

Financial Technology, Financial Inclusion and Economic Growth in Selected Sub-Saharan African (SSA) Countries

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**BEING A DISSERTATION WRITTEN IN THE DEPARTMENT OF FINANCE AND
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DEDICATION

This dissertation is dedicated to the Almighty God who has given me the capacity to undertake and complete this program. I dedicate this work to my parents: my late father, Mr. Ogbaisi Gabriel and my mother Mrs Comfort Ogbaisi. Your support and encouragement have been a pillar for me all the way.

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ABSTRACT

This study examined the effect of financial technology and financial inclusion on economic growth in selected sub-Saharan African (SSA) countries. The specific objectives of the study are to examine the effect of internet penetration and the influence of financial technology application on economic growth in selected SSA countries, while also examine the role of financial access, the extent financial usage impact and how financial quality impact on the economic growth in selected SSA countries. The method of analysis adopted in the study is the panel non-linear autoregressive distributed lags (PNARDL) approach which was chosen because it allows for the capture of the effect of potential asymmetries in the independent variables on the dependent variable. It therefore captures nonlinear dynamics that standard linear models might miss. With stratified sampling technique and the use of data filtering approach 29 countries were included in the study based on data availability, depth of the Fintec space and regionalization within the period 2014 to 2023. The study found that the internet penetration and financial technology significantly promotes economic growth in SSA countries. Similarly, financial access and financial quality were also found to positively promote economic growth while the reverse was the case for financial usage which was found to exhibit a negative relationship towards economic growth. In addition, the asymmetric effects of ICT infrastructure and Fintec are found to be much larger than the beneficial effects of their positive shocks with the coefficients of mobile banking (MBK) and POS agency positive but significant values of 0.185 and 0.002 respectively dwarfed by their respective coefficient of negative changes of -0.721 and -0.172. This result therefore calls for a combination of measures in addressing the digital deficits in SSA countries and also encouraging financial technology and inclusion while ensuring that digital services are stabilised and efficiently used over time to prevent costly disruptions.

CHAPTER ONE

INTRODUCTION

1.1 Background to the Study

Financial technology, otherwise called Fintech, exists as an off shoot of what is called the digital group of the drivers of the fourth industrial revolution and runs significantly on the power of the internet. The key driver of this new age will be the pervasive power of digitization and information technology and to that end, the broad landscape of the technological drivers of the fourth industrial revolution was classified into three groups: physical, digital and biological(Schwab, 2016). It is from the digital group of drivers of the fourth industrial revolution that the internet was given birth to and this in turn is further extending the reach of the global technological drive. Financial technology covers technology-enabling business models and digital innovations in the financial sector (Odeleye & Oyeneye, 2022).

The financial system, which has the traditional function of financial intermediation, has witnessed tremendous evolution and development globally through technology. From its earlier recorded days of money changers coming face-to-face with their clients to today's sophisticated technology driven real-time financial services delivery where financial services providers have the capability of dealing with multiple clients and branches in different parts of the world almost instantaneously and simultaneously, thus aborting the need for a face-to-face contact model of transaction (Boyett & Boyett, 2000; Schwab, 2016 and Rosenstein, 2022).

The progressive sophistication in financial services delivery and the current massive influence of technology is at the heart of financial technology (Fintech). Fintech has impacted on how financial services are delivered to the final consumer and has led to effectiveness and efficiency in the financial ecosystem which has improved the profitability of the service providers, thus,

ultimately impacting on the overall economy, leading to the economic development of the economies embracing it (Rosenstein, 2022).

In less developed countries, including Sub-Saharan Africa countries, where a large portion of the population lacks access to formal banking, Fintech has played a pivotal role in bridging this gap, for instance by providing mobile banking platforms (Kikulwe, Fischer & Qaim, 2013; Amadou, 2019). In the area of boosting financial participation, the World Bank Group rates financial inclusion as a critical facilitator of seven of the 17 Sustainable Development Goals. It adds that in the process of driving financial inclusion, one of the important ways Fintech contributes to this process is by granting easier access to payment systems and transaction accounts (World Bank Group, 2022).

Financial inclusion implies that economic entities such as individuals and businesses are able to access useful and affordable financial services and products that not only meet their needs such as savings, credit, payments, transactions, and insurance and these services are also delivered in a responsible and sustainable way. Being able to have access to a transaction account is a first step towards broader financial inclusion since a transaction account allows people to store money, send and receive payments. A transaction account is used to describe the penetrative power of financial services delivery and enabling such services to be accessed by all expected economic agents. A transaction account therefore serves as a gateway to other financial services and this has continued to be an area of focus for the World Bank Group (World Bank Group, 2022).

Financial access through financial inclusion facilitates day-to-day living while also helping families and businesses engage in both long-term planning and unexpected events. As account holders, people are more likely to use other financial services, such as credit and insurance, to start and expand businesses, invest in education or health, manage risk, and weather financial

shocks, and hence improve overall quality of lives. The lower the level of financial inclusion, the more limited exposure the economic agents are to financial services and products, thus limiting the economic growth and development of the country. One of the primary pillars for evaluating sustainable economic development is financial inclusion which enables nano, small and medium scale businesses to thrive and support job creation (Hirbu, 2023), thus leading to sustainable economic growth and development.

Economic growth refers to the growth in gross national product, or rise in personal incomes, or industrialization, or technological advancement or social modernization. This increase in the size of a nation's economy is expected to occur over a period of time (Australia, 2024). Therefore, economic growth can be defines as the increase in output of a country over a period of time. Schumpeter (1912), just like many other researchers over the years have been looking at the impact of finance and its various indices on economic growth. A major discussion has been on the direction and magnitude of the relationship by looking at cross-country regressions, historical data analysis, intra country data analysis with focus on variance across industries and regions, and even a combination of the listed three approaches (Haber, 2008). This study therefore is an attempt to provide an in-depth understanding of the nexus between Fintech, financial inclusion and economic growth in sub-Sahara African (SSA) countries.

1.2 Statement of the Research Problem

Research results have generally shown a positive relationship between various facets of the financial system such as financial development, financial inclusion and more recently, financial technology and economic growth (Gürbüz, *et al*, 2024; Boachie & Adu-Darko, 2024; Jiaqi, 2024; Kamara, 2024; Owandjokuna, 2024; Agala, & Efeghaje-Ego, 2024). These researches using amongst others variables such as internet penetration, mobile banking, Point-Of-Sale, Automated

Teller Machine, Web Payment platforms and many others as proxies for financial technology have generally come to the conclusion that technology is a key driver of economic growth. Similarly, in using variables such as bank accounts, bank branches, credit to the private sector, deposits to GDP ratio, Automated Teller Machine per 100,000 km², number of insurance corporations and so on as proxies for financial inclusion's subsets of financial access, financial usage and financial quality respectively, have also found that financial inclusion shares a positive relationship with economic growth. However, in spite of these positives, weaknesses and failures have been observed. While Fintech according to Flötotto, Gold, Olanrewaju, Jeenah and Kuyoro (2022) has been found to have been hindered by weak mobile and internet penetration in some markets, financial inclusion on the other hand according to a Global Findex survey reported by World Bank Group (2025) has been observed to have been hindered by a lack of money, lack of documentation, and distance to brick and mortar financial institutions. There is thus the need to examine the nexus between Fintech, financial inclusion and economic growth in SSA and how this can be harnessed positively.

In terms of practical gap, in recent years, there have been multiple studies on the effect of financial inclusion and Fintech on poverty alleviation, as well as economic growth (Arner, Buckley, Zetzsche & Veidt, 2020; Friedline, Naraharisetti & Weaver, 2020; Hirbu, 2023; Suri & Jack, 2016; Velasquez, 2020). However, most of these studies are country specific like Okon, Umoh & Samuel (2023) who investigated the effect of Fintech and financial inclusion on economic growth in Nigeria, and Agbelusi (2018) who investigated Fintech as a tool for promoting financial inclusion and economic development in Nigeria. Others who tried to cover SSA countries, however, limited their studies on the impacts of Fintech on financial inclusion (Djoufouet & Pondie, 2022). However, Tidjani and Madouri (2024) focused on Fintech, financial

inclusion, and sustainable development in African countries. A practical gap is to understand if Fintech really drives financial inclusion. That is, does Fintech driven financial inclusion really leads to economic growth or does it lead to more income inequality?

In terms of methodology, all studies from the empirical literature reviewed, have focused on the symmetric relationship between Fintech, financial inclusion and economic growth by using autoregressive distributed lag analysis (ARDL) (Alabdulrazag *et al.*, 2022; Ngong *et al.*, 2023; Odeleye, & Oyeneye, 2022) , Generalized Method of Moments analysis (GMM) (Kouladoum *et al.*, 2023; Muri, & Mehmet, 2021 ; Noha, & Mahmoud,, 2021, and so on) , panel analysis (Akwan *et al.*, 2023; Gürbüz *et al.*, 2024 and so on). While GMM is more broadly used for addressing endogeneity and dynamic panel data models with linear relationships, ARDL assumes linear relationships between the dependent and the independent variables. They both thus undermine or neglect the possibility of an asymmetric relationship among the variables, hence this study incorporate this asymmetric possibility into the study by using nonlinear autoregressive distributed lag (NARDL) to capture this asymmetric situation into the relationship between Fintech, financial inclusion and economic growth in SSA countries. The strength of Nonlinear Autoregressive Distributed Lag (NARDL) model lies in its ability to capture the asymmetric effects of positive and negative changes in variables on each other, both in the short and long run, unlike linear models such as ARDL, GMM, Panel Analysis and so on.

1.3 Research Questions

The following research questions guided the course of the study

- i. How does technology infrastructure (the average number of internet users as a share of the population) affect economic growth in selected SSA countries?

- ii. What is the influence of financial technology application (the amount of mobile banking transaction in a country and the number of Point-of-sale agents in a country) on the economic growth in selected SSA countries?
- iii. What is the extent of financial access (the number of adults with savings account and the number of bank branches per 100,000 adults) impact on the economic growth in selected SSA countries?
- iv. How does financial usage (credit to gross domestic product ratio and deposits to gross domestic product ratio) impact on the economic growth in selected SSA countries?
- v. What is the effect of financial quality (ATMs per 100,000 adults and the number of insurance firms per 100,000 adults) on the economic growth in selected SSA countries?

1.4 Objectives of the Study

The main objectives of this study will be to determine the impact of Fintech and financial inclusion on economic growth of selected sub-Saharan African countries. Specifically, the objectives will be to:

- i. Examine the effect of technology infrastructure (the average number of internet users as a share of the population) on economic growth in selected SSA countries.
- ii. Ascertain the influence of financial technology application (the amount of mobile banking transaction in a country and the number of Point-of-sale agents in a country) on economic growth in selected SSA countries.
- iii. Examine the role of financial access (the number of adults with savings account and the number of bank branches per 100,000 adults) on economic growth in selected SSA countries.
- iv. Evaluate to what extent financial usage (credit to gross domestic product ratio and deposits to gross domestic product ratio) impact on the economic growth in selected SSA countries.

- v. Examine how financial quality (ATMs per 100,000 adults and the number of insurance firms per 100,000 adults) impact on the economic growth in selected SSA countries.

1.5 Hypotheses of the Study

The following hypotheses which will guide the study:

- i. Ho₁: The effect of technology infrastructure (the average number of internet users as a share of the population) on economic growth in selected SSA countries is not significant
- ii. Ho₂: The effect of financial technology application (the amount of mobile banking transaction in a country and the number of Point-of-sale agents in a country) does not significantly affect economic growth in selected SSA countries
- iii. Ho₃: The effect of financial access (the number of adults with savings account and the number of bank branches per 100,000 adults) on economic growth in selected SSA countries is not significant
- iv. Ho₄: The effect of financial usage (credit to gross domestic product ratio and deposits to gross domestic product ratio) does not significantly impact on the economic growth in selected SSA countries is not significant
- v. Ho₅: The impact of financial quality (ATMs per 100,000 adults and the number of insurance firms per 100,000 adults) does not significantly impact on economic growth in selected SSA countries

1.6 Scope of the Study

This study focused on the relationship between financial technology (Fintech), financial inclusion (FI) and economic growth in selected sub-Saharan African Countries (SSA). Towards this direction, the study is limited to the indices of Fintech in SSA countries (which includes: the average number of Internet Users as a share of population in a country (IUI), the amount of Mobile Banking transactions in a country (MBK) and the average number of Point-of-Sale agents (POS)) and the indices of financial inclusion (which includes the average number of

Automated Teller Machine per 100,000 adults (ATM), the average number of bank branches per 100,000 adults (NBB), the average Credit to Gross Domestic Product ratio (CGDP), the average Deposits to GDP ratio (DGDP), the average number of Insurance Firms per 100,000 adults (NIC), the average number of adults with savings account (ACOW)). The choice of the variables of interest is because they are amenable for the study.

The geographical scope of the study covers Sub-Saharan African (SSA) countries and from this population, there is focus on 29 selected sub-Sahara African countries representing the four sub regions - Central, Eastern, Southern and Western. In a report by the Business day(2024) with reference to the International Monetary Fund's forecast for 2024, the top ten African nations by GDP size were stated as follows: South Africa (\$373 bn), Egypt (\$347 bn), Algeria(\$266 bn), Nigeria (\$252 bn), Ethiopia(\$205bn), Morocco(\$152bn), Kenya (\$104bn), Angola (\$92 bn), Cote D'Ivoire (\$86 bn) and Tanzania(\$79 bn). Mastercard (2022) also reported that Nigeria, Kenya and South Africa are among the countries leading the digital payment ecosystem. On this basis, the population of the study covers all the forty-eight (48) countries (World Bank Group, 2025) and using stratified sampling technique and data filtering approach, 29 countries (Angola, Benin, Botswana, Burkina Faso, Cameroon, Côte d'Ivoire, Eswatini, Ghana, Guinea, Guinea-Bissau, Kenya, Lesotho, Liberia, Madagascar, Malawi, Mali, Mauritius, Mozambique, Namibia, Niger, Nigeria, Rwanda, Senegal, Seychelles, South Africa, Togo, Uganda, Zambia, Zimbabwe) were selected based on data availability, viable Fintech system and regionalisation to represent the sub regions of Central, Eastern, Southern and Western sub- Saharan African countries.

For full understanding of the research problem, an empirical investigation covering 10 years from 2014 to 2023 is being done. This period captures the budding stage of Fintech generally and in SSA countries in particular. In addition, data availability is crucial in the decision to

choose this period of study especially in view of the fact that data collection across nations on the subject matter are different depending on what technology is prevalent. According to Nevellan, Keshan and Thiel (2024), M.Pesa penetration in Eastern Africa grew from 6.4% in 2017 to 26.6% in 2023. Also, multiple researches in literature have suggested that the bulk of the buzz in Fintech in the sub- Sahara Africa have actually become noticeable from 2019 till date (Flötotto, Gold, Olanrewaju, Jeenah & Kuyoro, 2022; Mastercard, 2022; Nwosu, Oji – Okoro & Anih, 2022).

1.7 Significance of the Study

This study by using the nonlinear Autoregressive Distributed Lag (NARDL) model, is incorporating not only symmetric but also asymmetric data changes unlike most regression models, thereby capturing the effect of both positive and negative data changes on the dependent variables. The outcome of the study is therefore expected to contribute to the existing debate and literature on the impact of Fintech and financial inclusion on economic growth especially for Sub-Saharan African countries.

The results of this study will be of huge benefits to the following stakeholders

Academia: The study is resourceful to researchers and students in management and social sciences and all other in the academic world generally. In addition, future researchers and those interested in furthering their knowledge in this area and extending it by using other robust methodology which may validated or invalidate the findings of the study, will find the study very useful

Regulatory Bodies: This study is of great importance to regulatory bodies overseeing financial and information communication and technology (ICT) institutions of the different SSA countries

in the region, especially the ministries of finance the respective central banks. The regulatory bodies are expected to make the business ecosystem in their different countries to be attractive in order to encourage inter-regional financial and ICT co-operation which will attract both domestic and foreign investments, thus developing their respective economies.

Financial Managers and Policy Makers: The study is beneficial to think-tanks, financial experts and managers and policy makers generally. This body of professional that seek to evaluate the impact of policy and plan directions on target populations.

General Public: The study is beneficial to the citizens of the SSA countries by letting them know the different Fintech platform their can use to do their respective banking or financial transactions, thus boosting their knowledge base and ultimately financial inclusion and reducing poverty in these countries.

1.8 Limitations of the Study

This study was constrained in the area of unavailability and up-to-date dataset for all the variables in Sub-Sahara countries to be considered in this study out of the 48 countries (World Bank 2024) and of this number, 29 Sub-Sahara African countries were selected for the study. In addition, the time frame was restricted to ten (10) years (2014 - 2023) primarily due to the fact that Fintech data capture became more extensive at the beginning of this time period. This is a relative short period in time series analysis but to make up for this challenge, the data was taken quarterly so there are four(4) observations yearly and for the ten(10) years data, there are 40 observations. The researcher therefore believes that despite this limitation of the study, the outcome of the study will not be hampered.

Also, data adoption and harmonization across the selected SSA countries is also a limitation including data scarcity, data quality issues, data interoperability, data availability, and data format. These challenges hinder the ability to conduct meaningful comparative studies and can lead to the generation of results that are generalizable across diverse regions.

In addition, the NARDL (Nonlinear Autoregressive Distributed Lag) model to be used has its own limitations. Though it is a powerful tool for capturing asymmetric effects in time series data, it cannot be applied if any variable in the model is integrated of order 2 (I(2)).

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

In this section, extant literature that relates to technology driven payment system (Fintech), financial inclusion and economic growth have been reviewed. This chapter covers conceptual review, theoretical review, empirical literature, summary of empirical literature, theoretical framework, conceptual framework and research gaps.

2.2 Conceptual Review

2.2.1 Concept of Economic Growth

According to the Reserve Bank of Australia (2024), economic growth refers to an increase in the size of a nation's economy over a period of time. This size is usually a measure of the total production of goods and services in the economy. This is referred to as the gross domestic product (GDP). In addition, economic growth can be measured in both 'nominal' and in 'real' terms. While nominal economic growth refers to the increase in the currency value of production over time, including the changes in both the volume of production and the prices of goods and services produced, the real economic growth looks at growth rate from the angle of increases in the volume of production after adjusting for price changes. This measurement is considered better because it focuses on the real value of production at a point in time compared with other points in time.

According to Argyrous, Forstater and Mongiovi, 2004, economics is all about making smart choices to cope with scarcity. The authors added further that the term economic growth is a process whereby the country's real national and per capita income increases over a long period

of time. This meaning of economic growth consists of the following features of economic growth: Economic Growth implies a process of increase in National Income and Per-Capita Income. The increase in Per-Capita income is the better measure of Economic Growth since it reflects increase in the improvement of living standards of masses. Economic Growth is measured by increase in real National Income and not just the increase in money income or the nominal national income. In other words the increase should be in terms of increase of output of goods and services, and not due to a mere increase in the market prices of existing goods (Argyrous, Forstater & Mongiovi, 2004). Increase in Real Income should be Over a Long Period: The increase of real national income and per-capita income should be sustained over a long period of time. The short-run seasonal or temporary increases in income should not be confused with economic growth. Increase in income should be based on Increase in Productive Capacity: Increase in Income can be sustained only when this increase results from some durable increase in productive capacity of the economy like modernization or use of new technology in production, strengthening of infrastructure like transport network, improved electricity generation and so on (Barro, 1997). Economic Growth is measured by quantitative factors such as an increase in real GDP or per capita income.

According to Poliduts and Kapkaev (2015), different interpretations of the "economic growth" concept provide both quantitative and qualitative characteristics. While the quantitative characteristic focus on changes in the amount of goods and services produced and the dynamics of these changes, the qualitative characteristic refer to the capacity of the economic system to meet the new growing needs of society. Going further, Poliduts and Kapkaev (2015) stated that the relative indicators of economic growth which characterize it from the quantitative side are the value of GDP per capita, disposable income of the population per capita, and also attributable to

per capita indicators of consumption, savings and investments. Other quantitative characteristics are the rates of industrial production growth in whole and for the main sectors and types of products, indicators of economic efficiency such as labour productivity. The qualitative aspect of economic growth is determined by living standards and quality of life indicators which could be estimated by using the consumer basket, cost of living, GDP structure by use; level of services development (the number of doctors per 10 thousand people, the number of hospital beds per one thousand people, and so on); state of the labor forces (average life expectancy, level of education, share of education expenditure in GDP and so on), and others. The quality of life is reflected by the content of labor and leisure activities, level of labour and life comfort, environment, functioning of social institutions and so on.

Another point of view in evaluating economic growth is from the angle of the needs and possibilities of the society, and also by the rates of population growth (Poliduts & Kapkaev, 2015). This approach was elicited from the work of Roy Harrod (Poliduts & Kapkaev, 2015). Harrod (1959) introduced the concept of natural, guaranteed and actual types of economic growth. According to Harrod (1959), natural economic growth is caused primarily by population growth, increase in the needs of this population, and also by desire of every individual to satisfy their material and spiritual needs as fully as possible, while using all potential opportunities for economic growth. Guaranteed economic growth was defined as some predicted line of development, on which the entrepreneurs are disposed and are satisfied with what they are doing, and lastly, actual growth is the real level of economic growth as a result of the combined action of natural and guaranteed economic growth (Harrod, 1959).

