.

[125] Guru, Biplab Kumar, and Inder Sekhar Yadav. "Financial development and economic growth: panel evidence from BRICS." *Journal of Economics, Finance and Administrative Science* 24, no. 47 (2019): 113-126.

In India, Barik and Sharma[126] claim that financial inclusion is no longer about creating a bank account, but rather about utilizing these accounts for saving and credit purposes. However, poverty is a barrier to digital transactions because a gadget is required to accomplish the latter. In Pakistan, Raza et al[127] examined the link between financial inclusion and economic development. In the study, the authors considered a meta-analysis research strategy. The research employs the Human Progress Index to assess economic development, with ATMs, deposit accounts, and bank branches serving as explanatory factors. The researchers employ descriptive statistics, regression analysis, and correlation analysis. The findings indicated a positive association between financial inclusion and economic growth, implying that increasing financial inclusion may lead to increased economic development. In particular, the number of bank accounts (per 1,000 adult population) and bank branches (per 100,000 inhabitants) show a positive significant link with the human development index (HDI). However, automated teller machines per 1,000 km2 (per cent) revealed a negative relationship.

Grohmann et al[128] investigate if increased financial literacy enhanced financial inclusion. Using cross-country evidence, researchers discovered that increasing financial literacy amplifies the benefit of greater financial depth. IV-regressions corroborate the causal interpretation of these findings. Bank branches demonstrated a strong connection to financial inclusion. Furthermore, the authors utilized private credit to GDP as a proxy variable in quantifying financial depth. The data revealed a favorable association between inclusiveness and happiness. Furthermore, bank branch penetration boosts GDP. The researchers go forward in their investigation by interacting with the

[126] Barik, Rajesh, and Pritee Sharma. "Analyzing the progress and prospects of financial inclusion in India." *Journal of Public Affairs* 19, no. 4 (2019): e1948.
[127] Raza, et al. "Determining the nexus between financial inclusion and economic development in Pakistan. *Journal of Money Laundering Control* (2019)."
[128] Grohmann, Antonia, Theres Klühs, and Lukas Menkhoff. "Does financial literacy improve financial inclusion? Cross country evidence." *World Development* 111 (2018): 84-96.

variables. The interaction terms simply tracked how events unfolded in the context of financial knowledge. However, the interaction term findings revealed differently. For instance, interacting bank branches and financial literacy resulted to an insignificant relationship to financial inclusion that headed towards zero which ought not to be the case. In the case of bank branches and financial depth the results indicated a positive influence to financial inclusion. However, the study suffers limitations in terms of the author did not clearly state reason behind interacting the variables and why he chose on the particular interactions as they lacked theoretical backing.

Yorulmaz[129] gives a detailed guide on index construction. The author builds the indices in the study by including more indicators into the equation to integrate more and more factors that measure financial inclusion. The conclusions of the author are concerned with the amount of financial access in inclusion. The author develops a financial index based on outreach metrics such as the number of branches per 1000 square kilometers and the number of ATMs per 1000 square kilometers. Accounts for deposits per 1000 adults Per 1000 adults, there are 1000 credit accounts. This study's utilization metrics include deposit income ratio, credit income ratio, and life insurance premium volume / GDP. By adding more indicators to the dimensions, the author distinguishes the indices. Moreover, author includes an additional time trend that monitors financial inclusion over time and how it has affected and vice versa. In using the financial index, Sethy and Goyari[130] suggested that policymakers should increase banking penetration and availability of banking services to push the usage of the banking system that eventually stimulates GDP per capita.

[129] Yorulmaz, Recep. "An analysis of constructing global financial inclusion indices." *Borsa Istanbul Review* 18, no. 3 (2018): 248-258.
[130] Sethy, Susanta Kumar, and Phanindra Goyari. "Measuring financial inclusion of Indian States: An empirical study." *Indian Journal of Economics and Development* 14, no. 1 (2018).

Pham and Doan[131] assess the influence of financial inclusion on Asian financial stability. In this study, two dimensions of usage and access are used to assess inclusiveness. Financial services include anything from accounts to credit, savings, and payment services. The financial outreach where individuals may use financial services is measured by access to the financial system. Meanwhile, the dependent variable is financial stability, as measured by the Bank Z-score. We use fixed effects and random effects regression to examine the effects of financial inclusion on financial stability. To improve the model's robustness, the Feasible Generalized Least Squares (FGLS) regression is used as the solution for the random effects regression. The empirical data show that financial inclusion has a limited overall beneficial effect on financial stability. The research findings also give relevant information to both financial institutions and governments, allowing them to establish an appropriate financial development plan, strengthen the regulatory framework, and, as a consequence, improve financial stability for the entire system. Furthermore, ATMs and bank branches had a strong beneficial effect on financial stability in the FE, RE and FGLS findings. However, only the FGLS had a sizable deposit account.

In a nutshell, consensus is absent on how availability of financial services shapes economic security. What is evident, however, is that the different arrived at in previous research point towards an area that further attention. In any case, previous research fell short of even striking a consensus on how exactly to measure financial availability precisely with some researches picking single indicator variables while others coming up with a composite dimension index. Even then, how the index was computed varied across the literature. Some researches, for instance, computed the dimension index via regression; some followed the logic presented by UNDP's development

[131] Pham, Manh Hung, and Thi Phuong Linh Doan. "The impact of financial inclusion on financial stability in Asian countries." *The Journal of Asian Finance, Economics and Business* 7, no. 6 (2020): 47-59.

index; while others made use of funny algebra. Computation and index measurement were, however, addressed in the methodology section of this research.

1.5.2.3 Penetration Dimension and Economic Security

Extant literature proxied penetration by accounts related to either deposits or mobile money. Within the monetary and economic union of West Africa (WAEMU), the overlap discrete wavelet transform estimates in Grakolet, Gourène & Mendy[132] revealed that economic growth and financial penetration cause each other. In 8 countries from South Asia, the FOLS and DOLS estimate in Singh and Stakic[133] suggested that economic growth rose in financial inclusion in the long-run as well as growth raised financial inclusion. In Asia, Ratnawati[134] revealed that financial stability is not affected by penetration of banks. Stability was given by z scores.

In India, the difference GMM estimates in Kumar[135] suggested that deposit penetration rose significantly in deposit-to-state deposit penetration ratio but declined insignificantly in credit penetration ratio and in net state deposit penetration per capita. According to Kumar, development at the state-level enhanced bank branch expansion which furthered financial services penetration. A shortcoming in Kumar is that the deposit penetration and deposit-to-state deposit penetration ratio could be highly correlated. Perhaps, Kumar ought to have utilized simultaneous equation modeling (SEM). Still in India, OLS estimates in Iqbal and Sami[136] suggested that GDP rose significantly in bank branches and the ratio of credit-to-deposit but insignificantly declined in

[132] Gourène, G.A.Z. and Mendy, P. (2019): "Financial Inclusion and Economic Growth in WAEMU: A Multiscale Heterogeneity Panel Causality Approach. Theoretical Economics Letters, 9, 477-488"
[133] Singh, D., & Stakic, N. (2020). "Financial inclusion and economic growth nexus: Evidence from SAARC countries. South Asia Research, 41(1), 1–21. https:// doi.org/10.1177/0262728020964605"
[134] Ratnawati (2020): "The Impact of Financial Inclusion on Economic Growth, Poverty, Income Inequality, and Financial Stability in Asia. Journal of Asian Finance, Economics and Business Vol 7 No 10 (2020) 073–085"
[135] Kumar, Nitin. "Financial Inclusion and Its Determinants: Evidence from India." *Journal of Financial Economic Policy* 5, no. 1 (January 1, 2013): 4–19.
[136] Iqbal, Badar Alam, and Shaista Sami. "Role of Banks in Financial Inclusion in India." *Contaduría y Administración* 62, no. 2 (April 1, 2017): 644–56."

ATM growth. This was attributed to banks serving as both savings mobilizers and production credit allocators which then meant that finance was available for productive use. Kumar's recommendation that ATMs should be expanded was however misleading since ATM expansion was not only found to be insignificant but also retarded GDP growth. Besides, it was not clear why Kumar used GDP in its raw form considering that it was extremely big in relation to the other variables. A better way would have been to transform GDP using logarithm.

Lashitew et al[137] look into the role of mobile phones in financial inclusion. According to the study's authors, one of the primary reasons for having a mobile account is to enable the sending and receiving of mobile transactions. The results were based on an examination of the nonlinear two-limit Tobit estimator, which takes into account the censoring of adoption rates on both sides of the distribution. The regression findings showed that the use of mobile money accounts via mobile transactions increased GDP per capita considerably. However, ATM penetration had a falling significant influence on mobile account ownership. Bank accounts, on the other hand, encouraged the acquisition of a mobile account. The report provides insight into the financial inclusion metrics on how one might affect the uptake of the other although they all are indicators of financial indicators. Lee et al[138] investigates telecommunications and economic growth in the SSA. While employing two-step difference GMM dynamic panel data estimation, the empirical results suggested that mobile expansion significantly rose the economic growth.

[137] Lashitew, Addisu A., Rob van Tulder, and Yann Liasse. "Mobile phones for financial inclusion: What explains the diffusion of mobile money innovations?. *Research Policy* 48, no. 5 (2019): 1201-1215."
[138] Lee, Sang H., John Levendis, and Luis Gutierrez. "Telecommunications and economic growth: An empirical analysis of sub-Saharan Africa." *Applied economics* 44, no. 4 (2012): 461-469.

On a panel of 52 nations, Asongu[139] investigated the influence of mobile phone usage on African inequality. The empirical procedures Robust Ordinary Least Squares and Two Stage Least Squares were used in the investigation. According to the findings, mobile money accounts give an opportunity for poverty eradication through inclusion through penetration. Furthermore, the author considers macroeconomic variables such as inflation, commercial openness, foreign aid, and the rule of law. The study's findings indicated that the financial indicators employed, namely mobile penetration and financial depth, greatly dropped the GINI index, indicating that it was beneficial to the poor, but inflation significantly increased the index. Combating inequality and poverty is the first step in achieving economic progress. Solving these problems allows for a lower consumption rate from savings and larger allocations to investments. Finally, the study findings revealed that financial inclusion promoted growth through addressing inequality issues.

Mobile money accounts enable the involuntarily excluded unbanked people in emerging countries to become financially involved. Andrianaivo and Kpodar[140] studied whether mobile phones promoted economic growth by facilitating financial inclusion. The GDP per capita was the dependent variable in the study, while the explanatory factors comprised mobile phone development and a set of growth drivers (including primary school enrolment rate, inflation, government consumption, and institutional development). To overcome endogeneity difficulties, the author used the System Generalized Method of Moments (GMM) estimator; the data verified that mobile phone development through ownership of an account to allow transactions contributed greatly to economic growth in African countries. The authors of the study employed particular

[139] Asongu, Simplice A., Peter Agyemang-Mintah, and Rexon T. Nting. "Law, mobile money drivers and mobile money innovations in developing countries." *Technological Forecasting and Social Change* 168 (2021): 120776.
[140] Andrianaivo, Mihasonirina, and Kangni Kpodar. "Mobile phones, financial inclusion, and growth. *Review of Economics and Institutions* 3, no. 2 (2012): 30."

indices of financial inclusion, such as the number of deposits and loans, in their research. Furthermore, the findings suggested that mobile adoption considerably aided economic growth. For example, the study's data showed that every extra 10% rise in mobile penetration rate is connected with a 0.6 percentage point boost in real GDP growth.

Kunt et al[141] looked at the connection between financial inclusion and inclusive growth. The author investigates how the financial product eventually leads to an increase in GDP per capita. According to the study, financial inclusion helps to decrease poverty by smoothing consumption and allowing individuals to invest in the near future. Furthermore, the author suggests that advancements in technology and an increase in financial services will be critical in realizing the benefit of financial inclusion on growth.

Anyanwu[142] investigates if Africa may benefit from Chinese insights to boost its economic growth. The researcher used many models to compare the factors of economic growth in China and Africa on an individual basis. Several models were used by the researcher to compare the impacts of individual explanatory factors, including pooled OLS, FGLS, IV-2SLS, and the IV-GMM. Credit to the private sector was utilized to show financial inclusion among the macroeconomic explanatory factors. The pooled OLS and IV-GMM revealed that the indicator had a negative but small influence on economic growth, however the FGLS and IV-2SLS stated that credit to the private sector considerably hindered economic expansion.

[141] Demirgüç-Kunt, Asli, and Dorothe Singer. "Financial inclusion and inclusive growth: A review of recent empirical evidence. *World Bank Policy Research Working Paper* 8040 (2017)."
[142] Anyanwu, John C. "Factors affecting economic growth in Africa: are there any lessons from China?." *African Development Review* 26, no. 3 (2014): 468-493.

From 1983 to 2006, Choong[143] investigated the link between foreign direct investment (FDI), financial development, and economic growth in a panel of 95 developed and developing nations. The authors' findings using generalized method of moment (GMM) panel data analysis revealed that financial development and FDI aided economic growth. Furthermore, the findings suggested that a strong financial system is a necessary condition for FDI to have a beneficial impact on economic growth. Furthermore, the author contends that nations with a well-developed financial sector have a better chance of reaping the enormous benefits of FDI. The researcher looked at three indicators to measure financial deepening in the study: liquid liabilities, the ratio of deposit money bank domestic assets to deposit money bank domestic assets plus central bank domestic assets, and the ratio of credit provided by financial intermediaries to the private sector to GDP. In all of the aforementioned measures, the outcome was good and substantial for GDP per capita.

ICT diffusion has the potential to increase financial inclusion by making it easier to provide cost-effective financial services. Chatterjee[144] used a fixed effect model to investigate if ICT may be a good predictor of financial inclusion. Furthermore, the study employs the GMM system to assess the growth nexus. The authors use depth of access, availability indicators, and usage indicators to assess financial inclusion. Deposit accounts were used to gauge penetration, while ATMs and branches were used to gauge availability, and domestic loans to the private sector and outstanding deposits were used to gauge utilization. In addition to the factors stated above, inflation and education were employed as control variables. The system GMM results suggested

[143] Choong, Chee-Keong. "Does domestic financial development enhance the linkages between foreign direct investment and economic growth?." *Empirical Economics* 42, no. 3 (2012): 819-834.
[144] Chatterjee, A. (2020). "Financial inclusion, information and communication technology diffusion, and economic growth: A panel data analysis. Information Technology for Development, 1–29. https://doi.org/10. 1080/02681102.2020.1734770"

that credit, mobile accounts, trade openness and ATM significantly rose the GDP per capita while bank branches was detrimental to growth. The RE model revealed similar outcomes. In addition, lagged GDP per capita significantly fostered growth. Trade openness and education significantly rose growth while inflation was seen to dampen GDP per capita.

Talom and Tengesh[145] conduct quantitative and qualitative study in Cameroon to investigate the impact of mobile money on the financial performance of Cameroonian SMEs. The researchers employed a mixed study paradigm, which comprised survey questionnaire data as well as in-depth interviews. According to the report's authors, SMEs are one of the primary drivers of economic growth. Adoption of mobile money transactions has been shown to indirectly promote economic growth in underdeveloped countries via SMEs. Through financial inclusion, the use of mobile money services in Cameroon has seen SMEs enhance their financial performance. According to the data, mobile money payment and receipt services contributed around 73% of the entire variation in the turnover of Cameroonian SMEs following financial inclusion via mobile money. This is accomplished by enhanced service offering to their clients as a result of lower operating expenses incurred by mobile transactions as contrasted to banks. Thus, financial inclusion through SMES is considered as having a good impact on Cameroon's economic growth.

Azam and Khan[146] reassess the impact of inflation on economic development in 27 nations. To estimate the inflation threshold and its implications on growth, the fixed effects and feasible generalized least squares (FGLS) methods are utilized. The results revealed a negative significant relationship over the threshold level. Furthermore, gross fixed capital creation, government

[145] Talom, Frank Sylvio Gahapa, and Robertson Khan Tengeh. "The impact of mobile money on the financial performance of the SMEs in Douala, Cameroon." *Sustainability* 12, no. 1 (2019): 183.
[146] Azam, Muhammad, and Saleem Khan. "Threshold effects in the relationship between inflation and economic growth: Further empirical evidence from the developed and developing world." *International Journal of Finance & Economics* 27, no. 4 (2022): 4224-4243

expenditure, household spending, and real exports drive economic growth, but population expansion is negative to regional growth. According to the authors' conclusions, inflation is harmful to growth if it surpasses a certain level. Notably, the threshold values differ among nations, from developing to developed. Moreover, the threshold still differs from country to country due to the different specific country characteristics.

In Ghana, Evans[147] utilized the ordinary least squares strategy to assess the impacts of expansion on the economy. In the review discoveries, other than expansion, joblessness likewise hurt the economy. Stevanovic et al[148] examined the effects of the implementation of the inflation targeting regime on economic growth. The creator involves panel data for Serbia, Turkey, Albania and Romania. The extension covered was for the period 1993-2020. The consequences of the regression model showed that there was a positive measurable importance between the flimsiness of expansion. In finding the impact of the past inflation rate to the momentum one, the specialists applied the GARCH model. The discoveries showed that there was a positive impact. In passing the creators figures out that inflation targeting significantly decreased the Gross domestic product development.

Batrancea et al[149] random effects findings from a panel data analysis to study the factors of economic growth revealed that the bank capital to assets ratio was mostly responsible for GDP per capita. The author employs three estimate models: pooled OLS, fixed effects, and random effects. In all three scenarios, inflation had a negligible impact on GDP. Despite the fact that the bank

[147] Evans, Yeboah. "The Effect of External Debt, Unemployment Rate, and Inflation on Economic Growth in Ghana." *Journal of Empirical Studies* 9, no. 2 (2022): 24-34.
[148] Stevanović, Suzana, Ivan Milenković, and Sladjana Paunović. "Effects of the implementation of the inflation targeting regime on economic growth." *Ekonomski horizonti* 24, no. 3 (2022): 297-311.

[149] Batrancea, Larissa, Malar Kumaran Rathnaswamy, and Ioan Batrancea. "A panel data analysis on determinants of economic growth in seven non-BCBS Countries." *Journal of the Knowledge Economy* 13, no. 2 (2022): 1651-1665.

capital asset ratio drove expansion, it had a negative impact. For example, increasing BCA by one unit reduces GDP growth rate by 0.07 unit.

In East Africa, Oloo et al[150] investigates Threshold Effect of Macroeconomic Convergence Criteria on Real GDP Growth Rate within the East African Community. The authors used a dynamic threshold panel model in their estimations. In the findings, the researcher's outcomes suggested a difference in the threshold levels initially set by the East African Monetary Committee. The author advocated for the thresholds to be reconsidered. The inflation threshold regressions indicated that inflation is statistically significant and rises GDP when it is below 7.5%. However, above that level it maintains a positive co efficient but becomes insignificant. In addition, when the threshold level is observed, investment, consumption and the government expenditure significantly spur growth while net exports significantly decrease GDP.

Bandura[151] investigates the impact of inflation on the finance-growth nexus. According to the authors' findings, inflation is only harmful to financial progress when it surpasses 31%. However, the studies show varying amounts depending on the financial measures examined. When private credit by deposit banks is employed as an indication, the threshold level falls to 13%. This demonstrates a lack of agreement among financial measures. Despite the 13% level, the researcher suggests that it be kept below 31% for long-term development through financial growth. The non-dynamic panel threshold analysis revealed that trade openness and gross capital formation aided growth substantially.

[150] Oloo, Michael, Mary Mbithi, and Martin Oleche. "Threshold Effect of Macroeconomic Convergence Criteria on Real GDP Growth Rate within the East African Community." *European Journal of Development Studies* 2, no. 2 (2022): 11-25.
[151] Bandura, Witness Nyasha. "Inflation and finance-growth nexus in Sub-Saharan Africa." *Journal of African Business* 23, no. 2 (2022): 422-434.

Rosnawintang et al[152] examines inflation effect on ASEAN5. To test for the effects, the author uses the panel Autoregressive Distributed Lag model and panel data with annual time series for the period from 1995 to 2018. The model parameter estimation results indicated that in the short run, internet and inflation significantly stifled economic growth. However, the results suggested otherwise in the long run. Inflation was positive but insignificant while internet increased economic growth significantly at the 10% level. Inflation however is seen to be country specific as it did not affect all the countries equally with the same magnitude. With reference to the same countries, Ridzuan et al[153] evaluates the determinants of growth in ASEAN5 countries for the period 1970-2013. In the methodology, ARDL approach is used in estimating for the long run and short run dynamic relationships the findings in the study indicated that population and trade openness have a positive and significant effect on economic growth.

Asteriou and Spanos[154] looks at the relationship of monetary turn of events and financial development if there should arise an occurrence of an emergency. The creator utilizes different panel regression models and multiplicative dummies to think about the two sub periods, one preceding emergency and one during the crisis. Using inflation and trade openness as the macroeconomic factors, the outcomes demonstrated that during the emergency, inflation was detrimental while trade openness cultivated development during that period.

[152] Rosnawintang, Rosnawintang. "Effects of crude oil prices volatility, the internet and inflation on economic growth in ASEAN-5 countries: A panel autoregressive distributed lag approach." *670216917* (2021).
[153] Ridzuan, Abdul Rahim, Muhammad Waqas Khalid, Nur Izzati Zarin, Mohd Idham Md Razak, Abdul Rauf Ridzuan, Irzan Ismail, and Norsabrena Norizan. “The impact of foreign direct investment, domestic investment, trade openness and population on economic growth: evidence from asean-5 countries. *International Journal of Academic Research in Business and Social Sciences* 8, no. 1 (2018): 128-143.”
[154] Asteriou, Dimitrios, and Konstantinos Spanos. "The relationship between financial development and economic growth during the recent crisis: Evidence from the EU." *Finance Research Letters* 28 (2019): 238-245.

Peter and Bakari[155] examined the impact of population growth on economic growth in Africa. The authors used the descriptive statistics, as well as dynamic panel models of difference and system GMM. The results from the analysis indicated that population growth significantly increased GDP. The inflation coefficient was positive. This indicated that inflation in Africa significantly increased the GDP. However, the research findings are disturbing and contradicting, for instance the researcher's results suggested that increase in crude death rate increased GDP while population growth simultaneously increased GDP. Similarly, Ogunleye et al[156] in Nigeria used a n ordinary least square regression to find out that population growth in Nigeria significantly increases GDP. Fertility rate and the crude death rate however decreased the GDP. Exchange rate following the regression results spurred growth in the country.

In Ethiopia, Degu[157] determines the nexus between population and economic growth. Using time series data for close to four decades, the ARDL approach indicated that population growth has significantly declined the GDP. Toader et al[158] empirically assessed the EU countries and found out that inflation rate, mobile cellular subscriptions, trade openness significantly affect the GDP per capita at EU level. In applying the panel data techniques, the authors results indicated that under the FE model Inflation was statistically significant with a negative coefficient. Mobile subscriptions and trade openness similarly were statistically significant art 1% but with a positive coefficient finding suggest that inflation harms growth while trade openness and mobile

[155] Peter, Amade, and Ibrahim Bakari. "Impact of population growth on economic growth in Africa: A dynamic panel data approach (1980-2015)." *Pakistan Journal of Humanities and Social Science (PJHSS)* 6, no. 4 (2018): 412-427.
[156] Ogunleye, Olusogo Olamide, Oluwarotimi Ayokunnu Owolabi, and Muazu Mubarak. "Population growth and economic growth in Nigeria: An appraisal." *International Journal of Management, Accounting and Economics* 5, no. 5 (2018): 282-299.
[157] Degu, Adisu Abebaw. "The nexus between population and economic growth in Ethiopia: An empirical inquiry." *International Journal of Business and Economic Sciences Applied Research (IJBESAR)* 12, no. 3 (2019)
[158] Toader, Elena, Bogdan Narcis Firtescu, Angela Roman, and Sorin Gabriel Anton. "Impact of information and communication technology infrastructure on economic growth: An empirical assessment for the EU countries." *Sustainability* 10, no. 10 (2018): 3750.

subscriptions promoted economic growth in the EU countries. In checking for the robustness of the results under the FE model, the author applies the FD-GMM model whereby it indicates trade openness is consistent with a positive significant effect on growth.

1.5.2.4 Usage Dimension and Economic Security

Extant literature contextualized usability of financial services in terms of either outstanding deposits or mobile money transactions as well as index of usage dimension (UDI)[159]. In India, Bayesian autoregression estimates in Dahiya and Kumar suggested that economic growth is significantly affected by financial services usage.

While at it, this research realized that other factors were included in previous research in attempts to explain economic security. These factors included human capital (measured using school enrolment and government expenditures), human development (measured using poverty and income inequality), the institutional environment (measured using regulatory extent, rule of law, and corruption control), trade openness (which constituted imports and exports), technical advancements (revealed through innovations such as mobile money and mobile telephony), inflation (which was measured and utilized in particularly disturbing ways), population growth, unemployment, and a country's level of development.