According to Poliduts and Kapkaev (2015), a third point of view of economic growth is from the angle of the productive forces that determines it. These forces include equipment and production

technologies. They added that, economists distinguish pre-industrial (traditional society stage), industrial and post-industrial types of economic growth. Pre-industrial type of growth takes place in those national economies where the main industry is agriculture and its part in GDP exceeds 50%. Industrial type of growth is characterized by overturn in the material basis of production, as a result the industry follows the agriculture and begins to play a decisive role across the national economy. The post-industrial types of economic growth according to Pestel (1988) is characterized by an economy that will again take the man and his life quality much higher level compared to traditional society. This higher level will lead to industries providing a high level of social welfare in whole, new needs and requirements being met relatively quickly, dangerous technologies being curtailed, and the environment being maintained in proper condition.

Economic literature clearly identifies increases in capital, labor force, technology, and human capital as key contributors to economic growth. These factors have therefore been recognized as the main facilitators of economic growth for both developed and developing countries. These factors have predominantly reproductive nature, and they are capital, territory, labor, scientific and technological progress, innovation and productivity, efficiency of productive unit, and so on. The factors both can directly and indirectly, positively and negatively effect on the rates and quality of growth (Denison, 1975; Poliduts & Kapkaev, 2015).

It can therefore be stated that increase in output is a characteristic of economic growth. It therefore means that productivity is the cornerstone of economic growth. According to Roubini and Backus (1998) nations are richer current date versus previous dates and developed countries are richer than underdeveloped countries because they are more productive. Using the production function, $Y = A F (K, N)$, where Y is output (real GNP), K is the stock of physical capital (plant and equipment), and N is labor (the number and hours of people working), and

letter A measuring “productivity”. It can be stated that a higher value of “A” means that the same inputs lead to more output. From this function, it can be deciphered that a higher output is possible for three reasons: because more people are working (higher N), because they have more equipment to work with (higher K), or because capital and labor are used more productively (a higher A). “K” which is capital or equipment or both, can be further decomposed into finance or technology. The role of the financial system and technology theoretically are further discussed in the theoretical framework of this work.

2.2.1.1 Indicators and Measures of Economic Growth

According to Stiglitz *et al.* (2009), the acts of attempting to guide the economy is like pilots steering a course without a reliable compass. The decisions depend to a large extent on what is measured, how the measurements are done and the interpretations thereafter. The authors added that a poorly designed measure can be equated to flying blind. They therefore are advocating for a proper measurement of economic growth in order to properly evaluate policy impacts. Economic literature is inundated with several alternate measures of economic growth but it is also interesting to note that just as Stiglitz *et al.* (2009) pointed out, no single measure, or even a limited set of measures, can provide all the information required to assess and manage an economy. In the journal by The Treasury (2015), economic growth measures discussed included the Gross Domestic Product per capita (GDP), Gross National Income (GNI), the Net National income (NNI) and Real Gross Domestic Income (RGDI).

- Gross Domestic Product GDP represents the total monetary value of all finished goods and services produced within a country's borders in a specific time period (usually a year or a quarter). It's a widely used indicator of a country's economic activity and overall economic health. GDP can be calculated using different approaches, including the

expenditure approach (summing up spending by consumers, businesses, government, and net exports). GDP is often adjusted for inflation (real GDP) to accurately reflect changes in output, rather than just price increases.

- **Gross National Income (GNI):** - Gross National Income (GNI), is GDP adjusted for income abroad) and is an alternative monetary measure to GDP. GNI represents the total income earned by a country's residents, both domestically and abroad. It includes GDP plus income from foreign sources (like investments or remittances) and subtracts income paid to foreign entities. GNI can differ from GDP, especially for countries with significant international investments or foreign-owned businesses (Boarini, Johansson, & Mira d'Ercole, 2006).
- **Net National income (NNI):**- Taking GNI further, by allowing for the depreciation of capital, Net National Income (NNI) is arrived at. Net national income (NNI) is essentially GDP corrected for net foreign income, indirect taxes and capital depreciation. NNI has therefore being defined as “gross domestic product (GDP) plus net receipts of wages, salaries and property income from abroad, minus the depreciation of fixed capital assets (dwellings, buildings, machinery, transport equipment and physical infrastructure) through wear and tear and obsolescence” (OECD, 2009). According to the view point of the OECD (2009), income (both domestic and foreign-sourced) is much more closely associated with economic well-being than domestic consumption.
- **Real GDP per capita (RGDP):**- This divides real GDP by the country's population, providing a measure of average economic output per person.

In an OECD work, Boarini, Johansson, and Mira d'Ercole (2006), espoused that within the national accounts framework, there are other and possibly better measures of economic resources

than GDP per capita making reference to gross national income (GNI) and the net national income. The OECD (2010) further affirms the above position which brought to the front burner the concept of real gross domestic income (RGDI) as a measure of comparing income and output across OECD countries and over time. The OECD analysis highlights that the gap between RGDI and RGDP growth for some countries (Australian and Norway) has exceeded one percentage point annually over the preceding decade.

In its contribution to the concept of GDP, The Treasury (2015), states that GDP is invariably the most commonly cited economic indicator of economic growth, but just like Boarini, Johansson, and Mira d'Ercole (2006), it states that other measures may also be preferred, such as gross domestic income (GDI) and net national income (NNI). According to OECD (2014), while the NNI is theoretically superior to the GDP, there are some practicality difficulties while the majority of the difference between GDP and GNI can be accounted for by net receipts of the property income account. According to OECD (2014), the key issue here is that retained foreign earnings are recorded as an income receipt and where a country has large outward foreign direct investment then the GNI figure would be distorted due to much of the foreign income never actually returning. Due to this difficulty and the issues associated with measurement of international flows and depreciation, GDP is the most widely used, despite its (theoretical) inferiority (OECD, 2014).

In a research by Gürbüz *et al* (2024) that studies the Impact of Fintech on Economic Growth with a focus on Turkey and Southeast Asian Countries between 2000 and 2020, GDP is used as a proxy for the dependent variable - economic growth. In another study by Boachie and Adu-Darko (2024) which looked at the effect of financial inclusion on economic growth in Sub-Saharan Africa between the year 2010 and 2020, as a proxy for economic growth, Real GDP per

capita is used. In Jiaqi (2024) which examines the impact of digital financial inclusion on economic development in urban and rural areas of China from 2011 to 2019, GDP per capita is used to proxy economic development. In another study by Kamara (2024) that examines the impact of financial inclusion on economic growth and poverty reduction with a focus on sub-Saharan Africa from 2014 to 2021, Gross Domestic Product (GDP) per capita was used as a proxy for economic growth. In a study that examined how financial inclusion impacts on economic growth in selected regions of Africa from 2009 to 2021, Owandjokuna (2024) uses GDP per capita as a proxy for economic growth.

2.2.2 Concept of Financial Technology (Fintech)

In discussing the concept of financial technology, otherwise known as Fintech, we will be looking at both the nature of Fintech and the types of Fintech.

2.2.3.1 Nature of Fintech

Fintech is a technology used and applied in the financial services sector including its involvement in mobile payments, money transfer, loans, fundraising, assets and property management. Technology as applied in finance, which is financial technology (Fintech), is defined as incorporating the use of technology to the delivering of financial services and products and the use of technology to create entirely new financial products and services (Rosenstein, 2022). Financial technology can also be described as a process whereby firms combine financial services with modern, innovative technologies in order to distribute financial services in a more effective, efficient and less costly manner (Al-Momani & Alomari, 2021). According to Hirbu (2023), Fintech has turned out to be a disruptive force in the global financial landscape and has altered the way financial services are provided and accessed and at the same

time, in many economies, aided financial inclusion, financial stability, reduced unemployment which is ultimately leading to economic growth and development. Fintech can also be described as the application of technological innovations in the business of finance. It is a product of innovation and innovation itself has been described by Blach (2011) as changes in the technological solutions which results in the creation of new combinations of productive means, generating the above-the-average rates of return and thus enhancing the dynamic development of the overall economy.

Fintech investment has grown exponentially recently in the world and particularly in Africa and is likely to continue to increase, given that Fintech is not only related to the financial services sector, but all companies that deal with the financial services industry and Fintech startups are usually smart and capable of causing positive disruption. According to Mastercard (2022), Fintech start-ups grew a staggering 81 percent in two years from 311 in 2019 to 564 in 2021. While also there was an 894 percent year-on-year growth in funding for Fintech start-ups in SSA countries, the highest in Middle East, Africa and Pakistan region within the period. According to Nwosu, Oji – Okoro and Anih (2022), the impact of Fintech was visibly significant for Kenya where it witnessed year-on-year growth from 2015 to 2019. Also, Fintech is described as those products and services that rely on technology to improve the quality of traditional financial services. They are quick and easy. In most cases, these services and products are developed by startup companies, which seek to improve retail and corporate banking in cooperation or competition with existing financial service providers. According to Dorfleitner, Hornuf, Schmitt and Weber, (2017), Fintech denotes companies or representatives of companies that combine financial services with modern, innovative technologies. Gomber, Koch and Siering (2017) defined Fintech as a neologism coming from “financial” and “technology” and referring to the

connection between modern internet technologies and established business activities of the banking sector. Meanwhile, Hung and Luo (2016), identified five dimensions that can change the dynamics of the Fintech market: players, added value, rules, tactics, and scope. In much of the literature, Fintech is used in a purely functional way, providing variation in terms of the subject (Alt, Beck & Smits, 2018; Gai, Qiu & Sun, 2018; Lee & Shin, 2018). It is closely related to information and communication technology, and it is an activity through which institutions use information and communication technologies in order to distribute financial services in a more effective and less costly manner (Yusuf cited in Almomani & Alomari, 2021).

Some features of Fintech companies according to Shu-Zhang (2020) are:

Access to all users: In traditional financial services, the customer is evaluated on the basis of his ownership of large assets or his periodic receipt of huge income, which makes these services limited to certain social classes, while emerging companies target all classes and groups and continuously enhance their capabilities through partnerships or redesign of products designed for low-income customers.

Flexibility and affordability: Fintech startups have several offers and plans to pay for goods and services, especially clean energy, that are flexible enough to suit customers on their differences on a daily, weekly or even monthly basis.

Customer-centric design: Fintech companies focus on user demands and design simple, easy products.

Speed: Powerful analytics allow Fintech companies to move quickly, with transactions completed in a few minutes using big data, algorithms and machine learning, and compared to

traditional small insurance companies that can take several days before a new policy is approved or a loan is approved, this applies in lending and when verifying digital identity.

Data policy first, mobile phones first: This policy can improve the products and services provided to design suitable services for them. There is no doubt that powerful analytics allow business owners to make better decisions and seize opportunities.

According to Kelvin and Anna, (2018) Fintech institutions work in such a way as to use innovative technologies, especially mobile phones, a computer or digital tablet connected to the internet or any other communication network in order to offer the end customer products and services that are richer and/or less expensive than those of other operators are. In addition, Ng and Kwok (2017) classified Fintech organisations into four different categories: efficient payment process, robo-advisors, peer-to-peer loan and deposit platforms, and crowdfunding. Meanwhile, Lee and Shin (2018) identifies five different elements of the Fintech ecosystems: Fintech start-ups, technology developers, the government, financial customers, and traditional financial institutions. Two markedly interesting views of Fintech lie within the scope of this general definition and classification: first, technology plays an important role and second, Fintech encompasses existing government policies and regulations.

Financial technology offers many possibilities and advantages, but an enabling environment must be provided, such as providing appropriate regulations for the work of emerging technology companies in this field, in addition to information security and the provision of information and communication technology infrastructure. The development of financial technology also depends on the review of legal and regulatory frameworks, especially the clarity of laws related to the circulation of digital financial products, and the management of risks that arise from newly

developed financial and banking products and services, using regulatory frameworks. The types of Fintech on the basis of activities or business are as follows:

- i. ***Blockchain and Cryptocurrencies:*** Blockchain technology has emerged as a transformative force in the Fintech industry, enabling secure, transparent, and decentralized financial transactions. Blockchain's distributed ledger technology allows for the creation of immutable records of transactions, reducing the need for intermediaries and increasing efficiency. This has led to the development of cryptocurrencies, such as Bitcoin and Ethereum, which allow for peer-to-peer transactions without the involvement of traditional financial institutions (Nakamoto, 2008). In addition, according to Zheng, Xie, Dai, Chen and Wang, (2017), not only are blockchain-based applications coming up everywhere and covering many fields such as financial services, Internet of Things (IoT) and reputation system etcetera, blockchain-based Fintech applications have also expanded into areas like smart contracts, asset tokenization, and decentralized finance.
- ii. ***Regulatory Technology (RegTech):*** RegTech, a subset of Fintech, focuses on the use of technology to streamline and automate regulatory compliance processes (Arner, Zetsche, Buckley and Barberis, 2016). RegTech solutions leverage technologies like artificial intelligence, machine learning, and natural language processing to enhance regulatory monitoring, reporting, and risk management (Mention, 2019). This has led to improved efficiency, reduced compliance costs, and increased transparency in the financial sector (Brummer & Yadav, 2019). RegTech applications include automated compliance systems, regulatory reporting, and know-your-customer (KYC) processes (Arner, Zetsche, Buckley & Barberis, 2016).

- iii. ***Insurance Technology (InsurTech)***: InsurTech refers to the application of technology to the insurance industry, aiming to improve the efficiency, accessibility, and user experience of insurance services (Catlin & Lorenz, 2017). InsurTech startups and established insurance companies are leveraging technologies such as mobile apps, big data analytics, and the Internet of Things (IoT) to offer personalized insurance products, streamline claims processing, and enhance customer engagement (Eling & Lehmann, 2018). InsurTech has the potential to increase insurance penetration, reduce costs, and provide more tailored coverage to consumers (Braun & Schreiber, 2017).

- iv. ***Mobile Payments***: Mobile payment systems, enabled by technologies like near-field communication (NFC), QR codes, and digital wallets, have revolutionized the way consumers make transactions (Dahlberg, Guo & Ondrus, 2015). Fintech companies have developed mobile payment platforms, such as Apple Pay, Google Pay, and PayPal, which allow users to make secure, convenient, and cashless transactions using their smartphones (Liébana-Cabanillas, Marinkovic, de Luna & Kalinic, 2018). The rise of mobile payments has contributed to financial inclusion by providing access to digital financial services for under-banked populations (Suri & Jack, 2016).

- v. ***Peer-to-Peer (P2P) Lending***: P2P lending platforms connect individual borrowers and lenders directly, bypassing traditional financial institutions (Bachmann, Becker, Buerckner, Hilker, Kock, Lehmann & Tiburtius, 2011). These Fintech-enabled platforms use algorithms and data analytics to assess creditworthiness, facilitate loan matching, and manage repayments, often at lower costs compared to traditional lending (Emekter, Tu, Jirasakuldech & Lu, 2015). P2P lending has expanded access to credit for individuals and

small businesses that may have difficulty obtaining loans from banks (Serrano-Cinca, Gutiérrez-Nieto & López-Palacios, 2015).

- vi. ***Wealth Management (WealthTech)***: Wealth management driven by Fintech is coming in the name WealthTech, or individual finance Fintech. It aims to improve wealth management and investment services by leveraging the latest technologies, such as robo-advisory platforms (Sironi, 2016). These Fintech solutions provide automated, algorithm-driven financial planning and investment management services, often at lower costs compared to traditional wealth management firms (D'Acunto, Prabhala & Rossi, 2019). WealthTech has the potential to democratize access to investment services and personalized financial advice (Philippon, 2016).
- vii. ***Crowdfunding***: Fintech has enabled new crowdfunding models, allowing individuals and businesses to raise funds from a large number of investors through online platforms (Belleflamme, Lambert & Schwienbacher, 2014). Crowdfunding platforms, such as Kickstarter and Indiegogo, have disrupted traditional fundraising methods by providing entrepreneurs and creators with access to a wider pool of potential investors (Mollick, 2014). Fintech-powered crowdfunding has also expanded into areas like equity crowdfunding and peer-to-peer lending (Ahlers, Cumming, Günther & Schweizer, 2015).

In general terms, theoretical contributions looking at the relationship between Fintech and economic growth including Gosavi (2018), Ozili (2018), Sun (2018) and Tchamyu, Erreygers and Cassimon (2019), seem to agree that ICT and Fintech are key drivers of financial inclusion and by extension, economic growth. It therefore means that Fintech has an indirect, direct and positive relationship with economic growth. In contributing to this line of thought, specifically,

Aggarwal, Brailovskaya and Robinson, (2020) showed that digital money implementation improves saving rates and translates to a redistribution of labour from businesses to agriculture among Malawian microenterprises. Similarly, Kikulwe, Fischer and Qaim, (2013) also showed that small hold farmers in Kenya that make use of M-Pesa purchase more inputs, sell a greater portion of their output in marketplaces, and thus have higher returns. In their own research, Suri and Jack (2016), stated that M-Pesa has lowered Kenya's poverty rate by 2%.

2.2.2.2 Measures of Financial Technology

By conjecture, any activity that makes a system more efficient is expected to make the system more productive. Research on the impact of technology on economic growth or development has been going on for decades now. Earlier studies have been on the impact of ATMs on the economic welfare of people or economic or banking activities. Research has also been looking at the impact of financial innovation on various micro and macroeconomic indices that represents dimensions of economic growth and development and in order instances, impact of financial technology on financial inclusion which is another dimension economic activities have also been studied (Beck, Chen, Lin & Song, 2016; Jagtiani & Lemieux, 2018; Laeven, Levine & Michalopoulos, 2015; Lashitew, van Tulder, & Liasse, 2019). Multiple studies have shown not only a positive relationship between financial technology and economic development, but a booting effect by financial technology on economic growth by increasing the GDP growth (Antonijević, Ljumović & Lukić, 2021; Feyen, Frost, Gambacorta, Natarajan & Saal, 2022; Haftu, 2019; Sahay, Ogawa, Khera & Ng, 2021). In other research, it was found that the relationship between financial technology in the form of digital financial inclusion and economic growth is a bi-directional causal relationship (Chinoda & Mashamba, 2021). The question now is what are the measures of Fintech? What are those variables that can be used to proxy Fintech? In

determining the measures, one needs to look at the ecosystem in the Fintech space. The Alliance for Financial Inclusion (2024) unbundles this space as follows:-

- **The institutions:-** Traditional financial institutions, Fintech startups, bigtech companies, payment service providers, peer-to-peer lenders, digital wallet providers, insurtech Firms,
- **The digital financial services activities:-** Digital payments (including the payment systems- mobile money and point-of-sale), digital banking, digital lending, digital capital raising, digital savings, asset management, insurtech services, Central Bank digital currencies, cryptocurrency
- **The technology enablers:-** Including cloud, application programming interface(API), biometric, distributed ledger, technology (DLT), Artificial Intelligence(AI), and machine learning (ML), digital ID and
- **The policy enablers: -** This includes e-KYC, open banking, data Protection, cybersecurity, Payment Systems, Electronic Money.

In empirical literature such as Jallow *et al.* (2024), Tissaoui *et al.* (2024), Tidjani and Madouri (2024), Agala and Efegehaje-Ego (2024), Okon *et al.* (2023), Akwam *et al.* (2023), Iwedi *et al.* (2023), Alabi & Olaoye (2022), Odeleye & Oyeneye (2022), various measures including internet users as a share of the population in a country (IUI), amount of mobile banking transactions in a country (MBK), and number of Point-of-sale Agents (POS) have been used as measures for technology, Fintech application and digital finance.

- Internet users as a share of the population in a country (IUI) is a metric that indicates the extent of internet access within a specific population. It is calculated by dividing the

number of internet users by the total population of a country and multiplying by 100. This generally measures the depth of the technology space or its level of acceptance or the depth of the prevailing ICT infrastructure. This provides a normalised measure, allowing for comparisons between countries with different population sizes (Okon *et al.*, 2023; Kouladoum *et al.*, 2023; Alabi & Olaoye, 2022).

- Mobile banking (MBK) which is a key component of Fintech, serves as a valuable measure of financial inclusion, Fintech application and technological advancement, particularly in developing economies. It enables access to financial services through mobile devices, often bypassing traditional banking infrastructure. Mobile banking adoption rates, transaction volumes, and the range of services offered are key indicators of Fintech's impact on financial inclusion and economic growth. Mobile banking measures Fintech by aiding financial inclusion through the expansion of access to financial services for both the unbanked and underbanked populations. In addition, high mobile money adoption rates indicate a strong uptake of Fintech solutions and a willingness to engage with digital financial services. Lastly, the volume and value of mobile money transactions reflect the level of activity and the extent to which mobile money is used for various financial needs (Agala & Efegehaje-Ego, 2024; Iwedi *et al.*, 2023; Odeleye & Oyeneye, 2022).
- Point-of-sale (POS) systems are a key measure of Fintech (financial technology) adoption and impact, particularly in the areas of financial inclusion, Fintech application and cashless transactions. POS systems, which enable electronic payments via cards or QR codes, facilitate the shift from cash-based transactions to digital payments, contributing to a more efficient and inclusive financial ecosystem. POS Systems measure Fintech by

expanding access to financial services, especially for those previously excluded from traditional banking. They enable businesses, even in remote areas, to accept digital payments, bringing more people into the formal financial system. On a second note, POS systems are integral to the growth of cashless economies, promoting the adoption of digital payment methods like credit/debit cards and mobile wallets. Also, POS systems streamline payment processes, reducing transaction time and costs compared to traditional cash handling (Agala & Efegehaje-Ego, 2024; Iwedi *et al.*, 2023; Odeleye & Oyeneye, 2022).

In a study by Agala and Efegehaje (2024), which looks at improving financial inclusion in Nigeria through Fintech with a focus on Nigeria, the following proxies for Fintech were adopted:- Automated Teller Machine(ATM), point-of-sale(POS), Web Pay and Mobile Pay. On the other hand, financial inclusion proxy was commercial bank loans to rural branches (CBLR), deposit to rural branches (CBDR), number of commercial bank branches (NBB), and Microfinance Bank loans (MFBL). In another contribution to research, Kindai (2024) in an empirical assessment of the effects of financial technology on economic growth in Nigeria, as proxy for Fintech, used Automated Teller Machine (ATM), point-on-sale (POS), web online payments, mobile transfers and national electronic fund transfers. Tafirei and Gani (2023) in their study of Fintech, bank funding, and economic growth in Sub-Saharan Africa, used mobile money as a measure of Fintech. In yet another study, Kanga, Oughton, Harris, and Murinde (2022) looked at the impact of financial inclusion, financial technology diffusion as represented by ATM and mobile phone penetration on per capita income. Jean-Claude *et al.* (2022) in their own research that examined the impact of digital technologies on financial inclusion in Sub- Saharan Africa, Automated Teller Machine (ATM), is used as a proxy for Fintech.

2.2.3 Concept of Financial Inclusion

Financial inclusion (FI) refers to the provision of diverse and affordable financial goods and services to businesses and individuals, regardless of their socio-economic background. It is a crucial component of the financial development process (Sahay, Cihak, N'Diaye, Barajas, Mitra, Kyobe, NianMooi & Yousefi, 2015). Kim (2016) defined FI as the capacity of a household to access a variety of financial services. In today's society, the extent to which a person's aptitude, political connections, initiative, and social position affect their economic prospects is variable. The authors added that FI also impacts the capacity to launch a business and pay for college. In addition, it affects an individual's ability to achieve economic goals, altering the wealth gap and its duration between generations. In order for customers to effectively engage in financial transactions, it is imperative that they possess a certain level of financial knowledge and abilities. Similarly, providers of financial products, services, and advice must have the necessary financial assessment to cater to the needs of these customers. Financial and developmental institutions alike aspire for inclusivity (Babajide, Adegboye & Omankhanlen, 2015).

FI has become a crucial aspect of improving the economic performance of the country. Firstly, by increasing access to credit and financial services, FI can help to promote entrepreneurship and small business development, which in turn can lead to job creation, economic growth, and poverty reduction. Secondly, FI can encourage the savings of individuals, which can provide a stable source of funding for investment and growth. This, in turn, can lead to increased economic activity and overall economic performance. Moreover, by providing access to insurance, FI can reduce the cost of risks and uncertainties for the economy, such as natural disasters and economic shocks. This can help to maintain stability and encourage investment, which is crucial

for sustainable economic growth. In conclusion, the promotion of FI is an important factor in promoting economic performance (Qazi, 2022).

Due to its effect on capital distribution, FI would alter the rate of economic growth and labour demand, with repercussions for poverty and wage distribution (Ziolo, Filipiak, Bąk, Cheba, Tîrca & Novo-Corti, 2019). A high level of FI is essential to a nation's economic health because it provides credit, risk management goods, insurance, and payment services to individuals with diverse requirements. It enables a comprehensive variety of freely accessible financial services with no costs or non-price obstacles, allowing disadvantaged individuals to benefit because they no longer need to rely on their savings to finance their education or to launch a business in order to pursue growth prospects. Therefore, increased FI leads to increased savings and investment, which ultimately encourages economic growth (Dogan, Madaleno & Taskin, 2022; Morgan, 2022).

The World Bank has also emphasized the importance of an inclusive financial system in promoting efficient resource allocation and equipping individuals with the necessary tools to address challenges related to stability, equitable resource distribution, improved welfare, poverty reduction, and sustainable development (World Bank, 2013). Economic stability and advancement is promoted by an inclusive financial system by guaranteeing that different individuals and businesses are able to obtain financial services at a cost that is realistic. It provides a platform that enables economic agents to overcome unappealing financial hurdles, thereby improving their quality of life, while also supporting a fairer distribution of resources, alleviating poverty, creating more employment opportunities, boosting a nation's stride towards achieving its long-term sustainable development objectives and overall enhancement of the national economy (Jia, Yushan & Cunyi, 2021). Financial inclusion efforts, seek to ensure that

all members of an economy can have access to and effectively use appropriate financial services. Improving financial inclusion has become a significant concern for developed and developing countries alike.

According to (Beck, Demirgüç-Kunt & Levine, 2007), an inclusive financial system sets the foundation for an inclusive sustainable economic development, aids job creation, promotes the growth of small and medium enterprises and also help maintain social and financial stability. As opined by many researchers, the dearth of financial exclusion in SSA, has partly been responsible for the increase in the emergence of alternative financial service providers, including Fintech businesses which aim to bridge the gap and offer financial services to individuals who have been excluded from the traditional banking sector, thereby successfully facilitating financial inclusion for a significant portion of the unbanked population (Chinoda & Mashamba 2021; Demir, Pesqué-Cela, Altunbas & Murinde, 2022; Djoufouet & Pondie, 2022; Ozili 2023).

Enhanced access to financial services can therefore be said to have a positive impact on a nation's Gross Domestic Product (GDP), inequality, and poverty rates. Underestimating the transformative power of financial inclusion would be a mistake since it can potentially empower low-income people and small companies, leading to increased independence and financial stability, ultimately benefiting a country's economy. Some argue that a nation's economic development is hindered, and poverty rates increase when individuals lack access to financial services. It was contended that those with the least financial resources ultimately bear the greatest cost of financial exclusion. A strong and widely available financial system influences long-term growth rates, investment decisions, information and transaction costs, savings rates, and technological innovation (Beck, Demirgüç-Kunt and Honohan (2009), thus leading to economic growth.

In espousing the relationship between financial inclusion and economic growth, Khera, Ng, Ogawa and Sahay (2021) states that there is a positive relationship between digital financial inclusion and growth in GDP per capital, using cross-sectional instrument variable approach. Similarly, in a research by McKinsey Global Institute (2016), using a self-designed general equilibrium macroeconomic model, the McKinsey Institute's analysis of seven developing countries spread across the geographical and income divide of the globe (Nigeria, Mexico, Pakistan, Brazil, China, Ethiopia and India), discovered that digital financial inclusion has the potential to increase the GDP of all the emerging economies studied by \$3.7 trillion or 6% by 2025. And the benefits will be accessible to all economic agents including the financial services provider and the government.

2.2.3.1 Measures of Financial Inclusion

Financial inclusion involves the adequate provision of all necessary financial services to a group of people and businesses which includes vital aspects such as banking and payment services, insurance and investments and loans and other credit facilities (Hirbu. 2023). In their own contribution, Kelly and Rhyne (2015), state that though the concept of financial inclusion lacked generally accepted definition, the concept can be said to be the process of enabling low-income, less privileged and vulnerable groups have timely access to and the use of a variety of formal financial services. Sarma (2008), defines financial inclusion as a collection of formal financial services available to bankable individuals as well as the process through which these services are made accessible, available and usable at an appropriate economic cost.

According to literature, financial inclusion can be measured through various indicators focusing on access, usage, and quality of financial services. While access measures include the number of adults with transaction accounts and the availability of financial services in a specific area, usage

metrics cover the frequency of using financial services like savings, credit, and insurance. Quality considerations involve factors like the cost, suitability, and consumer protection associated with financial products and services. According to Hirbu (2023), the two components of financial inclusion are *access* and *use*. “Access” here refers to the availability of tools, instruments, personnel and so on that enables financial transactions to happen. It is the supply of financial services – supply of products and the spread of this supply geographically and demographically. It includes the availability of bank branches, the depth of the financial system, the cost of the financial services and the legal system (Hirbu, 2023). The “use” refers to the usage of financial tools, instruments, services and so on. This is what Hirbu (2023) referred to as the demand side of financial inclusion. It looks at the consumption of the financial services - geographical and demographic consumption. According to Klapper, El-Zoghbi and Hess (2016) the symbiosis of the supply side and the demand side is necessary for financial inclusion to have the desired effect because financially literate and educated economic agents are as important as the financial technology infrastructure available and at the same time financial literacy empowers the economic agent to take advantage of unfolding financial events. The above listed metrics can be further expanded as follows:

- **Access:** Account Ownership [the percentage of adults (or specific demographics like women or rural populations) who have transaction accounts at formal financial institutions].
 - i. **Physical Access:-** The distance to the nearest financial service provider (e.g., bank branch, ATM).

- ii. Digital Access: - Availability and usage of digital financial services, including mobile banking and online platforms.
- **Usage:** Transaction Frequency [how often people use transaction accounts for deposits, withdrawals, and payments].
 - i. Savings Behavior: - The percentage of adults who save money and the amounts saved.
 - ii. Credit Usage: - The number of people who borrow money from formal financial institutions.
 - iii. Insurance Coverage: The percentage of people with access to and using insurance products.
 - iv. Digital Financial Services Usage: Frequency of using mobile money and other digital payment systems.
- **Quality:**
 - i. Cost of Services: - The affordability of financial products and services, including transaction fees and interest rates.
 - ii. Suitability of Products: - Whether financial products meet the specific needs of different individuals and businesses.
 - iii. Consumer Protection: - Measures to safeguard consumers from fraud, mis-selling, and other risks.

- iv. Financial Literacy: - The ability of individuals to understand and manage their finances effectively.
- v. Complaint Mechanisms: - The availability of channels for consumers to report issues and seek redress.

Multiple empirical literature including Tissaoui *et al.* (2024); Tidjani and Madouri (2024); Agala and Efegehaje-Ego (2024), Owandjokuna (2024), Tidjani and Madouri (2024), Akwam *et al.* (2023), Jean-Claude *et al.* (2023), Umar *et al.* (2023), Dinh and Nguyen (2019) amongst other have stated the following as important measures of elements of financial inclusion. While for financial access, the number of adults with savings account (ACOW) and the number of bank branches per 100,000 adults (NBB) aide in its measurement, average credit to gross domestic product ratio (CGDP) and the deposits to GDP ratio (DGDP) measure financial usage. To measure financial quality, automated teller machines per 100,000 adults (ATMs) and the average number of insurance firms per 100,000 adults in a country (NIC) provide the needed insight.

- The number of Adults with Savings Account (ACOW) are individuals or entities that maintain savings accounts at financial institutions. These accounts offer a secure way to store money while earning interest on the deposited funds. They are distinct from current accounts, which are designed for frequent transactions and typically do not earn interest (Tissaoui *et al.*, 2024; Akwam *et al.*, 2023; Jean-Claude *et al.*, 2023).
- The number of bank branches per 100,000 adults (NBB) is a key indicator of financial inclusion, reflecting the accessibility of banking services (Tissaoui *et al.*, 2024; Owandjokuna, 2024; Agala & Efegehaje-Ego, 2024).

- Average Credit to Gross Domestic Product ratio (CGDP) is a key economic indicator that reflects the extent to which a country's private sector relies on borrowing from domestic financial institutions. CGDP represents the total amount of credit (loans, etc.) extended to private entities (businesses and individuals) by domestic financial institutions, as a proportion of the country's Gross Domestic Product (Tissaoui *et al.*, 2024; Tidjani & Madouri, 2024; Owandjokuna, 2024).
- Average Deposits to Gross Domestic Product ratio (DGDP) is a financial metric that represents the total value of deposits held by banks and other financial institutions as a percentage of a country's Gross Domestic Product (GDP). It essentially shows how much of a nation's economic output is held in deposits within its financial system. The ratio is calculated by dividing the total value of deposits by the country's GDP and then multiplying by 100 to express it as a percentage. A higher DGDP generally indicates a deeper and more developed financial system, where a larger portion of the economy's resources are held in deposits (Tissaoui *et al.*, 2024).
- Automated teller machines per 100,000 adults (ATMs), measures the extent of ATM access within a specific population. It is calculated by dividing the total number of ATMs by the population size and then multiplying by 100,000. This provides a standardized comparison of ATM availability across different geographical divide (Tissaoui *et al.*, 2024; Tidjani & Madouri, 2024; Agala & Efegehaje-Ego, 2024; Akwam *et al.*, 2023; Iwedi *et al.*, 2023; Odeleye & Oyeneye, 2022; Yap, Lee & Liew, 2024 and Ehiogu, 2022).
- Average number of Insurance Firms per 100,000 adults in a country (NIC) is a critical measure of the availability and accessibility of crucial financial protection services. A

higher number of firms indicates a greater potential for insurance penetration, which helps vulnerable individuals and households manage shocks, mitigate risks, and stabilize finances, thereby reducing exclusion and promoting overall well-being within the economy (Yap, Lee & Liew, 2024; Ehiogu, 2022).

In a comparative examination of the role of digital banking in advancing financial inclusion in the United States and Nigeria, with the aim to identify and comparing practices and outcomes in these two distinct economic contexts, Nnaomah, Aderemi, Olutimehin, Orieno and Ogundipe (2024) through a comprehensive review of existing literature and analysis of case studies, found that digital banking has significantly contributed to financial inclusion by providing accessible, affordable, and convenient financial services. In the USA, technological advancements and a robust regulatory framework have fostered a competitive digital banking environment, leading to innovative solutions for reducing barriers to financial access. Conversely, in Nigeria, despite facing infrastructural and regulatory challenges, mobile banking and digital payment services have seen rapid growth, driven by the necessity to reach unbanked populations in remote areas.

In other research, Kamara and Yu (2024) as proxies for financial inclusion, used the number of ATMs in square kilometers, the number of bank branches in square kilometers, number of ATMs per 100,000 adults and the number of bank branches per 100,000 adults. In another research, Tissaoui *et al.*, (2024) in a study to evaluate if financial inclusion can enhance human development with a focus on low and middle income countries, as Index of financial inclusion, they also used ATMs per 100,000 adults (ATM), bank branches per 100,000 adults, account ownership at a financial institution, borrowers from commercial banks (per 1000 adults), depositors with commercial banks (per 1000 adults), bank deposit to GDP (% of GDP) and domestic credit to the private sector (% of GDP). In a study by Tidjani and Madouri (2024) on

the relationship between Fintech, financial inclusion, and sustainable development in the African region, the authors used ratio of domestic credit to the private sector as proxy for financial inclusion. Udensi and Akintunde (2024) in their own study which was about the impact of financial inclusion on economic growth in Nigeria, as proxy for financial inclusion, used number of bank accounts (BA), mobile money subscriptions (MMS) and credit availability (CA). Jean-Claude *et al.*, (2022) in their study uses bank accounts, bank branches, deposit, domestic credit and bank loans as proxies for financial inclusion.

2.2.4 Control Variables

The control variable to be used in this study is trade openness. Trade openness denotes the ability willingness of a country to participate in international trade by lowering barriers to trade and increasing the volume of goods and services exchanged across its borders. According to Gupta *et al.* (2020), trade openness is the flexibility of a host country and how accessible international trade is to foreign investors. Trade by conjecture is expected to lead to the economic growth of the trade participants. As suggested by Abinabo and Abubakar (2023), trade openness enhances industrial production and increase the income and wealth of those involved, which leads to improved standard of living which itself then allows people to live healthier and thereby positively impacting on life expectancy.

Trade openness is a product of globalization as stated Abinabo and Abubakar (2023) and according to Shah *et al.* (2021), the concepts of trade liberalization is closely related to globalization with many researchers using both terms interchangeably. Several researches have shown that trade openness tends to have a positive relationship with economic growth. According to Ullah (2018) several key factors including trade openness significantly impacts and

play very crucial role in the economic growth and development of a country. Similarly, Hye *et al.* (2016) states that both individual trade and composite trade indicators of trade openness positively relate to economic growth in the long and short-run. Çevik *et al.* (2019) in their own contribution empirically shows distinct temporal ordering in a feedback relationship between trade openness and economic growth, while Onakoya *et al.* (2012), Umoh and Effiong (2013) and Azhar (2014) suggest that trade openness has significant positive impact on key sectors of the economy of different nations and as such directly or indirectly impact on economic growth.

In measuring trade openness, Abinabo and Abubakar (2023), suggests that imports and exports, trade volume are valuable concepts. Trade openness can therefore be measured by the ratio of a country's total trade (exports and imports) to its Gross Domestic Product (GDP), with higher ratios generally indicating greater openness to trade. This refers to measurement by trade intensity. Trade openness can also be measured by focusing on the reduction of tariffs, quotas, and other trade restrictions.

2.2.5 Conceptual Framework

Figure 2.1: Schematic Representation of the Variables Relationship

Technology Infrastructure and Fintech Applications

- Average number of Internet users as a share of population (IUI)
- Amount of Mobile Banking Transactions in a country (MBK)

Source: *Author's Design*

2.3 Theoretical Review

In discussing the theoretical review, three theories are going to be evaluated - the neoclassical growth theory, the finance –led growth theory and the technology acceptance theory. The model of the relationship between financial technology and economic growth is built on the neoclassical growth theory while the model of the relationship between financial inclusion and economic growth is built on the finance –led growth theory. The technology acceptance theory provides insight as to how developed technology transitions into usage by the intended population group.

2.3.1 Neoclassical Growth Model (Technology Led Growth)

The neoclassical growth model propounded by Ramsey (1928) and further developed by Solow (1956). The neoclassical growth model explains long-run economic growth as a result of three key factors: labour, capital, and technology. It emphasizes that economic growth occurs through capital accumulation, driven by household savings, and also considers the impact of population growth and technological advancements. Through the 1960s the basic neoclassical growth model was extended in several directions, by Hirofumi Uzawa (two-sector model), Kenneth Arrow (learning by doing), James Tobin (money and growth), Peter Diamond (fiscal policy and overlapping generations), and many others. The model, often represented by the Solow-Swan model, suggests that economies converge to a steady state where growth rates are constant, and influenced by technological progress.

The theory states that short-term equilibrium results from varying amounts of labor and capital in the production function. The theory also argues that technological change has a major influence on an economy, and economic growth cannot continue without technological advances. Neoclassical growth theory outlines the three factors necessary for a growing economy. These are labor, capital, and technology. However, neoclassical growth theory clarifies that temporary equilibrium is different from long-term equilibrium, which does not require any of these three factors. This growth theory posits that the accumulation of capital within an economy, and how people use that capital, is important for economic growth. Further, the relationship between the capital and labour of an economy determines its output. Finally, technology is thought to augment labour productivity and increase the output capabilities of labour.

Therefore, the production function of neoclassical growth theory is used to measure the growth and equilibrium of an economy.

That function is $Y = AF(K, L)$ (i)

- Y denotes an economy's gross domestic product (GDP),
- K, represents its share of capital; L, describes the amount of unskilled labour in an economy; A, represents a determinant level of technology

However, because of the relationship between labour and technology, an economy's production function is often rewritten as

$$Y = F(K, AL) \dots \dots \dots (ii)$$

Increasing any one of the inputs shows the effect on GDP and, therefore, the equilibrium of an economy. However, if the three factors of neoclassical growth theory are not all equal, the returns of both unskilled labour and capital on an economy diminishes. These diminished returns imply that increases in these two inputs have exponentially decreasing returns while technology is boundless in its contribution to growth and the resulting output it can produce.

2.3.2 Finance Led Growth Model

Walter Bagehot's seminal work in the 1870s brought to bear a formal recognition of the interconnectedness between financial systems and real economic activities. Bagehot's theory is considered as a "modern" presentation of how financial market dynamics in Britain influenced the allocation of capital, foreseeing that capital would flow to areas offering the highest returns, akin to water seeking its level (Bagehot, 1873; Marwa & Zhanje, 2015; Abdulmalik & Umar, 2024). Literature has it that Bagehot's work spurred a lot of interest in this line of thought and subsequently scholars like Schumpeter and Keynes joined the foray. According to Schumpeter (1912), innovation (new combination) is the key driver to economic growth. He regarded a new combination as a form of new a new idea, a new means of production, new ways of producing existing goods, new market development, innovation in raw material and sectorial alteration. An example of a new market development according to Stolbov (2012) is the Mpesa Fintech

services offered in Kenya. Schumpeter also insisted that, such new combination can be realized through two channels i.e. administrative powers and by means of banking loans in case of open economy (Stolbov, 2012). It can therefore be said that Schumpeter position is that banks and other financial institutions are intermediary between innovators and owners of capital. Therefore, once loans are given by the bank, it authorizes the implementation of the new combination “innovative ideas” which in turn will spur economic growth and benefit the entire society. These loans according to him are crucial in the initial stage of creating new combinations. At the advanced stage of enterprises growth “at steady state” the revenue accrued from the production may finance the subsequent new combination. At this stage finance plays an auxiliary role. Therefore, it can be argued that finance facilitates economic development at least in the infant (early) stages of economic growth.