In eight MENA economies, the GMM estimates in Neaime and Gaysset[160] suggested that poverty growth significantly declined in school enrolment. According to Neaime and Gaysset, heavy investments in education alongside concerted efforts to promote literacy fostered school enrolment. Education in turn contributed towards human capital development which was vital in

[159] Nguyen, T. T. H. (2020). "Measuring financial inclusion: A composite FI index for the developing countries. Journal of Economics and Development, 23(1), 77–99. https://doi.org/101108/JED-03-2020-0027"
[160] Neaime, Simon, and Isabelle Gaysset. "Financial Inclusion and Stability in MENA: Evidence from Poverty and Inequality. *Finance Research Letters* 24 (March 1, 2018): 230–37. https://doi.org/10.1016/j.frl.2017.09.007."

poverty reduction crusades. A shortcoming in Neaime and Gaysset is that school enrolment was used along GDP. It is probable that GDP and school enrolment co-move together. Perhaps, Neaime and Gaysset could have controlled for either. In 45 Islamic States, the system GMM estimates in Ali, Hashmi, Nazir, Bilal, and Nazir[161] suggested that ln GDP significantly rose in primary school attendance. In 124 countries, fixed effects (FE) estimates in Van, Vo, Nguyen, and Vo[162] suggested that economic growth insignificantly rose in schooling in the full sample. In upper middle-income economies, however, the estimates suggested that economic growth rose in schooling.

In eight MENA economies, the GMM estimates in Neaime and Gaysset[163] suggested that poverty growth insignificantly rose in inflation. In the regression, however, both inflation and GDP alongside the square of GDP were utilized. Inflation and GDP may be highly correlated if both the Okun's law and the Philips Curve were considered. Perhaps, Neaime and Gaysset could have controlled for either. In 45 Islamic States, the system GMM estimates in Ali, Hashmi, Nazir, Bilal, and Nazir[164] suggested that ln GDP insignificantly declined in inflation rate. In MENA countries, the system GMM estimates in Emara and Said[165] indicated that for the 1990-2018 period, inflation insignificantly reduced GDP per capita. At the household-level, however, GDP per capita significantly declined in inflation (Emara and Said). For the 2011-2020 period in Indonesia, the

[161] Ali, Minhaj, Shujahat H. Hashmi, Muhammad R. Nazir, Ahmer Bilal, and Muhammad I. Nazir. "Does Financial Inclusion Enhance Economic Growth? Empirical Evidence from the IsDB Member Countries." *International Journal of Finance & Economics* 26, no. 4 (2021): 5235–58.
[162] Van, Loan Thi-Hong, Anh The Vo, Nhan Thien Nguyen, and Duc Hong Vo. "Financial Inclusion and Economic GROWTH: An International Evidence." *Emerging Markets Finance and Trade* 57, no. 1 (January 2, 2021): 239–63. https://doi.org/10.1080/1540496X.2019.1697672.
[163] Neaime, Simon, and Isabelle Gaysset. "Financial Inclusion and Stability in MENA: Evidence from Poverty and Inequality." *Finance Research Letters* 24 (March 1, 2018): 230–37. https://doi.org/10.1016/j.frl.2017.09.007.
[164] Ali, Minhaj, Shujahat H. Hashmi, Muhammad R. Nazir, Ahmer Bilal, and Muhammad I. Nazir. "Does Financial Inclusion Enhance Economic Growth? Empirical Evidence from the IsDB Member Countries." *International Journal of Finance & Economics* 26, no. 4 (2021): 5235–58. https://doi.org/10.1002/ijfe.2063.
[165] Emara, Noha, and Ayah El Said. "Financial Inclusion and Economic Growth: The Role of Governance in Selected MENA Countries." *International Review of Economics & Finance* 75 (September 1, 2021): 34–54. https://doi.org/10.1016/j.iref.2021.03.014.

VECM estimates in Adzimatinur and Manalu[166] suggested that inflation raised GDP in the long-run. In the short-run, inflation reduced/ raised GDP for lag one/ two, respectively.

According to Adzimatinur and Manalu, a rise in the price level incentivized producers to raise production which subsequently fostered growth; inflation, however, erodes purchasing power. Even then, it was not clear whether GDP was significantly affected since Adzimatinur and Manalu reported neither the test statistics nor probability values. For the 2004-2016 period in 33 developing economies, the two-step and one-step system GMM estimates in Ain, Sabir and Asghar[167] revealed that per capita GDP significantly declined in inflation. According to Ain, Sabir and Asghar high poverty incidences in developing countries meant that as price levels rose, poor people's effective demand declined. This then sent signals to firms to cut down on output levels. Thus economic growth declined. In 55 Islamic States, the difference GMM estimates in Kim, Yu and Hassan[168] indicated that per capita GDP insignificantly rose in inflation in the presence of ATMs expansion but significantly rose in inflation in the presence bank branches expansion and deposit growth.

In eight MENA economies, the GMM estimates in Neaime and Gaysset[169] suggested that poverty growth significantly rose in population growth. Neaime and Gaysset, however, utilized population and age dependency ratio in the same regression. It is probable that the two were highly

[166] Adzimatinur, Fauziyah, and Vigory Gloriman Manalu. "The Effect of Islamic Financial Inclusion on Economic Growth: A Case Study of Islamic Banking in Indonesia." *Budapest International Research and Critics Institute (BIRCI-Journal): Humanities and Social Sciences* 4, no. 1 (February 6, 2021): 976–85. https://doi.org/10.33258/birci.v4i1.1699.

[167] Ain, Noor ul, Samina Sabir, and Nabila Asghar. "Financial Inclusion and Economic Growth: Empirical Evidence from Selected Developing Economies." *Review of Economics and Development Studies* 6, no. 1 (September 30, 2020): 179–203.

[168] Kim, et al. "Financial Inclusion and Economic Growth in OIC Countries. *Research in International Business and Finance* 43 (January 1, 2018): 1–14. https://doi.org/10.1016/j.ribaf.2017.07.178."

[169] Neaime, Simon, and Isabelle Gaysset. "Financial Inclusion and Stability in MENA: Evidence from Poverty and Inequality." *Finance Research Letters* 24 (March 1, 2018): 230–37. https://doi.org/10.1016/j.frl.2017.09.007.

correlated. Perhaps, Neaime and Gaysset could have controlled for either. In 45 Islamic States, the system GMM estimates in Ali, Hashmi, Nazir, Bilal, and Nazir[170] suggested that ln GDP insignificantly rose in population growth. In MENA countries, the system GMM estimates in Emara and Said[171] indicated that for the 1990-2018 period, population growth insignificantly raised GDP per capita. In 124 countries, fixed effects (FE) estimates in Van, Vo, Nguyen, and Vo[172] suggested that economic growth insignificantly declined in population in the full sample. In Italy, the stochastic frontier analysis (SFA) estimates in Bernini and Brighi[173] suggested that population significantly raised technical inefficiency. Suggestive in this is that as population reached by banks grew, inefficiency arose. This could be attributed, however, to inefficiency arising from branching in the presence of overregulation Bernini and Brighi, nevertheless, did not control for regulatory quality. In 55 Islamic States, the difference GMM estimates in Kim, Yu and Hassan[174] indicated that per capita GDP significantly declined in population when controlled for ATMs and bank branches expansion.

In eight MENA economies, the GMM estimates in Neaime and Gaysset[175] suggested that poverty growth insignificantly rose in trade openness. In 45 Islamic States, the system GMM and

[170] Ali, Minhaj, Shujahat H. Hashmi, Muhammad R. Nazir, Ahmer Bilal, and Muhammad I. Nazir. "Does Financial Inclusion Enhance Economic Growth? Empirical Evidence from the IsDB Member Countries." *International Journal of Finance & Economics* 26, no. 4 (2021): 5235–58. https://doi.org/10.1002/ijfe.2063.
[171] Emara, Noha, and Ayah El Said. "Financial Inclusion and Economic Growth: The Role of Governance in Selected MENA Countries." *International Review of Economics & Finance* 75 (September 1, 2021): 34–54. https://doi.org/10.1016/j.iref.2021.03.014.
[172] Van, Loan Thi-Hong, Anh The Vo, Nhan Thien Nguyen, and Duc Hong Vo. "Financial Inclusion and Economic GROWTH: An International Evidence." *Emerging Markets Finance and Trade* 57, no. 1 (January 2, 2021): 239–63. https://doi.org/10.1080/1540496X.2019.1697672.
[173] Bernini, Cristina, and Paola Brighi. "Bank Branches Expansion, Efficiency and Local Economic Growth." *Regional Studies* 52, no. 10 (October 3, 2018): 1332–45. https://doi.org/10.1080/00343404.2017.1380304.
[174] Kim, et al. "Financial Inclusion and Economic Growth in OIC Countries. Research in International Business and Finance 43 (January 1, 2018): 1–14. https://doi.org/10.1016/j.ribaf.2017.07.178."
[175] Neaime, Simon, and Isabelle Gaysset. "Financial Inclusion and Stability in MENA: Evidence from Poverty and Inequality." *Finance Research Letters* 24 (March 1, 2018): 230–37. https://doi.org/10.1016/j.frl.2017.09.007.

the two-stages least squares (2SLS) estimates in Ali, Hashmi, Nazir, Bilal, and Nazir[176] suggested that ln GDP insignificantly rose in trade openness. In MENA countries, the system GMM estimates in Emara and Said[177] indicated that for the 1990-2018 period, trade openness significantly raised GDP per capita. In 124 countries, fixed effects (FE) estimates in Van, Vo, Nguyen, and Vo[178] suggested that economic growth insignificantly declined in trade openness. For the 2004-2016 period in 33 developing economies, the two-step and one-step system GMM estimates in Ain, Sabir and Asghar[179] revealed that per capita GDP significantly rose in trade openness. This was attributed to skilled human capital imports enhancing productive efficiency. It is, however, likely that trade openness is affected by political stability and the rule of law. Perhaps, Ain, Sabir, and Asghar could have instrumented trade openness on the rule of law and political stability. In 55 Islamic States, the difference GMM estimates in Kim, Yu and Hassan[180] indicated that per capita GDP insignificantly declined in trade openness in the presence of ATMs expansion and insignificantly rose in trade openness in the presence of bank branches expansion.

1.5.3 Gaps in Literature

Extant literature gave much thought to regions away from East Africa. Despite the evidence from experiences elsewhere that economic security is shaped by financial inclusion, it was unclear

[176] Ali, Minhaj, Shujahat H. Hashmi, Muhammad R. Nazir, Ahmer Bilal, and Muhammad I. Nazir. "Does Financial Inclusion Enhance Economic Growth? Empirical Evidence from the IsDB Member Countries." *International Journal of Finance & Economics* 26, no. 4 (2021): 5235–58. https://doi.org/10.1002/ijfe.2063.
[177] Emara, Noha, and Ayah El Said. "Financial Inclusion and Economic Growth: The Role of Governance in Selected MENA Countries." *International Review of Economics & Finance* 75 (September 1, 2021): 34–54. https://doi.org/10.1016/j.iref.2021.03.014.
[178] Van, et al. "Financial Inclusion and Economic GROWTH: An International Evidence. *Emerging Markets Finance and Trade* 57, no. 1 (January 2, 2021): 239–63. https://doi.org/10.1080/1540496X.2019.1697672."
[179] Ain, Noor ul, Samina Sabir, and Nabila Asghar. "Financial Inclusion and Economic Growth: Empirical Evidence from Selected Developing Economies." *Review of Economics and Development Studies* 6, no. 1 (September 30, 2020): 179–203. https://doi.org/10.47067/reads.v6i1.195.
[180] Kim, et al. "Financial Inclusion and Economic Growth in OIC Countries. Research in International Business and Finance 43 (January 1, 2018): 1–14. https://doi.org/10.1016/j.ribaf.2017.07.178."

how these dynamics would play out in East Africa. Besides, previous research did not settle the economic security-financial inclusion debate once and for all. Thus, there was room for the current research to make a contribution to the debate by removing some of the confusion pitying policy action against empirical evidence. Last, but not least, previous research overemphasized bank-specific characteristics such as ATMs, bank branches, and deposit accounts with mobile money services being considered only as an afterthought. Within East Africa, however, mobile money has been touted as the 'game changer'. Hence, this research sought to interrogate how mobile money shaped economic security within East Africa, and consequently narrowed the scope to the 10-year period spanning 2012 to 2021.

1.6 Research Hypotheses

H11: Economic security of EAC states is significantly affected by availability of financial services.

H01: Economic security of EAC states is not significantly affected by availability of financial services.

H12: Economic security of EAC states is significantly affected by penetration of financial services.

H02: Economic security of EAC states is not significantly affected by penetration of financial services.

H13: Economic security of EAC states is significantly affected by usage of financial services.

H03: Economic security of EAC states is not significantly affected by usage of financial services.

1.7 Justification of the Study

The significance of this research cannot be overstated because it provides a foundation for informed policy action among East African governments and Central Banks while also contributing to the academic community. The recommendations from this study are especially

useful in policy formation because they focus on financial inclusion and financial education within the context of financial regulation.

In terms of academic rationale, considering that it was a pioneering study on financial inclusion in the expanding EAC in the age of digitization, this research generated a massive quantity of known knowledge. The documentation and subsequent dissemination of this information has the potential to help students, researchers, teachers, and general readers throughout the subregion and beyond. Another component of academic motivation for this study was its ability to clarify grey areas in the existing body of literature on how financial inclusion shapes economic security and the variables that dictate this course. While most studies found that financial inclusion improves economic security, a few others found an unfavourable association between the two.

1.8 Limitations & delimitations

This study experience some limitations. First, The East African Community Trading bloc consists of seven (7) countries as at October 2023. This study examined three of the seven countries i.e. Kenya, Uganda, and Rwanda because of availability of consistent and representative data. This reduced the target population, however results of the study shall be utilized to make generalizations for all the EAC countries.

Second, the data utilized in the analysis was secondary data that was gathered from the International Monetary Fund's (IMF) Financial Access Survey (FAS) and the World Bank's World Development Indicators (WDI). This data might be subject to various macroeconomic variable from one country to another.

The researcher chose 2012 as the starting year owing to the introduction of mobile money in that year, which represents a favourable outcome in the extension of financial services for poor countries. However, this reduced the study period for a panel data study

1.9 Theoretical Framework

The Financial Intermediation Theory will serve as the foundation for this research. Financial intermediation is the deposit of funds by surplus units with financial institutions, which then lend to deficit units. This research benefited immensely from the works of Schumpeter[181], Goldsmith[182] and Shaw[183] that emphasized financial mobilization in intermediation process which subsequently formed the basis for economic development. McKinnon[184] affirmed the theory by providing evidence that shows that demand for money has a direct relationship with physical accumulation of capital. That is, physical accumulation of capital and investment within the economy can only thrive when money is available within the economy, which is the rationale behind the existence of financial intermediaries.

Shaw further avers that this is because intermediation results to mobilization of savings which can be channelled into investment for physical capital accumulation or other productive endeavours. Substantially, the industrial revolution in the Great Britain which is a major example of economic development was only made possible because banks were available to extend credit

[181] Schumpeter, J.A. (1934). The theory of economic development. Cambridge: Harvard University Press. Available at https://www.hup.harvard.edu/catalog.php?isbn=9780674879904
[182] Goldsmith, R.W. (1969). Financial structure and development. New Haven: Yale University Press. Doi: https://doi.org/10.2307/2230134
[183] Shaw, E.S. (1973). Financial deepening in economic development. New York: Oxford University Press.
[184] McKinnon, R.I. (1973). Money, capital and banking. Washington D. C.: Brooklyn Institution. Available at https://www.brookings.edu/book/money-and-capital-in economic-development

to the economy[185]. Apart from the major role in economic development[186] submitted that the presence of intermediaries has reduced information asymmetries, strengthened resource allocation and improved liquidity within the economy. One major assumption of this theory is the importance attached to the financial system in driving economic development through its channels such as its financial intermediaries. Thus, financial intermediaries are vital channels for reaching the largely unbanked population of the economy in a bid to drive an all-inclusive growth.

1.10 Methodology

The realization of the objectives necessitated the formulation of a rigorous analytical model. Towards this end, design and scope of the research were presented alongside the data, coverage, and the analytical model followed by research operationalization.

1.10.1 Research Design

A research design is a blueprint or an overall strategy for the collection, measurement, and analysis of data. Saunders (2009) postulates that a research design is an overall plan that guides the researcher work. It directs the researcher on how to go about answering the research question(s).

The Study employed Pragmatic (Mixed method) RD to investigate the effect of financial inclusion on economic security of EAC states. This research design incorporates both qualitative and quantitative elements. Combining different designs in one study increases validity of the findings.

[185] Schumpeter, J.A. (1934). The theory of economic development. Cambridge: Harvard University Press. Available at https://www.hup.harvard.edu/catalog.php?isbn=9780674879904

[186] Greenwood, J., & Jovanovich, B. (1990). "Financial development, growth and the distribution of income. Journal of Political Economy, 98(1), 1076-1107."

1.10.2 Scope of the Research

This study examined three EAC nations to investigate the impact of financial inclusion on economic security. Kenya, Uganda, and Rwanda are the countries involved. The data was gathered from the International Monetary Fund's (IMF) Financial Access Survey (FAS) and the World Bank's World Development Indicators (WDI) from 2012 to 2021. The nations were chosen because consistent representative data was available. The researcher chose 2012 as the starting year owing to the introduction of mobile money in that year, which represents a favourable outcome in the extension of financial services for poor countries.

1.10.3 Target Population

Individuals with common characteristics that are observable constitute a population. The target population for this study will be all the seven (7) countries that for the EAC trading bloc. The countries are Kenya, Rwanda, Tanzania, Uganda, Burundi, South Sudan, and the Democratic Republic of Congo.

1.10.4 Research Sample and Sampling Technique

To examine the effects of financial inclusion on economic security of seven EAC states, the study applied purposeful sampling techniques. Purposive sampling is a non-probability sampling strategy in which units are chosen because they possess traits that you require in your sample. The study sampled Kenya, Uganda and Rwanda based on availability of consistent and representative data. Data for Burundi, South Sudan, DRC and Tanzania was incomplete for the period under study.

1.10.5 Data Collection Method

The data came from the International Monetary Fund's Financial Access Survey (FAS) and the World Bank's World Development Indicators (WDI). The countries were chosen based on the availability of consistent representative data. Economic growth is the study's dependent variable. It is described as an increase in the real market value of an economy's goods and services over time. GDPPC (Gross Domestic Product Per Capita) will be used to measure economic growth. The GDPPC's value will be expressed in US dollars and in natural logarithms.

Financial inclusion has three dimensions: availability, penetration, and accessibility. First, the availability dimension index is computed by multiplying the number of bank branches, ATMs, and mobile money agents by the natural logarithm of their number. Second, the penetration dimension index is calculated by taking the natural logarithms of deposit and mobile money account balances and multiplying them by the number of accounts. Third, the utilization dimension index is produced by taking the natural logarithms of outstanding commercial bank deposits as a percentage of GDP, outstanding commercial bank loans as a percentage of GDP, and mobile money transactions as a percentage of GDP and multiplying them by the number of transactions.

Table 1: **Operationalization of study variables**

Dimension	Measure	Description	Data Source (s)
Availability	Bank branches	"Number of commercial bank branches per 100,000 adults"	IMF's Financial Access Survey
	Number of ATMs	"Number of Automated ATMs per 100,000 adults"	IMF's Financial Access Survey
	Mobile money agents	"Number of registered mobile money agent outlets per 100,000 adults"	IMF's Financial Access Survey

Dimension	Measure	Description	Data Source (s)
Penetration	Deposit accounts	"Number of deposit accounts with commercial banks per 1,000 adults"	IMF's Financial Access Survey
	Mobile money accounts	"Number of registered mobile money accounts per 1,000 adults"	IMF's Financial Access Survey
Usage	Outstanding deposits	"Outstanding deposits with commercial banks (% of GDP)"	IMF's Financial Access Survey
	Outstanding loans	"Outstanding loans from commercial banks (% of GDP)"	IMF's Financial Access Survey
	Mobile money transactions	"Total volume of mobile money transactions (% of GDP)"	IMF's Financial Access Survey
Inflation rate		"Annual percentage change in the average consumer price index"	World Bank's World Development Indicators
Population growth rate		"The rate at which the total population increases over time"	World Bank's World Development Indicators
Trade openness		"Trade openness measured by Export + Import as a percentage of GDP"	World Bank's World Development Indicators

1.10.6 Data Analysis and Presentation

The research strategy adopted by the current study followed the works of Ifediora al.[187], Inoue and Hamori[188] and Makina &Walle[189] which empirically estimated the relationship between financial inclusion and economic security using generalized method of moments (GMM). The analysis of data involved describing the data as well as model estimation. Data description utilized measures of scale and location. Model estimation was, on its part, preceded by stationary panel

[187] Ifediora, et al. (2022): "Financial inclusion and its impact on economic growth: Empirical evidence from subSaharan Africa, Cogent Economics & Finance, 10:1, 2060551, DOI: 10.1080/23322039.2022.2060551"
[188] Inoue, T., & Hamori, S. (2016). "Financial access and economic growth: Evidence from Sub-Saharan Africa. Emerging Markets Finance and Trade, 52(3), 743–753. https://doi.org/10.1080/1540496X.2016. 1116282"
[189] Makina, D., & Walle, Y. M. (2019). "Financial inclusion and economic growth: Evidence from a panel of selected African countries. Extending Financial Inclusion in Africa, 9, 193–210. https://doi.org/10.1016/B978- 0-12-814164-9.00009-8"

test, and succeeded by model diagnosis. Financial inclusion was investigated in independently within the context of usage, penetration, and availability of financial services. The model was estimated using system GMM in the procedure of Blundell and Bond[190].

Measuring Financial Inclusion

Prior to establishing the analytical model, it was necessary gaining an understanding of how financial inclusion has been used and measured in previous researches. Data constraints have implied a divergence in computation of financial inclusion index, especially in terms of the variables to be considered (Gupte, Venkataramani and Gupta[191]). Despite absence of universality in the computation of financial inclusion index, various formulations are worth mentioning. Sarma & Pais[192] adopted the formulation: $I_I = 1 - \left(\frac{(1-FI_P)^2 + \left(\frac{1}{2} - FI_A\right)^2 + \left(\frac{1}{2} - FI_U\right)^2}{\frac{3}{2}} \right)^{0.5}$, where the subscript I, U, P, and A capture composite inclusion, usage dimension, penetration dimension, and availability dimension of financial inclusion (FI). In Sarma & Pais, low weights were assigned to the usage and accessibility dimension due to data constraints which then meant that the dimensions could not be exhaustively computed. Even then, data constraint is not a sufficient reason for the weighting given in Sarma & Pais.

Cámara and Tuesta[193] assign weights endogenously through the utilization of principal component analysis (PCA) in two stages. First, indices for three dimensions are computed through

[190] Blundell, Richard, and Stephen Bond. "Initial Conditions and Moment Restrictions in Dynamic Panel Data Models. *Journal of Econometrics*, 1998."
[191] Gupte, Rajani, Bhama Venkataramani, and Deepa Gupta. "Computation of Financial Inclusion Index for India. *Procedia - Social and Behavioral Sciences*, The International Conference on Emerging Economies - Prospects and Challenges (ICEE-2012), 12-13 January 2012: 133–49. https://doi.org/10.1016/j.sbspro.2012.03.281."
[192] Sarma, Mandira, and Jesim Pais. "Financial Inclusion and Development. *Journal of International Development* 23, no. 5 (2011): 613–28. https://doi.org/10.1002/jid.1698."
[193] Cámara, Noelia, and David Tuesta. "Measuring Financial Inclusion: A Muldimensional Index." SSRN Scholarly Paper. Rochester, NY, September 22, 2014.

PCA. This is then followed by computation of the composite index using the three sub-indices. Financial inclusion index (FI_I) is then captured as: $I_I = \theta_P FI_P + \theta_A FI_A + \theta_U FI_U + w$, where the weights θ are endogenously determined from PCA, and the variation w is random.

Fungáčová and Weill[194] measured financial inclusion using respective indicator measures in a probability unit model given by $FI_g = a + b_1 M_g + b_2 D_g + b_3 E_g + b_4 L_g + u_g$, where for the gth individual, the probability (FI) of being included financially is explained by gender (L), age (E), education (D), and income status (M), with u being a white noise term. FI was given by either usage, barriers, or availability of financial services. Using the Global Findex dataset, an individual was assigned 1, if for example he/ she accessed financial services, and zero otherwise. In the estimation, however, Fungáčová and Weill incorporated the squared term for age. While such an exercise could offer insights on age threshold, it raises the problem of multicollinearity. Thus, besides, the formulation presented in Fungáčová and Weill does not adequately capture financial inclusion as a whole. Similarly, Zins and Weill[195] proxy financial inclusion by credit, saving, and account in a formal financial institution using probability unit model, and fall victim to the temptation of investigating threshold using a quadratic term in age.