Additionally, the work of Gerschenkron (1962) looks at the role of finance on economic growth based on the degree of economic backwardness of the country. The countries which are more backward economically they need a strong financial system to catalyse development while those countries which are relatively not economically backward did not need active financial sector. Using German and Britain as polar example of economic backward and noneconomically backward country respectively during the time of his writing (Eschenbach, 2004). The work of Patrick, 1966 and Goldsmith 1969 further complemented the position of Gerschenkron (1962) by emphasizing the role of financial sector in propelling the process of economic development. Their works however fell short of clearly answering the question of causality between the two phenomena (Marwa & Zhanje, 2015).

The link between finance and economic growth may run through various transmission channels. Already a very simple growth model illustrates that there are three important connections

through the impact of attitude. Attitude has either a direct or an indirect effect on behaviour, and it is either a one-dimensional or a multidimensional factor. Ajzen & Fishbein (1980) mentioned that TRA was designed to explain virtually any human behaviour. TRA is a general model, not designed for a specific behaviour or technology. It is one of the most fundamental theories of human behaviour. According to Ajzen & Fishbein(1980), in predicting human behavior, two major constructs were key : attitude toward behaviour and subjective norm.

In further extending the TRA, by Ajzen (1985), developed the theory of Planned Behaviour (TPB). This TPB extended the TRA by adding a new construct which was perceived behavioural control. It is theorised to be an additional determinant of intention and behaviour. Ajzen (1985) considered that this theory is moderated by three main constructs; attitude toward behaviour and subjective norm which are adopted from TRA, and the new one, the perceived behavioural control. Presenting the relationship mathematically, TPB expresses the main equation as:

$$BI = A + SN + PBC.$$

Where BI represents behavioral intention, A is attitude towards the behavior, SN is subjective norm, and PBC is perceived behavioral control. This equation suggests that an individual's intention to perform a behavior is influenced by their attitude towards that behavior, the social pressure they perceive to perform it, and their perceived ability to control the behavior.

2.4 Empirical Review

This empirical review is divided into three areas- empirical reviews on the impact of Fintech on economic growth, empirical reviews on the impact of financial inclusion on economic growth and lastly on empirical reviews on the relationship between Fintech, financial inclusion and economic growth.

2.4.1 Empirical Review on the Impact of Fintech on the Economic Growth

The following extant literatures were reviewed on the impact of Fintech on the Economic Growth.

Andrianaivo and Kpodar (2010) examined the impact of information and communication technologies (ICT), especially mobile phone rollout, on economic growth in a sample of African countries from 1988 to 2007. Further, the study investigated whether financial inclusion is one of the channels through which ICT influences economic growth. In estimating the model, the study used a wide range of ICT indicators, including the mobile and fixed telephone penetration rates and the cost of local calls, and addressed any endogeneity issues by using the System GMM estimator. Financial inclusion was captured by variables measuring access to financial services, such as the number of deposits or loans per head, compiled by Beck *et al.* (2007) and the Consultative Group to Assist the Poor (CGAP, 2009). The results confirmed that ICT, including mobile phone development, accounts for economic growth in African countries.

Tijani, and Ilugbemi (2015) in a study of Fintech, examined the impact of electronic payments channels (EPC) on National development (ND). The survey was targeted at current and savings accounts customers of deposit money banks in Nigeria. One hundred and twenty (120) questionnaires were administered in six (06) banks in Ado –Ekiti metropolis. Ninety-Eight (98) questionnaires were returned for processing. The data was analyzed using inferential statistics specifically with the use of chi-square. The study reveals that electronic payment channels (EPC) have impacted on the economy and therefore contributing positively to national development.

Thaddeus, Ngong and Manasseh (2020) examines the long run causal effect of digital financial inclusion on economic growth in sub-Saharan Africa. The study employs a sample of 22 sub-Saharan African countries using quarterly data from 2011 to 2017. The dependent variable was

economic growth measured by GDP per capita with the indicators of digital financial inclusion being automated teller machine (ATM), number of commercial bank branches (CBB), Loan Outstanding (LOS), Mobile agent outlets (MOAO) and Mobile money transactions (MOMO). The long run causal effect of digital financial inclusion was analyzed using the vector error correction model and the granger causality test for causality and direction. The estimated results indicated that a long run causal relationship exists between digital financial inclusion and economic growth in sub- Sahara Africa and the direction of causality is unidirectional running from economic growth to digital financial inclusion. The study observed that digital financial inclusion is strongly associated with the progress and development of the sub-Saharan economic growth.

Noha and Mahmoud (2021) analysed the impact of the proliferation of financial technology (Fintech) on the achievability of the Sustainable Development Goals (SDGs) with respect to extreme poverty by 2030. The study used system General Method of Moments (GMM) dynamic panel estimation methodology on annual data for 12 MENA and 45 SSA countries in addition to 70 emerging markets and developing economies from outside the two regions over the period from 2004 to 2018. Three different measures characterize Fintech adoption: the number of mobile cellular subscriptions per 100 people, the number of fixed broadband subscriptions per 100 people, the percentage of people in the population who use the internet. The preliminary results of the study indicated that Fintech measures have a positive statistically significant impact on reducing extreme poverty for the full sample as well as the MENA and the SSA regions. The second part of the study employs a gap analysis against four poverty targets — United Nations' 0%, World Bank's 5%, and two intermediaries of 1.5% and 3% to capture all possibilities. The results of the gap analysis suggested that the situation in the MENA region is more promising

than the SSA region where improvements in Fintech along will bring extreme poverty below 5% in all MENA countries with the exception of Yemen and Djibouti. For the SSA region, only 4 out of the 45 countries; Gabon, Cabo Verde, Seychelles, and Mauritius were able to close the extreme poverty target of 5%.

Samuel, Onwumere, Abner and Inim (2023) investigated the effect of Fintech on economic growth by extension financial inclusion on a quarterly period from 1999 to 2020 in Nigeria. Fintech is posit to affects economic growth directly and indirectly through financial inclusion. The Johansen cointegration test, and the Granger non-causality test, a Toda–Yamamoto procedure were adopted. Findings showed that Fintech impact on economic growth and financial inclusion through a reduction in income inequality and poverty rate.

Olubukola, Ikpefan, Akinrinola and Itai (2023) investigated the impact of digital financial services on the Nigerian economy, a study of Nigerian deposit money banks (DMBs). An expo-facto data analysis was carried out on independent variables of digital financial services: volume of ATM transactions (VATM), volume of POS transactions (VPOS), volume of WEBPAY transactions (VWBP) and volume of mobile banking (VMOB) regressed on Gross Domestic Product (GDP) as a dependent variable. These data were obtained from the Central Bank of Nigeria (CBN) Statistical Bulletin and analysed using the ordinary least square regression (OLS). Findings from the study revealed that the volume of mobile banking, point of sales, and volume of automatic teller machines transactions have positive impact on the economy of Nigeria with the volume of automated teller machines having the highest impact on the gross domestic product of Nigeria as a proxy of economic growth while the volume of web services has a negative impact on the Nigerian gross domestic product.

Akwam, Okaro, Okonkwo, Adigwe and Ogbonna (2023) examined the effect of financial technology on economic growth of Sub-Saharan African economies from 2004 to 2021 using panel regression analysis. Owing to findings that Fintech evolutions does not comply with financial institution regulations and their engagement in regulatory arbitrage, the study attempts to ascertain the implication of financial technology components on economic growth rate of Sub-Saharan African economies. The study was anchored on Technology Acceptance Model (TAM). The findings showed that the number of ATM per 100,000 adults had significant relationship with GDP for the Sub-Saharan African economies combined within the period under review. The number of mobile money accounts per 1000 adults also had a significant relationship with GDP for the Sub-Saharan African economies combined while the number of mobile money transactions per 100,000 adults (MMT) also showing a significant relationship that improved economic growth rate in the Sub-Saharan African economies. However, financial technology does not granger cause a significant change in the economic growth rate of Sub-Saharan African economies. The results revealed a strong significant relationship between financial technology and economic growth of Sub-Saharan African economies, while showing mixed results at individual level with financial technology having significant effect on Nigerian economic growth rate but showing insignificant effect on the economic growth rate of Kenya and South Africa.

Elfenesh, Amsalu and Atnafu (2023) investigated the influence of digital technology on the economic growth of Sub-Saharan African countries, utilizing data from 33 sample countries from 2010 to 2020. A two-step system GMM (Generalized Method of Moments) model was employed for data analysis, considering various factors including investment levels, inflation rates, government expenditures, unemployment, foreign direct investment, and the influence of digital technology on economic growth. Short-term analysis reveals a significant positive

correlation between digital technology and economic growth. Additionally, investment levels, inflation rates, and government consumption expenditures were found to positively predict the short-term economic growth, while unemployment and foreign direct investment had adverse effects. Long-run model analyses also confirm the substantial positive influence of digital technology on economic growth in the region. The study underscores the necessity for investments in developing digital technology alongside clear policy frameworks. It suggests that augmenting human capital and infrastructure development will further amplify the positive effects of digital technology on economic growth in Sub-Saharan Africa. The findings highlight the pivotal role of digital technology in fostering economic growth in Sub-Saharan Africa, emphasizing the importance of strategic investments and policy initiatives to harness its potential. Tafirei and Gani (2023) examined the extent to which Fintech has affected bank funding and economic growth in the region by utilizing data from 56 banks across 19 SSA economies from 2010 to 2020. The analysis was conducted using a covariance-based structural equation modeling method. The results show that Fintech disruptions have triggered an increase in equity funding for banks, while having negligible effects on deposit and long-term debt financing. The study also outlines that Fintech's limited size within the financial system has ultimately restricted its effects on economic growth in SSA. Furthermore, the study did not find evidence of Fintech mediating the impact on economic growth via the bank funding channel, suggesting that SSA banking systems are capable of resisting Fintech disruptions for financial stability.

Ngong *et al.* (2023) examined financial technology and economic growth nexus in the East African community states. The aim of the study was to examine the causation linking financial technology to economic growth in the East African Community states from 1997 to 2019. Autoregressive distributed lag was used. Gross domestic product per capita proxies economic

growth, automated teller machines, point of sale, debit card ownership and mobile banking measure financial technology. The results unveil a significant relationship between financial technology and economic growth. The findings showed bidirectional causality between automated teller machine and economic growth, with unidirectional causation from economic growth to point of sales and internet banking, mobile banking and government effectiveness to economic growth. The error correction term was negatively significant, demonstrating a long-term convergence between Fintech measures and economic growth.

Gürbüz, Kılıç and Tatlıyer (2024) examined the impact of Fintech on economic growth: evidence from panels of Turkey and Southeast Asian countries. The study attempted to evaluate the impact of financial technological improvements on economic growth from 2000 to 2020 for Turkey and selected Asian countries. In obtaining results, panel data analysis was used. The results indicated that internet usage rates and fixed broadband subscriptions have positive impacts on economic growth. However, mobile cellular subscriptions do not have any impact on economic growth. According to the findings, information-communication technologies and other macroeconomic factors positively affect economic growth.

Jiaqi (2024) examined the impact of digital financial inclusion on economic development in urban and rural areas of China using remote sensing. With the aim of investigating the non-spatial and spatial effects of digital financial inclusion on urban and rural economic development, 31 provinces from 2011 to 2019 were targeted and the research gap was complemented by processing luminosity-corrected GDP and land cover images to generate urban and rural GDP statistics. This study highlighted the following conclusions: first, digital financial inclusion has positively localized effects on rural economic development. Additionally, the spatial spillover effect of digital financial inclusion in rural regions is more profound than that of traditional

finance. Last, digital financial inclusion has spatial spillover effects in narrowing urban-rural inequality that traditional finance lacks.

Kindai (2024) empirically assessed the effect of financial technology on economic growth in Nigeria spanning a data period from 2000 to 2022. The gross domestic product, a proxy for economic growth, is made as a function of automated teller machine, point-on-sale, web online payments, mobile transfers and national electronic fund transfers. The restricted error correction model is utilized by the study and findings indicate evidence of long run relationship between economic growth and Fintech variables. Accordingly, the study finds that both in the short run and long run economic growth is significant and positively responsive to changes in automated teller machine, point-on-sale and mobile transfer channels contrary to significant and negative response to changes in web online payments and NEF transfers in Nigeria.

Ngong, Thaddeus and Onwumere (2024) examined financial technology and economic growth nexus in the East African community states from 1997 to 2019. Autoregressive distributed lag was adopted for the study. Gross domestic product per capita proxies economic growth, automated teller machines, point of sale, debit card ownership and mobile banking measure financial technology. The results unveil a significant relationship between financial technology and economic growth. The findings show bidirectional causality between automated teller machine and economic growth, with unidirectional causation from economic growth to point of sales and internet banking, mobile banking and government effectiveness to economic growth. The error correction term is negatively significant, demonstrating a long-term convergence between Fintech measures and economic growth.

2.4.2 Empirical Review on the impact of Financial Inclusion on the Economic Growth

Tita and Aziakpono (2017) analysed the relationship between various aspects of financial inclusion and income inequality in sub-Saharan African using the Findex 2011 dataset with the intention to determine which aspects of financial inclusion have the greatest effect on income inequality. The study using general method of moments (GMM) analysed data from sub Saharan African countries from 2011 to 2014. The results showed that formal account use for business, electronic payments and formal savings have a positive relationship with income inequality.

Dinh and Nguyen (2019) evaluated the impact of indicators of financial inclusion on economic development in the Asia-Pacific region from 2005 to 2015 using Pooled Least Squares, Fixed Effects, and Random Effects models. The result showed that correlations exist between large numbers of bank branches, ATMs, domestic credit in the private sector and the increased rate of development in the economy. People will gain a more prosperous life due to this development. The paper also provides recommendations for the governments of developing countries to improve financial inclusion.

Nguling'wa (2019) examined the impact of financial inclusion on economic growth using a panel of 25 Sub-Saharan African countries, each observed over six years from 2009 to 2014. The study using pooled least squares(POLS), fixed effects(FE), and random effects(RE) models, test whether an increase in the level of financial inclusion, controlling for gross savings and gross primary school enrollment leads to economic growth. The findings based on a two-way random effects estimation revealed the impact of financial inclusion on economic growth. Gross savings lead to economic growth, but gross primary school enrollment has an unexpected negative impact. The finding implied that Sub-Saharan African countries can increase economic growth by enhancing financial inclusion by leveraging financial technology.

Angga, Feri and Someya (2020) empirically analysed the contribution of the financial inclusion to economic growth, poverty alleviation and income inequality in Eastern Indonesia. The study utilizes two approaches in this research - Toda-Yamamoto VAR bivariate causality model and the dynamic Panel Vector Autoregression (PVAR). The results of the bivariate causality model indicate a high relationship level between financial inclusion, economic growth, poverty, and income distribution in Eastern Indonesia. The socio-economic growth has a positive impact on the level of financial inclusion, with a negative impact on poverty. Also, financial inclusion was found to have a positive effect on inequality, which lead to widespread income inequality in Eastern Indonesia.

Chinoda and Mashamba (2021) examined the interplay between financial inclusion, bank competition and economic growth in Africa. The study employed the pooled mean group estimation-based panel autoregression distribution lag approach from 2004 to 2018. A panel data analysis for 20 African countries was used. The study found a significant positive relationship between financial inclusion and economic growth in the long run. However, in the short run, economic growth significantly reduces financial inclusion. We also found that in the long-run bank competition reduces financial inclusion in line with the information hypothesis. However, in the short run the effect is significantly positive, consistent with the market power hypothesis.

Muri and Mehmet (2021) empirically assesses the relationship between financial inclusion and economic growth in Sub-Saharan African (SSA) countries for the period from 2004 to 2017, using the generalized method of moments and Dumitrescu–Hurlin's causality test. Based on the multidimensionality of the financial inclusion measures, a principal component analysis was applied to develop a composite index for financial inclusion. The results showed that financial inclusion has a significant positive influence on economic growth in SSA countries. Other

findings indicated that there is causality running from economic growth to financial inclusion in the short run.

Wytone (2021) examined the effect of financial inclusion and depth on inclusive growth for 26 sub-Saharan Africa countries from 2011 to 2017. Using the random effects panel regressions, the results suggested that financial inclusion positively affects inclusive growth in the sub-Saharan Africa region, while financial depth variable does not. At very high levels of financial inclusion, however, the results portray decreasing marginal effects of financial inclusion on inclusive growth. Evidence from this study, however, shows weak transmission channel from financial deepening indicators to inclusive growth.

Adedokun and Aĝa (2022) investigated the effects of financial inclusion on 41 Sub-Saharan African countries from 2004 to 2019, employing the generalized method of moments (GMM) method and a Granger causality analysis. According to the results there existed a positive relationship between financial inclusion and economic growth. The non-causality tests revealed bi-directional causality between the variables for the whole region and low-income and lower-middle-income countries. In addition, unidirectional causality was shown to run from financial inclusion to economic growth in upper- middle-income countries. In conclusion, the study is of the opinion that financial inclusion positively affects the economic growth of SSA.

Alabdulrazag, Harrathi and Omar (2022) empirically examined the impact of financial inclusion in Saudi Arabia, measured as a multidimensional index, on economic growth, using quarterly data over the period from 2009 to 2018. The study adopts the autoregressive distributed lag estimation technique and the required statistical tests to ensure the model's validity. The empirical findings reveal evidence of a significant long-run positive impact of financial inclusion on per-capita GDP in Saudi Arabia.

Azimi (2022) explored the effects of financial inclusion on economic growth in a global perspective with a large number of panels classified by income and regional levels from 2002 to 2020. For analysis, a comprehensive composite financial inclusion index comprised of penetration, availability, and usage of financial services is developed along with an estimation of heterogeneous panel data models augmented with well-known variables. The study also employs a GMM (generalized method of moment) approach using System-GMM estimators to examine the effects of financial inclusion and the control predictors on economic growth. The results of the panel cointegration test supports a long-run relationship between economic growth, financial inclusion, and the control variables in the full panel, income-level, and regional-level economies. In addition, the results of the GMM model clearly indicate that financial inclusion has a significantly positive impact on economic growth across all panels. This implies that financial inclusion is an effective tool in fostering rapid economic growth in the world.

Ehiogu (2022), investigated the role of the insurance business in financial inclusion in Nigeria for the period from 2000 to 2021. Using an ex-post-facto research design where Error Correction Model technique was used to estimate the model, the dependent variable was financial inclusion proxied by the ratio of total bank deposits to the total population while the independent variables were insurance penetration rate, insurance density, dependency ratio, and income level. The results showed that though insurance penetration, dependency ratio, and income level had negative effects on financial inclusion in Nigeria for the period studied, however, insurance density increased financial inclusion significantly over the same period.

Ifediora, Kenechukwu, Eze, Eboseleme Ageme, Ibe and Onwumere (2022) examined the impact of financial inclusion on economic growth using panel data of 22 sub-Sahara African (SSA) countries during the period spanning from 2012 to 2018. The study employed the system

Generalized Method of Moments (GMM) and also uses a composite index of financial inclusion as well as individual financial inclusion indicators. The result of the study showed that the availability dimension of financial inclusion, penetration dimension of financial inclusion and composite financial inclusion (all indicators put together) significantly and positively impact economic growth while the usage dimension of financial inclusion improves economic growth but not significantly.

Sarpong and Nketiah-Amponsah (2022) empirically examined the quantitative relationship between financial inclusion and inclusive growth in sub-Saharan Africa using a panel of 46 countries for the period from 2004 to 2018. The evidence suggested that usage of financial services, among other covariates, has a quantifiable and discernible impact on inclusive growth compared with availability and knowledge of financial services.

Qazi, (2022) examined the impact of financial inclusion on economic growth in Vietnam, utilizing data spanning the period from 2001 to 2021. The study uses composite risk, trade openness, and government expenditures as control variables. The study follows the access to finance theory, which suggests that access to financial services such as credit, savings, and insurance can help promote economic growth and development. The nexus between financial inclusion and economic growth has never been examined in the case of Vietnam, which represents a greater share of global trade and income. Moreover, this study uses trade openness, government expenditures, and the composite risk index as control variables in the empirical model. Hence, the study contributes to the existing literature in some meaningful ways. This study employs the FMOLS method to estimate the long-run coefficients of financial inclusion, trade openness, composite risk, and government expenditures. According to the findings, financial inclusion boosts economic performance.

Jima and Makoni (2023) examined the relationship between financial inclusion and economic growth while further identifying the direction of causality between the two variables in twenty-six (26) Sub-Saharan African (SSA) economies using annual secondary data covering from the year 2000 to 2019. Methodology wise, to develop a single composite index to proxy financial inclusion, the study uses the principal component analysis (PCA) technique. For the purpose of assessing the stationarity properties, assess the factors that affect economic growth, and examine the long-run relationships between financial inclusion and economic growth, the study adopts the panel unit root, system generalised method of moment (GMM), and ARDL cointegration tests respectively. The Granger non-causality test is also used to verify the direction and magnitude of causality. The study reveals that financial inclusion and economic growth share a strong long-run relationship and that there is bi-directional causality, indicating synergy between these two variables.

Kilimvi and Ezekwesiri (2023) examined the effect of financial inclusion on economic growth of Africa. Descriptive and correlational research design were employed to explain and examine the relationship between financial inclusion and economic growth. This study adopted the quantitative research approach. Secondary data from Financial Access Survey (FAS), World Development Indicators (WDI) and The Global Financial Index Report from 2015 – 2021 were examined. The relationships were tested using Generalized Moments Method (GMM) that was preferred over the Ordinary Least Square method (OLS) because of its efficiency and veracity to work with small samples. The results showed that financial inclusion indicators were positively correlated to the economic growth. Using the dimensions of financial inclusion such as availability, penetration, and usage, it can ascertain a positive impact on the economic growth of Africa at large.

Mohammed, Kassem, and Ali (2023) examined the impact of financial inclusion and institutional quality on economic growth in Sub-Saharan Africa (SSA). The study concentrates on 20 SSA nations and de-plays panel data from 2004 to 2020 using a two-step system Generalized Method of Moments (SysGMM) approach. The results show that financial inclusion has a positive impact on SSA's economic growth irrespective of the measure of economic growth examined. The results also revealed varied effects of institutional quality on various measures of economic growth. The implication is that institutions and financial inclusion should not be ignored in growth policies.

Wenzhi and Yingdong (2023) examined Digital financial inclusion and quality of economic growth. The study, using China's provincial panel data, measures the quality of economic growth based on technological innovation, coordinated development, environmental protection, opening to the outside world, and people's livelihood. It verified the impact of digital financial inclusion on the quality of economic growth by utilizing the panel fixed effect model, mediation effect model, panel threshold model, and spatial Durbin model. Digital financial inclusion has a positive impact on the quality of economic growth, particularly in the eastern region and regions with high marketization. It can effectively promote the quality of economic growth by stimulating entrepreneurial vitality, and has had a positive and increasing non-linear effect on the quality of economic growth over the past few years. Moreover, digital financial inclusion can promote the quality of economic growth in neighboring regions. Therefore, the quality of economic growth can be significantly improved by expanding the coverage, the breadth, the usage and the depth of digital financial inclusion.

Yakubi, Basuki, Purwono and Usman (2023) examined the influence of all financial inclusion elements, which included Access, Usage, and Quality on Socio-Economic development in 77

low-income countries. Cross-sectional data from the year 2018 to 2021 were gathered from various sources, including the World Bank and the IMF while SPSS software was used in analyzing the data and conducting the multiple regression process. Results showed that all financial inclusion components have a significant positive impact on socio-economic development, yet at different levels. Elements of Access and Usage were higher than those of Quality. The study also revealed an important positive association between the aspects of sustainable development, particularly the educational levels of the population and the amount of real income per capita in low-income households.

Adeniji, Odugbemi and Obaniyi (2024) empirically examined the impact of financial inclusion on the economic growth of forty-one SSA countries for the period from 2005 to 2017. The study employed static and dynamic panel using Pooled OLS, Random Effect Model, and the Generalized Method of Moment Panel Model as estimation techniques. The result of GMM-Difference showed a positive and significant relationship between measures of financial inclusion (number of commercial bank branches, mobile cellular subscriptions and the deposits to GDP ratio) and economic growth, while the result of GMM-System showed a positive and significant relationship between financial inclusion, i.e., mobile cellular subscriptions and economic growth.

Agala and Efeghaje-Ego (2024) assessed the effect of financial technology and financial inclusion on the implications of Nigeria's economy. The objectives of the study were to assess how assess the pattern of trend of Fintech and real GDP in Nigeria and ascertain the pattern of movement of financial inclusion and real GDP in Nigeria. The study adopts the expost facto design method to generate the necessary information required for the study. Data were sourced from the Central Bank of Nigeria from the period 2010 to 2020. The study utilized the trend and

descriptive method of estimation and found direct and substantial influence of Fintech on real GDP; but a mild effect between financial inclusion and real GDP in Nigeria.

Boachie and Adu-Darko (2024) investigated how financial inclusion affects the expansion of the economy in sub-Saharan Africa. It was conducted through a quantitative research design to analyse the interactive effects of financial inclusion and human capital on this growth. The research was conducted in 47 African countries from 2010 to 2020. The study found that financial inclusion and economic growth were positively correlated using a Driscoll Kray error estimate approach. Financial inclusion has a beneficial effect on economic growth through human capital. To boost economic growth in sub-Saharan Africa, the agenda for financial inclusion must be continuously improved, and human capital development must be furthered.

Kamara (2024) examined the impact of financial inclusion (FI) on economic growth (EG) and poverty reduction in 18 sub-Saharan Africa (SSA) over the period from 2014 to 2021. The study employed fixed effects, random effects, panel-corrected standard errors (PCSE), Driscoll Kraay standard errors, the generalized method of moments (GMM), and quantile regression. A financial inclusion composite index was created using principal component analysis (PCA). According to the findings from all the models, FI had a significant positive effect on EG, and it also reduces poverty in SSA.

Girma (2024) investigated the effect of financial inclusion and financial stability on economic growth in a panel study of 30 African countries over the period from 2004 to 2020. Data were analyzed using the panel ARDL model. The panel ARDL estimation results demonstrated that financial inclusion has a statistically significant positive long-term effect on economic growth, though its short-term impact is insignificant. The study also found that the effects of financial inclusion on economic growth vary across different income levels. Specifically, there is a

positive association in low-income countries, a negative association in lower-middle-income countries, and a positive but insignificant effect in upper-middle-income countries.

Jallow, Sahoo and Mahapatra (2024) examined the relationship between financial inclusion and per capita income growth for 42 sub-Saharan African countries from 2007 to 2020. Using the Generalized Method for Moments framework, the study discloses that a rise in the number of bank branches, automated teller machines, and savings stimulates per capita economic growth. Conversely, an elevated number of credit provisions to the private sector and high growth of population hinder per capita economic growth.

Odumusor, Sackey and Abiji (2024) examined financial inclusion and its effect on economic growth in Nigeria. The general objective of the study was to ascertain the effect of financial inclusion on Nigeria's GDP growth. Determining the effect of loans on small businesses and the extent to which deposits and loans from commercial banks' rural branches influenced Nigeria's economic growth were two specific objectives. In this investigation, an ex post facto research design was implemented. This research investigated commercial bank loans extended to small-scale enterprises, deposits, and loans from commercial bank branches located in rural areas. Additionally, it examined the GDP of Nigeria from 2000 to 2020. The study employed a judgmental sampling technique. The data were analyzed in the research using Ordinary Least Square Regression, facilitated by Statistical Package E-View version 10.0. The study's findings indicate that the provision of small business financing by commercial banks has a substantial influence on the growth of the Nigerian GDP.

Owandjokuna (2024) investigated the relationship between financial inclusion and economic growth in East, West, and Southern Africa. The study covered the period from 2009 to 2021, and for analysis, it uses a unique econometric method known as fully modified ordinary least squares.

Furthermore, the research sample was separated into two groups according to the income. The results show that financial inclusion has statistically significant effect on economic growth. Financial inclusion positively impacts on economic growth in both low-income and high-income countries.

Tissaoui, Hakimi and Zaghdoudi (2024) examined if financial inclusion in low-, lower-middle-, and upper-middle-income nations promotes human development. The aim was accomplished by employing an empirical technique of using the System Generalized Method of Moments (SGMM) and dynamic threshold panel (DTP) data on a sample of 79 nations between 2000 and 2017. Three sub-samples representing low-, lower-, and upper-middle-income nations were created from the entire sample. In general, lower- and upper-middle-income nations' human development is positively impacted by financial inclusion, according to SGMM empirical studies. Furthermore, the DTP method's results show that there is a threshold impact for both human development and financial inclusion. The degree of human development in upper-middle-income and lower-middle-income countries is greatly raised by financial inclusion, whether the threshold is met or beyond.

Udensi and Akintunde (2024) investigated the impact of financial inclusion on economic growth in Nigeria, a country where a significant portion of the population remains financially excluded despite ongoing efforts to enhance access to financial services. The research data cover the period from 2014 to 2023 and the data was analysed using Multiple Linear Regression, Pearson Correlation and Granger Causality Test. The problem addressed is the limited understanding of how various aspects of financial inclusion, particularly mobile money, banking services, and credit availability, affect Nigeria's GDP growth. The primary objectives of the study were to assess the current level of financial inclusion, analyze its relationship with GDP growth, and

provide evidence-based policy recommendations to improve financial access and support economic development. To achieve these objectives, a secondary data analysis was conducted, employing multiple linear regression, Pearson correlation, and Granger causality tests. The findings reveal a marginally significant positive relationship between Mobile Money Subscriptions (MMS) and GDP growth, while access to formal banking services and credit availability showed no significant correlation with economic growth. These results highlight the importance of mobile money as a key driver of financial inclusion, contrasting with the limited impact of traditional banking services.

Yap, Lee & Liew (2024) in their contribution, examined the roles of insurance and banking services in financial inclusion. They employed the use of Principal Component Analysis to compute different sets of a multidimensional financial inclusion Index (FI index) that incorporates banking, life, and non-life insurance indicators for 72 countries from 2015 to 2019. The result showed that some countries experience significant leaps in their financial inclusion levels, while the opposite holds true for most countries regardless of their developmental stage. Meanwhile, it was found that non-life insurance has a strong positive impact on the overall financial inclusivity of the sample countries, with more than half of them recording higher financial inclusion. The authors therefore came to the conclusion that non-life insurance has a significant contribution in enabling financial inclusion.

2.4.3 Empirical Review on the Relationship between Fintech, Financial Inclusion and Economic Growth

Femi-Lawal (2017) explored the role of Mobile Money Services (MMS), also known as DFS in enhancing access to financial services. The research was driven by the increasing mobile network spread, the under-served, ubiquity/ penetration of mobile devices amongst both the poor

and low-income earners, factors affecting FI, fees which are disincentive to users, introduction of cashless Nigeria by the Central Bank of Nigeria as well as the emergence of Mobile Money Services in 2009. An in-depth analysis of MMS in driving FI and paradigm shift in traditional payment systems was embarked on and focused on issues associated with services provided MMS Operators viz transaction fees, transaction value and count; stakeholders within the ecosystem, user experience and security of funds, policy and regulation on financial services delivery as well as inclusive participation of the government, regulatory bodies and infrastructure providers. The findings showed that while the MMS have a huge potential to drive DFS in Nigeria, it would require deliberate actions by all stakeholders to establish an appropriate solution capable of transforming the economy and also the contribution of MMS to FI in reducing the financially excluded is critical to the nation. Advancing this therefore, the government and other critical stakeholders would need to create a framework that will enhance access to financial services.

Yengeni (2020) in the study titled “Myth or Magic: The Impact of Financial Technology on Financial Inclusion in Africa”, examined the relationship between financial technology (Fintech) and financial inclusion by running a regression analysis between Fintech variables and the financial inclusion indices. The study found that that the highest financial inclusion levels were in the Southern and East African regions, with the lowest in Central Africa. The introduction of mobile money has had a significant impact on financial inclusion levels, particularly in East Africa. The study analysis also found that the usage variable is critical in understanding the depth of financial inclusion. While this was so, there is still a great need for improvements across financial access, usage and availability in Africa. The regression analysis confirmed this

assessment, showing that overall, the use of mobile accounts has a positive and significant relationship with financial inclusion.

Bayar, Gavriletea and Păun (2021) examined impact of mobile phones and internet use on financial inclusion: empirical evidence from the EU post-communist countries. The study investigated this linkage in a sample of 11 post-communist countries of the European Union from 1996 to 2017 using panel cointegration and causality analyses. Firstly, the study investigated whether mobile cellular phone subscriptions and the rate of Internet usage affect financial institutions' access; secondly, it analysed the impact of these variables on financial market access. Results indicated that mobile cellular phone subscriptions positively affect both financial institution access in countries like Hungary, Latvia, Lithuania, Poland, and Slovenia and financial market access in Bulgaria, Croatia, and Hungary. Also, a negative relationship between mobile cellular phone subscriptions and financial institution access was noticed in the Czech Republic and regarding financial market access in the Czech Republic and Poland. The findings also indicated both positive and negative relationships between Internet usage rates and financial institutions and financial markets access. By increasing Internet usage users can improve access to financial institutions in Bulgaria, Croatia, Czech Republic, Hungary, and Poland and can increase financial markets access in Latvia and Slovenia.

Inoussa (2021) explored the relationship between Fintech, financial inclusion, economic growth and income inequality for a panel of 16 SSA countries using data from the Financial Access Survey, the Global Findex database and the World Development Indicators for 2014 and 2017. The study introduces three new indices of financial inclusion for 16 SSA. The indices were used to assess the impact of Fintech-driven financial inclusion on economic growth and income inequality. The results provided evidence that Fintech-driven financial inclusion is significantly

positively related with economic growth and that Fintech-driven financial inclusion reduces income inequality (2013).

Alabi and Olaoye (2022) examined the effects of Technology Adoption on Financial Inclusion with focus on Automated Teller Machines, Internet usage and Mobile Cellular subscriptions as the major drivers in a cross-country analysis between China and Nigeria. The study employed Pooled OLS and Feasible Generalized Least Squares estimators. Financial Inclusion was represented by number of depositors with Commercial Banks per 1,000 adults' population. The results revealed that Automated Teller Machines, Internet usage and Mobile Cellular Subscriptions exert insignificant positive effects on Financial Inclusion both in China and Nigeria. The technology variables however exerted significant positive impact on Financial Inclusion as represented by other dummy countries in the Panel. The study also found that GDP growth rate has significant negative relationship with Financial Inclusion in China and Nigeria as well as the rest of the world as represented.

Ashenafi and Dong (2022) investigated the impact of financial inclusion and Fintech on income inequality using waves of survey data for 2011, 2014, and 2017 across 39 African countries. By using pooled ordinary least square and two-stage least square (2sls) estimation methods, we obtain three key findings. First, institutional factors such as political stability, control of corruption, and government effectiveness determine Fintech and financial inclusion. Second, Fintech encouraged individuals to have a formal bank account, thereby promoting financial inclusion. Third, financial inclusion and Fintech exacerbate income inequality.

Djoufouet and Pondie (2022) examined the impacts of Fintech on Financial Inclusion, the Case of Sub-Saharan Africa. The objective of the paper was to determine the impact of Fintech on the financial inclusion of populations in sub-Saharan Africa where financial education is low. To do

so, data were collected on a sample of 35 countries over a period from 2011 to 2020. Estimates were made using two-stage least squares models and the Lewbel 2LS model. It was clear from the results that Fintech contributed significantly to the financial inclusion of people in sub-Saharan Africa. Mobile phone ownership facilitates the use of financial services. It is noted that a 1% increase in the number of people using a phone would contribute to a 0.67% increase in the financial inclusion rate. Driscoll-Kraay technique consolidated these results by showing that with 1% of people having access to Fintech tools, there is an improvement in the financial inclusion rate of about 0.70%.

Ekong and Ekong (2022) empirically investigated the effect of digital currency development (digital finance) on financial inclusion in Nigeria for the period. Nigeria undertook her digital currency development to rip the benefits of financial inclusion, safer remittances and exchange rate regularization among others. The researchers developed high-frequency quarterly data for the analysis from quarter one 2006 to quarter four 2020 in a weighted stepwise forward regression. A model similar to the one used by Demir *et al.* (2022) and Altunbas and Thornton (2019) with some modifications was developed. Findings suggested that (1) a unit rise in the usage of automated teller machines by citizens spontaneously raised financial inclusion in a quarter in Nigeria by 0.012 units and were statistically significant; (2) a percentage rise in the use of point of sales transaction by citizens in the country also raised financial inclusion in Nigeria by approximately one percent(1%); (3) a percentage increase by mobile payment users in Nigeria will spontaneously increase financial inclusion by at least 0.4%; (4) a percentage rise in web payment services reduces financial inclusion by 22% in Nigeria; (5) Cumulative positive effect of digital finances on financial inclusion in Nigeria was approximately seven percent(7%).

Islam, Ysuuf and Shuaibu (2022) examined the impact of financial technology (Fintech) on financial service delivery of deposit money banks in Nigeria. The research design used as a guide is ex-post facto method, as the study entails the use of annual reports and accounts of listed deposit money banks in the Nigerian Stock Exchange (NSE); secondary data were sourced from the bank's financial reports for the period of ten years from 2012 to 2021 as contained in bank's annual reports and accounts. Descriptive statistics, correlation and regression analysis are used to analyze the data using SPSS 22 statistical software. The result showed that mobile banking, internet banking and POS banking have significant impact on the financial service of listed deposit money banks in Nigeria.

Jean-Claude, Wirajing and Nchofoung (2022), investigated the digital technology-financial inclusion nexus in 43 Sub-Saharan African countries from 2004 to 2019. The methodologies are the Generalized Method of Moment (GMM) to take care of double causality and country heterogeneity and IV-Tobit to take into account the limited range in the dependent variables. At all levels, digital technology measured by ICT indicators of the subscription rate of fixed and mobile telephone users, fixed broadband, internet users and a composite indicator of digitalization have positive significant effects on financial inclusion. A further robustness check is conducted by computing a composite indicator of financial inclusion to determine how it is affected by digital technology. The findings indicate that the rate of financial inclusion in Sub Saharan Africa rises with increasing digital technologies. There should be more investments in terms of promoting financial and technological infrastructures and also in the human capital sector since financial literacy can play an important part in promoting financial stability and inclusive finance in Africa.

Kouladoun, Wirajing and Nchofoung (2022) investigated the digital technology-financial inclusion nexus in 43 Sub-Saharan African countries from 2004 to 2019. The methodologies were the Generalized Method of Moment (GMM) to take care of double causality and country heterogeneity and IV-Tobit to take into account the limited range in the dependent variables. At all levels, digital technology measured by ICT indicators of the subscription rate of fixed and mobile telephone users, fixed broadband, internet users and a composite indicator of digitalization have positive significant effects on financial inclusion. A further robustness check was conducted by computing a composite indicator of financial inclusion to determine how it is affected by digital technology. The findings indicated that the rate of financial inclusion in Sub Saharan Africa rises with increasing digital technologies. There should be more investments in terms of promoting financial and technological infrastructures and also in the human capital sector since financial literacy can play an important part in promoting financial stability and inclusive finance in Africa.

Odeleye and Oyeneye, (2022) investigated the impact of financial technology (Fintech) on financial inclusion in Nigeria. The impact of financial technology on financial inclusion in Nigeria is the focus of the study. ARDL method was employed to test the relationship between Fintech and financial inclusion on a quarterly time-series data from 2009 to 2019. The empirical result of the study showed that financial technology has significant and negative impact on financial inclusion; implying that the current state of the country's financial technology does not translate to improvement in financial inclusion in the short-run. In addition, it showed that economic growth significantly influenced financial inclusion in Nigeria on short-run and long-run basis respectively.

Doku, Iddrisu, Bortey and Ladime (2023) studied the impact of digital financial technology on financial inclusion in Sub-Saharan Africa: The moderation role of institutional quality. The study looked at how the quality of institutions affects the relationship between digital financial technology and the level of financial inclusion over a 17-year period (2004-2021) in 34 Sub-Saharan African nations. The results of the two-stage system GMM show that digital finance technology has a favourable and considerable impact on financial inclusion. Furthermore, the presence of high-quality institutions strengthens the beneficial association between digital finance technology and financial inclusion, emphasising the significance of institutional quality in promoting digital finance and fostering financial inclusion.

Ibourk and Elouaourti (2023) examined financial technology as a driver of financial inclusion and inclusive development in the MENA region: risks and opportunities. The purpose of the paper was to investigate the impact of Fintech on financial inclusion levels across the MENA countries and Fintech as a tool for promoting financial inclusion. On the basis of micro-level data on 9,053 individuals extracted from the World Bank's latest Global Findex 2021 database, the comparative analysis utilized the principal component analysis method to develop a Digital Financial Inclusion Index (DFII) which highlighted that despite the various initiatives that have been undertaken, digital financial inclusion in the MENA region remains at a low level compared to other countries worldwide. Second, the results of the estimations on a Logit model points out that the educational level, labour force participation, information and communication technologies, and internet access are the main drivers of digital financial inclusion in the MENA region.

Iwedi Owakah and Wofuru-Nyenke (2023) examined the effect of financial technology on financial inclusion in Nigeria. This study used quarterly secondary data and all the data were

extracted from Central Bank of Nigeria (CBN) Statistical Bulletin (2021) from 2009 to 2019. In this study, financial technology was proxy using point of sale, automated teller machine, web banking technology and mobile banking technology, while financial inclusion in Nigeria was proxy using deposit ratio. Time series data were analyzed using the vector auto regression (VAR) estimation technique. The results showed that web banking technology has a positive and significant effect on financial inclusion in Nigeria, whereas point of sale, automated teller machine and mobile banking technology have a positive but not significant effect on financial inclusion in Nigeria. This suggests that an increase in the usage of financial technology (ATM, POS, WEB and mobile technology) will cause more Nigerians to be financially included.

Okon, Umoh and Samuel (2023), examined the effect of Fintech and financial inclusion on economic growth in Nigeria with data covering the period 2009 to 2019. The autoregressive distributed lag (ARDL) bounds test cointegration approach was used to estimate the respective equations and find evidence of a long-run nexus between Fintech, financial inclusion, and economic growth. The results showed that the direct measures of Fintech positively and significantly impact financial inclusion and economic growth but not automated teller machines. The negative nexus between automated teller machines, financial inclusion, and economic growth can be attributed to the closure of most automated teller machine galleries in bank branches and outside the branches due to, high maintenance costs and insecurity around galleries. The study contributes to the extant literature by expanding the generic Fintech frontier to capture the direct measures (automated teller machine, web pay, mobile banking, and point of sale) and also test the model on Nigeria by unbundling financial inclusion indicators' individual index to examine the degree of contribution.