Sarma[196] and Gopalan, Kikuchi and Sarma[197] borrowed from the index of human development in computing financial inclusion with the hth dimension following the formulation

[194] Fungáčová, Zuzana, and Laurent Weill. "Understanding Financial Inclusion in China." *China Economic Review* 34 (July 2015): 196–206. https://doi.org/10.1016/j.chieco.2014.12.004.
[195] Zins, Alexandra, and Laurent Weill. "The Determinants of Financial Inclusion in Africa." *Review of Development Finance* 6, no. 1 (June 2016): 46–57. https://doi.org/10.1016/j.rdf.2016.05.001.

[196] Sarma, Mandira. "Index of Financial Inclusion- A measure of financial sector inclusiveness." *Berlin Working Papers on Money, Finance, Trade and Development.* No. 7/2012 (July 2012).
[197] Sarma, Mandira. "Measuring Financial Inclusion for Asian Economies. In *Financial Inclusion in Asia*, edited by Sasidaran Gopalan and Tomoo Kikuchi, 3–34. London: Palgrave Macmillan UK, 2016. https://doi.org/10.1057/978-1-137-58337-6_1."

$FI_h = y_h \frac{T_h - z_h}{X_h - z_h}$, where the upper and lower limit of the dimension are X and Z, respectively, with T being the actual value, and y being the weight assigned to the dimension. Sarma then computes financial inclusion index using $FI_I = 0.5(Q_1 + Q_2)$, with $Q_1 = \frac{\sqrt{\sum_{h=1}^{n} FI_h^2}}{\sqrt{\sum_{h=1}^{n} y_h^2}}$, and $Q_2 = 1 - \frac{\sqrt{\sum_{h=1}^{n} (y_h - FI_h)^2}}{\sqrt{\sum_{h=1}^{n} y_h^2}}$. The challenge with the computation in Sarma is that the limits are arbitrarily fixed between 0 and 1 so that dimension indices are squeezed with the [0, 1] interval. Again, the weighting 0.5, 0.5, and 0.5 given to usage, availability, and penetration was arbitrary.

Demirgüç-Kunt and Klapper[198] measure penetration by the proportion of adults with either formal saving account or formal account. Bagli and Dutta[199] consider 10 financial inclusion indicators, including self-help groups, and utilize rotated PCA in deriving indicator weights. An intriguing element in Bagli and Dutta is that the first, second, and third principal components assign negative weights to credit deposit ratio, banks, and credit-to-state output ratio, respectively. Gupte, Venkataramani and Gupta[200] consider 4 dimensions with financial inclusion being given by the geometric average $FI_I = (FI_O . FI_U . FI_{E1} . FI_{E2} . FI_C)^{0.2}$, where outreach dimension (O) captures penetration and availability while transactions cost and ease are reflected in E2 and E1, respectively. In Gupte, Venkataramani and Gupta, the dimension index was given by $FI_h = \frac{T_h - z_h}{X_h - z_h}$.

[198] Demirgüç-Kunt, Asli, and Leora Klapper. "Measuring Financial Inclusion: Explaining Variation in Use of Financial Services across and within Countries. *Brookings Papers on Economic Activity* 2013, no. 1 (2013): 279–340. https://doi.org/10.1353/eca.2013.0002."

[199] Bagli, Supravat, and Papita Dutta. "A Study of Financial Inclusion in India. *RADIX INTERNATIONAL JOURNAL OF ECONOMICS & BUSINESS MANAGEMENT* 1" (August 2, 2012): 1–18.

[200] Gupte, Rajani, Bhama Venkataramani, and Deepa Gupta. "Computation of Financial Inclusion Index for India." *Procedia - Social and Behavioral Sciences*, The International Conference on Emerging Economies - Prospects and Challenges (ICEE-2012), 12-13 January 2012, 37 (January 1, 2012): 133–49. https://doi.org/10.1016/j.sbspro.2012.03.281.

Allen, Demirguc-Kunt, Klapper and Martinez Peria[201] proxy financial inclusion by bank account dimensions, namely; ownership, saving, and frequency with each dimension being considered independently as a dummy variable. Igbal and Sami[202] use ATMs expansion, inverse of deposit-to-credit ratio, and bank branches as proxies of financial inclusion with each being sufficient in its own right. Chattopadhyay[203] compute dimension index similar to Gupte, Venkaratamani and Gupta. In computing financial inclusion index, however, Chattopadhyay utilize the formulation $I_I = 1 - \left(\frac{\sum_{h=1}^{n}(1-FI_h)^2}{n}\right)^{0.5}$, where the denominator normalizes the value. The computation in Goel and Sharma[204] is identical to Sarma.

From the aforementioned, it was evident that no consensus exists on how to measure financial inclusion. Consequently, this research stayed as close as possible to Cámara and Tuesta[205] in assigning weights endogenously through the utilization of principal component analysis (PCA) in two stages. First, indices for three dimensions are computed through PCA. This was then followed by computation of the composite index using the three sub-indices. Financial inclusion index (FI_I) was then captured as: $I_I = \theta_P FI_P + \theta_A FI_A + \theta_U FI_U + w$, where the weights θ are endogenously determined from PCA, and the variation w is random.

[201] Allen, et al. "The Foundations of Financial Inclusion: Understanding Ownership and Use of Formal Accounts. *Journal of Financial Intermediation* 27 (July 1, 2016): 1–30. https://doi.org/10.1016/j.jfi.2015.12.003."
[202] Iqbal, Badar Alam, and Shaista Sami. "Role of Banks in Financial Inclusion in India." *Contaduría y Administración* 62, no. 2 (April 1, 2017): 644–56. https://doi.org/10.1016/j.cya.2017.01.007.
[203] Chattopadhyay, Sadhan Kumar. "Financial Inclusion in India: A Case-Study of West Bengal." MPRA Paper, January 2011. https://mpra.ub.uni-muenchen.de/34269/.
[204] Goel, Sweta, and Rahul Sharma. "Developing a Financial Inclusion Index for India." *Procedia Computer Science*, 5th International Conference on Information Technology and Quantitative Management, ITQM 2017, 122 (January 1, 2017): 949–56. https://doi.org/10.1016/j.procs.2017.11.459.
[205] Cámara, Noelia, and David Tuesta. "Measuring Financial Inclusion: A Muldimensional Index." SSRN Scholarly Paper. Rochester, NY, September 22, 2014. https://doi.org/10.2139/ssrn.2634616.

With that in mind, this research considered it beneficial setting forth on a rigorous exercise of explaining economic security. Foremost, following Wandeda, Masai, and Nyandemo[206], this research considered economic crimes as distortionary. However, it assumed that economic crimes are at best non-existent and that institutions function properly. This necessarily meant that economic inefficiencies are assumed away, although this not be the case in practice. These assumptions were justified by data limitations. With institutions being strong and effective, this research proceeded to assume that financial inclusion was anchored on the institutional space being right. A key question then became, "How does function inclusion enter the production function?"

In the approach employed in Ifediora et al.[207], Inoue and Hamori[208] and Makina and Walle[209], the question is addressed superfluously with the authors fixing financial inclusion in panacea. To respond to the question above, this research begins with production function suggested by Cobb and Douglas[210] where output (Y) depends on labour (N) and capital (K) input being combined technically using a technology specified by: $Y_m = Y_m(N_m, K_m) = sN_m^c K_m^j$, where j and c denote output shares going to capital and labour, respectively, in firm m while s is an efficiency parameter. The definition of c and j necessarily imply that c+j=1, hence the specified function exhibits constant returns to scale. The formulation above is, nevertheless, at the firm-level. In order to take advantage of macroeconomic data, this research assumed that the economy behaves as though it were a single firm. Taking that way, N captures labour force in the economy whereas K

[206] Wandeda Dickson O., Masai Wafula, and Nyandemo Samuel M. "Institutional quality and economic growth: evidence from Sub-Saharan Africa countries." *AJER IX*, no. (IV) (September 2022): 106-125.
[207] Ifediora, et al (2022): "Financial inclusion and its impact on economic growth: Empirical evidence from subSaharan Africa, Cogent Economics & Finance, 10:1, 2060551, DOI: 10.1080/23322039.2022.2060551"
[208] Inoue, T., & Hamori, S. (2016). "Financial access and economic growth: Evidence from Sub-Saharan Africa. Emerging Markets Finance and Trade, 52(3), 743–753. https://doi.org/10.1080/1540496X.2016. 1116282"
[209] Makina, D., & Walle, Y. M. (2019). "Financial inclusion and economic growth: Evidence from a panel of selected African countries. Extending Financial Inclusion in Africa, 9, 193–210. https://doi.org/10.1016/B978- 0-12-814164-9.00009-8"
[210] Cobb, C.W. and Douglas, P.H. (1928) "A Theory of Production. American Economics Review, 18, 139-165."

captures the capital outlay at the disposal of the labourers. For simplicity, labour force was assumed to equal the population. This, however, is not true in practice. For instance, a 1-day-old infant cannot participate on the labour market. However, there is no harm in making the assumption either way.

Now, agents in the economy were used to save part of the output which later constituted capital that could be invested back. Since capital accumulation is a process, this research considered a fraction (e) of current period's output to be exactly equal to the next period's capital outlay. That is $K_{t+1} = eY_t$, where time t is known. Shifting this equation backwards by 1 period yields $K_t = eY_{t-1}$, and substituting this back into the original equation gives $Y_{m,t} = sN_{m,t}^{c}(eY_{t-1})^{j}$ which is non-linear. Analytical software, however, is trained to treat all input as linear. Transformation was thus necessary in order for the model to conform with software training. This was achieved through taking natural logarithm on both sides of the equation. This then yielded the function:

$$\ln Y_{m,t} = \ln s + cln\, N_{m,t} + jlne + jlnY_{m,t-1} = s_0 + clnN_{m,t} + jlnY_{m,t-1}$$

This was then augmented by introducing financial inclusion (FI), inflation (Q), and trade openness (P) which were treated as externalities since they were not explicitly given in the naïve technology. This then meant that there could be deviations from Y arising from unobserved factors, which in this respect were idiosyncratic. The model was thus redefined to take the analytical form:

$$\ln Y_{m,t} = s_0 + clnN_{m,t} + jlnY_{m,t-1} + a_k X_{k,m,t} + u_{m,t}$$

Where X captured financial inclusion, s, j and a were model parameters while u captured idiosyncratic disturbances. Economies were indicated by subscript m, and in this respect, the economies considered were Rwanda, Uganda, and Kenya, and; t was the year. Since $Ym,_t$ and $u_{m,t}$

are correlated, it followed that $u_{m,t}$ and $Y_{m,t-1}$ were also correlated. This constitutes endogeneity. As such, the employment of ordinary least squares (OLS) technique to retrieve the model's parameters would lead into biased and inconsistent estimates. Similarly, pooling the data cannot address the endogeneity problem. Blundell and Bond[211] argued that addressing endogeneity problem in dynamic panels is best done using generalized method of moments (GMM). These includes the system and the differenced GMM techniques which yield consistent estimates. Blundell and Bond further indicated that system GMM outperforms the differenced GMM in retrieving efficient estimators. Accordingly, this research opted for system GMM, and followed the prescription advanced in Blundell and Bond.

System GMM, in practice, generates instruments in the estimation process. It was, therefore, important to cross-check the instruments for validity. Blundell and Bond as well as Bhargava and Sargan[212] suggested that overidentifying assumptions could be examined using a test proposed by either Hansen or Sargan. Consequently, this research employed the Sargan test. The test interrogated the claim that system GMM instruments were valid. The decision rule was such this claim would not hold if the Sargan test's probability value was smaller than 5%. 5% was the chosen level of significance although other conventional levels could have also been used. The findings were extensively discussed in subsequent chapters.

1.10.7 Ethical Consideration

In this study, issues concerning the ethical conduct of research such as informed consent, confidentiality, and privacy were upheld. According to Saunders et al., (2009), ethics are the norms

[211] Blundell, Richard, and Stephen Bond. "Initial Conditions and Moment Restrictions in Dynamic Panel Data Models. *Journal of Econometrics*, 1998."
[212] Bhargava, Alok, and J. D. Sargan. "Estimating Dynamic Random Effects Models from Panel Data Covering Short Time Periods." *Econometrica* 51, no. 6 (1983): 1635–59. https://doi.org/10.2307/1912110.

or standards of behaviour that drive moral decisions about our behaviour and our relationships with others.

A research permit was sought from the National Commission for Science, Technology, and Innovation (NACOSTI) to allow use of secondary data from Financial Access Survey (FAS) of the International Monetary Fund (IMF) and the World Development Indicators (WDI) of the World Bank to help address concerns about collecting data, keeping data collected strictly private and confidential with use only for academic research, and ensuring the privacy of the organizations from which data is collected.

1.10.8 Definition of Terms

Availability: Availability is a dimension of financial inclusion which measures the outreach of financial services in terms of geographical and demographic variables. It includes the number of branch networks, ATMs and mobile money agents. It is measured with the natural logarithms of the number bank branches, number of ATMs and the number of mobile money agents.

Economic Security: Buzan (1991a, p. 19) states that economic security is related to the access to resources, finance and markets which are needed to support acceptable wealth and power levels in the state. It is the process by which a nation's wealth increases over time. It's measured by changes in real Gross Domestic Product.

Financial inclusion: Sarma[213] defined financial inclusion as a process which leads to ease of access, availability, and usage of the formal financial services for all members of the economy.

[213] Sarma, M. (2016). "Measuring financial inclusion for Asian economies. In Financial inclusion in Asia. Palgrave Macmillan."

Mobile banking: This is a service provided by a financial institution that allows its customers to conduct financial transactions remotely using a mobile device such as a smartphone or tablet.

Penetration: Penetration is a dimension of financial inclusion that captures individuals with an active account in their own name with at least one financial service provider. It's the process of broadening the use of financial services. It is measured with the natural logarithms of deposit accounts and mobile money accounts.

Usage: Usage is a dimension of financial inclusion which measures the actual use financial products and services. It measures how clients use financial services as indicated by volume of deposits and credits to GDP. It is calculated using the natural logarithms of outstanding commercial bank deposits as a percentage of GDP, outstanding commercial bank loans as a percentage of GDP, and mobile money transactions as a percentage of GDP.

CHAPTER TWO

AVAILABILITY DIMENSION AND ECONOMIC SECURITY OF EAC STATES

2.1 Introduction

This chapter presents findings on the effect of availability dimension of financial inclusion on economic security of EAC states. The analyses entail descriptive statistics and model estimation. In the descriptive analysis, a comparison between the economies of Uganda, Rwanda, and Kenya is made. This was actualized through execution of the two-sample t-test. Model estimation came thereafter alongside model diagnosis. Data utilized in this research was retrieved from the Financial Access Surveys.

Descriptive Statistics

Data on mobile money agent outlets for Burundi, South Sudan, and DRC was not available for the 2012-2021 period while for Uganda, it was missing for year 2012. Data on inflation for DRC was missing for the period 2017-2021 while for Uganda and Tanzania it was missing for year 2021. Data on bank branches, and ATMs for Tanzania was unavailable for the years 2016-2021. Accordingly, Kenya, Uganda, and Rwanda were considered.

Following Ifediora et al[214], the availability dimension was captured by mobile money agents, and measured as the number of registered mobile money agent outlets for every 0.1million adults. Other control variables, namely; trade openness, population growth, inflation rate, and GDP per capita were also adopted from Ifediora et al.

In comparing financial inclusion as well as per capita GDP in the region, two-sample t-test was employed. Table 2 suggested that per capita incomes in Kenya was significantly higher than

[214] Ifediora, et al | (2022): "Financial inclusion and its impact on economic growth: Empirical evidence from sub-Saharan Africa, Cogent Economics & Finance, 10:1, 2060551, DOI: 10.1080/23322039.2022.2060551."

of Uganda while Uganda's per capita income was higher than Rwanda's. Financial services availability was lowest in Rwanda and highest in Kenya. With respect to availability indicators, it was evident that although mobile money agent outlets in Uganda was not statistically different from Rwanda's, it was higher than Kenya's. ATMs availability was highest in Kenya but lowest in Uganda, whereas bank branches availability was highest in Rwanda but lowest in Uganda.

Table 2: Financial Inclusion Comparisons

Variable	H0		H1		Conclusion	
Per capita GDP	K=R	K<R (1)	K=R (0.00)	K>R (0.00)	K≥R	
	R=U	R<U (0.007)	R=U (0.013)	R>U (0.99)	U≥R	K≥U≥R
	K=U	K<U (1)	K=U (0.00)	K>U (0.00)	K≥U	
Dimension:						
Availability	R=U	R<U (0.00)	R=U (0.00)	R>U (1)	R≤U	
	K=R	K<R (1)	K=R (0.00)	K>R (0.00)	K≥R	R≤U≤K
	K=U	K<U (1)	K=U (0.00)	K>U (0.00)	K≥U	
Indicator:						
Mobile money agents	K=U	K<U (0.101)	K=U (0.202)	K>U (0.899)	K=U	
	K=R	K<R (0.0581)	K=R (0.116)	K>R (0.942)	K<R	U=R≥K
	R=U	R<U (0.677)	R=U (0.647)	R>U (0.324)	R=U	
ATMs	K=U	K<U (1)	K=U (0.00)	K>U (0.00)	K≥U	
	K=R	K<R (1)	K=R (0.00)	K>R (0.00)	K≥R	K≥R≥U
	R=U	R<U (1)	R=U (0.001)	R>U (0.000)	R≥U	
Bank branches	R=U	R<U (1)	R=U (0.00)	R>U (0.00)	R≥U	
	K=R	K<R (0.085)	K=R (0.169)	K>R (0.916)	K<R	U≤K<R
	K=U	K<U (1)	K=U (0.00)	K>U (0.00)	K≥U	
Economy key	K=Kenya	U=Uganda	R=Rwanda			

Probability values from the two-sample t-tests are in brackets.

Correlation

A regional analysis of the associations between GDP per capita and other factors was based on correlations whose coefficients were documented in Table 3. This research established that significant linear associations were between per capita GDP and ATMs, trade openness, and population growth. When either inflation or population growth rose, GDP per capita declined whereas GDP per capita and ATMs co-moved in the same direction. Although GDP per capita had negative/ positive association with mobile money agent outlets/ bank branches, this association was not statistically significant.

Table 3: Matrix of Correlations

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
1. Bank branches	1.00									
2. ATMs	0.50**	1.00								
3. mobile money agents (Ak)	-0.13	-0.34	1.00							
4. trade openness	0.39*	-0.14	0.42*	1.00						
5. population growth	-0.80***	-0.58**	-0.04	-0.18	1.00					
6. inflation	0.30	0.37	-0.33	-0.06	-0.23	1.00				
7. Ak<500	0.18	0.14	-0.67***	0.15	-0.06	0.19	1.00			
8. 500≤Ak≤720	0.08	0.39*	-0.21	-0.42*	-0.10	0.07	-0.40*	1.00		
9. Ak>720	-0.24	-0.49**	0.80***	0.25	0.15	-0.24	-0.55**	-0.55**	1.00	
10. GDP per capita	0.15	0.85***	-0.12	-0.42*	-0.48**	0.24	-0.13	0.37	-0.22	1.00
N	28									

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

Pre-estimation Test

Panel unit root test

In model estimation based on the generalized method of moments (GMM) using long panels (i.e., time periods exceeding 20), Baum et al[215] argue that the panels must be stationary. This research, however, utilized a panel spanning 10 years. The stationary panel restriction was, thus, considered unimportant. Hence, the panel stationary test was not executed. Similarly, the panels were not examined for possible cointegrating relationships.

Model Estimation and Diagnostic

In Uganda, Ebong & George[216] indicated an initial up-jump in mobile money agent outlets (as well as bank branches) followed by a slump in the momentum of availability. That is, agents and bank branches were increasing but at a declining rate. Suggestive in this was that mobile

[215] Christopher F. Baum, Mark E. Schaffer, & Steven Stillman (2003). "Instrumental variables and GMM: Estimation and testing. The Stata Journal (2003) 3, Number 1, pp. 1–31."

[216] Ebong, Jimmy, and Babu George. "Financial Inclusion through Digital Financial Services (DFS): A Study in Uganda. *Journal of Risk and Financial Management* 14 (August 24, 2021): 393. https://doi.org/10.3390/jrfm14090393."

money agent outlets' and bank branches' availability could have a varied effect on growth of the economy. These insights paved way for sub-division of mobile money agent outlets data into three bands, namely, less than 500 (A_1), between 500 and 720 (A_2), and above 720 (A_3) outlets per 0.1million adults while ensuring that each band was representative enough. Similarly, bank branches per 0.1million adults was subdivided thus: fewer than 3 (B_1), between 3 and 5 (B_2), and more than 5 branches (B_3). This exercise further offered an update to the methodology. Availability dimension was computed using principal component analysis (PCA) as indicated in Ifediora et al. The availability dimension (FI_A) was then given by:

$$FI_A = (0.2566A_1 + 0.2685A_2 - 0.4655A_3) * A_g + (-0.4087B_1 - 0.1323B_2 + 0.4734B_3) * B_g + 0.4866C_g$$

Where standardized values A_g, B_g, and C_g denote mobile money agent outlets, bank branches, and ATMs, respectively. Transformation of variables using logarithms was informed by the need to ensure a near normal distribution (symmetry) and reduce extremely large numbers to comparably small ones while standardization was informed by procedures in PCA. Following Ifediora et al[217], system GMM was employed with the estimates being documented in Table 4. Two lags were employed only in situations where GDP per capita did overshoot (i.e., its first lag had a coefficient larger than 1). The findings suggested that mobile money agent outlets foster economic growth when agents serving 100000 adults are between 500 and 720; per capita GDP significantly rises in bank branch expansion as well as in increased ATMs availability (see columns 1,2, and 3/4, respectively, Table 4). This research also documented that per capita GDP significantly rose in financial services availability (see column 5, Table 4).

[217] Ifediora, et al. "Financial inclusion and its impact on economic growth: Empirical evidence from sub-Saharan Africa. *Cogent Economics & Finance* 10, no. 1 (2022): 2060551."

Oloo et al[218] analyzed inflation using bands. This research borrowed from Oloo et al, and categorized inflation into three ranges, namely: less than 5%, between 5-7%, and above 7%. The findings suggested that per capita GDP significantly rose when inflation was either below 5% or between 5-7% against the above 7% benchmark (see column 1, Table 4). In the absence of threshold analysis, inflation significantly erodes growth of incomes (see columns 2-5, Table 4). In all relevant specifications, trade openness and population growth did not affect per capita incomes significantly. Lastly, persistence of per capita GDP was evident (i.e., coefficient of lag ln GDP per capita in the open interval (0, 1)), suggesting that part of previous period's per capita GDP was realized in the current period.

Table 4: Availability and Growth

VARIABLES	(1) Ln GDP per capita	(2) Ln GDP per capita [z]	(3) Ln GDP per capita [z]	(4) Ln GDP per capita	(5) Ln GDP per capita
L. ln GDP per capita	0.890***			0.628**	0.685**
	(0.0696)			(0.320)	(0.327)
Mobile money agent outlets (500≤ak≤720)	0.0279**				
	(0.0137)				
Mobile money agent outlets (ak>720)	0.0220				
	(0.0151)				
Mobile money agent outlets (ak<500)	-				
Population growth	-0.0122				
	(0.0204)				
Inflation (qk≤5%)	0.0553***				
	(0.0136)				
Inflation (5%≤qk≤7%)	0.0354**				
	(0.0173)				
Trade openness	0.000842				
	(0.000956)				
L. ln GDP per capita [z]		0.706**	0.628**		
		(0.321)	(0.320)		
L2. GDP per capita [z]		0.390	0.372		
		(0.300)	(0.307)		
Ln bank branches [z]		0.140***			
		(0.0521)			

[218] Oloo, Michael, Mary Mbithi, and Martin Oleche. "Threshold Effect of Macroeconomic Convergence Criteria on Real GDP Growth Rate within the East African Community." *European Journal of Development Studies* 2, no. 2 (2022): 11-25.

Table 4: Availability and Growth

VARIABLES	(1) Ln GDP per capita	(2) Ln GDP per capita [z]	(3) Ln GDP per capita [z]	(4) Ln GDP per capita	(5) Ln GDP per capita
Ln inflation [z]		-0.0749***	-0.0628***		
		(0.0200)	(0.0197)		
Ln population growth [z]		0.0739	-0.00904		
		(0.0458)	(0.0286)		
Ln trade openness [z]		0.0187	0.0329		
		(0.0334)	(0.0326)		
Ln ATMs [z]			0.0773**		
			(0.0382)		
L2. Ln GDP per capita				0.372	0.356
				(0.307)	(0.310)
Ln ATMs				0.0714**	
				(0.0353)	
Ln inflation				-0.0423***	-0.0423***
				(0.0132)	(0.0132)
Ln population growth				-0.0165	0.0142
				(0.0524)	(0.0584)
Ln trade openness				0.0507	0.0557
				(0.0503)	(0.0496)
Availability					0.0167**
					(0.00822)
Constant	0.723	0.0647*	0.0770**	-0.200	-0.405
	(0.483)	(0.0351)	(0.0346)	(0.510)	(0.509)
Observations	27	21	21	21	21
Sargan test (C,p)	(21.78, 0.65)	(14.96, 0.73)	(17.86, 0.53)	(17.86, 0.53)	(17.79, 0.54)
Number of economy ID	3	3	3	3	3

Standard errors in parentheses except Sargan test
*** p<0.01, ** p<0.05, * p<0.1
Z=standardized, C=Chi-square statistic, and p=corresponding probability value

The relevant diagnosis utilized the Sargan test in analyzing the validity of system GMM instruments. The claim under consideration was that the instruments were valid. The decision rule was such that probability value below 5% would invalidate that claim. In all specifications, it was evident that the instruments employed were valid since the probability values from the Sargan test were above 5%.

Main Hypothesis

This section's main hypothesis had four parts as indicated below:

$H0_1$: Availability of mobile money agents in East Africa significantly affects economic security. This claim is validated for mobile money agents between 500 and 720 for every 0.1million adults. Thus, East Africa's economic security significantly rises in mobile money agent outlets when agents are between 500 and 720 for every 0.1million adults.

$H0_2$: East Africa's bank branches availability significantly affects the region's economic security. This claim was validated. Thus, East Africa's economic security rises in bank branches' availability.

$H0_3$: East Africa's ATMs availability significantly affects the region's economic security. This claim was validated. Thus, East Africa's economic security significantly rises in the number of ATMs.

H0: East Africa's economic security significantly rises in financial services availability. This claim is validated. Thus, East Africa's economic security significantly rises in financial services availability.

2.2 Discussion

This research suggested that per capita GDP significantly rose in mobile money agents between 500 and 720 for every 0.1million adults, automated teller machines (ATMs), and bank branches. This was evident from the system GMM estimates, where the choice of system GMM followed Emara & Said[219] such that growth of incomes is consistently estimated. In Asia, the GMM estimates in Ratnawati[220] suggested that although economic growth rose/ declined in ATMs/ bank branches, the effects were not statistically significant. Ratnawati[4] also established that

[219] Emara, N., & El Said, A. (2021). "Financial inclusion and economic growth: The role of governance in selected MENA countries. *International Review of Economics & Finance*, *75*, 34-54."
[220] Ratnawati, K. (2020). "The impact of financial inclusion on economic growth, poverty, income inequality, and financial stability in Asia. *The Journal of Asian Finance, Economics and Business*, *7*(10), 73-85."

economic growth insignificantly rose in inflation rate. In 31 countries, and focusing on banks, the dynamic OLS estimates in Sethi & Acharya[221] suggested that economic growth rises in financial inclusion. Similarly, Ifediora et al[222] established significant increments in economic growth with improvements in financial inclusion in 22 countries within the sub-Saharan Africa region. In 41 countries, the GMM estimates in Chatterjee[223] indicated that economic growth rises in bank branches and ATMs. In India, OLS estimates in Sofi & Zamir[224] suggested that GDP rose significantly in ATMs with the findings being attributed to higher education when enhanced ATMs' operability in rural areas. This research, thus, disagrees with Ratnawati but supports Sethi & Acharya, Chatterjee, Sofi & Zamir, and Ifediora et al. Following Ifediora et al, this research argues that financial services availability through bank expansion enabled unbanked individuals to enjoy financial services with mobile money agent outlets bridging the banking gap. Besides, bank expansion and expansion of mobile money agent outlets expanded employment opportunities which effectively fostered growth of incomes.

Trade openness, as a control variable did not significantly affect per capita GDP. Singh & Stakic[225] and Emara & Said[226] indicated that economic growth rises in trade openness. According to Emara & Said trade openness was enhanced by regulatory quality. Azam & Khan[227] revealed

[221] Sethi, D., & Acharya, D. (2018). Financial inclusion and economic growth linkage: Some cross-country evidence. *Journal of Financial Economic Policy*.
[222] Ifediora, et al (2022). "Financial inclusion and its impact on economic growth: Empirical evidence from sub-Saharan Africa. *Cogent Economics & Finance* 10, no. 1 (2022): 2060551."
[223] Chatterjee, A. (2020). Financial inclusion, information and communication technology diffusion, and economic growth: a panel data analysis. *Information Technology for Development*, *26*(3), 607-635.
[224] Sofi, Z., & Zamir, M. N. (2019). The impact of financial inclusion on the economic growth of India: An empirical analysis. *Journal of Commerce and Accounting Research, 8*(3).
[225] Singh, D., & Stakic, N. (2020). "Financial inclusion and economic growth nexus: Evidence from SAARC countries. *South Asia Research,* 41(1), 1–21. https:// doi.org/10.1177/0262728020964605."
[226] Emara, Noha, and Ayah El Said. "Financial Inclusion and Economic Growth: The Role of Governance in Selected MENA Countries." *International Review of Economics & Finance* 75 (September 1, 2021)
[227] Azam, M., & Khan, S. (2022). Threshold effects in the relationship between inflation and economic growth: Further empirical evidence from the developed and developing world. *International Journal of Finance & Economics*, *27*(4), 4224-4243.

that economic growth rises in real exports in 27 selected economies. In Cote d'Ivoire, the ARDL estimates in Keho[228] indicated that economic growth rises in trade openness. According to Keho, trade openness boosts capital formation which subsequently fosters economic growth. The current research established that trade openness had a statistically insignificant effect on economic growth within the context of ATMs, bank branches, and mobile money agent outlets. Thus, this research does not support Singh & Stakic, Emara & Said, Azam & Khan, and Keho. Insignificant results cannot, however, be discussed.

This research established that per capita GDP rose significantly in inflation rate below 7%. Ratnawati[229] showed that economic growth insignificantly rises in inflation rate. In 16 developing countries, the feasible generalized least squares and the fixed effects estimates in Azam & Khan[230] suggested that economic growth rises in inflation up to an inflation rate of 9.31% and 12.23%, respectively, before declining in further inflation. In 11 developed countries, Azam & Khan showed that the inflation threshold was lower than that reported in developing countries. Within the East African Community (EAC), Oloo et al[231] reported an inflation threshold of 5.98%. It was, nevertheless, unclear how inflation shaped economic growth in EAC since the GMM estimates in Oloo et al focused on explaining inflation, and not growth, with the threshold being evaluated against a target. Based on threshold analysis, therefore, this research supported Oloo et al and partially supported Azam & Khan although disagreed with Ratnawati. Following Oloo et al, this

[228] Keho, Yaya. "The impact of trade openness on economic growth: The case of Cote d'Ivoire." *Cogent Economics & Finance* 5, no. 1 (2017): 1332820.
[229] Ratnawati, Kusuma. "The impact of financial inclusion on economic growth, poverty, income inequality, and financial stability in Asia." *The Journal of Asian Finance, Economics and Business* 7, no. 10 (2020): 73-85.
[230] Azam, Muhammad, and Saleem Khan. "Threshold effects in the relationship between inflation and economic growth: Further empirical evidence from the developed and developing world. *International Journal of Finance & Economics* 27, no. 4 (2022): 4224-4243"
[231] Oloo, Michael, Mary Mbithi, and Martin Oleche. "Threshold Effect of Macroeconomic Convergence Criteria on Real GDP Growth Rate within the East African Community." *European Journal of Development Studies* 2, no. 2 (2022): 11-25.

research argued that moderate inflation between 5% and 7% incentivized production which consequently fostered growth of per capita incomes.

This research revealed that per capita incomes do not significantly change in population growth. Azam & Khan[232] showed that as population growth rises, economic growth in both developed and developing countries declines. In Nigeria, the OLS estimates in Ogunleye et al[233] revealed that population growth enhances the growth of real GDP. In Ethiopia, ARDL estimates in Degu[234] suggested that long run and short run economic growth declines in population growth. Within the Organization for Economic Co-operation and Development (OECD), Bucci et al[235] indicate significant GDP increments in population growth. This research, therefore, does not support Azam & Khan, Ogunleye et al, and Bucci et al. Since the research's finding was insignificant, it could not be discussed further.

2.3 Chapter summary

This chapter analyzed financial services availability effect on economic security, and used variable definition given in Ifediora et al[236]. The availability dimension was first proxied by mobile money agent outlets, and then by bank branches and ATMs. Data constraints narrowed down the scope to Kenya, Uganda, and Rwanda. Two kinds of analyses were utilized, namely; descriptive

[232] Azam, Muhammad, and Saleem Khan. "Threshold effects in the relationship between inflation and economic growth: Further empirical evidence from the developed and developing world." *International Journal of Finance & Economics* 27, no. 4 (2022): 4224-4243

[233] Ogunleye, Olusogo Olamide, Oluwarotimi Ayokunnu Owolabi, and Muazu Mubarak. "Population growth and economic growth in Nigeria: An appraisal." *International Journal of Management, Accounting and Economics* 5, no. 5 (2018): 282-299.

[234] Degu, Adisu Abebaw. "The nexus between population and economic growth in Ethiopia: An empirical inquiry." *International Journal of Business and Economic Sciences Applied Research (IJBESAR)* 12, no. 3 (2019): 43-50.

[235] Bucci, A., Carbonari, L., & Trovato, G. (2021). Variety, competition, and population in economic growth: theory and empirics. *Macroeconomic Dynamics*, *25*(5), 1303-1330.

[236] Ifediora, et al (2022). "Financial inclusion and its impact on economic growth: Empirical evidence from sub-Saharan Africa. *Cogent Economics & Finance* 10, no. 1 (2022): 2060551."

analysis and regression analysis. In the descriptive part, a comparison of financial services availability was made across the three economies. The findings from the two-sample t-test suggested that financial services availability was lowest in Rwanda and highest in Kenya although bank branches availability was highest in Rwanda but lowest in Uganda. An analysis of correlations indicated significant linear associations between per capita GDP and ATMs, trade openness, population growth, and inflation.

Following Baum et al[237], stationary panel test was considered unnecessary since the data spanned only 10 periods which fell short of the minimum 20 required to warrant a stationary panel test. Thereafter, model estimation made use of one-step system GMM with some variables being banded following the revelations in Ebong & George[238]. Model estimation suggested that per capita GDP rose significantly in financial services availability, bank branches, and mobile money agent outlets while declining in inflation rate above 7%. Neither trade openness nor population growth significantly affected per capita GDP.

[237] Christopher F. Baum, Mark E. Schaffer, & Steven Stillman (2003). Instrumental variables and GMM: Estimation and testing. The Stata Journal (2003) 3, Number 1, pp. 1–31.
[238] Ebong, Jimmy, and Babu George. "Financial Inclusion through Digital Financial Services (DFS): A Study in Uganda." *Journal of Risk and Financial Management* 14 (August 24, 2021): 393. https://doi.org/10.3390/jrfm14090393.

CHAPTER THREE

PENETRATION DIMENSION AND ECONOMIC SECURITY OF EAC STATES

3.1 Introduction

This chapter presents findings on the effects of penetration of financial services on economic security of EAC states. It presents findings for both descriptive statistics and correlation analysis. This is then followed by model estimation via the employment of system GMM alongside diagnosis.

Descriptive Statistics

Data on mobile money accounts for Burundi and South Sudan was not available for the 2012-2021 period while for DRC, it was absent for year 2012 and 2021. Data on inflation for DRC was missing for the period 2017-2021 while for Uganda and Tanzania it was missing for year 2021. Data on deposit accounts for Tanzania was unavailable for the years 2016-2021. Accordingly, Kenya, Uganda, and Rwanda were considered. Mobile money accounts in Tanzania were given by mobile account users.

Following Ifediora et al, the penetration dimension was captured by mobile money accounts, and deposit accounts. These accounts were measured per 0.001million adults. Other control variables, namely, trade openness, population growth, inflation rate, and GDP per capita were also adopted from Ifediora et al. Country comparisons employed the two-sample t-test with the results being documented in Table 5.**Table 5** The findings suggest that per capita incomes in Kenya was significantly higher than of Uganda while Uganda's per capita income was higher than Rwanda's. Financial services penetration in Uganda as well as in Rwanda was lower than in Kenya. With respect to penetration indicators, it was evident that although mobile money agent accounts in Uganda was not statistically different from Rwanda's, it was lower than Kenya's.

similarly, although deposit accounts in Uganda was not statistically different from Rwanda's, it was lower than Kenya's.

Table 5: Penetration Comparison						
Variable	**H0**	**H1**			**Conclusion**	
Per capita GDP	K=R	K<R (1)	K=R (0.00)	K>R (0.00)	K≥R	
	R=U	R<U (0.007)	R=U (0.013)	R>U (0.99)	U≥R	K≥U≥R
	K=U	K<U (1)	K=U (0.00)	K>U (0.00)	K≥U	
Dimension:						
Penetration	R=U	R<U (0.593)	R=U (0.812)	R>U (0.406)	R=U	
	K=R	K<R (0.95)	K=R (0.099)	K>R (0.049)	K>R	K≥U=R
	K=U	K<U (0.983)	K=U (0.034)	K>U (0.017)	K≥U	
Indicator:						
Mobile money accounts	R=U	R<U (0.895)	R=U (0.211)	R>U (0.105)	R=U	
	K=R	K<R (0.624)	K=R (0.753)	K>R (0.377)	K=R	K≥R=U
	K=U	K<U (0.981)	K=R (0.038)	K>R (0.019)	K≥R	
Deposit accounts	K=U	K<U (1)	K=U (0.00)	K>U (0.00)	K≥U	
	K=R	K<R (1)	K=R (0.00)	K>R (0.00)	K≥R	K≥R=U
	R=U	R<U (0.464)	R=U (0.929)	R>U (0.536)	R=U	
Economy key	K=Kenya	U=Uganda	R=Rwanda			
Probability values from the two-sample t-tests are in brackets.						

Correlations

In Uganda, Ebong & George239 indicated an initial up-jump in mobile money accounts (as well as deposit accounts) followed by a slump in the momentum of penetration. That is, accounts (mobile money and deposit) were increasing but at a declining rate. Suggestive in this was that mobile money accounts' and deposit accounts' penetration could have a varied effect on growth of the economy. These insights paved way for sub-division of mobile money accounts data into three bands, namely, less than 1000 (AC_1), between 1000 and 1300 (AC_2), and above 1300 (A_3) accounts per 0.001million adults while ensuring that each band was representative enough. Similarly, deposit accounts per 0.001million adults was subdivided thus: fewer than 350 (D_1), between 350 and 849 (D_2), and more than 849 deposit accounts (D_3). Relevant correlation

[239] Ebong, Jimmy, and Babu George. "Financial Inclusion through Digital Financial Services (DFS): A Study in Uganda." *Journal of Risk and Financial Management* 14 (August 24, 2021): 393. https://doi.org/10.3390/jrfm14090393.

coefficients were documented in Table 6. The findings suggested that mobile money accounts and deposit accounts have significant linear associations with per capita GDP. Furthermore, deposit accounts above 849 per 0.001 million adults significantly co-move with per capita GDP while deposit accounts fewer than 350 significantly co-move with per capita GDP but in opposite directions.

Table 6: Penetration Correlations

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
1. Deposit accounts (D)	1.00								
2. Mobile money accounts (AC)	0.50**	1.00							
3. AC<1000	-0.31	-0.69***	1.00						
4. 1000≤AC≤1300	-0.11	-0.12	-0.53**	1.00					
5. AC>1300	0.42*	0.82***	-0.43*	-0.53**	1.00				
6. D<350	-0.61***	-0.55**	0.41*	-0.06	-0.35	1.00			
7. 350≤D≤849	-0.23	0.24	-0.20	0.08	0.11	-0.58***	1.00		
8. D≥850	0.92***	0.34	-0.23	-0.03	0.26	-0.46*	-0.46*	1.00	
9. GDP per capita	0.93***	0.37*	-0.15	-0.10	0.26	-0.62***	-0.19	0.88***	1.00
N	30								

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

Pre-estimation Test

Stationary Panels Test

In model estimation based on the generalized method of moments (GMM) using long panels (i.e., time periods exceeding 20), Baum et al[240] argue that the panels must be stationary. This research, however, utilized a panel spanning 10 years. The stationary panel restriction was, thus, considered unimportant. Hence, the panel stationary test was not executed. Similarly, the panels were not examined for possible cointegrating relationships.

Model Estimation and Diagnosis

Following revelations in Ebong & George[241] regarding an initial up-jump in mobile money accounts (as well as deposit accounts) followed by a slump in the momentum of penetration, it

[240] Christopher F. Baum, Mark E. Schaffer, & Steven Stillman (2003). Instrumental variables and GMM: Estimation and testing. The Stata Journal (2003) 3, Number 1, pp. 1–31.

[241] Ebong, Jimmy, and Babu George. "Financial Inclusion through Digital Financial Services (DFS): A Study in Uganda." *Journal of Risk and Financial Management* 14 (August 24, 2021): 393. https://doi.org/10.3390/jrfm14090393.

was necessary to band the data on mobile money accounts and deposit accounts. The banding was realized through sub-division of mobile money accounts data into three bands, namely; less than 1000 (AC_1), between 1000 and 1300 (AC_2), and above 1300 (A_3) accounts per 0.001million adults while ensuring that each band was representative enough. Similarly, deposit accounts per 0.001million adults was subdivided thus: fewer than 350 (D_1), between 350 and 849 (D_2), and more than 849 deposit accounts (D_3). This exercise further offered an update to the methodology. Penetration dimension was computed using principal component analysis (PCA) as indicated in Ifediora et al. The penetration dimension (FI_P) was then given by:

$$FI_P = (-0.5911D_1 + 0.3052D_2 + 0.3115D_3) * D_g + (-0.5191AC_1 + 0.0846AC_2 + 0.4287AC_3) * AC_g$$

Where standardized values D_g and AC_g denote deposit accounts and mobile money accounts, respectively. The standardization is part of the procedure in PCA, and was employed in other studies, including Ifediora et al. Model estimation employed one-step system GMM with the results being documented in Table 7. Where per capita GDP did overshoot, two lags were used, instead of 1, in order to correct the overshooting problem.

Against a benchmark of above 1300 mobile money accounts per 0.001million adults, having fewer than 1000 mobile money accounts slows down growth (see column 1, Table 7). Suggestive here was that per capita income significantly rise when mobile money accounts are above 1300. Similarly, against a benchmark of at least 850 deposit accounts for every 0.001 million adults, having deposit accounts below 350 insignificantly reduces growth while per capita GDP significantly decline in deposit accounts between 350 and 849 (see column 2, Table 7). This suggested that, for per capita incomes to significantly rise, deposit accounts must exceed 849 (see

column 3/4, Table 7). Penetration, as a whole, however, insignificantly raised per capita GDP (see column 7, Table 7).

In all specifications, population growth did not significantly affect per capita GDP while per capita GDP rose in trade openness when considering mobile money accounts. Generally, inflation slowed down growth. However, per capita GDP rose significantly in inflation when inflation was less than 5%. Similarly, per capita GDP declined significantly in inflation above 7% (the reference group). Lastly, it was evident that per capita GDP was significantly persistent as indicated by the coefficient of lag ln GDP per capita being in the open interval (0, 1).

Table 7: Penetration-to-Growth

VARIABLES	(1) Ln GDP per capita	(2) Ln GDP per capita	(3) Ln GDP per capita	(4) Ln GDP per capita [z]	(5) Ln GDP per capita [z]	(6) Ln GDP per capita	(7) Ln GDP per capita
L. ln GDP per capita	0.0889	0.973***	0.889***			0.859**	0.887***
	(0.381)	(0.0688)	(0.0494)			(0.349)	(0.0904)
L2. Ln GDP per capita	0.901**					0.238	
	(0.358)					(0.321)	
Mobile money accounts (AC<1000)	-0.0381*						
	(0.0198)						
Mobile money accounts (1000≤AC≤1300)	-0.00852						
	(0.0152)						
Mobile money accounts (AC>1300)	-						
Ln inflation	-0.0506***					-0.0509***	
	(0.0137)					(0.0134)	
Ln population growth	-0.0465					-0.0365	
	(0.0586)					(0.0495)	
Ln trade openness	0.103**					0.0742	
	(0.0499)					(0.0472)	
Deposit accounts (D<350)		-0.0201					
		(0.0318)					
Deposit accounts (350≤D≤849)		-0.0456*					
		(0.0272)					
Deposit accounts (D>849)		-					
Inflation		-0.0112***	-0.0101***				
		(0.00176)	(0.00168)				
Trade openness		0.00201**	0.00126				0.000622
		(0.000903)	(0.000813)				(0.000940)
Population growth		0.0191	0.0136				-0.0113
		(0.0188)	(0.0191)				(0.0224)

Table 7: Penetration-to-Growth

VARIABLES	(1) Ln GDP per capita	(2) Ln GDP per capita	(3) Ln GDP per capita	(4) Ln GDP per capita [z]	(5) Ln GDP per capita [z]	(6) Ln GDP per capita	(7) Ln GDP per capita
Deposit accounts (DEP≤849)			-0.0479*	-0.188*			
			(0.0282)	(0.0966)			
L. GDP per capita [z]				0.992***	0.859**		
				(0.0493)	(0.349)		
Inflation [z]				-0.0701***	-0.0757***		
				(0.0177)	(0.0200)		
Population growth [z]				0.0124	-0.0199		
				(0.0318)	(0.0270)		
Trade openness [z]				0.0410	0.0481		
				(0.0262)	(0.0307)		
L2. GDP per capita [z]					0.238		
					(0.321)		
Deposit intensity (DA)					-0.211**	-0.0638**	
					(0.0974)	(0.0295)	
Penetration							0.00691
							(0.0103)
Inflation (qk<5%)							0.0475***
							(0.0125)
Inflation (5%≤qk≤7%)							0.0307*
							(0.0167)
Inflation (qk>7%)							
Constant	-0.134	0.146	0.778**	0.178***	0.204***	-0.761	0.773
	(0.509)	(0.497)	(0.340)	(0.0685)	(0.0586)	(0.537)	(0.612)
Sargan test (C, p)	(17.84, 0.47)	(19.95, 0.75)	(21.23, 0.73)	(24.37, 0.38)	(18.23, 0.51)	(18.23, 0.51)	(25.90, 0.47)
Observations	21	26	26	24	21	21	27
Number of economy ID	3	3	3	3	3	3	3

Standard errors in parentheses except the Sargan test
*** p<0.01, ** p<0.05, * p<0.1
DA=deposit account/ maximum value

Z=standardized, C=Chi-square statistic, and p=probability value.

Model diagnostic was based on the Sargan test which examined the validity of system GMM instruments. The claim being investigated was that the system GMM instruments were valid. For probability value less than 5%, this claim would have been rejected. However, probability values in the Sargan test documented in Table 7 were all larger than 5% significance level. This then suggested that the instruments used were valid.

Main Hypotheses

Based on the findings, it was important to revisit the hypotheses under consideration with the following observations:

$H0_1$: East Africa's economic security is not significantly affected by mobile money accounts. The findings suggested that economic security is significantly impacted upon by mobile money accounts when mobile money accounts exceed 1300 for every 0.001 million adults. Thus, this claim is refused.

$H0_2$: East Africa's economic security is not significantly affected by deposit accounts. The findings suggested that per capita GDP declines when deposit accounts are fewer than 850 but rise when deposit accounts are more than 849 for every 0.001million adults. Thus, this claim is refused.

$H0_3$: East Africa's economic security is not significantly affected by financial services penetration. The findings suggested that per capita GDP rises insignificantly in financial services penetration. There is, thus, insufficient evidence to refuse this claim.

3.2 Discussion

This research suggested that per capita GDP significantly rose in mobile money accounts above 1300 for every 0.001million adults as well as in deposit accounts above 849 for every 0.001million adults. Put together, however, per capita incomes rose insignificantly in financial services penetration. In 41 countries, the fixed effects and the GMM estimates in Chatterjee[242] suggested that within the current period, growth of per capita income rises in deposit accounts and in mobile phone subscription. According to Chatterjee, ICT infrastructural development enhanced financial inclusion in poorer/ backward regions which then catapulted growth of output. In Nigeria,

[242] Chatterjee, A. (2020). "Financial inclusion, information and communication technology diffusion, and economic growth: A panel data analysis. Information Technology for Development, 1–29. https://doi.org/10. 1080/02681102.2020.1734770"

the OLS estimates in Babajide et al[243] showed that total factor productivity (TFP) growth rose significantly in previous period's deposit accounts.