Umar, Abbas and Sheharyar (2023) evaluated the impact of mobile Fintech on financial inclusion in 18 Sub-Saharan African (SSA) countries using data from the Global Findex database for the period from 2014 to 2021, as well as the World Development Indicators database. The research employs principal component analysis (PCA) to construct a financial inclusion index and uses random effects, fixed effects, panel corrected standard errors (PCSE), and generalized method of moments (GMM) models. The empirical findings reveal that mobile Fintech significantly enhances financial inclusion, with the payment component of mobile Fintech having a greater impact than mobile money accounts.

Yeyouomo, Simplicie and Agyemang-Mintah (2023) examined Fintechs and the financial inclusion gender gap in Sub-Saharan African countries. The study addresses the issue of financial innovation in developing countries, focusing specifically on the role Fintechs have in closing the gender gap of financial inclusion in Sub-Saharan Africa (SSA) over the period 2011 to 2017. The empirical evidence was based on the multilevel tobit regression model fitted to panel data. The results of the study showed that Fintechs reduced the financial inclusion gender gap by mitigating the gender gap in access to and use of financial services. Furthermore, they cast doubt on the ability of Fintechs development to bridge this gap on its own, and hint on the joint importance of targeted policy initiatives aimed at directly closing the gender gap to this end.

Cele and Gumede (2024) examines the role of financial technologies (Fintech) in financial inclusion in South Africa, drawing from qualitative research that was carried out by interviewing 18 industry experts and 17 financial services customers. Using an inductive approach due to the dearth of data according to the researcher, relevant data was collected and common themes and relationships identified among their observations, using a bottom-up approach to develop explanations and theories to explain those patterns. The findings confirmed that Fintechs

enhance financial inclusion by creating access to financial services for previously excluded people and to small businesses, among other advantages brought about by and through Fintechs. The paper argues that Fintechs play a significant role in expanding the reach of financial services and contribute to the achievement of some sustainable development goals.

Girma and Fariz (2024) explored the causal relationship between Fintech development, financial inclusion, and income inequality in a panel study of 29 African countries. The study applied pooled OLS regression and structural equation models to samples from the years 2011, 2014, and 2017. The findings indicated that Fintech has a positive and statistically significant effect on financial inclusion and income inequality in African countries. The study results also demonstrate that financial inclusion plays a pivotal mediation role in the negative effect of Fintech on income inequality in African economies. Further, financial inclusion (the ability to create a bank account and borrow money) negatively and significantly affects income inequality in African countries, whereas saving shows a positive and significant impact on income inequality.

Kamara and Yu (2024) investigated the impact of Fintech adoption on traditional financial inclusion in 22 countries in Sub-Saharan Africa (SSA). The research uses the World Bank's Development Indicators data and the International Monetary Fund's Financial Access Survey data covering the period from 2004 to 2022. The Principal Component Analysis (PCA) is used to construct the dimensions of traditional financial inclusion and the overall financial inclusion index while the Generalized Method of Moments estimation technique is applied to the annual data. The findings show that while Fintech has a negative and statistically significant effect on the geographic and usage dimensions, it however has a positive and statistically significant impact on the demographic dimension and the overall traditional financial inclusion index. These

findings indicate that Fintech does not have a detrimental impact on traditional financial inclusion.

Tidjani and Madouri (2024) examined Fintech, financial inclusion, and sustainable development in the African region. The aim is to investigate the connection between Fintech, financial inclusion, and sustainable development. The empirical exploration spans 25 African countries from 2011 to 2019, employing econometric methods such as dynamic panel (SGMM two-steps) and static panel (OLS, FE, LSDV). Utilizing key indicators like Adjusted Net Savings (ANS) and Gross Saving rate (GS). The result of the study revealed a substantial positive impact of financial inclusion and Fintech on sustainable development.

Tiony (2024) examined the impact of financial technology (Fintech) innovation on financial inclusion and economic growth in Kenya. The study using descriptive statistics, correlation analysis, and regression analysis on data covering the period from 2015 to 2020. The findings reveal that Fintech innovations have significantly improved financial inclusion in Kenya by increasing accessibility, affordability, and usage of financial services. Mobile money platforms like M-Pesa have been particularly effective in providing financial services to the unbanked population, while digital banking and blockchain technology also contribute to this trend, though to a lesser extent. Economic growth has been positively influenced by Fintech through the development of SMEs, job creation, and contributions to GDP growth. SMEs have benefited from easier access to credit and financial services, enabling them to expand and contribute to the economy.

Table 2.1 Tabular Summary of Empirical Literature Reviewed

| S/ N | Author(s) & Year | Country of Study | Variables used in the Study | Methodology | Findings |
|------|--|---|---|---|---|
| 1 | Adeniji, S.O. <i>et al.</i> (2024) | Sub-Saharan Africa 2005 to 2017 | DV: GDP IV: Number of commercial bank branches, mobile cellular subscriptions and the deposits to GDP ratio | Pooled OLS, Random Effect Model, and the Generalized Method of Moment Panel model | The result of GMM-Difference showed a positive and significant relationship between measures of financial inclusion (number of commercial bank branches, mobile cellular subscriptions & the deposits to GDP ratio) and economic growth, while the result of GMM-System showed a positive and significant relationship between financial inclusion and economic growth. |
| 2 | Agala, H. O. & Efeghaje-Ego, B. (2024) | Nigeria 2010 to 2020 | DV: Real GDP IV: ATM, POS, Web Pay, Mobile Pay, Commercial Bank Loans to Rural Branches (CBLR), Deposit to Rural Branches (CBDR) | Trend and Descriptive Method of estimations | Fintech has a direct and substantial influence on real GDP but a mild effect between financial inclusion and real GDP in Nigeria. |
| 3 | Boachie, C. & Adu-Darko, E. (2024) | Sub-Saharan Africa 2010 to 2020 | DV: Real GDP IV: Financial inclusion, indicators, inflation, Trade openness | Principal Component Analysis (PCA) and Panel ordinary Least Squares(OLS) | Financial inclusion and economic growth were positively correlated using a Driscoll Kray error estimate approach. Financial inclusion has a beneficial effect on economic growth through human capital. |
| 4 | Cele, S. K., & Gumede, V., (2024) | South Africa 18 industry experts and 17 financial services customers | DV: Financial inclusion index IV: Digital finance technology index | Inductive approach and bottom-up approach | Fintech amongst other advantages enhances financial inclusion by creating access to financial services for previously excluded people and to small businesses. |
| 5 | Girma, A. G., & Fariz, H (2024) | Africa 2004 to 2020. | DV: Financial inclusion index IV: Digital finance technology index | pooled OLS regression and structural equation models | Fintech has a positive and statistically significant effect on financial inclusion and income inequality in African countries while also, financial inclusion plays a pivotal mediation role in the negative effect of Fintech on income inequality. |
| 6 | Gürbüz,A., <i>et al.</i> (2024) | Turkey and South-East Asian countries 2000 to 2020 | DV: Real GDP IV: financial inclusion index , and financial stability | Panel Regression Analysis | Information-communication technologies and other macroeconomic factors positively affect economic growth. |

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|----|--------------------------------------|---|--|--|--|
| 7 | Jallow, S. <i>et al.</i> (2024) | Sub-Saharan Africa 2007 to 2020 | DV: Real GDP IV: Number of bank branches, automated teller machines, and savings | Generalized Method Moments | A rise in the number of bank branches, automated teller machines, and savings stimulates per capita economic growth just as an elevated number of credit provisions to the private sector and high growth of population hinder per capita economic growth. |
| 8 | Jiaqi, L. (2024) | China 2011 to 2019 | DV: GDP IV: Digital financial inclusion, | Two-way fixed effect panel model | Digital financial inclusion has positively localised effects on rural economic development. |
| 9 | Kamara, A.K. (2024) | Sub-Saharan Africa (SSA) 2014 to 2021 | DV: GDP IV: FI, population growth, age dependency, trade, | Generalized method of moments (GMM), and quantile regression | FI has a significant positive effect on EG, and it also reduces poverty in SSA. |
| 10 | Kamara, A.K. & Yu, B. (2024) | Sub-Saharan Africa 2004 to 2022 | DV Real GDP IV: Fixed broadband subscriptions, mobile cellular subscriptions., | Generalized Method of Moments estimation technique | Fintech has a negative and statistically significant effect on the geographic and usage dimensions, while also having a positive and statistically significant impact on the demographic dimension and the overall traditional financial inclusion index. |
| 11 | Kindai, P.D. (2024) | Nigeria 2000 to 2022 | DV: GDP IV: ATM, POS, web online payments, mobile transfers and national electronic fund transfers | Error Correction Model | Short run and long run economic growth is significant and positively responsive to changes in automated teller machine, point-on-sale and mobile transfer channels contrary to significant and negative response to changes in web online payments and NEF transfers in Nigeria. |
| 12 | Ngong, C.A., <i>et al.</i> (2024) | East African Community 1997 to 2019 | DV: GDP IV: ATM, POS, Mobile banking, Internet Banking | Autoregressive Distributed Lag | The results unveil a significant relationship between financial technology and economic growth. |
| 13 | Odumusor, C. J. <i>et al.</i> (2024) | Nigeria 2000 to 2020. | DV: GDP IV: Commercial bank loans to small-scale businesses, and deposits and loans of rural branches of commercial banks | Ordinary Least Square Regression | Loans and deposits from rural subsidiaries of commercial banks have a substantial effect on Nigeria's GDP growth. |
| 14 | Owandjokuna, J.F. (2024) | East, West, and Southern Africa 2009 to 2021 | DV GDP IV: Number of commercial bank branches per 1000 km ² , Number of ATMs per 1,000 km ² | Fully modified Ordinary Least Squares | Financial inclusion has statistically significant effects on economic growth both in low and high-income countries. |

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|----|-------------------------------------|--|---|---|--|
| | | | Outstanding deposits with commercial banks (% of GDP) Outstanding loans from commercial banks (% of GDP) | | |
| 15 | Tidjani C & Madouri A (2024) | Africa 2011 to 2019 | DV: Gross Saving as percentage of GNI IV : ratio of domestic credit to the private sector | SysGMM, Two-steps and static panel (OLS, FE, LSDV). | There exists substantial positive impact of financial inclusion and Fintech on sustainable development while also exhibiting a weak negative and significant effect interaction between the variables. |
| 16 | Tiony, O.k. (2024) | Kenya 2015 to 2020 | DV: GDP IV: Mobile money index, digital banking index, and block chain index | Descriptive Statistics, Correlation Analysis, and Regression Analysis. | Fintech innovations have significantly improved financial inclusion in Kenya by increasing accessibility, affordability and usage of financial services. |
| 17 | Tissaoui, K., <i>et al.</i> (2024) | Lower-middle, and upper-middle-income nations 2000 to 2017 | DV Human development index IV: Index of financial inclusion, ATMs per 100,000 adults (ATM), | System Generalized Method of Moments(SysGMM) | The degree of human development in upper-middle-income and lower-middle-income countries is greatly raised by financial inclusion. |
| 18 | Udensi, I.U & Akintunde, P.I (2024) | Nigeria 2014 to 2023 | DV: GDP IV: Number of Bank Accounts (BA): Mobile Money Subscriptions (MMS): Credit Availability (CA): | Multiple Linear Regression, Pearson Correlation, and Granger Causality Tests. | A marginally significant positive relationship between Mobile Money Subscriptions and GDP growth, while access to formal banking services and credit availability showed no significant correlation. |
| 19 | Yap, S., <i>et al.</i> (2024). | 72 countries selected from the member countries on the World Bank website 2015 to 2019 | DV: Financial inclusion index IV: Life insurance index, non-life insurance index | Principal Component Analysis | Life insurance has a positive impact on financial inclusion in some countries but negative in most regardless of their developmental stage. However, non-life insurance has a strong positive impact on the overall financial inclusivity of the sample countries, with more than half of them recording higher financial inclusion. |
| 20 | Akwam, O. P., <i>et al.</i> (2023) | Sub-Saharan Africa 2004 to 2021 | DV: GDP IV: ATM per 100,000 adults; No. of registered Mobile money account per 1000 Adults; Mobile Money | Panel regression analysis | Strong significant relationship between financial technology and economic growth. |

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|----|--------------------------------------|--|---|---|---|
| | | | Transactions per 100,000 Adults | | |
| 21 | Boachie, R. <i>et al.</i> (2023) | sub-Saharan Africa 2010 to 2020 | DV: Real GDP IV: Labour force in the country; Stock of physical capital; Financial inclusion; | Driscoll Kray error estimate approach | Financial inclusion and economic growth are positively correlated. |
| 22 | Doku, J.N. <i>et al.</i> (2023) | Sub-Saharan Africa 2004 to 2021 | DV: Financial inclusion index IV: Digital finance technology index, | Two-stage SysGMM | Digital finance technology has a favourable and considerable impact on financial inclusion. |
| 23 | Elfesh, M. B., <i>et al.</i> (2023) | Sub-Saharan Africa 2010 to 2020 | DV: GDP IV: Active workforce; capital formation per GDP; digital technology index | A two-step system Generalized Method of Moments | Short-term and long term analyses reveal significant positive correlation between digital technology and economic growth |
| 24 | Hassan, H.B. (2023) | Africa 2011 to 2021 | DV: Real GDP IV: Digital finance technology index, trade | Descriptive and Inferential statistics, Regression analyses | Nigeria, Kenya, Egypt, and South Africa had a considerable rate of Fintech penetration as reflected by the large volume of their cross border payments. |
| 25 | Ibourk, A., & Elouaourti, Z. (2023) | Middle East and North Africa Micro-level data on 9,053 individuals extracted from the World Bank's latest Global Findex 2021 database | DV: Digital financial inclusion index IV: Gender, Age, income, Education, workforce, Mobile phone, location, internet user | Principal Component Analysis method and Logit model | Educational level, labor force participation, information and communication technologies, and internet access are the main drivers of digital financial inclusion in the MENA region |
| 26 | Iwedi, M. <i>et al.</i> (2023) | Nigeria 2009 to 2019 | DV: Deposit ratio IV: ATM, POS, WEB and mobile technology | Vector Auto Regression (VAR) estimation | Web banking technology has a positive and significant effect on financial inclusion in Nigeria, while point of sale, automated teller machine and mobile banking technology have a positive but insignificant effect. |
| 27 | Jean-Claude, K. <i>et al.</i> (2022) | Sub-Saharan Africa 2004 to 2019 | DV: Financial inclusion index, IV: Bank accounts, bank branches, ATM, deposit, domestic credit, bank loans | Generalized Method of Moment (GMM) and IV-Tobit | Digital Technology as measured by ICT indicators have positive significant effects on financial inclusion. |

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|----|---|-------------------------------------|--|---|---|
| 28 | Kilimvi, A.S., & Ezekwesiri, A.S (2023) | Africa 2015 to 2021 | DV: GDP IV: Number of ATMs per 100,000 adults , Number of registered mobile money agent outlets per 100,000 adults, | Generalized Moments Method (GMM) | Financial inclusion indicators are positively correlated to the economic growth |
| 29 | Kouladoum, J.C., <i>et al.</i> (2023) | Sub-Saharan Africa 2004 to 2019 | DV: Number of bank accounts per 100,000 adults, the number of bank branches and the number of ATMs subscribers per 100,000 adults IV: Number of individuals using internet, the number of fixed broadband subscribers, the number of fixed phone and mobile cellular phone subscriber | Generalized Method of Moment (GMM) | The rate of financial inclusion in Sub Saharan Africa rises with increasing digital technologies |
| 30 | Mohammed, S.S. <i>et al.</i> (2023) | Sub-Saharan African 2004 to 2020 | DV: GDP; Financial inclusion indicators IV: inflation rate, trade openness, Unemployment rate, investment expenditure | The Principal Component Analysis and Two-step SysGMM approach | Financial inclusion has a positive impact on SSA's economic growth irrespective of the measure of economic growth examined. |
| 31 | Ngong, C.A., <i>et al.</i> (2023) | East Africa 1997 to 2019 | DV: GDP per capita IV: automated teller machine (ATM), point of sale (POS); debit card ownership; web banking; financial operations remotely done | Autoregressive distributed lag (ARDL) | A significant relationship exists between financial technology and economic growth. |
| 32 | Okon, E.V., <i>et al.</i> (2023) | Nigeria 2009Q1 to 2019Q4 | DV: GDP IV: ATM, web pay, point of sales, and mobile banking, Bank branches, Credit to the private sector(% of GD), | Autoregressive distributed lag (ARDL) | The direct measures of Fintech positively and significantly impact financial inclusion and economic growth. |

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|----|--------------------------------------|------------------------------------|---|--|--|
| | | | Banks depositors (BD), Domestic credit to the private sector (% of GDP) | | |
| 33 | Olubukola A.A., <i>et al.</i> (2023) | Nigeria 2009 to Q4 of 2017 | DV: GDP IV: ATM, Agency Banking, Online Banking | Ordinary Least Square regression (OLS). | The volume of mobile banking, point of sales, and volume of automatic teller machines transactions have positive impact on the economy of Nigeria proxied by its gross domestic product while the volume of web services has a negative impact. |
| 34 | Samuel , U.E. <i>et al.</i> (2023) | Nigeria 1999Q1 to 2020Q4 | DV: Real GDP IV: ATM =Depth of Automated Teller Machine; DINB = Depth of Internet Banking; MOBP = Depth of Mobile Pay (Mobile Money); WEB = Web Pay, DR-GDP = The ratio of deposits-GDP or credit-GDP or (deposit + credit)/GDP; | The Johansen Co-integration Test, and the Granger Non-Causality Test, a Toda–Yamamoto procedure | Findings shows that Fintech impact on economic growth and financial inclusion through a reduction in income inequality and poverty rate. |
| 35 | Tafirei ,M. & Gani, S. (2023) | Sub-Saharan Africa 2010 to 2020 | DV: GDP per capital IV: Mobile money, retail core deposits, equity funding, long-term funding | Covariance-based Structural Equation Modeling Method | Fintech disruptions have triggered an increase in equity funding for banks, while having negligible effects on deposit and long-term debt financing; the Fintech’s limited size has ultimately restricted its effects on economic growth in SSA and lastly, there was no evidence of Fintech mediating the impact on economic growth via the bank funding channel. |
| 36 | Umar. M. <i>et al.</i> (2023) | Sub-Saharan Africa 2014 to 2021 | DV:Accounts, savings, and borrowing IV: FinTech1, FinTech2, GDP , Trade, Inflation , Broad Money , Domestic Credit | Random Effects, Fixed Effects, Panel Corrected Standard Errors (PCSE), and Generalized Method of Moments (GMM) models. | Mobile Fintech significantly enhances financial inclusion, with the payment component of mobile Fintech having a greater impact than mobile money accounts. |
| 37 | Wenzhi , X., & Yingdong, W. (2023) | China 2011 to 2017 | DV:High-Quality Development Index IV: Digital Financial Inclusion Index, Digital Financial Coverage Breadth | Panel regression analysis | Digital financial inclusion has a positive impact on the quality of economic growth, particularly in the eastern region and regions with high marketization. |

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|----|---|-----------------------------------|--|--|--|
| | | | Index, Digital Financial Usage Depth Index | | |
| 38 | Yakubi, Y.A.Y., <i>et al.</i> (2023) | Low-income countries 2018 to 2021 | DV: GDP per capita IV: Access to financial services, Usage of financial services, Quality of financial services | Multiple regression process | All financial inclusion components have a significant positive impact on socio-economic development |
| 39 | Yeyouomo, A. K., <i>et al.</i> (2023) | Sub-Saharan Africa 2011 to 2017 | DV: Financial Inclusion index IV: ATM, Agency Banking, Online Banking | Multilevel Tobit regression model | Fintechs reduced the financial inclusion gender gap by mitigating the gender gap in access to and use of financial services. |
| 40 | Alabdulrazag A. B. <i>et al.</i> (2022) | Saudi Arabia 2009 to 2018 | DV: Gross fixed capital formation, labour force, financial inclusion indicator, energy consumption IV: Gross fixed capital formation, labour force, financial inclusion indicator, energy consumption | Autoregressive Distributed Lag Modeling Approach | Findings reveal evidence of a significant long-run positive impact of financial inclusion on per-capita GDP in Saudi Arabia. Furthermore, estimates confirm the finance-led growth hypothesis in Saudi Arabia. |
| 41 | Adedokun, M.W., <i>et al.</i> (2022) | Sub-Saharan Africa 2004 to 2019 | DV: GDP IV: Financial inclusion index, trade, | Generalized Method of Moment(GMM) | A positive relationship exists between financial inclusion and economic growth. |
| 42 | Alabi, A.W & Olaoye, F.O. (2022) | China and Nigeria 2004 to 2020 | DV: Financial Inclusion index IV: Automated Teller Machines, Individuals using the internet, Mobile Cellular Subscriptions | Pooled OLS and Feasible Generalized Least Squares estimators | Automated Teller Machines, Internet usage and Mobile Cellular Subscriptions exert insignificant positive effects on financial inclusion both in China and Nigeria but the technology variables however exert significant positive impact on financial inclusion, while also, it was found that GDP growth rate has significant negative relationship with Financial Inclusion. |
| 43 | Ashenafi, B.B. & Dong, Y. (2022) | Africa 2011 to 2017 | DV: Income inequality IV: Political instability, control of corruption | Pooled Ordinary Least Square and Two-stage Least Square (2sLS) estimation methods, | Financial inclusion and Fintech exacerbate income inequality |

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|----|--|---------------------------------|--|--|---|
| 44 | Azimi, M.N. (2022) | World 2004 to 2021 | DV: GDP growth IV: Composite financial inclusion index, | Generalized Method of Moment (GMM) | The GMM model clearly indicate that financial inclusion has a significantly positive impact on economic growth across all panels. |
| 45 | Djoufouet, W.F., & Pondie, T.M. (2022) | Sub-Saharan Africa 2011 to 2020 | DV: Financial Inclusion Index IV: Fixed Telephone; Mobile Phone; Gross Domestic Product | Two-stage Least Squares models and the Lewbel 2LS model | Fintech contributes significantly to the financial inclusion of people in sub-Saharan Africa. |
| 46 | Ehiogu, C. P., (2022). | Nigeria 2000 to 2021 | DV: Financial Inclusion Inde IV: Number of Insurance firms, Gross Domestic Product | Ex-post-facto research design where Error Correction Model technique | Insurance penetration, dependency ratio, and income level had negative effects on financial inclusion in Nigeria for the period studied. However, only the insurance penetration rate and income level were significant. Also, insurance density increased financial inclusion significantly over the period studied. |
| 47 | Ekong, U.M & Ekong, C.N. (2022) | Nigeria 2006:Q1 to 2020:Q4 | DV: Fin Inclusion Index IV: (POS) transactions, the ATMs and the Web payments | OLS regression | Fintech in the form of automated teller machine users, point of sales transaction users, mobile payment users and web payment services significantly and positively impacted on financial inclusion. |
| 48 | Ifediora, C., <i>et al.</i> (2022) | Sub-Sahara Africa 2012 to 2018 | DV: Real GDP IV: Composite financial inclusion index, inflation rate | Generalized Method of Moments(GMM) | The availability dimension of financial inclusion, penetration dimension of financial inclusion and composite financial inclusion significantly and positively impact economic growth while the usage dimension of financial inclusion did not significantly improve economic growth. |
| 49 | Islam, M.S.N., <i>et al.</i> (2022) | Nigeria 2012 to 2021 | DV: Deposits/savings from financial service transactions IV: Mobile Banking, internet banking and POS | Descriptive statistics, correlation and regression analysis | Mobile banking, internet banking and POS banking have significant impact on the financial service of listed deposit money banks in Nigeria. |
| 50 | Qazi, M.A. H. (2022) | Vietnam 2001 to 2021 | DV: GDP IV: Financial inclusion | FMOLS | Financial inclusion boosts economic growth unlike composite risk. |
| 51 | Odeleye, A. T., & Oyeneye, I.(2022) | Nigeria 2009 to 2019 | DV: Financial Inclusion IV: ATM transaction (atm), POS transaction (pos), web payment transaction (web), mobile | ARDL | Financial technology has significant and negative impact on financial inclusion |

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|----|---|--|--|---|--|
| | | | Money payment transaction (mob), information and communication technology infrastructure | | |
| 52 | Sarpong, B. & Nketiah-Amponsah, E. (2022) | Sub-Saharan Africa 2004 to 2018 | DV: Financial availability, usage and knowledge variables IV: Government consumption, investment, access to quality infrastructure | Generalized Method of Moment(GMM) | The evidence suggested that usage of financial services, among other covariates, has a significant impact on inclusive growth. |
| 53 | Bayar, Y, <i>et al.</i> (2021) | European Union 1996 to 2017 | DV: Financial inclusion index IV: Index of financial institutions access, Index of financial markets access | Panel Cointegration and Causality Analyses. | Mobile cellular phone subscriptions positively affect financial institution access in some East European member countries while in some other observations, a negative relationship was found. Also, it was found that both positive and negative relationships exists between Internet usage rates and financial institutions and financial markets access. |
| 54 | Chinoda, T., & Mashamba. T. (2021) | Africa 2004 to 2018 | DV: Real GDP IV: Financial inclusion index (FII), bank competition (BOONE) | Pooled Mean Group Estimation-based Panel Autoregression Distribution Lag | A significant positive relationship between financial inclusion and economic growth in the long run whereas in the short run, economic growth significantly reduces financial inclusion. |
| 56 | Inoussa. H. (2021) | Sub-Saharan Africa 2014 to 2017 | DV: Real GDP IV: Comprehensive Financial Inclusion; Traditional Financial Inclusion | Ordinary Least Square multiple regression models | Fintech-driven financial inclusion is significantly positively related with economic growth and Fintech-driven financial inclusion reduces income inequality. |
| 57 | <u>Muri, W. A, & Mehmet, A</u> (2021) | Sub-Saharan Africa 2004 to 2017 | DV: Real GDP IV: Financial inclusion index | Generalized Method of Moments(GMM) and Dumitrescu–Hurlin's Causality Test | Financial inclusion has a significant positive influence on economic growth in SSA countries while other findings indicated that there is a short-run causality from economic growth to financial inclusion. |
| 58 | Noha, E., & Mahmoud, M (2021) | Middle East and North Africa and Sub-Saharan Africa 2004 to 2018 | DV: Poverty headcount ratio at \$1.90 a day IV: GDP growth rate, inflation rate, trade openness as a percentage of GDP, and the annual population growth rate | General Method of Moments(GMM) | Fintech measures have a positive statistically significant impact on reducing extreme poverty for the full sample as well as the MENA and the SSA regions |

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|----|---------------------------------------|------------------------------------|--|--|---|
| 59 | Wytone, J. (2021) | Sub-Saharan Africa 2011 to 2017 | DV: Real GDP IV: Financial inclusion index | random effects panel regressions | Financial inclusion positively affects inclusive growth in the sub-Saharan region, unlike financial depth. |
| 60 | Angga, E. <i>et al.</i> (2020) | Indonesia 2007 to 2017 | DV: Real GDP IV: Unemployment, education, infrastructure, dimension of accessibility, | The Toda-Yamamoto VAR bivariate causality model and the dynamic Panel Vector Autoregression (PVAR) | A high relationship level between financial inclusion, economic growth, poverty, and income distribution in Eastern Indonesia. The socio-economic growth has a positive impact on the level of financial inclusion, with a negative impact on poverty while also financial inclusion has a positive effect on inequality. |
| 61 | Thaddeus, K., <i>et al.</i> (2020) | Sub-Sahara Africa 2011 to 2017 | DV: GDP per capita IV: automated teller machine (ATM), number of commercial bank branches (CBB), Loan Outstanding (LOS), Mobile agent outlets (MOAO) and Mobile money transactions (MOMO) | Vector Error Correction model and the Granger Causality | A long run causal relationship exists between digital financial inclusion and economic growth in sub-Sahara Africa and the direction of causality is unidirectional running from economic growth to digital financial inclusion. |
| 62 | Yengeni, S. (2020) | Africa 2011 to 2017 | DV: Financial Inclusion Index IV: Mobile banking account access; GDP growth; Digital payment use; Banking sector development | Regression analysis | The use of mobile accounts has a positive and significant relationship with financial inclusion. |
| 63 | Dinh, T. T. V. & Nguyen, H. L. (2019) | Asian-Pacific 2005 to 2015 | DV: Human Development Index (HDI) IV: Number of bank branches per 100,000 adults, The number of ATMs per 100,000 adults, Domestic credit to the private sector (% of GDP) | Pooled Least Squares (POLS), Fixed Effects (FE), and Random Effects (RE) models | Correlations exist between large numbers of bank branches, ATMs, domestic credit in the private sector and the increased rate of development in the economy |
| 64 | Nguling'wa, P.B. (2019) | Sub-Saharan Africa 2009 to 2014 | DV: Real GDP IV: Financial inclusion, gross primary school enrollment, and gross national savings | Pooled Least Squares (POLS), Fixed Effects (FE), and Random Effects (RE) models | Sub-Saharan African countries can increase economic growth by enhancing financial inclusion by leveraging financial technology. |
| 65 | Femi-Lawal, F.B (2017) | Nigeria 2009 | DV: Real GDP IV: Transaction fees, transaction value and count; | Content analysis | Mobile Money System has a huge potential to drive digital financial system in Nigeria. |

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|----|---|---------------------------------|---|---------------------------------|---|
| | | | stakeholders within the ecosystem | | |
| 66 | Tita, A.F.,_ & Aziakpono M.J.(2017) | Sub-Saharan Africa 2011 to 2014 | DV: Real GDP IV: Electronic payment, Inflation, Health expenditure | General Method of Moments(GMM) | Formal account use for business, electronic payments and formal savings have a positive relationship with income inequality. |
| 67 | Tijani, J. A.1 & Ilugbemi, A. O. (2015) | Nigeria 120 questionnaires | DV:National development (ND). IV: Current and savings accounts customers of deposit money banks | Chi-square | Electronic payment channels (EPC) have impacted on the economy and therefore contributing positively to national development (ND) |
| 68 | Andrianaivo M. & Kpodar, K(2012) | Africa 1988 to 2007 | DV: GDP IV: Fixed telephone line per head; Mobile telephone subscribers per head; Mobile telephone subscribers per head squared; | General Method of Moments (GMM) | ICT, including mobile phone development, accounts for economic growth in African countries |

2.5 Research Gaps

This study has been able to review Fintech, financial inclusion and economic growth in SSA countries. In this section, topics like concept of economic growth, financial technology (Fintech), types of Fintech, concept of financial inclusion, theoretical review, conceptual framework, relationship between Fintech and economic growth, relationship between financial inclusion and economic growth, relationship between Fintech, financial inclusion and economic growth and empirical review has been discussed.

From the review, it was clear that the plethora of the empirical literature were either between Fintech and inclusion, or Fintech and economic growth or financial inclusion and economic growth. Not too many studies covered Fintech, financial inclusion and economic growth in SSA countries (Inoussa, 2021; Girma & Fariz, 2024; and Tidjani & Madouri, 2024) to the best of the researcher's knowledge, hence the need for this study to update empirical literature on the subject matter.

Also, from the literature we also found that prior studies along this subject line, have used econometric analysis in which only symmetric effects of the changes in the independent variables on the dependent variables have been considered using techniques such as Generalized Method of Moment, Principal Component Analysis (PCA), pooled OLS regression (Adeniji *et al.*, 2024; Boachie & Adu-Darko, 2024; Girma & Fariz, 2024). None of the reviewed studies considered the impact of the asymmetric nature of the independent variables on the dependent variable, to the best of the researcher's knowledge. However, other studies though not on this subject matter area (Apanisile, 2017; Thye, Law & Trinugroho, 2022 and Tejesh, 2024) in an attempt to understand the effects of both the symmetric and the asymmetric nature of the independent variables on the dependent variables have utilized the nonlinear Autoregressive Distributed Lag Model (NARDL)

approach. The NARDL not only provides a more accurate and interpretable analysis by distinguishing between positive and negative changes in variables, identifying structural features, improving forecasting accuracy when asymmetry exists, and yielding better in-sample results, but just as the traditional Autoregressive Distributed Lag Model (ARDL) model on which it is founded, it also has the capacity to analyse the long-run and short-run dynamic relationships between time series variables, especially when dealing with mixed orders of integration and small sample sizes(Pesaran & Shin, 1999; Pesaran *et al.*, 2001; Shin *et al.*, 2014 and Nkoro & Uko, 2016). This justification forms the basis of the research adoption of the NARDL in this study. NARDL therefore has the tendency to produce a more revealing, robust and reliable outcome. These two gaps mentioned above form the principal gaps which this study is working to fill.

CHAPTER THREE

METHODOLOGY

3.1 Introduction

This chapter presents the methods and techniques employed in carrying out the study which is discussed under the following sub-headings, research design, population, sample size, sources of data, theoretical framework model specification and method of data analysis.

3.2 Research Design

This study employs both cross sectional and ex-post factor research designs. The use of cross-sectional design is justified on the ground that data sets are collected from across different countries of sub-Sahara Africa. Similarly, collecting data across several time intervals tends to generate historical process; hence the use of ex-post facto research.

3.3 Population Sampling Technique and Sample size

The population of the study covers all the forty-eight (48) countries (World Bank Group, 2025) that make up sub-Sahara African countries. There are four (4) regions that make up Sub-Sahara Africa, namely East Africa, Southern Africa, West Africa and Central Africa. In addition, using stratified sampling technique and data filtering approach 29 countries (Angola, Benin, Botswana, Burkina Faso, Cameroon, Côte d'Ivoire, Eswatini, Ghana, Guinea, Guinea-Bissau, Kenya, Lesotho, Liberia, Madagascar, Malawi, Mali, Mauritius, Mozambique, Namibia, Niger, Nigeria, Rwanda, Senegal, Seychelles, South Africa, Togo, Uganda, Zambia, Zimbabwe) were included in the study based on data availability, viable Fintech system and regionalisation. The secondary data used in this study were generated from world development indicators (WDI) and international monetary fund (IMF) financial structure database. The sampling filtering technique is stratified sampling technique. The stratified sampling technique was chosen because it ensures

that each subgroup within the population receives proper representation within the sample. As a result, stratified random sampling provides better coverage of the population since the researchers have control over the subgroups to ensure all of them are represented in the sampling. From the four sub regions, 29 countries have been selected.

3.4 Sources of Data

The relevant data for this study is sourced from World Development indicator (WDI) database publications by the World Bank database and the International Monetary Fund (IMF) financial structure database for the period 2014 to 2023.

3.5 Theoretical Framework

The theoretical foundation underpinning this study is rooted in the finance-led growth theory and the neoclassical economic growth theory with emphasis on the role of financial systems and technology respectively in driving economic growth. The finance –led growth theory asserts that the development of financial systems cultivates an environment conducive to growth, operating through either a supply leading or 'demand-following' mechanism. This perspective underscores the critical importance of addressing financial exclusion that is often linked to persistent income disparities and sluggish economic growth. In this context, ensuring access to secure, convenient, and affordable financial services becomes imperative for catalyzing growth, ameliorating income inequality, alleviating poverty, promoting inclusive opportunities, integrating marginalized segments into the economy, and fortifying resilience against economic shocks (Schumpeter, 1912; Serrao, Sequeira & Hans, 2012). In addition, the neoclassical growth theory is relied upon to also give direction as to the relationship between technology and economic growth. The neoclassical growth model explains long-run economic growth as a result of three key factors: labour, capital, and technology. It emphasizes that economic growth occurs through capital accumulation, driven

by household savings, and also considers the impact of population growth and technological advancements (Ramsey, 1928; Solow, 1956).

3.6 Model Specifications

3.6.1 Neoclassical Growth Model (Technology Led Growth)

This growth theory posits that the accumulation of capital within an economy, and how people use that capital, is important for economic growth. Further, the relationship between the capital and labour of an economy determines its output. Finally, technology is thought to augment labour productivity and increase the output capabilities of labour (Solow, 1956).

Therefore, the production function of neoclassical growth theory is used to measure the growth and equilibrium of an economy.

That function is $Y = Af(K, L)$(i)

- Y denotes an economy's gross domestic product (GDP)
- K represents its share of capital
- L describes the amount of unskilled labour in an economy
- A represents a determinant level of technology

However, because of the relationship between labour and technology, an economy's production function is often rewritten as

$$Y = f(K, AL)..... (ii)$$

Increasing any one of the inputs shows the effect on GDP and, therefore, the equilibrium of an economy. However, if the three factors of neoclassical growth theory are not all equal, the returns of both unskilled labour and capital on an economy diminishes. These diminished returns imply that increases in these two inputs have exponentially decreasing returns while technology is boundless in its contribution to growth and the resulting output it can produce.

Since this study is on financial technology, the researcher removes L and K, thus

$$Y = f(A) \dots \dots \dots (iii)$$

Replacing A with Fintech

$$Y = f(Fintech) \dots \dots \dots (iv)$$

Fintech in this study is decomposed into

Internet users as a share of population (IUI)

Mobile Banking Transactions (MBK)

Number of Point-of-sale Agents (POS)

Trade openness (TOP) is included as a control variable

$$\text{Thus Fintech} = f(IUI, MBK, POS, TOP) \dots \dots \dots (v)$$

Substituting (xvi) into (xv) and changing Y to rGDP

$$rGDP = f(IUI, MBK, POS, TOP) \dots \dots \dots (vi)$$

Stating in econometric format

$$rGDP = \delta_0 + \delta_1 IUI + \delta_2 MBK + \delta_3 POS + \delta_4 TOP + vt \dots \dots \dots (vii)$$

Following the ARDL bounds testing technique, founded by Pesaran and Shin (1999) and Pesaran *et al.* (2001), the specification of models based on the auto-regressive distributed lag (ARDL) (p , q_1 ,, q_k) as utilised by Tejesh (2024) is as shown below:

a) ARDL Equation for short-run relationship:

$$\Delta Y_t = \alpha_0 + \sum_{i=1}^p \alpha_i \Delta Y_{t-i} + \sum_{i=0}^q \beta_i \Delta X_{t-i} + \varepsilon_t \dots \dots \dots \text{equation (1)}$$

b) ARDL Equation for long-run relationship:

$$Y_t = \alpha + \sum_{i=1}^p \gamma_i \Delta Y_{t-i} + \sum_{i=0}^q \delta_i X_{t-i} + \varepsilon_t \quad \dots\dots\dots\text{equation(2)}$$

where Y_t and X_t are dependent and independent variables at time t Δ denotes the first difference operator, indicating the short -run relationship, p and q represent the lag lengths for the dependent and independent variables, α_0 is the intercept term for the short run equation, α is the intercept term for the long run equation, α_1 , β_1 , γ_1 , and δ_1 are coefficients associated with the lagged values of Y and X variables, and ε_t represents the error term at time t .

Applying to equation vii

Short run equation

$$\Delta rGDP = \delta_0 + \delta_1 \Delta rGDP_{t-1} + \delta_2 \Delta IUI_{t-1} + \delta_3 \Delta MBK_{t-1} + \delta_4 \Delta POS_{t-1} + \delta_5 \Delta TOP_{t-1} + v_{1t} \dots \text{(viii)}$$

Long run equation

$$rGDP = \delta_0 + \delta_1 rGDP_{t-1} + \delta_2 IUI_{t-1} + \delta_3 MBK_{t-1} + \delta_4 POS_{t-1} + \delta_5 TOP_{t-1} + v_{2t} \dots\dots\dots\text{(ix)}$$

Recalling NARDL

Shin *et al.* (2014) developed NARDL by considering an asymmetric long-run regression:

$$Y_t = \beta^+ X_t + \beta^- X_t + u_t \dots\dots\dots\text{equation (3)}$$

$$\Delta x_t = v_t \dots\dots\dots\text{equation (4)}$$

where Y_t and X_t are scalar $I(1)$ variables, and X_t is decomposed as

$x_t = x_0 + x_t^+ + x_t^-$ where x_t^+ and x_t^- are partial sum processes of positive and negative changes in x_t

$$Z_t = \beta_0^+ Y_t^+ + \beta_0^- Y_t^- + \beta_1^+ X_t^+ + \beta_1^- X_t^- \dots\dots\dots\text{equation (5)}$$

If Z_t is stationary, then Y_t and X_t are asymmetrically cointegrated. The standard linear (symmetric) conintegration is a special case of (3), obtained only if $\beta_0^+ = \beta_0^-$ and $\beta_1^+ = \beta_1^-$. Shin *et al.* (2014) considered the case where the following restriction holds

$\beta_0^+ = \beta_0^- = \beta_0$. In the expression of equation (5), this implies that

$$\beta^+ = -\beta_1^+ / \beta_0 \text{ and } \beta^- = -\beta_1^- / \beta_0$$

Applying NARDL equation viii and ix,

Short run equation

$$\Delta rGDP = \delta_0^{(+/-)} + \delta_1 \Delta rGDP_{t-1}^{(+/-)} + \delta_2 \Delta IUI_{t-1}^{(+/-)} + \delta_3 \Delta MBK_{t-1}^{(+/-)} + \delta_4 \Delta POS_{t-1}^{(+/-)} + \delta_5 \Delta TOP_{t-1}^{(+/-)} + V_{1t} \dots\dots\dots(x)$$

Long run equation

$$rGDP = \delta_0^{(+/-)} + \delta_1 rGDP_{t-1}^{(+/-)} + \delta_2 IUI_{t-1}^{(+/-)} + \delta_3 MBK_{t-1}^{(+/-)} + \delta_4 POS_{t-1}^{(+/-)} + \delta_5 TOP_{t-1}^{(+/-)} + V_{2t} \dots\dots\dots(xi)$$

Apriori expectation: δ_1 to $\delta_5 > 0$. This apriori expectation is based on empirical research including Gürbüz, A *et al.* (2024), Tidjani and Madouri (2024), Agala and Efegehaje-Ego (2024), Jallow *et al.* (2024), Kindai (2024), Udensi and Akintunde (2024), Tiony (2024), Ngong *et al.* (2024) and Samuel *et al.* (2023) amongst others which generally state a positive relationship between financial technology and economic growth.