In India, the vector auto-regression (VAR) estimates in Sharma[244] suggested that growth of per capita GDP rose significantly in deposit accounts and penetration two years prior but declined insignificantly in deposit accounts the previous year. Within 44 countries in Africa, the system GMM estimates in Lundqvist & Erlandsson[245] economic growth significantly rises in per capita deposits. This was attributable to financial inclusion paving the way for mobile phone subscriptions to foster economic growth. This research, therefore, supports Chatterjee and Lundqvist & Erlandsson. Following Haftu[246], this research argues that financial services penetration arose from penetration of mobile phone subscriptions which paved way for mobile phone banking. Thus, individuals would create bank deposit accounts using their mobile phones which then saved on time that would have otherwise been spent queueing in banks to create a deposit account. The time saved was then directed towards gainful production which consequently fostered growth of incomes. Besides, as Myovella et al[247] argued, expansion of mobile phone subscriptions enabled the inclusion of previously financially excluded households as well as enabled an additional unbanked population to access finance for business and production.

[243] Babajide, Abiola A, Folasade B Adegboye, and Alexander E Omankhanlen. "Financial Inclusion and Economic Growth in Nigeria" 5, no. 3 (2015).
[244] Sharma, Dipasha. "Nexus between financial inclusion and economic growth: Evidence from the emerging Indian economy." *Journal of financial economic policy* (2016).
[245] Lundqvist, Maria, Frida Erlandsson, and Pontus Hansson. "The diffusion of mobile phones and its impact on financial inclusion and economic growth in Africa." PhD diss., Master Thesis, Department of Economics, Lund University, 2014.
[246] Haftu, Girmay Giday. (2019). Information communications technology and economic growth in Sub-Saharan Africa: A panel data approach. https://www.sciencedirect.com/science/article/abs/pii/S0308596117303737.
[247] Myovella, Godwin, Mehmet Karacuka, and Justus Haucap. "Digitalization and economic growth: A comparative analysis of Sub-Saharan Africa and OECD economies." *Telecommunications Policy* 44, no. 2 (2020): 101856.

This research revealed that per capita GDP was significantly affected by the previous period's per capita GDP with high persistence. Chatterjee[248] gave a significant persistence parameter of 0.08-0.13. In India, Sharma[249] indicated statistically insignificant persistence. Lundqvist & Erlandsson (2014) reported a negative but statistically significant persistence coefficient. In sub-Saharan Africa, Haftu indicated a 0.92 persistence coefficient. Myovella et al[250] report negative persistence parameter in an OECD-SSA comparative investigation. This research, therefore, presents a persistence parameter much higher than that documented in Chatterjee but one consistent with Haftu. Furthermore, this research does not Sharma, Myovella et al, and Lundqvist & Erlandsson. Following Haftu, this research argued that bad economic times lead to bad economic times while good times enhance good times in future.

This research revealed that per capita GDP significantly rises in inflation below 7% but declines in inflation above 7%. Taken as a whole, however, per capita GDP declined in inflation. The system GMM in Lundqvist & Erlandsson[251] suggested that inflation's effect on economic growth was statistically insignificant among 44 African economies. Haftu, however, revealed significant declines in economic growth as inflation rose in 40 sub-Saharan African economies. Within the European Union, Asteriou & Spanos[252] revealed significant declines in economic growth as subprime crisis inflation rate rose. Among OPEC countries, the GMM estimates in

[248] Chatterjee, A. (2020). "Financial inclusion, information and communication technology diffusion, and economic growth: A panel data analysis. Information Technology for Development, 1–29. https://doi.org/10. 1080/02681102.2020.1734770"

[249] Sharma, Dipasha. "Nexus between financial inclusion and economic growth: Evidence from the emerging Indian economy." *Journal of financial economic policy* (2016).

[250] Myovella, Godwin, Mehmet Karacuka, and Justus Haucap. "Digitalization and economic growth: A comparative analysis of Sub-Saharan Africa and OECD economies." *Telecommunications Policy* 44, no. 2 (2020): 101856.

[251] Lundqvist, Maria, Frida Erlandsson, and Pontus Hansson. "The diffusion of mobile phones and its impact on financial inclusion and economic growth in Africa." PhD diss., Master Thesis, Department of Economics, Lund University, 2014.

[252] Asteriou Dimitrios & Spanos Konstantinos. (2018). The relationship between financial development and economic growth during the recent crisis: Evidence from the EU. https://www.sciencedirect.com/science/article/abs/pii/S1544612318301193.

Seperhrdoust & Ghorbanseresht[253] suggested that economic growth declined in inflation rate. This research, therefore, does not support Lundqvist & Erlandsson but offers support to Haftu, Asteriou & Spanos, and Seperhrdoust & Ghorbanseresht. This research, thus, argues that moderate inflation below 7% incentivizes production which in turn fosters growth of income per capita.

This research revealed that per capita GDP is insignificantly affected by population growth. Haftu showed that as population growth rose, economic growth in 40 sub-Saharan African economies declined. The comparative system GMM estimates in Myovella et al[254] suggested that economic growth declines as population growth rises. In China, the ARDL estimates in Furuoka[255] suggested that economic growth declined in population growth. In 5 ASEAN economies, Ridzuan et al[256] indicated that population growth boosts economic growth. This research, therefore, does not support the mentioned studies. Given the insignificance of the finding, the results could not be discussed further.

Although trade openness raised per capita GDP, its significance depended upon model specification. Myovella et al[257] showed that as per capita incomes significantly rose in trade openness. Chatterjee[258] indicated significant increments in per capita GDP growth with a rise in

[253] Sepehrdoust, H., & Ghorbanseresht, M. (2019). "Impact of information and communication technology and financial development on economic growth of OPEC developing economies. *Kasetsart Journal of Social Sciences*, *40*(3), 546-551."
[254] Myovella Godwin, Karacuka Mehmet & Haucap, Justus. (2020). "Digitalization and economic growth: A comparative analysis of Sub-Saharan Africa and OECD economies," Telecommunications Policy, Elsevier, vol. 44(2).
[255] Furuoka, F. (2018). Is population beneficial to economic growth? An empirical study of China. *Quality & Quantity*, *52*(1), 209-225.
[256] Ridzuan, A. R., Khalid, M. W., Zarin, N. I., Razak, M. I. M., Ridzuan, A. R., Ismail, I., & Norizan, N. (2018). The impact of foreign direct investment, domestic investment, trade openness and population on economic growth: evidence from asean-5 countries. *International Journal of Academic Research in Business and Social Sciences*, *8*(1), 128-143.
[257] Myovella, Godwin, Mehmet Karacuka, and Justus Haucap. "Digitalization and economic growth: A comparative analysis of Sub-Saharan Africa and OECD economies." *Telecommunications Policy* 44, no. 2 (2020): 101856.
[258] Chatterjee, A. (2020). "Financial inclusion, information and communication technology diffusion, and economic growth: A panel data analysis. Information Technology for Development, 1–29. https://doi.org/10. 1080/02681102.2020.1734770."

trade openness. Asteriou & Spanos[259] indicated significant declines in per capita incomes as trade openness increased during the 2008-2009 subprime crisis. Within OPEC, Seperhrdoust & Ghorbanseresht showed that as economies became increasingly open, growth declined. In 5 ASEAN economies, Ridzuan et al indicated that economic growth is enhanced by trade openness. This research, therefore, does not support Seperhrdoust & Ghorbanseresht and Asteriou & Spanos while partially supporting Ridzuan et al, Myovella et al, and Chatterjee.

3.3 Chapter Summary

This chapter analyzed how East Africa's economic security is shaped by financial services penetration with a focus on two key indicators, namely; mobile money accounts and deposit accounts. The analyses involved descriptive analysis followed by model estimation. In the descriptive part, a comparison of financial services penetration across the region was made. The two-sample t-test suggested that financial services penetration, mobile money agents, and deposit accounts in Uganda as well as in Rwanda was lower than in Kenya. Thereafter, some variables were banded following revelations in Ebong & George[260]. An analysis of correlations suggested that mobile money accounts and deposit accounts had significant linear associations with per capita GDP. Furthermore, deposit accounts above 849 per 0.001 million adults significantly co-moved with per capita GDP while deposit accounts fewer than 350 significantly co-moved with per capita GDP but in opposite directions.

[259] Asteriou, Dimitrios, and Konstantinos Spanos. "The relationship between financial development and economic growth during the recent crisis: Evidence from the EU." *Finance Research Letters* 28 (2019): 238-245.
[260] Ebong, Jimmy, and Babu George. "Financial Inclusion through Digital Financial Services (DFS): A Study in Uganda." *Journal of Risk and Financial Management* 14 (August 24, 2021): 393. https://doi.org/10.3390/jrfm14090393.

In gearing up towards model estimation, stationary panel test was deemed unnecessary following a clarification given in Baum et al[261] on time periods exceeding 19.

Following the clarification given in Emara and Said[262], one-step system GMM was employed in model estimation. This research established that although GDP per capita insignificantly rose in financial services penetration, per capita GDP significantly rose in mobile money accounts above 1300 as well as in deposit accounts above 849, and moderate inflation below 7%. Model diagnosis based on the Sargan test revealed that system GMM instruments were valid.

[261] Christopher F. Baum, Mark E. Schaffer, & Steven Stillman (2003). Instrumental variables and GMM: Estimation and testing. The Stata Journal (2003) 3, Number 1, pp. 1–31.
[262] Emara, Noha, and Ayah El Said. "Financial inclusion and economic growth: The role of governance in selected MENA countries." *International Review of Economics & Finance* 75 (2021): 34-54.

CHAPTER FOUR

USAGE DIMENSION AND ECONOMIC SECURITY OF EAC STATES

4.1 Introduction

This chapter presents a summary of the data based on the descriptive statistics and correlation analysis. This is then followed by model estimation and diagnosis in the current section. Section 4.2 presents a discussion of the findings in line with literature.

Descriptive Statistics

Data on mobile money transactions for Burundi and South Sudan was missing for the years 2012-2021 while for DRC, it was only available for the years 2018-2020. Data on inflation for DRC was missing for the period 2017-2021 while for Uganda and Tanzania it was missing for year 2021. Data on outstanding deposits for Tanzania was unavailable for the years 2016-2021. Accordingly, Kenya, Uganda, and Rwanda were considered. Mobile money accounts in Tanzania were given by mobile account users.

Following Ifediora et al, the usage dimension was captured by mobile money transactions and outstanding deposits, both measured as a percentage of GDP. Other control variables, namely; trade openness, population growth, inflation rate, and lag GDP per capita were also adopted from Ifediora et al.

In comparing financial inclusion as well as per capita GDP in the region, two-sample t-test was employed. Table 8 suggested that per capita incomes in Kenya was significantly higher than of Uganda while Uganda's per capita income was higher than Rwanda's. Financial services usage in Kenya was lower than either Uganda or Rwanda. With respect to usage indicators, it was evident that although mobile money transactions in Uganda was not statistically different from Kenya's,

it was higher than Rwanda's. Outstanding deposit usage was highest in Kenya but lowest in Uganda.

Table 8: Usage and Growth						
Variable	**H0**	**H1**			**Conclusion**	
Per capita GDP	K=R	K<R (1)	K=R (0.00)	K>R (0.00)	K≥R	
	R=U	R<U (0.007)	R=U (0.013)	R>U (0.99)	U≥R	K≥U≥R
	K=U	K<U (1)	K=U (0.00)	K>U (0.00)	K≥U	
Dimension:						
Usage	K=U	K<U (0.00)	K=U (0.00)	K>U (1)	K≤U	
	K=R	K<R (0.000)	K=R (0.001)	K>R (1)	K≤R	K≤U=R
	R=U	R<U (0.199)	R=U (0.397)	R>U (0.801)	R=U	
Indicator:						
Mobile money transactions	K=U	K<U (0.311)	K=U (0.623)	K>U (0.689)	K=U	
	K=R	K<R (1)	K=R (0.00)	K>R (0.00)	K≥R	R≤U=K
	R=U	R<U (0.005)	R=U (0.010)	R> U (0.995)	R≤U	
Outstanding deposits	R=U	R<U (1)	R=U (0.000)	R>U (0.000)	R≥U	
	K=R	K<R (1)	K=R (0.00)	K>R (0.00)	K≥R	K≥R≥U
	K=U	K<U (1)	K=U (0.00)	K>U (0.00)	K≥U	
Economy key	K=Kenya	U=Uganda	R=Rwanda			
Probability values from the two-sample t-tests are in brackets.						

Correlations

Product moments were computed with the resultant coefficients being documented in Table 9. Following revelations in Ebong & George[263] regarding an initial up-jump in mobile money transactions (as well as outstanding deposits) followed by a slump in the momentum of usage, it was necessary to band the data on mobile money transactions and outstanding deposits. The banding was realized through sub-division of mobile money transactions data into three bands, namely; less than 2% (Tk_1), between 2% and 3.5% (Tk_2), and above 3.5% (Tk_3). Transactions were given as a share of GDP while the banding was done in such a way that ensured sufficient representativeness of the bands. Similarly, outstanding deposits were banded into two: less than 20% (UD_1) and at least 20% (UD_2) of GDP. This exercise further offered an update to the

[263] Ebong, Jimmy, and Babu George. "Financial Inclusion through Digital Financial Services (DFS): A Study in Uganda." *Journal of Risk and Financial Management* 14 (August 24, 2021): 393. https://doi.org/10.3390/jrfm14090393.

methodology. Table 9 suggested that per capita GDP and outstanding deposits significantly co-moved together in the same direction. Outstanding deposits below 2%, however, significantly co-moved with GDP per capita but in opposite directions. The co-movements between mobile money transactions and GDP per capita were statistically insignificant.

Table 9: Usage Correlations

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
1. Outstanding deposits (UD)	1.00						
2. Mobile money transactions (Tk)	-0.19	1.00					
3. UD<20%	-0.90***	0.12	1.00				
4. Tk<2%	-0.09	-0.57**	0.06	1.00			
5. 2%≤Tk≤3.5%	0.27	-0.19	-0.11	-0.67***	1.00		
6. Tk>3.5%	-0.23	0.91***	0.07	-0.38*	-0.44*	1.00	
7. GDP per capita	0.93***	-0.21	-0.86***	-0.12	0.32	-0.25	1.00
N	30						

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

Pre-estimation Test

Stationary Panels Test

In model estimation based on the generalized method of moments (GMM) using long panels (i.e., time periods exceeding 20), Baum et al[264] argue that the panels must be stationary. This research, however, utilized a panel spanning 10 years. The stationary panel restriction was, thus, considered unimportant. Hence, the panel stationary test was not executed. Similarly, the panels were not examined for possible cointegrating relationships.

Model Estimation and Diagnosis

Product moments were computed with the resultant coefficients being documented in Table 9. Following revelations in Ebong & George[265] regarding an initial up-jump in mobile money

[264] Christopher F. Baum, Mark E. Schaffer, & Steven Stillman (2003). Instrumental variables and GMM: Estimation and testing. The Stata Journal (2003) 3, Number 1, pp. 1–31.

[265] Ebong, Jimmy, and Babu George. "Financial Inclusion through Digital Financial Services (DFS): A Study in Uganda." *Journal of Risk and Financial Management* 14 (August 24, 2021): 393. https://doi.org/10.3390/jrfm14090393.

transactions (as well as outstanding deposits) followed by a slump in the momentum of usage, it was necessary to band the data on mobile money transactions and outstanding deposits. The banding was realized through sub-division of mobile money transactions data into three bands, namely; less than 2% (Tk_1), between 2% and 3.5% (Tk_2), and above 3.5% (Tk_3). Transactions were given as a share of GDP while the banding was done in such a way that ensured sufficient representativeness of the bands. Similarly, outstanding deposits were banded into two: less than 20% (UD_1) and at least 20% (UD_2) of GDP. This exercise further offered an update to the methodology. Following Ifediora et al, the usage index (FI_U) was computed using principal component analysis (PCA) with the index being:

$$FI_U = (-0.0423Tk_1 + 0.1749Tk_2 - 0.1657Tk_3) * Tk_g + 0.9696UD_1 * UD_g$$

Where standardized values Tk_g and UD_g refer to mobile money transactions and outstanding deposits. Thereafter, one-step system GMM was employed in retrieving the model's parameters. Lag 2 was utilized in situations where the per capita GDP was overshooting (i.e., whenever the coefficient of lag ln GDP per capita exceeded 1).

Optimal mobile money transactions were found to be between 2% and 3.5% of GDP such that per capita GDP rose in mobile money transactions in the interval [2%, 3.5%) (see columns 1-5, Table 10). Against a benchmark of above 20%, per capita GDP significantly rose in outstanding deposits below 20% of GDP (see column 6, Table 10). Taken as a whole, financial services usage significantly raised per capita GDP (see column 7, Table 10).

Generally, inflation eroded per capita GDP (see columns 1,2, 5-7). However, per capita incomes significantly rose in inflation below 5% as well as between 5%-7% although the magnitude was stronger in inflation below 5% (see columns 3-4, Table 10). The effect of population

growth and trade openness on per capita GDP was varied (both in direction and statistical significance). Lastly, it was evident that per capita GDP was persistent as suggested by coefficients of lag ln GDP per capita falling in the open interval (0, 1).

Table 10: Usage-to-Growth

VARIABLES	(1) Ln GDP per capita	(2) Ln GDP per capita	(3) Ln GDP per capita	(4) Ln GDP per capita [z]	(5) Ln GDP per capita [z]	(6) Ln GDP per capita	(7) Ln GDP per capita [z]
L. ln GDP per capita	0.894***	0.628***	0.875***			0.650**	
	(0.0604)	(0.206)	(0.0747)			(0.265)	
L2. Ln GDP per capita		0.281				0.482*	
		(0.195)				(0.250)	
Mobile money transactions (Tk<2%)	-	0.0124	-	-	0.0723		
		(0.0169)			(0.0539)		
Mobile money transactions (2%≤Tk<3.5%)	0.0191*	0.0285**	0.0292**	0.0965**	0.159***		
	(0.0107)	(0.0124)	(0.0136)	(0.0450)	(0.0423)		
Mobile money transactions (Tk≥3.5%)	-0.00479		0.0111	0.0366			
	(0.0143)		(0.0179)	(0.0592)			
Inflation	-0.0110***	-0.00927***					
	(0.00181)	(0.00239)					
Population growth	0.00551	0.0126					
	(0.0177)	(0.0198)					
Trade openness	0.000812	0.00133					
	(0.000765)	(0.000939)					
Inflation (qk<5%)			0.0609***	0.201***			
			(0.0139)	(0.0459)			
Inflation (5%≤qk≤7%)			0.0379**	0.125**			
			(0.0175)	(0.0577)			
Inflation (qk>7%)			-	-			
Ln Population growth			-0.0331			-0.118**	
			(0.0582)			(0.0458)	
Ln trade openness			0.0449			0.0735*	
			(0.0380)			(0.0405)	
L. GDP per capita [z]				0.875***	0.552*		0.595**
				(0.0747)	(0.313)		(0.257)
Population growth [z]				-0.0181	-0.00130		-0.0388*
				(0.0318)	(0.0262)		(0.0227)
Trade openness [z]				0.0292	0.0748***		0.0611**
				(0.0247)	(0.0287)		(0.0257)
L2. GDP per capita [z]					0.486*		0.499**
					(0.293)		(0.244)
Inflation [z]					-0.0907***		-0.0623***
					(0.0198)		(0.0161)
Outstanding deposits (UD<20%)						0.105***	
						(0.0257)	
Outstanding deposits (UD≥20%)						-	
Ln inflation						-0.0259**	
						(0.0119)	
Usage (U2)							0.220***
							(0.0492)

Table 10: Usage-to-Growth

VARIABLES	(1) Ln GDP per capita	(2) Ln GDP per capita	(3) Ln GDP per capita	(4) Ln GDP per capita [z]	(5) Ln GDP per capita [z]	(6) Ln GDP per capita	(7) Ln GDP per capita [z]
Constant	0.746*	0.592	0.693	-0.122*	-0.0144	-1.049**	-0.0410
	(0.417)	(0.463)	(0.547)	(0.0630)	(0.0512)	(0.461)	(0.0413)
Sargan test (C, p)	16.46, 0.90	(12.46, 0.93)	(21.26, 0.68)	(21.26, 0.68)	(11.84, 0.86)	(14.41, 0.76)	(12.83, 0.85)
Observations	26	23	27	27	21	21	21
Number of economy ID	3	3	3	3	3	3	3

Standard errors in parentheses except the Sargan test
*** p<0.01, ** p<0.05, * p<0.1
Z=standardized, C=chi-square statistic, and p=probability value.

Model diagnosis utilized the Sargan test in interrogating the validity of the system GMM instruments. The claim under consideration was that the instruments were valid with the decision rule being such that this claim would not hold for probability values less than 5% significance level. In all model specifications, it was evident that corresponding probability values from the Sargan test were larger than 5%. Hence, the system GMM instruments were valid.

Main Hypotheses

In line with the research's goals, this section's main hypotheses were thus:

$H0_1$: East Africa's economic security is not significantly affected by mobile money transactions. The findings suggested that mobile money transactions significantly raise per capita GDP when they are between 2% to 3.5% of GDP. This claim was that refused.

$H0_2$: East Africa's economic security is not significantly affected by outstanding deposits. The findings suggested that outstanding deposits below 20% significantly raise per capita GDP. This claim was thus refused.

$H0_3$: East Africa's economic security is not significantly affected by financial services usage. The findings of this research suggested that financial services usage significantly raise per capita GDP. This claim was thus refused.

4.2 Discussion

This research revealed that per capita GDP significantly rose in financial services usage, mobile money transactions between 2% to 3.5% of GDP, and in outstanding deposits less than

20% of GDP. In India, Sarika & Vasantha[266] argued that electronic payments using mobile phones fostered economic growth. Myovella et al[267] revealed that growth was inevitable following the surge in digitization in Africa. In India, the VAR estimates in Sharma[268] suggested that growth of per capita GDP rises significantly in financial services usage as well as in outstanding deposits two years back whereas usage and outstanding deposits a year back have no statistically significant effect on economic growth.

In 24 Asian economies, the fixed effects in Siddik et al[269] indicated that real per capita GDP rose significantly in previous year's outstanding deposits. In South Asia, the panel vector error correction model (VECM) estimates in Thathsarani et al[270] suggested that outstanding deposits growth significantly boosted growth of per capita GDP. Similarly, in eight South Asian economies, the dynamic OLS and fully modified OLS estimates in Singh & Stakic[271] revealed that growth of per capita GDP rose significantly in financial inclusion index, whose computation involved the incorporation of outstanding deposits. This research, therefore, supports Sharma, Sarika & Vasantha, Thathsarani et al, and Singh & Stakic. Following Myovella et al, this research argues that financial services usage was a means through which finances could be channeled which then enabled the utilization of finance in driving the growth agenda.

[266] Sarika, P., & Vasantha, S. (2019). Impact of mobile wallets on cashless transaction. *Int. J. Recent Technol. Eng*, *7*(6), 1164-1171.
[267] Myovella, Godwin, Mehmet Karacuka, and Justus Haucap. "Digitalization and economic growth: A comparative analysis of Sub-Saharan Africa and OECD economies." *Telecommunications Policy* 44, no. 2 (2020): 101856.
[268] Sharma, Dipasha. "Nexus between financial inclusion and economic growth: Evidence from the emerging Indian economy." *Journal of financial economic policy* (2016).
[269] Siddik, M. N. A., Ahsan, T., & Kabiraj, S. (2019). "Does financial permeation promote economic growth? Some econometric evidence from Asian countries. *Sage Open*, *9*(3), 2158244019865811."
[270] Thathsarani, U. S., Wei, J., & Samaraweera, G. R. S. R. C. (2021). "Financial inclusion's role in economic growth and human capital in South Asia: an econometric approach. *Sustainability*, *13*(8), 4303."
[271] Singh, D., & Stakic, N. (2020). "Financial inclusion and economic growth nexus: Evidence from SAARC countries". *South Asia Research,* 41(1), 1–21. https:// doi.org/10.1177/0262728020964605

This research revealed that trade openness raised per capita GDP although its significance varied with model specification. Within 37 sub-Saharan African economies, the difference GMM estimates in Inoue & Hamori[272] suggested that economic growth significantly rises in economic openness. In South Asia, Singh & Stakic[273] revealed that economic growth rises in trade openness. Huchet-Bourdon et al[274] revealed that, in the presence of interaction effects, economic growth significant declined in export ratio although export ratio interacted with export quality significantly raised economic growth in 169 countries. Within the EU, GMM estimates in Toader et al suggested that economic growth rises in trade openness.

In 10 economies from Southeast Europe (SEE), the system GMM and difference GMM estimates in Fetahi-Vehapi et al[275] suggested that economic growth rose significantly in trade openness. In East and Central Europe, fixed effects estimate in Dauti & Eleza[276] suggested that GDP growth rises significantly in trade openness. The system GMM estimates, however, indicated no significant trade openness' effect on GDP growth. This research, therefore, partially supports Fetahi-Vehapi et al, Dauti & Eleza, and Inoue & Hamori but does not support Hutchet-Bourdon et al. Following Fetahi-Vehapi et al, this research argued that trade openness, especially through export expansion and diversification, incentivized increased production which subsequently raised incomes (in the significant specifications).

[272] Inoue, T., & Hamori, S. (2016). Financial access and economic growth: Evidence from Sub-Saharan Africa. *Emerging Markets Finance and Trade*, *52*(3), 743-753.
[273] Singh, D., & Stakic, N. (2020). "Financial inclusion and economic growth nexus: Evidence from SAARC countries". *South Asia Research,* 41(1), 1–21. https:// doi.org/10.1177/0262728020964605
[274] Huchet-Bourdon, Marilyne, Chantal Le Mouël, and Mariana Vijil. "The relationship between trade openness and economic growth: Some new insights on the openness measurement issue." *The World Economy* 41, no. 1 (2018): 59-76.
[275] Fetahi-Vehapi Merale, Luljeta Sadiku & Petkovski Mihail. (2015). Empirical Analysis of the Effects of Trade Openness on Economic Growth: An Evidence for South East European Countries.
[276] Dauti, B., & Elezi, S. (2022). Economic growth in the Central East European Union and the Western Balkan countries in the course of Stability and Growth Pact and COVID-19. *Zbornik radova Ekonomskog fakulteta u Rijeci: časopis za ekonomsku teoriju i praksu*, *40*(1), 29-61.

In this research, it was evident that per capita GDP was significantly affected by previous period's per capita GDP with conspicuous persistence. Inoue & Hamori[277] documented positive persistence coefficient. In South Asia, Thathsarani et al[278] indicated that this coefficient was not statistically significant. Utilizing a panel of 169 countries, the system GMM estimates in Huchet-Bourdon et al[279] suggested that initial per capita GDP levels mattered a lot in shaping economic growth. Toader et al[280] revealed positive persistence coefficient within the EU. In South East Europe, Fetahi-Vehapi et al[281] document significant persistence of economic growth. In East and Central Europe and Western Balkan region, the system GMM estimates in Dauti & Eleza[282] suggested that GDP growth significantly rises in previous year's growth. This research, therefore, supports Inoue & Hamori, Hutchet-Bourdon et al, and Dauti & Eleza but does not support Thathsarani et al. Following Hutchet-Bourdon et al, this research argues that present period's per capita GDP forms the basis of resource mobilization for productive activities in the future.

As a whole, per capita GDP significantly declined in inflation. However, per capita GDP significantly rose in inflation below 7% but declined in inflation above 7%. Siddik et al[283] documented significant per capita real GDP declines as inflation rose in 24 Asian economies. In

---

[277] Inoue, Takeshi, and Shigeyuki Hamori. "Financial access and economic growth: Evidence from Sub-Saharan Africa." *Emerging Markets Finance and Trade* 52, no. 3 (2016): 743-753.
[278] Thathsarani, U. S., Jianguo Wei, and G. R. S. R. C. Samaraweera. "Financial inclusion's role in economic growth and human capital in South Asia: an econometric approach." *Sustainability* 13, no. 8 (2021): 4303.
[279] Huchet-Bourdon Marilyne, Chantal Le Mouel & Mariana Vijil. (2017). The relationship between trade openness and economic growth: Some new insights on the openness measurement issue.
[280] Toader, Elena, Bogdan Narcis Firtescu, Angela Roman, and Sorin Gabriel Anton. "Impact of information and communication technology infrastructure on economic growth: An empirical assessment for the EU countries." *Sustainability* 10, no. 10 (2018): 3750.
[281] Fetahi-Vehapi, Merale, Luljeta Sadiku, and Mihail Petkovski. "Empirical analysis of the effects of trade openness on economic growth: An evidence for South East European countries." *Procedia Economics and Finance* 19 (2015): 17-26.
[282] Dauti, Bardhyl, and Shiret Elezi. "Economic growth in the Central East European Union and the Western Balkan countries in the course of Stability and Growth Pact and COVID-19." *Zbornik radova Ekonomskog fakulteta u Rijeci: časopis za ekonomsku teoriju i praksu* 40, no. 1 (2022): 29-61.
[283] Siddik, Md Nur Alam, Tanveer Ahsan, and Sajal Kabiraj. "Does financial permeation promote economic growth? Some econometric evidence from Asian countries." *Sage Open* 9, no. 3 (2019): 2158244019865811.

the Balkan region, East and Central Europe, the system GMM estimates in Dauti & Eleza[284] suggested that GDP growth insignificantly declined in inflation rate. Within the EU, the first-difference GMM estimates in Toader et al[285] indicated that economic growth was insignificantly affected by inflation rate. This research, therefore, supports Siddik et al but does not support Dauti & Eleza and Toader et al. Following Oloo et al[286], this research argued that whereas moderate inflation incentivized production of commodities, inflation above 7% disincentivized production.

4.3 Summary

This chapter analyzed how East Africa's economic security is affected by financial services usage with a focus on key usage indicators, namely; mobile money transactions and outstanding deposits. The analyses involved both descriptive analysis and model estimation. Due to data constraints, the economies considered were Uganda, Kenya, and Rwanda. In the descriptive part, the two-sample t-test suggested that financial services usage in Kenya was lower than either Uganda or Rwanda although outstanding deposit usage was highest in Kenya but lowest in Uganda. Before analyzing correlations, revelations in Ebong & George[287] were brought into perspective. These revelations informed the banding of some variables. The findings suggested that although per capita GDP and outstanding deposits significantly co-moved together in the same direction, outstanding deposits below 2% significantly co-moved with GDP per capita in opposite directions. The co-movements between mobile money transactions and GDP per capita were

[284] Dauti, Bardhyl, and Shiret Elezi. "Economic growth in the Central East European Union and the Western Balkan countries in the course of Stability and Growth Pact and COVID-19." *Zbornik radova Ekonomskog fakulteta u Rijeci: časopis za ekonomsku teoriju i praksu* 40, no. 1 (2022): 29-61.

[285] Toader, E., Firtescu, B. N., Roman, A., & Anton, S. G. (2018). Impact of information and communication technology infrastructure on economic growth: An empirical assessment for the EU countries. *Sustainability*, *10*(10), 3750.

[286] Oloo, Michael, Mary Mbithi, and Martin Oleche. "Threshold Effect of Macroeconomic Convergence Criteria on Real GDP Growth Rate within the East African Community." *European Journal of Development Studies* 2, no. 2 (2022): 11-25.

[287] Ebong, Jimmy, and Babu George. "Financial Inclusion through Digital Financial Services (DFS): A Study in Uganda." *Journal of Risk and Financial Management* 14 (August 24, 2021): 393. https://doi.org/10.3390/jrfm14090393.

statistically insignificant. Following a clarification in Baum et al[288] on stationary panel test, the test was considered unnecessary since time periods considered in this research were fewer than 20.

Following Emara & Said[289], one-step system GMM was employed to estimate the model. The findings suggested that per capita GDP significantly rose in financial services usage, mobile money transactions between 2% and 3.5% of GDP, outstanding deposits below 20% of GDP, and inflation below 7%. Although trade openness raised per capita incomes, its significance varied with the model specified. Similarly, in almost all specifications, population growth insignificantly affected per capita incomes.

[288] Christopher F. Baum, Mark E. Schaffer, & Steven Stillman (2003). Instrumental variables and GMM: Estimation and testing. The Stata Journal (2003) 3, Number 1, pp. 1–31.
[289] Emara, Noha, and Ayah El Said. "Financial Inclusion and Economic Growth: The Role of Governance in Selected MENA Countries." *International Review of Economics & Finance* 75 (September 1, 2021): 34–54. https://doi.org/10.1016/j.iref.2021.03.014.

CHAPTER FIVE

COMPOSITE FINANCIAL INCLUSION AND ECONOMIC SECURITY OF EAC STATES

5.1 Introduction

This chapter presents findings on the effects of composite financial inclusion (all the three dimensions put together) on economic security of EAC states. Here, a summary of the data based on the descriptive statistics and correlation analysis is documented. This is then followed by model estimation and diagnosis in the current section.

Descriptive Statistics

From the previous chapters, index financial inclusion was computed using data covering Kenya, Rwanda, and Uganda with the index's computation following variable measurement as well as the procedure employed in Ifediora et al. In comparing financial inclusion as well as per capita GDP in the region, two-sample t-test was employed. Table 11 suggested that per capita incomes in Kenya was significantly higher than of Uganda while Uganda's per capita income was higher than Rwanda's. Financial inclusion in Kenya was not statistically different from Rwanda's although it was lower than Uganda's. Population growth, inflation, and trade openness were control factors. Inflation in Kenya was not statistically different from Rwanda's or Uganda's. population growth was statistically highest in Uganda and lowest in Kenya. Lastly, although trade openness in Kenya was not statistically different from Uganda's, it was lower than Rwanda's.

Table 11: Financial Inclusion and Growth

Variable	H0	H1			Conclusion	
Per capita GDP	K=R	K<R (1)	K=R (0.00)	K>R (0.00)	K≥R	
	R=U	R<U (0.007)	R=U (0.013)	R>U (0.99)	U≥R	K≥U≥R
	K=U	K<U (1)	K=U (0.00)	K>U (0.00)	K≥U	
Inflation	K=R	K<R (0.868)	K=R (0.264)	K>R (0.132)	K=R	
	K=U	K<U (0.874)	K=U (0.252)	K>U (0.126)	K=U	K=U=R
	R=U	R<U (0.439)	R=U (0.877)	R>U (0.562)	R=U	
Financial inclusion	R=U	R<U (0.007)	R=U (0.013)	R>U (0.993)	R≤U	
	K=R	K<R (0.787)	K=R (0.425)	K>R (0.213)	K=R	K=R≤U
	K=U	K<U (0.003)	K=U (0.006)	K>U (0.997)	K≤U	
Population growth	K=U	K<U (0.000)	K=U (0.000)	K>U (1)	K≤U	

Table 11: Financial Inclusion and Growth						
Variable	**H0**	**H1**			**Conclusion**	
	K=R	K<R (0.017)	K=R (0.033)	K>R (0.983)	K≤R	K≤R≤U
	R=U	R<U (0.000)	R=U (0.000)	R>U (1)	R≤U	
Trade openness	R=U	R<U (1)	R=U (0.000)	R>U (0.000)	R≥U	
	K=R	K<R (0.001)	K=R (0.002)	K>R (0.999)	R≥K	K=U≤R
	K=U	K<U (0.460)	K=U (0.920)	K>U (0.540)	K=U	
Probability values from the two-sample t-tests are in brackets. K=Kenya, R=Rwanda, U=Uganda						

Correlations

Relevant product moments were computed with the coefficients being documented in Table 12. The findings suggested that population growth/ trade openness/ inflation below 5% and per capita GDP significantly co-moved in opposite directions. Between 5% to 7% inflation, inflation and per capita GDP significantly co-moved in the same direction. The co-movement between per capita GDP and financial inclusion was not statistically significant.

Table 12: Financial Inclusion Correlations

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
1. index financial inclusion	1.00							
2. inflation (qk)	-0.27	1.00						
3. population growth	0.52**	-0.23	1.00					
4. trade openness	-0.39*	-0.06	-0.18	1.00				
5. qk<5%	0.16	-0.79***	0.25	0.18	1.00			
6. 5%≤qk≤7%	0.12	0.19	-0.04	-0.48**	-0.65***	1.00		
7. qk>7%	-0.33	0.71***	-0.25	0.36	-0.42*	-0.42*	1.00	
8. GDP per capita	-0.01	0.24	-0.48**	-0.42*	-0.37*	0.46*	-0.11	1.00
N	28							

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

Pre-estimation Test

Stationary Panels Test

In model estimation based on the generalized method of moments (GMM) using long panels (i.e., time periods exceeding 20), Baum et al[290] argue that the panels must be stationary. This research, however, utilized a panel spanning 10 years. The stationary panel restriction was,

[290] Christopher F. Baum, Mark E. Schaffer, & Steven Stillman (2003). Instrumental variables and GMM: Estimation and testing. The Stata Journal (2003) 3, Number 1, pp. 1–31.

thus, considered unimportant. Hence, the panel stationary test was not executed. Similarly, the panels were not examined for possible cointegrating relationships.

Model Estimation and Diagnosis

Following Ifediora et al, composite index for financial inclusion (FI_I) was computed using principal component analysis (PCA). Inputs in the PCA were the composite indices for the three dimensions, namely: usage (FI_U), penetration (FI_P), and availability (FI_A). The index financial inclusion was thus:

$$FI_I = 0.3556FI_P + 0.7811FI_U + 0.5132FI_A$$

Where the constituent indices were standardized as part of the PCA procedure. Thereafter, system GMM was employed in retrieving the model's parameters. Lag 2 was incorporated when per capita GDP was overshooting (i.e., the lag per capita GDP having a coefficient larger than 1).

It was evident that per capita GDP significantly rose in financial inclusion (see columns 1-5, Table 13). In all specifications, population growth slowed down per capita GDP growth. Taken as a whole, inflation stifled growth. However, per capita GDP significantly rose in inflation below 7% but declined in inflation above 7%. Per capita GDP rose in trade openness although with varied statistical significance. Lastly, it was evident that per capita GDP was persistent as suggested that coefficients of lag GDP being in the open interval (0, 1).

Table 13: Financial Inclusion-to-Growth

VARIABLES	(1) Ln GDP per capita [z]	(2) Ln GDP per capita	(3) Ln GDP per capita	(4) Ln GDP per capita	(5) Ln GDP per capita [z]
L. ln GDP per capita [z]	0.231				0.933***
	(0.235)				(0.0544)
L2. Ln GDP per capita [z]	0.754***				
	(0.222)				
Index financial inclusion	0.116***	0.0351***	0.0144**	0.0165**	0.0561**
	(0.0236)	(0.00715)	(0.00654)	(0.00772)	(0.0253)
Ln inflation [z]	-0.0510***				
	(0.0146)				
Population growth [z]	-0.0660***				-0.0530*
	(0.0217)				(0.0312)

Table 13: Financial Inclusion-to-Growth

VARIABLES	(1) Ln GDP per capita z	(2) Ln GDP per capita	(3) Ln GDP per capita	(4) Ln GDP per capita	(5) Ln GDP per capita z
Trade openness z	0.0610***				0.0347
	(0.0229)				(0.0240)
L. ln GDP per capita		0.231	0.912***	0.926***	
		(0.235)	(0.0452)	(0.0543)	
L2. Ln GDP per capita		0.754***			
		(0.222)			
Ln population growth		-0.121***			
		(0.0398)			
Ln trade openness		0.0940***			
		(0.0353)			
Ln inflation		-0.0343***			
		(0.00981)			
Trade openness			0.000865	0.00109	
			(0.000716)	(0.000886)	
Population growth			-0.0115	-0.0304	
			(0.0169)	(0.0199)	
Inflation			-0.00995***		
			(0.00164)		
Inflation (qk<5%)				0.0147	0.160***
				(0.0145)	(0.0385)
Inflation (qk>7%)				-0.0338**	
				(0.0158)	
Inflation (5%≤qk≤7%)				-	0.115**
					(0.0517)
Constant	0.104***	-0.0344	0.674**	0.568	-0.0480
	(0.0241)	(0.374)	(0.319)	(0.381)	(0.0356)
Sargan test (C, p)	(17.17, 0.57)	(17.17, 0.58)	(20.59, 0.76)	(24.98, 0.52)	(24.98, 0.52)
Observations	21	21	26	27	27
Number of economy ID	3	3	3	3	3

Standard errors in parentheses except the Sargan test
*** p<0.01, ** p<0.05, * p<0.1
C=chi-square statistic, p=peobability value, z=standardized

Model diagnosis utilized the Sargan test. The claim under consideration was that the one-step system GMM instruments were valid. This claim was validated since the probability values from the Sargan test were larger than 5% significance level.

Overall Hypothesis

The overall claim under investigation was that East Africa's economic security was not significantly affected by financial inclusion. The findings suggested that per capita GDP significantly rose in financial inclusion. This claim was thus refused.

5.2 Discussion

This research revealed that per capita GDP rose significantly in financial inclusion index. Ifediora et al, Ain et al, Adegboyegun et al, and Emara & Said documented significant per capita GDP increments in financial inclusion. Similarly, the ARDL and GMM estimates in Chiad et al[291] and Winful et al[292], respectively, revealed that per capita GDP rose significantly in financial inclusion. In the monetary and economic union of West Africa, Gourene et al[293] indicated that economic growth rose significantly in the usage and penetration of financial services after 4 years. Nkwede[294], however, indicated significant growth declines in financial inclusion. This research, therefore, supports Ifediora et al, Ain et al, Adegboyegun et al, Emara & Said, Chiad et al, Winful et al, and Gourene et al but does not support Nkwede. Following Ifediora et al, this research argued that financial inclusion through bringing onboard the previously unbanked individuals not only fostered access to finance but also enabled utilization of finance to foster production, and subsequently raised per capita GDP.

This research revealed that inflation between 5% and 7% significantly raised per capita GDP while inflation above 7% significantly reduced per capita GDP. Azam & Khan[295] offered inflation threshold above 7% whereas Oloo et al[296] offered a threshold at 5.98%. This research,

[291] Chiad, Faycal, Amine Aouissi, and Ahcene Lahsasna. "Financial Market Inclusion and Economic Growth: Evidence from Algeria." (2021): 1793-1812.
[292] Winful, Ernest C., K. Opoku-Asante, Mathew O. Mensah, and Josiah NA Quaye. "Financial Inclusion and Economic Development in Africa." *European Journal of Business and Management Research* 7, no. 2 (2022): 130-138.
[293] Gourene, G.A.Z., and Mendy, P. (2019) Financial Inclusion and Economic Growth in WAEMU: A Multi Hetergeneity Panel Causality Approach. Theoretical Economic Letter.
[294] Nkwede, Friday. "Financial inclusion and economic growth in Africa: Insight from Nigeria." *European journal of business and management* 7, no. 35 (2015): 71-80.
[295] Azam, Muhammad, and Saleem Khan. "Threshold effects in the relationship between inflation and economic growth: Further empirical evidence from the developed and developing world." *International Journal of Finance & Economics* 27, no. 4 (2022): 4224-4243
[296] Oloo, Michael, Mary Mbithi, and Martin Oleche. "Threshold Effect of Macroeconomic Convergence Criteria on Real GDP Growth Rate within the East African Community." *European Journal of Development Studies* 2, no. 2 (2022): 11-25.

therefore, supports Oloo et al but does not support Azam & Khan. Following Oloo et al, this research argues that moderate inflation between 5% and 7% incentivizes investment in productive activities which subsequently foster growth of output. Inflation above 7%, however, disincentivizes production by raising the cost of investment.

Although trade openness raised per capita GDP, its significance depended on the specification. The GMM estimates in Ndiaye & Yade[297] suggested that per capita GDP significantly rises in trade openness. This research, therefore, partially supports Ndiaye & Yade. Lastly, this research revealed that although population growth reduced per capita GDP, its significance depended on the specification. Insignificant results could not, however, be discussed further.

5.3 Chapter Summary

This supplementary chapter analyzed how East Africa's economic security is shaped by financial inclusion whose index was a composite of financial services usage, penetration, and availability. Data constraints led to Kenya, Rwanda, and Uganda being considered. The analyses involved descriptive analysis as well as model estimation. In the descriptive analysis, a comparison across the countries was done with the utilization of the two-sample t-test. The findings suggested that per capita incomes in Kenya was significantly higher than of Uganda while Uganda's per capita income was higher than Rwanda's; financial inclusion in Kenya was not statistically different from Rwanda's although it was lower than Uganda's; inflation in Kenya was not statistically different from Rwanda's or Uganda's; population growth was statistically highest in Uganda and lowest in Kenya, and; lastly, trade openness in Kenya was not statistically different from Uganda's but it was lower than Rwanda's. An analysis of correlations suggested that per

[297] NDIAYE, Abdoulaye, and Mouhamadou Lamine YADE. "Financial inclusion and economic growth in sub-Saharan Africa."

capita GDP significantly co-moved but in opposite direction with population growth, trade openness, and inflation below 5%, but; per capita GDP significantly co-moved in the same direction with inflation between 5% to 7%, whereas; the co-movement between per capita GDP and financial inclusion was not statistically significant.

Following Baum et al[298], stationary panel test was deemed unnecessary since the time periods covered were fewer than 20. Following Emara & Said[299], one-step system GMM was employed in estimating the model. The findings suggested that per capita GDP significantly rose in financial inclusion, and inflation between 5% and 7% whereas population growth and trade openness' effect was mixed.

[298] Christopher F. Baum, Mark E. Schaffer, & Steven Stillman (2003). Instrumental variables and GMM: Estimation and testing. The Stata Journal (2003) 3, Number 1, pp. 1–31.
[299] Emara, Noha, and Ayah El Said. "Financial Inclusion and Economic Growth: The Role of Governance in Selected MENA Countries." *International Review of Economics & Finance* 75 (September 1, 2021): 34–54. https://doi.org/10.1016/j.iref.2021.03.014.

CHAPTER SIX

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

6.1 Summary

This research sought to investigate the effect of financial inclusion on growth of economies within the East African region, notably; Rwanda, Uganda, and Kenya. Three financial inclusion dimensions were considered, namely; usage, penetration, and availability with each dimension being analysed in a separate chapter. Measures of these dimensions were borrowed from existing literature. In the second chapter, financial inclusion was based on mobile money agent outlets, ATMs, and bank branches as proxies as well as composite availability index.

In the third chapter, financial penetration was based on mobile money accounts and deposit accounts as proxies as well as composite penetration index. In the fourth chapter, financial inclusion was based on mobile money transactions and outstanding deposits as proxies as well as composite usage index. In the fifth chapter, financial inclusion index was computed and subsequently interrogated.

In all the four chapters, economic growth was measured by per capita GDP. Lastly, inflation rate, openness to trade, and population growth rate were incorporated in the models as control variables. The incorporation was based on what had been done by previous researches. This research utilized panel data for three East African countries spanning the years 2012 to 2021.

Summary of Availability

In the context of financial services availability, it was evident that per capita GDP rose significantly in availability of financial services, bank branches, ATMs, and mobile money agents. Among the control factors, inflation below 7% significantly raised per capita GDP. Trade openness and population growth did not significantly affect per capita GDP.

Summary of Penetration

In the context of financial services penetration, it was evident that per capita GDP insignificantly rose in penetration as a whole. The various indicators, however, suggested that per capita GDP significantly rises in mobile money accounts above 1300 and in deposit accounts above 849 for every 0.001million adults. Among the control variables, it was evident that although population growth did not significantly affect per capita GDP, per capita GDP significantly rose in inflation below 7%. Per capita GDP also rose in trade openness although the significance of the change depended upon the specification of the model.

Summary of Usage

In the context of financial services usage, it was evident that per capita GDP significantly rose financial services usage, mobile money transactions between 2% to 3.5% of GDP, outstanding deposits below 20%, and inflation below 7%.

Summary of Financial Inclusion Index

Put together, financial inclusion significantly raised per capita GDP. In addition, per capita GDP significantly rose in inflation below 7% whereas the significance of population growth and trade openness was mixed.

6.2 Conclusions

From the findings, this research drew these conclusions:

(i) Expanding mobile money agent outlets, bank branches, and ATMs as well as raising financial services availability significantly fosters economic security.

(ii) Increasing mobile money accounts and deposit accounts beyond 1300 and 849, respectively, for every 0.001million adults significantly raises economic security.

(iii) Expanding mobile money transactions and outstanding deposits between 2% to 3.5% and below 20%, respectively, of GDP as well as raising financial services usage significantly raises economic security.

(iv) Moderate inflation below 7% significantly raises economic security.

6.3 Recommendations

EAC governments must champion for financial inclusion in their quest to imptove economic security, combat terrorism and other criminal activities that potentially arise from financial exclusion by:

(i) Establishment of a National Commission on Financial Inclusion under the National Treasury (NT) to synchronize financial inclusion-related laws, rules, programs, and initiatives.

(ii) Increasing the number of credit reference bureaus (CRBs) in EAC to deal with information asymmetry.

(iii) Africa should better exploit the opportunities offered by new technologies in order to broaden people's access to financial services in the light of mobile money and mobile banking.

(iv) Governments through respective central banks combat illicit financial flows such as money laundering, terrorism financing and fraud schemes like ‘tuma kwa hii namba’, fraudulent Mpesa reversals, and pyramid schemes which capitalize on naivety.

(v) Governments must invest in financial education so that households and firms fully take advantage of financial inclusion.

BIBLIOGRAPHY

Abduh, Muhamad, and Omar Mohd Azmi. “Islamic Banking and Economic Growth: The Indonesian Experience.” *International Journal of Islamic and Middle Eastern Finance and Management* 5, no. 1 (January 1, 2012): 35–47. https://doi.org/10.1108/17538391211216811.

Achugamonu Bede Uzoma, Alexander E. Omankhanlen , Gershon Obindah , Ajibola Arewa & Lawrence Uchenna Okoye | (2020) ‘Digital finance as a mechanism for extending the boundaries of financial inclusion in sub-Saharan Africa: A general methods of moments approach’, *Cogent Arts & Humanities*, 7:1, 1788293

Adedokun, M. W., & Ağa, M. (2021). *“Financial inclusion: A pathway to economic growth in Sub-Saharan economies.” International Journal of Finance and Economics*, 1–17. https://doi.org/10.1002/ijfe.2559.

Aduda, Josiah, and Elizabeth Kalunda. “Financial Inclusion and Financial Sector Stability With Reference To Kenya: A Review of Literature,” 2012. http://www.scienpress.com/Upload/JAFB/Vol%202_6_8.pdf.

Adzimatinur, Fauziyah, and Vigory Gloriman Manalu. “The Effect of Islamic Financial Inclusion on Economic Growth: A Case Study of Islamic Banking in Indonesia.” *Budapest International Research and Critics Institute (BIRCI-Journal): Humanities and Social Sciences* 4, no. 1 (February 6, 2021): 976–85. https://doi.org/10.33258/birci.v4i1.1699.

Agarwal, Sumit, Wenlan Qian, Yuan Ren, Hsin-Tien Tsai, and Bernard Yin Yeung. "The real impact of FinTech: Evidence from mobile payment technology." *Available at SSRN 3556340* (2020).

Agu, Anthony Ogbonna, and S. V. Agu. "Cashless policy and the Nigerian economy: A disaggregated approach." *International Journal of Humanities Social Sciences and Education* 7, no. 4 (2020): 21-30.

Ahassan, Tijani Forgor, Tatiana Blokhina, and Julie Ahou Kouadio. "Financial Innovation: The Impact of Mobile Money on Innovative Economic Growth." In *Proceeding of the International Science and Technology Conference" FarEastCon 2020"*, pp. 27-38. Springer, Singapore, 2021.

Ahmad, Ahmad Hassan, Christopher Green, and Fei Jiang. "Mobile money, financial inclusion and development: A review with reference to African experience." *Journal of Economic Surveys* 34, no. 4 (2020): 753-792.

Ahmad, Mahmood, Abdul Majeed, Muhammad Asif Khan, Muhammad Sohaib, and Khurram Shehzad. "Digital financial inclusion and economic growth: Provincial data analysis of China." *China Economic Journal* 14, no. 3 (2021): 291-310.

Ain, Noor ul, Samina Sabir, and Nabila Asghar. “Financial Inclusion and Economic Growth: Empirical Evidence from Selected Developing Economies.” *Review of Economics and Development Studies* 6, no. 1 (September 30, 2020): 179–203. https://doi.org/10.47067/reads.v6i1.195.

Ajide, Kazeem B., Olorunfemi Y. Alimi, Simplice A. Asongu, and Ibrahim D. Raheem. "The role of institutional infrastructures in financial inclusion-growth relations: Evidence from SSA." *International Journal of Finance & Economics* 27, no. 1 (2022): 175-191.

Ali, Jamshed, and Muhammad Arshad Khan. "Micro and Macro financial inclusion and their impacts on economic growth: Evidence from Asian economies with alternative approaches." *International Transaction Journal of Engineering, Management, & Applied Sciences & Technologies* 11, no. 5 (2020): 1-15.

Ali, Minhaj, Shujahat H. Hashmi, Muhammad R. Nazir, Ahmer Bilal, and Muhammad I. Nazir. "Does financial inclusion enhance economic growth? Empirical evidence from the IsDB member countries." *International Journal of Finance & Economics* 26, no. 4 (2021): 5235-5258.

Alleman, James, and Paul Rappoport. "Mobile money: Implications for emerging markets." *Communications and strategies* 79 (2010): 15-28.

Allen, Franklin, Asli Demirguc-Kunt, Leora Klapper, and Maria Soledad Martinez Peria. “The Foundations of Financial Inclusion: Understanding Ownership and Use of Formal Accounts.” *Journal of Financial Intermediation* 27 (July 1, 2016): 1–30. https://doi.org/10.1016/j.jfi.2015.12.003.

Anand, S., and Kuldip S. Chhikara. "A theoretical and quantitative analysis of financial inclusion and economic growth." *Management and Labour Studies* 38, no. 1-2 (2013): 103-133.

Andrianaivo, Mihasonirina, and Kangni Kpodar. "Mobile phones, financial inclusion, and growth." *Review of Economics and Institutions* 3, no. 2 (2012): 30.

Anwar, Suhardi M., Junaidi Junaidi, Salju Salju, Ready Wicaksono, and Mispiyanti Mispiyanti. "Islamic bank contribution to Indonesian economic growth." *International Journal of Islamic and Middle Eastern Finance and Management* (2020).

Anyanwu, John C. "Factors affecting economic growth in Africa: are there any lessons from China?." *African Development Review* 26, no. 3 (2014): 468-493.

Arellano, Manuel, and Stephen Bond. “Some Tests of Specification for Panel Data: Monte Carlo Evidence and an Application to Employment Equations.” *The Review of Economic Studies* 58, no. 2 (April 1991): 277. https://doi.org/10.2307/2297968.

Asongu, Simplice A., and Raufhon Salahodjaev. "Demand-side mobile money drivers of financial inclusion: minimum economic growth thresholds for mobile money innovations." *Journal of the Knowledge Economy* (2022): 1-18.

Asongu, Simplice A., Peter Agyemang-Mintah, and Rexon T. Nting. "Law, mobile money drivers and mobile money innovations in developing countries." *Technological Forecasting and Social Change* 168 (2021): 120776.

Asongu, Simplice. "The impact of mobile phone penetration on African inequality." *International Journal of Social Economics* 42, no. 8 (2015): 706-716.

Asteriou, Dimitrios, and Konstantinos Spanos. "The relationship between financial development and economic growth during the recent crisis: Evidence from the EU." *Finance Research Letters* 28 (2019): 238-245.
Auerbach and Siddiki (2004): *Financial Liberalisation and Economic Development: An Assessment*. Kingston University

Azam, Muhammad, and Saleem Khan. "Threshold effects in the relationship between inflation and economic growth: Further empirical evidence from the developed and developing world." *International Journal of Finance & Economics* 27, no. 4 (2022): 4224-4243

Azimova, Tarana, and Ebubekir Mollaahmetoglu. "Innovation in financial markets and its impact on savings." *Journal of Business Economics and Finance* 6, no. 2 (2017): 147-154.

Babajide, Abiola A., Folasade B. Adegboye, and Alexander E. Omankhanlen. "Financial inclusion and economic growth in Nigeria." *International Journal of economics and financial issues* 5, no. 3 (2015): 629-637.
Bagehot, w., (1973). *A description of money market.* Lombard street, London UK.

Babajide, Abiola A, Folasade B Adegboye, and Alexander E Omankhanlen. “Financial Inclusion and Economic Growth in Nigeria” 5, no. 3 (2015).

Bagli, Supravat, and Papita Dutta. “A Study of Financial Inclusion in India.” *RADIX INTERNATIONAL JOURNAL OF ECONOMICS & BUSINESS MANAGEMENT* 1 (August 2, 2012): 1–18.

Bakang, Marlyse Linda Ngo. "Effects of financial deepening on economic growth in Kenya." *International journal of business and commerce* 4, no. 7 (2015): 1-50.

Bakar, H. & Sulong, Z. (2018). “The Role of Financial Inclusion on Economic Growth: Theoretical and Empirical Literature Review Analysis”. *Journal of Business and Financial Affairs,* 7(4).

Bandura, Witness Nyasha. "Inflation and finance-growth nexus in Sub-Saharan Africa." *Journal of African Business* 23, no. 2 (2022): 422-434.

Banerjee, A.., Duflo, E., Glennerster, R., & Kinnan, C., (2013). 'The miracle of microfinance? Evidence from a randomized evaluation'. *MIT bureau for research and economic analysis of development work paper*.

Banna, Hasanul, M. Kabir Hassan, and Md Rabiul Alam. "Digital financial inclusion, Islamic banking stability and sustainable economic growth." *Islamic perspective for sustainable financial system* (2020): 131-152.

Bara, Alex, Gift Mugano, and Pierre Le Roux. "Financial innovation and economic growth in the SADC." *African Journal of Science, Technology, Innovation and Development* 8, no. 5 (2016): 483-495.

Barik, Rajesh, and Pritee Sharma. "Analyzing the progress and prospects of financial inclusion in India." *Journal of Public Affairs* 19, no. 4 (2019): e1948.

Batrancea, Larissa, Malar Kumaran Rathnaswamy, and Ioan Batrancea. "A panel data analysis on determinants of economic growth in seven non-BCBS Countries." *Journal of the Knowledge Economy* 13, no. 2 (2022): 1651-1665.

Baza, Andualem Ufo, and K. Sambasiva Rao. "Financial inclusion in Ethiopia." *International Journal of Economics and Finance* 9, no. 4 (2017): 191-201.

Bernini, Cristina, and Paola Brighi. "Bank Branches Expansion, Efficiency and Local Economic Growth." *Regional Studies* 52, no. 10 (October 3, 2018): 1332–45. https://doi.org/10.1080/00343404.2017.1380304.

Bhanot, Disha, Varadraj Bapat, and Sasadhar Bera. "Studying Financial Inclusion in North-east India." Edited by Sharyn Rundle Thiele and Cheryl Leo. *International Journal of Bank Marketing* 30, no. 6 (January 1, 2012): 465–84. https://doi.org/10.1108/02652321211262221.

Bhargava, Alok, and J. D. Sargan. "Estimating Dynamic Random Effects Models from Panel Data Covering Short Time Periods." *Econometrica* 51, no. 6 (1983): 1635–59. https://doi.org/10.2307/1912110.

Bist, Jagadish Prasad. "Financial development and economic growth: Evidence from a panel of 16 African and non-African low-income countries." *Cogent Economics & Finance* 6, no. 1 (2018): 1449780.

Blundell, Richard, and Stephen Bond. "Initial Conditions and Moment Restrictions in Dynamic Panel Data Models." *Journal of Econometrics*, 1998.

Bucci, A., Carbonari, L., & Trovato, G. (2021). Variety, competition, and population in economic growth: theory and empirics. *Macroeconomic Dynamics*, *25*(5), 1303-1330.

Cámara, Noelia, and David Tuesta. "Measuring Financial Inclusion: A Muldimensional Index." SSRN Scholarly Paper. Rochester, NY, September 22, 2014. https://doi.org/10.2139/ssrn.2634616.
Célerier, Claire, and Adrien Matray. "Bank-branch supply, financial inclusion, and wealth accumulation." *The Review of Financial Studies* 32, no. 12 (2019): 4767-4809.

Chakravarty, S. R., & Pal, R. (2013). "Financial inclusion in India: An axiomatic approach". *Journal of Policy Modelling*, 35(5), 813–837.

Chatterjee, A. (2020). 'Financial inclusion, information and communication technology diffusion, and economic growth: A panel data analysis. Information Technology for Development', 1–29. https://doi.org/10. 1080/02681102.2020.1734770.

Chattopadhyay, Sadhan Kumar. "Financial Inclusion in India: A Case-Study of West Bengal." MPRA Paper, January 2011. https://mpra.ub.uni-muenchen.de/34269/.

Cheng, Xiaoqiang, and Hans Degryse. "The Impact of Bank and Non-Bank Financial Institutions on Local Economic Growth in China." *Journal of Financial Services Research* 37, no. 2 (June 1, 2010): 179–99. https://doi.org/10.1007/s10693-009-0077-4.

Chiad, Faycal, Amine Aouissi, and Ahcene Lahsasna. "Financial Market Inclusion and Economic Growth: Evidence from Algeria." (2021): 1793-1812.

Chinoda, Tough. "The nexus between financial inclusion, trade and economic growth in Africa?." *Transnational Corporations Review* 12, no. 3 (2020): 266-275.

Choong, Chee-Keong. "Does domestic financial development enhance the linkages between foreign direct investment and economic growth?" *Empirical Economics* 42, no. 3 (2012): 819-834.

Dauti, Bardhyl, and Shiret Elezi. "Economic growth in the Central East European Union and the Western Balkan countries in the course of Stability and Growth Pact and COVID-19." *Zbornik radova Ekonomskog fakulteta u Rijeci: časopis za ekonomsku teoriju i praksu* 40, no. 1 (2022): 29-61.

Degu, Adisu Abebaw. "The nexus between population and economic growth in Ethiopia: An empirical inquiry." *International Journal of Business and Economic Sciences Applied Research (IJBESAR)* 12, no. 3 (2019): 43-50.

Demirgüç-Kunt, Asli, and Dorothe Singer. "Financial inclusion and inclusive growth: A review of recent empirical evidence." *World Bank Policy Research Working Paper* 8040 (2017).

Demirgüç-Kunt, Asli, and Leora Klapper. *Financial Inclusion in Africa: An Overview*. Policy Research Working Papers. The World Bank, 2012. https://doi.org/10.1596/1813-9450-6088.

———. "Measuring Financial Inclusion: Explaining Variation in Use of Financial Services across and within Countries." *Brookings Papers on Economic Activity* 2013, no. 1 (2013): 279–340. https://doi.org/10.1353/eca.2013.0002.

Emara, Noha, and Ayah El Said. "Financial Inclusion and Economic Growth: The Role of Governance in Selected MENA Countries." *International Review of Economics & Finance* 75 (September 1, 2021): 34–54. https://doi.org/10.1016/j.iref.2021.03.014.

Ene, Emeka E., Gabriel O. Abba, and Gideon F. Fatokun. "The impact of electronic banking on financial inclusion in Nigeria." *American Journal of Industrial and Business Management* 9, no. 6 (2019): 1409-1422.

Erlando A., Riyanto F.D. & Masakazu S., 2020, "Financial inclusion, economic growth, and poverty alleviation: evidence from eastern Indonesia", *Heliyon,* 6 (2020) e05235.

Eton, Marus, Uwonda Gilbert, Mwosi Fabian, Barigye Godfrey, and Patrick Ogwel Benard. "Financial Inclusion and Economic Growth in Uganda A case study of selected districts in Western Uganda." (2019).

Evans, Yeboah. "The Effect of External Debt, Unemployment Rate, and Inflation on Economic Growth in Ghana." *Journal of Empirical Studies* 9, no. 2 (2022): 24-34.

Fabregas, Raissa, and Tite Yokossi. "Mobile money and economic activity: Evidence from Kenya." *The World Bank Economic Review* 36, no. 3 (2022): 734-756.

Fanta, Ashenafi Beyene, and Daniel Makina. "The relationship between technology and financial inclusion: Cross-sectional evidence." In *Extending financial inclusion in Africa*, pp. 211-230. Academic Press, 2019.

Fetahi-Vehapi, Merale, Luljeta Sadiku, and Mihail Petkovski. "Empirical analysis of the effects of trade openness on economic growth: An evidence for South East European countries." *Procedia Economics and Finance* 19 (2015): 17-26.

Fungáčová, Zuzana, and Laurent Weill. "Understanding Financial Inclusion in China." *China Economic Review* 34 (July 2015): 196–206. https://doi.org/10.1016/j.chieco.2014.12.004.

Furuoka, Fumitaka. "Is population beneficial to economic growth? An empirical study of China." *Quality & Quantity* 52, no. 1 (2018): 209-225.

Gehrung, Marcel. "The ATM Around the Corner - How Financial Development, Access, and Integration Influence Economic Growth and Inequality." SSRN Scholarly Paper. Rochester, NY, November 23, 2020. https://doi.org/10.2139/ssrn.3595265.

Gencer, Menekse. "The mobile money movement: Catalyst to jump-start emerging markets." *Innovations: Technology, Governance, Globalization* 6, no. 1 (2011): 101-117.

Ghosh, Saibal. "How important is mobile telephony for economic growth? Evidence from MENA countries." *info* 18, no. 3 (2016): 58-79.

Global Partnership for Financial Inclusion (GPFI) the First G20 Global Partnership for Financial Inclusion (GPFI) Forum (2011). Forum report published on October 01st, 2011. Retrieved on 18 September 2019. Available at: https://www.gpfi.org/sites/default/files/documents/ GPFI%20Forum%20Report.pdf.

Goel, Sweta, and Rahul Sharma. "Developing a Financial Inclusion Index for India." *Procedia Computer Science*, 5th International Conference on Information Technology and Quantitative Management, ITQM 2017, 122 (January 1, 2017): 949–56. https://doi.org/10.1016/j.procs.2017.11.459.

Goldsmith, R.W. (1969). Financial structure and development. New Haven: Yale University Press. Doi: https://doi.org/10.2307/2230134

Gourene, G.A.Z., and Mendy, P. (2019) Financial Inclusion and Economic Growth in WAEMU: A Multi Hetergeneity Panel Causality Approach. Theoretical Economic Letter

Gourène, Grakolet Arnold Zamereith, and Pierre Mendy. "Financial inclusion and economic growth in WAEMU: A multiscale heterogeneity panel causality approach." (2017).

Greenwood, J., & Jovanovich, B. (1990). Financial development, growth and the distribution of income. Journal of Political Economy, 98(1), 1076-1107.

Grohmann, Antonia, Theres Klühs, and Lukas Menkhoff. "Does financial literacy improve financial inclusion? Cross country evidence." *World Development* 111 (2018): 84-96.

Gul, Faid, Muhammad Usman, and Muhammad Tariq Majeed. "Financial Inclusion and Economic growth: A global perspective." *Journal of Business & Economics* 10, no. 2 (2018): 133-152.

Gupte, Rajani, Bhama Venkataramani, and Deepa Gupta. "Computation of Financial Inclusion Index for India." *Procedia - Social and Behavioral Sciences*, The International Conference on Emerging Economies - Prospects and Challenges (ICEE-2012), 12-13 January 2012, 37 (January 1, 2012): 133–49. https://doi.org/10.1016/j.sbspro.2012.03.281.

Guru, Biplab Kumar, and Inder Sekhar Yadav. "Financial development and economic growth: panel evidence from BRICS." *Journal of Economics, Finance and Administrative Science* 24, no. 47 (2019): 113-126.

Hasan, Iftekhar, Tania De Renzis, and Heiko Schmiedel. "Retail Payments and Economic Growth." SSRN Scholarly Paper. Rochester, NY, April 20, 2012. https://doi.org/10.2139/ssrn.2100651.

Huchet-Bourdon, Marilyne, Chantal Le Mouël, and Mariana Vijil. "The relationship between trade openness and economic growth: Some new insights on the openness measurement issue." *The World Economy* 41, no. 1 (2018): 59-76.

Huseynli, Nigar. "Econometric Analysis of the Relationship Between Tourism Revenues, Inflation and Economic Growth: The Case of Morocco and South Africa." *African Journal of Hospitality, Tourism and Leisure* 11, no. 1 (2022): 135-146.

Ibrahim, M., & Alagidede, P. (2018). “Effect of financial development on economic growth in sub-Saharan Africa”. *Journal of Policy Modelling*, 40(6), 1104–1125. https://doi.org/10.1016/j.jpolmod.2018.08.001

Ifediora, Chuka, Kenechukwu Onochie Offor, Eze Festus Eze, Samuel Manyo Takon, Anthony Eboselume Ageme, Godwin Imo Ibe, and Josaphat UJ Onwumere. "Financial inclusion and its impact on economic growth: Empirical evidence from sub-Saharan Africa." *Cogent Economics & Finance* 10, no. 1 (2022): 2060551.

Inoue, Takeshi, and Shigeyuki Hamori. "Financial access and economic growth: Evidence from Sub-Saharan Africa." *Emerging Markets Finance and Trade* 52, no. 3 (2016): 743-753.

Iqbal, Badar Alam, and Shaista Sami. “Role of Banks in Financial Inclusion in India.” *Contaduría y Administración* 62, no. 2 (April 1, 2017): 644–56. https://doi.org/10.1016/j.cya.2017.01.007.

Ireokwu, Napoleon, Ugo Eke, and Ogechukwu Abel. “Impact of Financial Inclusion on Economic Growth of Nigeria.” *International Journal of Sustainable Development* 12, no. 2 (August 2019): 46–58.

Jayaratne, J., and P. E. Strahan. “The Finance-Growth Nexus: Evidence from Bank Branch Deregulation.” *The Quarterly Journal of Economics* 111, no. 3 (August 1, 1996): 639–70. https://doi.org/10.2307/2946668.

Jegede, C. A. "Effects of automated teller machine on the performance of Nigerian banks." *American Journal of Applied Mathematics and Statistics* 2, no. 1 (2014): 40-46.

Jisha Joseph, Ms, and Titto Varghese. "Role of financial inclusion in the development of Indian economy." *growth* 5, no. 11 (2014).

Kasseeah, Harshana, and V. E. R. E. N. A. Tandrayen-Ragoobur. "Mobile money in an emerging small island economy." *ARPN Journal of Science and Technology* 2, no. 5 (2012): 454-461.

Keho, Yaya. "The impact of trade openness on economic growth: The case of Cote d’Ivoire." *Cogent Economics & Finance* 5, no. 1 (2017): 1332820.

Khan, H. R. (2011). ‘Financial Inclusion and Financial Stability: Are They Two Sides of the Same Coin. The Indian Bankers Association and Indian Overseas Bank, India’.

Khan, Nasir, Mahwish Zafar, Abiodun Funso Okunlola, Zeman Zoltan, and Magda Robert. "Effects of Financial Inclusion on Economic Growth, Poverty, Sustainability, and Financial Efficiency: Evidence from the G20 Countries." *Sustainability* 14, no. 19 (2022): 12688.

Kim, Dai-Won, Jung-Suk Yu, and M. Kabir Hassan. "Financial inclusion and economic growth in OIC countries." *Research in International Business and Finance* 43 (2018): 1-14.

Kim, Jong-Hee. “A Study on the Effect of Financial Inclusion on the Relationship Between Income Inequality and Economic Growth.” *Emerging Markets Finance and Trade* 52, no. 2 (February 2016): 498–512. https://doi.org/10.1080/1540496X.2016.1110467.

Kumar, M. & Yadar,G. (2013) Liquidity risk management in bank, a conceptual framework. AIMA Journal of Management & Research, 7(2), 2-12.

Kumar, Nitin. “Financial Inclusion and Its Determinants: Evidence from India.” *Journal of Financial Economic Policy* 5, no. 1 (January 1, 2013): 4–19. https://doi.org/10.1108/17576381311317754.

Laeven, Luc, Ross Levine, and Stelios Michalopoulos. "Financial innovation and endogenous growth." *Journal of Financial Intermediation* 24, no. 1 (2015): 1-24.

Lashitew, Addisu A., Rob van Tulder, and Yann Liasse. "Mobile phones for financial inclusion: What explains the diffusion of mobile money innovations?" *Research Policy* 48, no. 5 (2019): 1201-1215.

Lee, Sang H., John Levendis, and Luis Gutierrez. "Telecommunications and economic growth: An empirical analysis of sub-Saharan Africa." *Applied economics* 44, no. 4 (2012): 461-469.

Lenka, S.K. & Barik, R. (2018) 'Has Expansion of Mobile Phone and Internet Use Spurred Financial Inclusion in the SAARC Countries?', *Financial Innovation,* 4(5): 1–19.

Lenka, Sanjaya Kumar, and Ruchi Sharma. "Does financial inclusion spur economic growth in India?." *The Journal of Developing Areas* 51, no. 3 (2017): 215-228.

Liu, Dong, Yuying Zhang, Muhammad Hafeez, and Sana Ullah. "Financial inclusion and its influence on economic-environmental performance: demand and supply perspectives." *Environmental Science and Pollution Research* (2022): 1-10.

Lundqvist, Maria, Frida Erlandsson, and Pontus Hansson. "The diffusion of mobile phones and its impact on financial inclusion and economic growth in Africa." PhD diss., Master Thesis, Department of Economics, Lund University, 2014.

Mabeba, Mahlatse. "Measuring financial inclusion: a comparative analysis of regional South Africa." *Econ 3x3, June* (2021): 1-14.
Mader, Philip. "Contesting Financial Inclusion: Debate: Contesting Financial Inclusion." *Development and Change* 49, no. 2 (March 2018): 461–83. https://doi.org/10.1111/dech.12368.

Makina, D., & Walle, Y. M. (2019). 'Financial inclusion and economic growth: Evidence from a panel of selected African countries. Extending Financial Inclusion in Africa', 9, 193–210. https://doi.org/10.1016/B978- 0-12-814164-9.00009-8.

Marcelin, Isaac, Aklesso YG Egbendewe, Djoulassi K. Oloufade, and Wei Sun. "Financial inclusion, bank ownership, and economy performance: Evidence from developing countries." *Finance Research Letters* 46 (2022): 102322.

Maune, Alexander, Ephraim Matanda, and Justice Mundonde. "Does financial inclusion cause economic growth in Zimbabwe? An empirical investigation." *Acta Universitatis Danubius. Œconomica* 16, no. 1 (2020).

Mbutor, O. Mbutor, and A. Uba Ibrahim. "The impact of financial inclusion on monetary policy in Nigeria." *Journal of Economics and International Finance* 5, no. 8 (2013): 318-326.

McKinnon, R.I. (1973). Money, capital and banking. Washington D. C.: Brooklyn Institution. Available at https://www.brookings.edu/book/money-and-capital-in economic-development

McKinnon, R.I., 1973. *Money and Capital in Economic Development.* Brookings Institution, Washington, DC.

Mishra, R., and S. Bvuma. "Conceptualising the Relationship between Mobile Money Banking and Financial Inclusion to Support Sustained Economic Growth." *African Journal of Public Affairs* 13, no. 1 (2022): 54-78.

Morgan, Peter, and Victor Pontines. "Financial Stability and Financial Inclusion." SSRN Scholarly Paper. Rochester, NY, July 9, 2014. https://doi.org/10.2139/ssrn.2464018.

Motsatsi, Johane Moilwa. "Financial sector innovation and economic growth in the context of Botswana." *Int J Econ Financ* 8, no. 6 (2016): 291-300.

Mugenda, O.M. & Mugenda, A.G. (2003). Research Methods: Quantitative and Qualitative approach, Nairobi: Act press.

Mugo & Kilonzo (2021). *Impacts of Financial Inclusion in Kenya with Particular Focus On Poverty Eradication and Employment Creation*

Murshed, Muntasir, Nicholas Apergis, Md Shabbir Alam, Uzma Khan, and Sakib Mahmud. "The impacts of renewable energy, financial inclusivity, globalization, economic growth, and urbanization on carbon productivity: Evidence from net moderation and mediation effects of energy efficiency gains." *Renewable Energy* 196 (2022): 824-838.

Museba, Tapiwanashe James, Edmore Ranganai, and Gianfranco Gianfrate. "Customer perception of adoption and use of digital financial services and mobile money services in Uganda." *Journal of Enterprising Communities: People and Places in the Global Economy* (2021).

Myeni, Siphesihle, Marshall Makate, and Nyasha Mahonye. "Does mobile money promote financial inclusion in Eswatini?" *International Journal of Social Economics* 47, no. 6 (2020): 693-709.

Myovella, Godwin, Mehmet Karacuka, and Justus Haucap. "Digitalization and economic growth: A comparative analysis of Sub-Saharan Africa and OECD economies." *Telecommunications Policy* 44, no. 2 (2020): 101856.

Nan, Wenxiu Vince. "Mobile money and socioeconomic development: A cross-country investigation in Sub-Saharan Africa." *Journal of International Technology and Information Management* 27, no. 4 (2019): 36-65.

Ndiaye, Abdoulaye, and Mouhamadou Lamine YADE. "Financial inclusion and economic growth in sub-Saharan Africa."

Neaime, Simon, and Isabelle Gaysset. "Financial Inclusion and Stability in MENA: Evidence from Poverty and Inequality." *Finance Research Letters* 24 (March 1, 2018): 230–37. https://doi.org/10.1016/j.frl.2017.09.007.

Nguyen, T. T. H. (2020). "Measuring financial inclusion: A composite FI index for the developing countries". *Journal of Economics and Development*, 23(1), 77–99. https://doi.org/101108/JED-03-2020-0027

Nguyen, Yen Hai Dang, and Dao Thieu Thi HA. "The effect of institutional quality on financial inclusion in ASEAN Countries." *The Journal of Asian Finance, Economics and Business* 8, no. 8 (2021): 421-431.

Nkwede, Friday. "Financial inclusion and economic growth in Africa: Insight from Nigeria." *European journal of business and management* 7, no. 35 (2015): 71-80.

Nwafor, Michael C. "The nexus between financial inclusion and economic growth: Evidence from Nigeria." *International Journal of Science and Innovation in Social Science* 2, no. 4 (2018).

Ogunleye, Olusogo Olamide, Oluwarotimi Ayokunnu Owolabi, and Muazu Mubarak. "Population growth and economic growth in Nigeria: An appraisal." *International Journal of Management, Accounting and Economics* 5, no. 5 (2018): 282-299.

Oloo, Michael, Mary Mbithi, and Martin Oleche. "Threshold Effect of Macroeconomic Convergence Criteria on Real GDP Growth Rate within the East African Community." *European Journal of Development Studies* 2, no. 2 (2022): 11-25.

Oruo, Julie. "The relationship between Financial Inclusion and GDP growth in Kenya." PhD diss., University of Nairobi, 2013.

Oyewole, Oginni Simon, Jibreel Gambo, Mohammed Abba, and Michael Ezekiel Onuh. "Electronic payment system and economic growth: a review of transition to cashless economy in Nigeria." *International Journal of Scientific Engineering and Technology* 2, no. 9 (2013): 913-918.

Ozili, Peterson K. "Financial Inclusion Research around the World: A Review." *Forum for Social Economics* 50, no. 4 (October 2, 2021): 457–79. https://doi.org/10.1080/07360932.2020.1715238.

———. “Impact of Digital Finance on Financial Inclusion and Stability.” *Borsa Istanbul Review* 18, no. 4 (December 1, 2018): 329–40. https://doi.org/10.1016/j.bir.2017.12.003.

Ozturk, Ilhan, and Sana Ullah. "Does digital financial inclusion matter for economic growth and environmental sustainability in OBRI economies? An empirical analysis." *Resources, Conservation and Recycling* 185 (2022): 106489.

Park, S.C., Kim, S, C., Taghizadeh-Hesary, C. J. & Sirivunnabood, P., (Eds.), ‘Economic Integration in Asia and Europe: Lessons and Policies’ (pp. 641–664). *Asian Development Bank* Institute. https://www.adbi.org

Pazarbasioglu, C., Mora, A. G., Uttamchandani, M., Natarajan, H., Feyen, E., & Saal, M. (2020). ‘Digital Financial Services’. *World Bank Group.* https://www. worldbank.org.

Peter, Amade, and Ibrahim Bakari. "Impact of population growth on economic growth in Africa: A dynamic panel data approach (1980-2015)." *Pakistan Journal of Humanities and Social Science (PJHSS)* 6, no. 4 (2018): 412-427.

Pham, Manh Hung, and Thi Phuong Linh Doan. "The impact of financial inclusion on financial stability in Asian countries." *The Journal of Asian Finance, Economics and Business* 7, no. 6 (2020): 47-59.

Ratnawati, Kusuma. "The impact of financial inclusion on economic growth, poverty, income inequality, and financial stability in Asia." *The Journal of Asian Finance, Economics and Business* 7, no. 10 (2020): 73-85.

Raza, Muhammad Subtain, Jun Tang, Sana Rubab, and Xin Wen. "Determining the nexus between financial inclusion and economic development in Pakistan." *Journal of Money Laundering Control* (2019).

Rewilak, Johan. "The role of financial development in poverty reduction." *Review of development finance* 7, no. 2 (2017): 169-176.

Ridzuan, Abdul Rahim, Muhammad Waqas Khalid, Nur Izzati Zarin, Mohd Idham Md Razak, Abdul Rauf Ridzuan, Irzan Ismail, and Norsabrena Norizan. "The impact of foreign direct investment, domestic investment, trade openness and population on economic growth: evidence from asean-5 countries." *International Journal of Academic Research in Business and Social Sciences* 8, no. 1 (2018): 128-143.

Rosnawintang, Rosnawintang. "Effects of crude oil prices volatility, the internet and inflation on economic growth in ASEAN-5 countries: A panel autoregressive distributed lag approach." *670216917* (2021).

Sanderson, Abel, Learnmore Mutandwa, and Pierre Le Roux. “A Review of Determinants of Financial Inclusion.” *International Journal of Economics and Financial Issues* 8, no. 3 (2018): 1–8.

Sarika, P., and S. Vasantha. "Impact of mobile wallets on cashless transaction." *Int. J. Recent Technol. Eng* 7, no. 6 (2019): 1164-1171.

Sarma, M. (2015). ‘Measuring financial inclusion’. *Economics Bulletin*, 35(1), 604–611.

Sarma, Mandira. “Measuring Financial Inclusion for Asian Economies.” In *Financial Inclusion in Asia*, edited by Sasidaran Gopalan and Tomoo Kikuchi, 3–34. London: Palgrave Macmillan UK, 2016. https://doi.org/10.1057/978-1-137-58337-6_1.

Sarma, Mandira, and Jesim Pais. “Financial Inclusion and Development.” *Journal of International Development* 23, no. 5 (2011): 613–28. https://doi.org/10.1002/jid.1698.

Schumpeter, J.A. (1934). The theory of economic development. Cambridge: Harvard University Press. Available at https://www.hup.harvard.edu/catalog.php?isbn=9780674879904

Seman, J. A. (2016). *Financial inclusion: the role of financial system and other determinants*. University of Salford, Salford, United Kingdom.

Sepehrdoust, Hamid, and Morteza Ghorbanseresht. "Impact of information and communication technology and financial development on economic growth of OPEC developing economies." *Kasetsart Journal of Social Sciences* 40, no. 3 (2019): 546-551.

Serrao, M., Sequeira, A., & Hans, V., 'Designing a Methodology to Investigate Accessibility and Impact of Financial Inclusion' (March 18, 2012). Available at SSRN: https://ssrn.com/abstract=2025521 or http://dx.doi.org/10.2139/ssrn.2025521

Sethi, Dinabandhu, and Debashis Acharya. "Financial inclusion and economic growth linkage: Some cross-country evidence." *Journal of Financial Economic Policy* (2018).

Sethy, Susanta Kumar, and Phanindra Goyari. "Measuring financial inclusion of Indian States: An empirical study." *Indian Journal of Economics and Development* 14, no. 1 (2018).

Sharma, Dipasha. "Nexus between Financial Inclusion and Economic Growth: Evidence from the Emerging Indian Economy." *Journal of Financial Economic Policy* 8, no. 1 (January 1, 2016): 13–36. https://doi.org/10.1108/JFEP-01-2015-0004.

Sharma, Dr Anupama, and Sumita Kukreja. "An Analytical Study:Relevance of Financial Inclusion For Developing Nations" 2, no. 6 (2013): 15–20.

Shaw E. S. *Financial deepening in economic development*. New York: Oxford University Press; 1973

Shobsnde, Olatunji A., and Ibrahim R. LANRE. "Do financial inclusion drive boom-bust cycles in Africa?" *Journal of Economics Bibliography* 5, no. 3 (2018): 159-174.

Shrier, David, German Canale, and Alex Pentland. "Mobile money & payments: Technology trends." *Massachusetts Inst. Technol* 27 (2016).

Shylaja, H. N., and H. N. Prasad. "Measuring financial inclusion: The access and usage dimension." *Smart Journal of Business Management Studies* 14, no. 1 (2018): 1-10.

Siddik, Md Nur Alam, Tanveer Ahsan, and Sajal Kabiraj. "Does financial permeation promote economic growth? Some econometric evidence from Asian countries." *Sage Open* 9, no. 3 (2019): 2158244019865811.

Sindani, Moses, and A. N. Buchichi. "The impact of financial sector deepening on economic growth in Kenya." (2013).

Singh, D., & Stakic, N. (2020). "Financial inclusion and economic growth nexus: Evidence from SAARC countries". *South Asia Research*, 41(1), 1–21. https:// doi.org/10.1177/0262728020964605

Singh, Dharmendra, and Nikola Stakic. "Financial inclusion and economic growth nexus: Evidence from SAARC countries." *South Asia Research* 41, no. 2 (2021): 238-258.

Sofi, Zubair, and M. Nasir Zamir. "The impact of financial inclusion on the economic growth of India: An empirical analysis." *Journal of Commerce and Accounting Research* 8, no. 3 (2019).

Sparatt & Stephen (2013), *Financial Regulation in low income countries. Banking Growth with stability* (5th Edition). London: Prentice Hall

Suidarma, I. Made. "The nexus between financial inclusion and economic growth in ASEAN." *JEJAK* 12, no. 2 (2019): 267-281.

Stevanović, Suzana, Ivan Milenković, and Sladjana Paunović. "Effects of the implementation of the inflation targeting regime on economic growth." *Ekonomski horizonti* 24, no. 3 (2022): 297-311.

Sulong, Z., and H. O. Bakar. "The role of financial inclusion on economic growth: theoretical and empirical literature review analysis." *J Bus Fin Aff* 7, no. 356 (2018): 2167-0234.

Suri, Tavneet. "Mobile money." *Annual Review of Economics* 9 (2017): 497-520.

Tahir, Safdar Husain, Said Shah, Fatima Arif, Gulzar Ahmad, Qaria Aziz, and Muhammad Rizwan Ullah. "Does financial innovation improve performance? An analysis of process innovation used in Pakistan." *Journal of Innovation Economics Management* 27, no. 3 (2018): 195-214.

Talom, Frank Sylvio Gahapa, and Robertson Khan Tengeh. "The impact of mobile money on the financial performance of the SMEs in Douala, Cameroon." *Sustainability* 12, no. 1 (2019): 183.

Thathsarani, U. S., Jianguo Wei, and G. R. S. R. C. Samaraweera. "Financial inclusion's role in economic growth and human capital in South Asia: an econometric approach." *Sustainability* 13, no. 8 (2021): 4303.

Thomi & Mose (2021): "Financial Inclusion in East Africa: Does Economic Growth Matter?" *Journal of Economics, Management and Trade*. 27(2): 1-8, 2021; Article no. JEMT.68331 ISSN: 2456-9216

Toader, Elena, Bogdan Narcis Firtescu, Angela Roman, and Sorin Gabriel Anton. "Impact of information and communication technology infrastructure on economic growth: An empirical assessment for the EU countries." *Sustainability* 10, no. 10 (2018): 3750.

Tuesta, David, Gloria Sorensen, Adriana Haring, and Noelia Camara. "Financial inclusion and its determinants: the case of Argentina." *Madrid: BBVA Research* (2015).

ul Ain, Noor, Samina Sabir, and Nabila Asghar. "Financial inclusion and economic growth: Empirical evidence from selected developing economies." *Review of Economics and Development Studies* 6, no. 1 (2020): 179-203.

Van, D. T. T., & Linh, N. H. (2019). 'The impacts of financial inclusion on economic development: Cases in Asian-Pacific countries'. *Comparative Economic Research*, 22(1), 7–16. https://doi.org/10.2478/cer2019-0001

Van, Loan Thi-Hong, Anh The Vo, Nhan Thien Nguyen, and Duc Hong Vo. "Financial inclusion and economic growth: An international evidence." *Emerging Markets Finance and Trade* 57, no. 1 (2021): 239-263.

Wandeda Dickson O., Masai Wafula, and Nyandemo Samuel M. "Institutional quality and economic growth: evidence from Sub-Saharan Africa countries." *AJER IX*, no. (IV) (September 2022): 106-125.

Williams, Harley Tega. "Role of financial inclusion in economic growth and poverty reduction in a developing economy." (2017).

Winful, Ernest C., K. Opoku-Asante, Mathew O. Mensah, and Josiah NA Quaye. "Financial Inclusion and Economic Development in Africa." *European Journal of Business and Management Research* 7, no. 2 (2022): 130-138.

World Bank (2014) Global Financial Development Report 2014: *Financial Inclusion. World Bank, Washington DC*. License: Creative Commons Attribution CC BY 3.0.

World Bank (2021a) Financial inclusion. https://www.worldbank.org/en/topic/financialinclusion/overview (accessed on 08 October 2021)

World Bank (2021b). The Global Findex Database 2021: Financial Inclusion, Digital Payments, and Resilience in the Age of COVID-19, https://www.worldbank.org/en/publication/globalfindex (accessed on 26 August 2022)

World Bank. *Banking the poor: Measuring bank access in 54 countries.* Washington DC: World Bank; 2008.

World Bank. *Banking the poor: Measuring bank access in 54 countries.* Washington DC: World Bank; 2008.

Yakubu, Ibrahim Nandom, and Alhassan Bunyaminu. "Financial Inclusion and Economic Growth in West Africa: The Moderating Effect of Financial Openness." (2021): 155-164.

Yorulmaz, Recep. "An analysis of constructing global financial inclusion indices." *Borsa Istanbul Review* 18, no. 3 (2018): 248-258.

Zhang, Jin, Lanfang Wang, and Susheng Wang. "Financial development and economic growth: Recent evidence from China." *Journal of Comparative Economics* 40, no. 3 (2012): 393-412.

Zins, Alexandra, and Laurent Weill. “The Determinants of Financial Inclusion in Africa.” *Review of Development Finance* 6, no. 1 (June 2016): 46–57. https://doi.org/10.1016/j.rdf.2016.05.001.

APPENDIX 1: NACOSTI RESEARCH PERMIT

REPUBLIC OF KENYA

NATIONAL COMMISSION FOR SCIENCE,TECHNOLOGY & INNOVATION

Ref No: **761919**

Date of Issue: **06/December/2022**

RESEARCH LICENSE

This is to Certify that Mr.. PETER Misiani KERAGE of National Defence College Kenya, has been licensed to conduct research as per the provision of the Science, Technology and Innovation Act, 2013 (Rev.2014) in Nairobi on the topic: FINANCIAL INCLUSION AND ECONOMIC SECURITY OF EAST AFRICAN COMMUNITY STATES for the period ending : 06/December/2023.

License No: **NACOSTI/P/22/22248**

761919

Applicant Identification Number

Director General
NATIONAL COMMISSION FOR SCIENCE,TECHNOLOGY & INNOVATION

Verification QR Code

NOTE: This is a computer generated License. To verify the authenticity of this document, Scan the QR Code using QR scanner application.

See overleaf for conditions

THE SCIENCE, TECHNOLOGY AND INNOVATION ACT, 2013 (Rev. 2014)

Legal Notice No. 108: The Science, Technology and Innovation (Research Licensing) Regulations, 2014

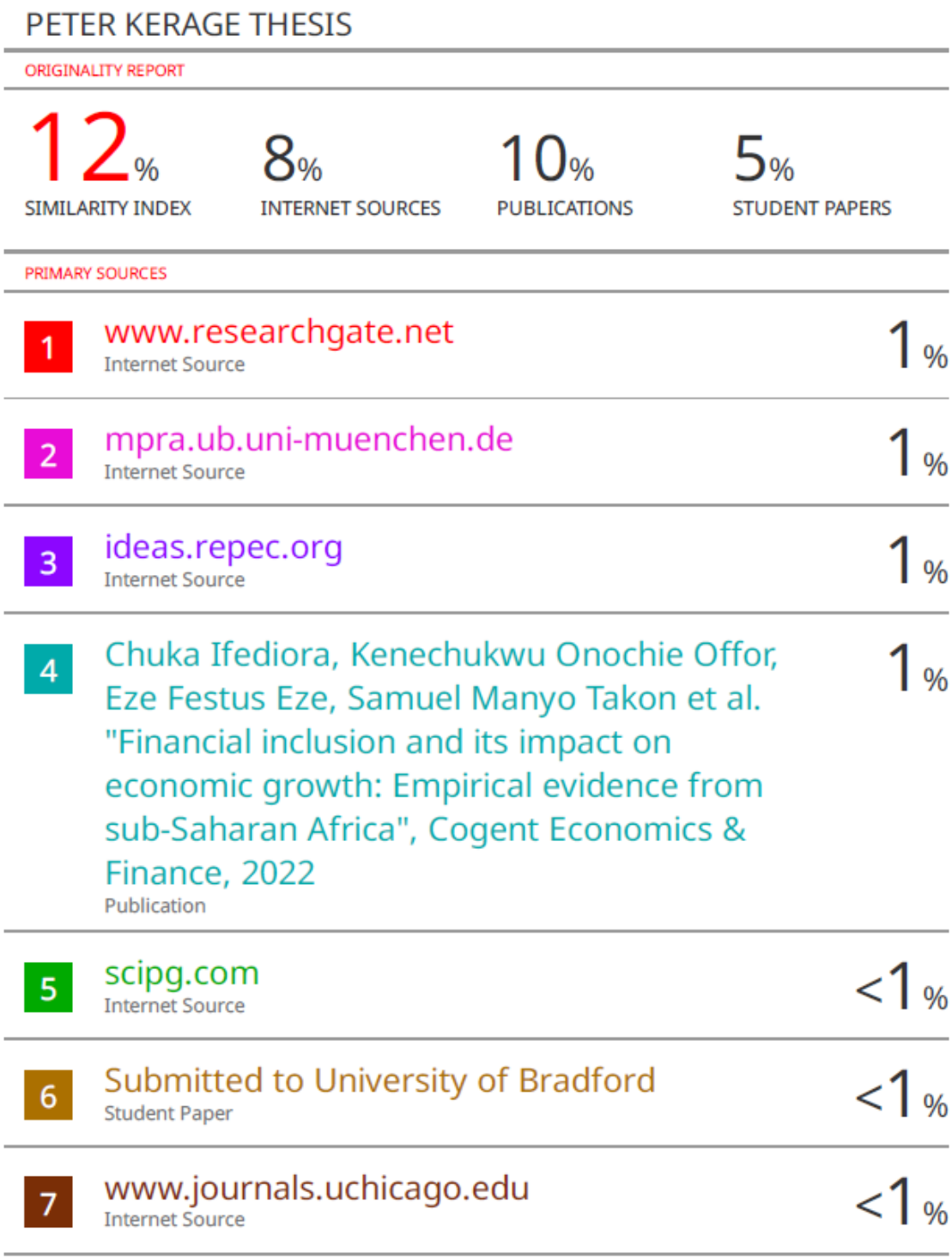
The National Commission for Science, Technology and Innovation, hereafter referred to as the Commission, was the established under the Science, Technology and Innovation Act 2013 (Revised 2014) herein after referred to as the Act. The objective of the Commission shall be to regulate and assure quality in the science, technology and innovation sector and advise the Government in matters related thereto.

CONDITIONS OF THE RESEARCH LICENSE

1. The License is granted subject to provisions of the Constitution of Kenya, the Science, Technology and Innovation Act, and other relevant laws, policies and regulations. Accordingly, the licensee shall adhere to such procedures, standards, code of ethics and guidelines as may be prescribed by regulations made under the Act, or prescribed by provisions of International treaties of which Kenya is a signatory to
2. The research and its related activities as well as outcomes shall be beneficial to the country and shall not in any way;
    i. Endanger national security
    ii. Adversely affect the lives of Kenyans
    iii. Be in contravention of Kenya's international obligations including Biological Weapons Convention (BWC), Comprehensive Nuclear-Test-Ban Treaty Organization (CTBTO), Chemical, Biological, Radiological and Nuclear (CBRN).
    iv. Result in exploitation of intellectual property rights of communities in Kenya
    v. Adversely affect the environment
    vi. Adversely affect the rights of communities
    vii. Endanger public safety and national cohesion
    viii. Plagiarize someone else's work
3. The License is valid for the proposed research, location and specified period.
4. The license any rights thereunder are non-transferable
5. The Commission reserves the right to cancel the research at any time during the research period if in the opinion of the Commission the research is not implemented in conformity with the provisions of the Act or any other written law.
6. The Licensee shall inform the relevant County Director of Education, County Commissioner and County Governor before commencement of the research.
7. Excavation, filming, movement, and collection of specimens are subject to further necessary clearance from relevant Government Agencies.
8. The License does not give authority to transfer research materials.
9. The Commission may monitor and evaluate the licensed research project for the purpose of assessing and evaluating compliance with the conditions of the License.
10. The Licensee shall submit one hard copy, and upload a soft copy of their final report (thesis) onto a platform designated by the Commission within one year of completion of the research.
11. The Commission reserves the right to modify the conditions of the License including cancellation without prior notice.
12. Research, findings and information regarding research systems shall be stored or disseminated, utilized or applied in such a manner as may be prescribed by the Commission from time to time.
13. The Licensee shall disclose to the Commission, the relevant Institutional Scientific and Ethical Review Committee, and the relevant national agencies any inventions and discoveries that are of National strategic importance.
14. The Commission shall have powers to acquire from any person the right in, or to, any scientific innovation, invention or patent of strategic importance to the country.
15. Relevant Institutional Scientific and Ethical Review Committee shall monitor and evaluate the research periodically, and make a report of its findings to the Commission for necessary action.

National Commission for Science, Technology and Innovation(NACOSTI),
Off Waiyaki Way, Upper Kabete,
P. O. Box 30623 - 00100 Nairobi, KENYA
Telephone: 020 4007000, 0713788787, 0735404245
E-mail: dg@nacosti.go.ke
Website: www.nacosti.go.ke

APPENDIX 2: PLAGIARISM REPORT



PETER KERAGE THESIS

ORIGINALITY REPORT

12%	8%	10%	5%
SIMILARITY INDEX	INTERNET SOURCES	PUBLICATIONS	STUDENT PAPERS

PRIMARY SOURCES

1	www.researchgate.net Internet Source	1%
2	mpra.ub.uni-muenchen.de Internet Source	1%
3	ideas.repec.org Internet Source	1%
4	Chuka Ifediora, Kenechukwu Onochie Offor, Eze Festus Eze, Samuel Manyo Takon et al. "Financial inclusion and its impact on economic growth: Empirical evidence from sub-Saharan Africa", Cogent Economics & Finance, 2022 Publication	1%
5	scipg.com Internet Source	<1%
6	Submitted to University of Bradford Student Paper	<1%
7	www.journals.uchicago.edu Internet Source	<1%