3.6.2 Finance Led Growth

A notable proponent of this theory is Walter Bagehot, whose seminal work in the 1870s elucidated the interconnectedness between financial systems and real economic activities. Bagehot's theory (Bagehot, in Abdulmalik & Umar, 2024) elucidated how financial market dynamics in Britain influenced the allocation of capital, foreseeing that capital would flow to areas offering the highest returns, akin to water seeking its level. The theory posits that successful enterprises supported by efficient financial systems stimulate economic growth through positive spillover effects. Thus, mathematically, it presents the below equation:

$$Y_t = f(fs) \dots\dots\dots(xii)$$

Where *fs* is financial service, *Yt* is economic growth

Moreover, the finance-growth theory has been enriched and expanded upon by subsequent scholars, including Karl Marx (Hilferding, 1981). Other theorists from the mid-1900s such as Joseph Schumpeter also added their thoughts to this theory. For instance, Schumpeter's theory of economic growth accentuated the pivotal role of innovation as a driver of growth, emphasizing the importance of new combinations of production methods, market development, and sectoral transformations, facilitated either through administrative mechanisms or banking channels in open economies (Stolbov, 2012).

The link between finance and economic growth may run through various transmission channels. Already a very simple growth model illustrates that there are three important connections between financial variables and economic activity. Financial development might (1) reduce the loss of resources required to allocate capital; (2) increase the savings ratio; and (3) raise capital productivity. The underlying model here is the AK model as derived from the Cobb- Douglas function (Cobb & Douglas, 1928). AK model assumes only one type of goods, which is produced with capital as the only input factor (Pagano, 1993). Thus,

$$Y_t = AK_t \dots\dots\dots(xiii)$$

With Y_t being output in period t produced by capital K_t and with A symbolising capital productivity,

Substituting equation (xiii) into equation (xii)

$$Y_t = f(fs) \dots\dots\dots(xiv)$$

$$fs = f(\hat{fincl}) \dots\dots\dots(xv)$$

Where \hat{fincl} is financial inclusion

Substituting equation (xv) into equation (xiv)

$$Y_t = f(\hat{fincl}) \dots\dots\dots(xvi)$$

$$\hat{fincl} = f(FA, FU, FQ) \dots\dots\dots(xvii)$$

Where FA is financial access, FU is financial usage and FQ is financial quality

$$FA = f(ACOW, NBB) \dots \dots \dots (xviii)$$

$$FU = f(CGDP, DGDP) \dots \dots \dots (xix)$$

$$FQ = f(ATM, NIC) \dots \dots \dots (xx)$$

Substituting equation (xviii), (xix) and (xx) into equation (xvii)

$$fincl = f(ACOW, NBB, CGDP, DGDP, ATM, NIC) \dots \dots \dots (xxi)$$

ACOW: - is the number of adults with savings account

NBB: - is the number of bank branches per 100,000 adults

CGDP: - is the Credit to Gross Domestic Product ratio

DGDP: - is the Deposits to GDP ratio

ATM: - is the number of Automated Teller Machine per 100,000 adults

NIC: - is the number of Insurance Firms per 100,000 adults

Stating in econometric format

Substituting equation (xxi) into equation (xvi) and changing Y_t to $rGDP$

$$rGDP = f(ACOW, NBB, CGDP, DGDP, ATM, NIC) \dots \dots \dots (xxii)$$

Stating in econometric format

$$rGDP = \alpha_0 + \alpha_1 ACOW + \alpha_2 NBB + \alpha_3 CGDP + \alpha_4 DGDP + \alpha_5 ATM + \alpha_6 NIC + \alpha_7 TOP + u_t \dots (xxiii)$$

TOP: - is Trade Openness included as a control variable

Following the ARDL model specification shown below as utilised by Tejesh (2024):

a) ARDL Equation for short-run relationship:

$$\Delta Y_t = \alpha_0 + \sum_{i=1}^p \alpha_i \Delta Y_{t-i} + \sum_{i=0}^q \beta_i \Delta X_{t-i} + \varepsilon_t \dots \dots \dots \text{equation(1)}$$

b) ARDL Equation for long-run relationship:

$$Y_t = \alpha + \sum_{i=1}^p \gamma_i \Delta Y_{t-i} + \sum_{i=0}^q \delta_i X_{t-i} + \varepsilon_t \dots \dots \dots \text{equation(2)}$$

where Y_t and X_t are dependent and independent variables at time t Δ denotes the first difference operator, indicating the short -run relationship, p and q represent the lag lengths for the dependent

and independent variables, α_0 is the intercept term for the short run equation, α is the intercept term for the long run equation, α_l , β_l , γ_l , and δ_l are coefficients associated with the lagged values of Y and X variables, and ϵ_t represents the error term at time t .

Applying to equation xix

Short run equation

$$\Delta rGDP_t = \alpha_0 + \alpha_1 \Delta rGDP_{t-1} + \alpha_2 \Delta NBB_{t-1} + \alpha_3 \Delta CGDP_{t-1} + \alpha_4 \Delta DGDP_{t-1} + \alpha_5 \Delta NIC_{t-1} + \alpha_6 \Delta ACOW_{t-1} + \alpha_7 \Delta ATM_{t-1} + \alpha_8 \Delta TOP_{t-1} + u_{1t} \dots \dots \dots (xxiv)$$

Long run equation

$$rGDP_t = \alpha_0 + \alpha_1 rGDP_{t-1} + \alpha_2 NBB_{t-1} + \alpha_3 CGDP_{t-1} + \alpha_4 DGDP_{t-1} + \alpha_5 NIC_{t-1} + \alpha_6 ACOW_{t-1} + \alpha_7 \Delta ATM_{t-1} + \alpha_8 \Delta TOP_{t-1} + u_{1t} \dots \dots \dots (xxv)$$

NARDL

Shin *et al.* (2014) developed NARDL by considering an asymmetric long-run regression:

$$Y_t = \alpha^+ X_t + \alpha^- X_t + u_t \dots \dots \dots \text{equation (3)}$$

$$\Delta x_t = v_t \dots \dots \dots \text{equation (4)}$$

where Y_t and x_t are scalar $I(1)$ variables, and x_t is decomposed as

$x_t = x_0 + x_t^+ + x_t^-$ where x_t^+ and x_t^- are partial sum processes of positive and negative changes in x_t

$$Z_t = \alpha_0^+ Y_t^+ + \alpha_0^- Y_t^- + \alpha_1^+ X_t^+ + \alpha_1^- X_t^- \dots \dots \dots \text{equation (5)}$$

If Z_t is stationary, then Y_t and X_t are asymmetrically cointegrated. The standard linear (symmetric) conintegration is a special case of (3), obtained only if $\alpha_0^+ = \alpha_0^-$ and $\alpha_1^+ = \alpha_1^-$. Shin *et al.* (2014) considered the case where the following restriction holds

$\alpha_0^+ = \alpha_0^- = \alpha_0$. In the expression of equation (5), this implies that

$$\alpha^+ = -\alpha_1^+ / \alpha_0 \text{ and } \alpha^- = -\alpha_1^- / \alpha_0$$

Applying NARDL equation xx and xxi,

Short run equation

$$\Delta rGDP_t = \alpha_0^{(+/-)} + \alpha_1 \Delta rGDP_{t-1}^{(+/-)} + \alpha_2 \Delta NBB_{t-1}^{(+/-)} + \alpha_3 \Delta CGDP_{t-1}^{(+/-)} + \alpha_4 \Delta DGDP_{t-1}^{(+/-)} + \alpha_5 \Delta NIC_{t-1}^{(+/-)} + \alpha_6 \Delta ACOW_{t-1}^{(+/-)} + \alpha_7 \Delta ATM_{t-1}^{(+/-)} + \alpha_8 \Delta TOP_{t-1}^{(+/-)} + u_{1t} \dots \dots \dots (xxvi)$$

Long run equation

$$rGDP_t = \alpha_0^{(+/-)} + \alpha_1 rGDP_{t-1}^{(+/-)} + \alpha_2 NBB_{t-1}^{(+/-)} + \alpha_3 CGDP_{t-1}^{(+/-)} + \alpha_4 DGDP_{t-1}^{(+/-)} + \alpha_5 NIC_{t-1}^{(+/-)} + \alpha_6 ACOW_{t-1}^{(+/-)} + \alpha_7 \Delta ATM_{t-1}^{(+/-)} + \alpha_8 \Delta TOP_{t-1}^{(+/-)} + u_{1t} \dots \dots \dots (xxvii)$$

Apriori expectation: α_1 to $\alpha_5 > 0$. This positive apriori expectation is based on the reviewed literature including Azimi (2022), Alabdulrazag *et al.* (2022), Boachie and Adu-Darko (2024), Jiaqi (2024), Tidjani and Madouri (2024) and Kamara (2024) amongst others which state that financial inclusion is expected to have a positive relationship with economic growth.

Equations x, xi, xxvi and xxvii are the equations for this study.

3.7 Method of Data Analysis

In the course of this study, I used the NARDL integration technique. In addition, the lag structure criteria, stationarity test, Bound test, heteroskedasticity test and the descriptive test were also used to run the analysis.

NARDL: The NARDL (Nonlinear Autoregressive Distributed Lag) model is an extension of the ARDL (Autoregressive Distributed Lag) model that allows for asymmetric effects of variables on a dependent variable. Specifically, it captures the fact that positive and negative changes in an independent variable may have different impacts on the dependent variable, both in the short and long run. Unlike ARDL, which assumes a symmetric relationship (e.g., a 1% increase and a 1% decrease have the same impact), NARDL allows for different effects of positive and negative shocks. This framework helps in determining both the long and short-run impact of Fintech and financial inclusion on economic growth.

Lag structure criteria: The lag selection criteria are the Akaike’s information criterion (AIC), Schwarz’s information criterion (SIC), Phillips’ posterior information criterion (PIC) and

Keating's (1995)'s procedure using, alternatively, the AIC and SIC criterion to select the lag order. The rule-of-thumb is to select the criterion with the lowest value which again is the AIC at 26.90693 this is because the lower the value, the better the model. We can conclude that the optimal lag length for the model is 2 and the best criterion to adopt for the model is AIC

Stationarity test: Dickey Fuller test is a statistical test that is used to check for stationarity in time series. This is a type of unit root test, through which the study find if the time series is having any unit root. **Unit root** is a feature of time series data that indicates if there is any stochastic trend in the time series that drives it away from its mean value. Presence of unit root makes a time series non-stationary and as a result it leads to difficulties in deriving statistical inferences from the time series and future predictions. A p-value close to 1 indicates that there is likely a unit root. If there is a unit root, the series is not stationary. A p-value closer to 0 means the likelihood of the rejection of the assumption that there is a unit root and the series is stationary.

Augmented Dickey Fuller (ADF) test is an extension of Dickey Fuller test for more complex models than AR (1). The primary difference between the two tests is that the ADF is utilized for a larger sized set of time series models which can be more complicated.

The test is conducted under following assumptions:

Null Hypothesis (H0): There exists a unit root in the time series and it is non-stationary. *Unit root > 0.05 using 95% confidence level*

Alternate Hypothesis (H1): There exists no unit root in the time series and it is stationary. *Unit root < 0.05 using 95% confidence level*

Bound test: ARDL bounds testing approach is a cointegration method developed by Pesaran, Shin and Smith (2001) to test presence of the long run relationship between the variables. This procedure, a relatively new method, has many advantages over the classical cointegration tests.

Firstly, the approach is used irrespective of whether the series are $I(0)$ or $I(1)$. Secondly, unrestricted error correction model (UECM) can be derived from the ARDL bounds testing through a simple linear transformation. This model has both short and long run dynamics. Thirdly, the empirical results show that the approach is superior and provides consistent results for small samples. If the F statistic is: lesser than the lower bound of the critical values null hypothesis is accepted (cointegration), larger than the upper bound of the critical values, the null hypothesis is rejected (no cointegration), and inside the upper and lower bounds then the test is unsure about integration between the series

Heteroskedasticity: This implies the absence of homoscedasticity. This indicates a violation of the constant variance assumption of the Ordinary Least Square estimator. It implies the absence of non-constant variance leading to the breakdown of the BLUE properties in which the efficiency and consistency property are lost. Hence, to obtain the desired goal of unbiasedness, efficiency and consistency, the stochastic error term must satisfy the least square assumptions (that is the errors must be independently distributed random variates with zero means, constant variances and zero covariances). For this study, the Breusch-Pagan test, developed in 1979 by Trevor Breusch and Adrian Pagan, will be used to test for heteroskedasticity in the analysis of the study. It tests whether the estimated variance of the residuals from the regression is dependent on the values of the independent variables. Using the Breusch-pagan test, the decision rule is to conclude that there is no heteroscedasticity if the F-statistic and observed R- square values are respectively greater than the critical values at 5% level. In the absence of this (that is if the critical value at 5% is greater than the F-statistic and observed R-square value), it is concluded that there is homoscedasticity.

Descriptive test: Descriptive analytics is a statistical interpretation used to analyze historical data to identify patterns and relationships. Descriptive analytics seeks to describe an event, phenomenon, or outcome. It helps understand what has happened in the past and provides businesses the perfect base to track trends. The mean, medium, mode, minimum, maximum, skewness, kurtosis jarque bera (JB) will be analysed in this study.

3.8 Measurement of Variables

The definitions of the variables in the model as well as their measurement, expectations and sources of data are provided in Table 3.1.

Table 3.1: Definition of Variables and Sources of Data Used in Regression Analysis

| Variable | Definition and Measurement | Type of variables | <i>Apriori</i> Expectation | Source of Data |
|----------|--|---|----------------------------|--------------------------------------|
| rGDP | Real gross domestic product is an inflation-adjusted measure of the value of all goods and services produced in an economy. | Dependent Variable and Independent Variable | + | World Development Indicator database |
| IUI | Average number of Internet users as a share of population | Independent Variable | + | World Development Indicator database |
| MBK | Amount of Mobile Banking Transactions in a country | Independent Variable | + | World Development Indicator database |
| POS | Number of Point-of-sale Agents | Independent Variable | + | World Development Indicator database |
| ATM | Average number of Automated Teller Machine per 100,000 adults | Independent Variable | + | World Development Indicator database |
| NBB | Average number of Bank Branches per 100,000 adults | Independent Variable | + | World Development Indicator database |
| CGDP | Credit to Gross Domestic Product ratio | Independent Variable | + | World Development Indicator database |
| DGDP | Deposits to GDP ratio | Independent Variable | + | World Development Indicator database |
| NIC | Average number of Insurance Firms per 100,000 adults | Independent Variable | + | World Development Indicator database |
| ACOW | Number of Adults with Savings Account | Independent Variable | + | World Development Indicator database |
| TOP | Trade Openness | Independent Variable | + | World Development Indicator database |

Source: *Researcher's compilation (2025)*.

CHAPTER FOUR

DATA PRESENTATION, ANALYSIS AND PRESENTATION OF RESULTS

4.1 Introduction

This chapter focuses on the presentation, analysis, and discussion of empirical findings. The estimation results are structured to align with the research objectives. A blend of statistical and econometric techniques is employed to ensure a solid analytical basis. The chapter opens with descriptive statistics—presented through tables, charts, and correlation analysis—to highlight the fundamental characteristics of the dataset. These descriptive tools serve to identify initial patterns, trends, and relationships among the variables, thereby laying the groundwork for the subsequent inferential analysis.

Econometric evaluation is then carried out in alignment with the study's objectives. The econometric strategy involves a combination of dynamic empirical framework and non-linear evaluation of the empirical relationships. As noted in the previous Chapter, the panel non-linear autoregressive distributed lags which draws asymmetric relationships within the Pooled Mean Group (PMG) approach is employed for the main econometric analysis. Several estimation procedures and hypothesis tests are conducted to address different aspects of the study. These begin with the pre-estimation tests for stationarity and cointegration. While the post-estimation tests involve analysis of asymmetry tests and tests for normality. The empirical results from the study provide grounds for the tests of the hypotheses of the study.

4.2 Data Presentation

The data set used for the study are presented in table one (1) of the Appendix (page 166).

4.3 Descriptive Statistics

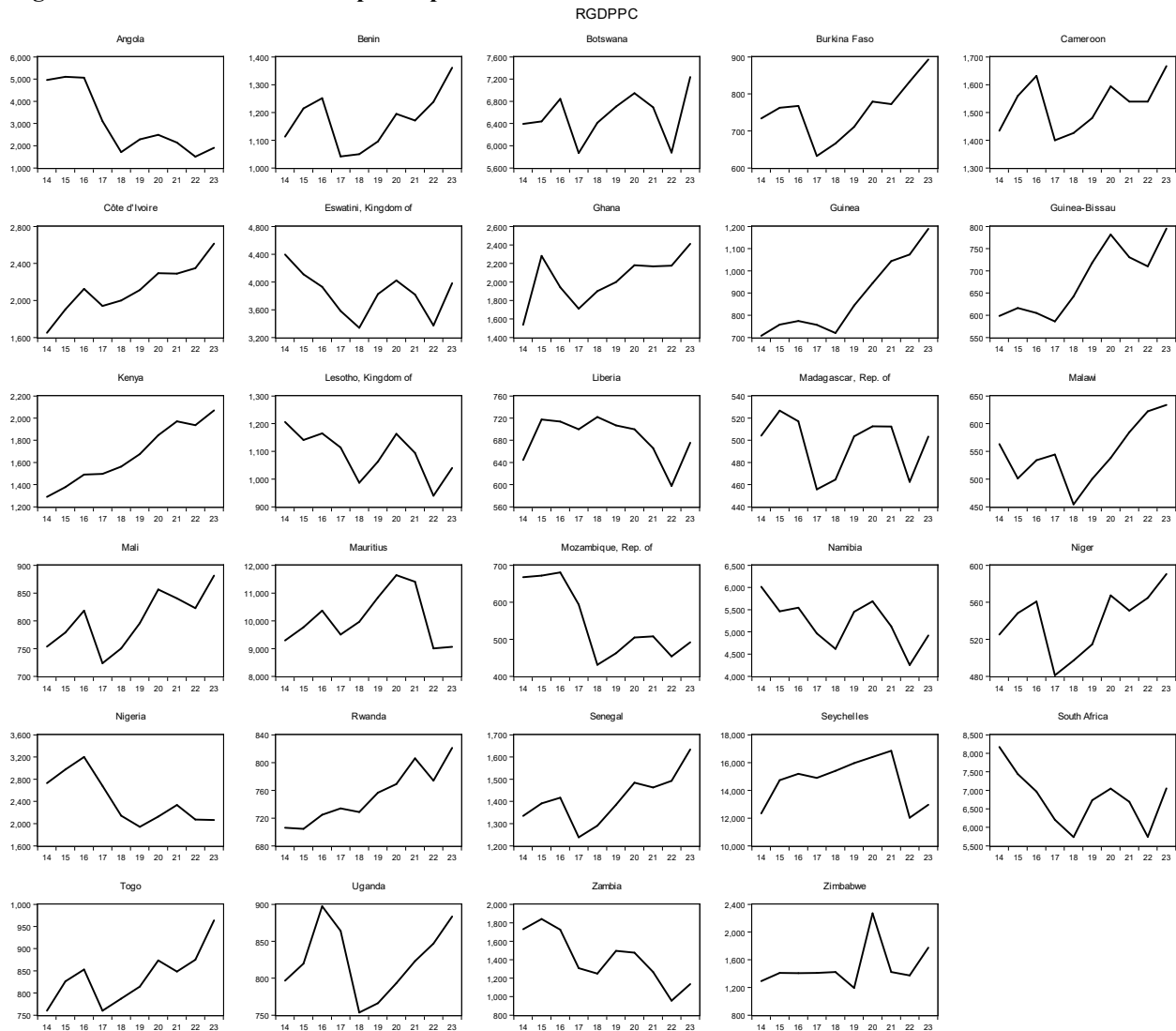
4.3.1 Trend Analysis

In this section the overall trends in the major variables in the study (life insurance and economic growth) are examined over the period of the study. This is to reveal the pattern of development and changes across the sample. The trends in real GDP per capita growth for the sampled countries in the study are reported

in Figure 4.1. It is seen that most of the countries experienced significant growth in their economies over the period of the study (since the year 2014). Several countries like Kenya, Cote d'Ivoire, Rwanda, Botswana, Guinea, and Guinea Bisau show a consistently upward trend which indicates steady improvement in per capita income over time. Other countries like Burkina Faso and Cameroun and Mali experienced initial drop in the real per capita income, but latter showed strong improvements.

Similarly, countries like Botswana, Madagascar, and Zimbabwe demonstrate significant volatility with sharp rises and falls in RGDPCC, while other countries like Togo and Burundi experienced stagnation over long periods. Finally, other group of countries like Nigeria, South Africa, and Namibia have actually experienced significant decline in per capita income over the study period. Thus, there is strong divergence in the trend of economic growth prospects among the SSA countries over the period of the study. The chart therefore demonstrates the diversity in economic trajectories across SSA countries. While some have managed stable and rising per capita incomes others have faced frequent economic upheavals. The data suggests that despite common regional challenges, country-specific factors play a significant role in economic outcomes in the region.

Figure 4.1: Trends in Real GDP per Capita for Selected SSA Countries

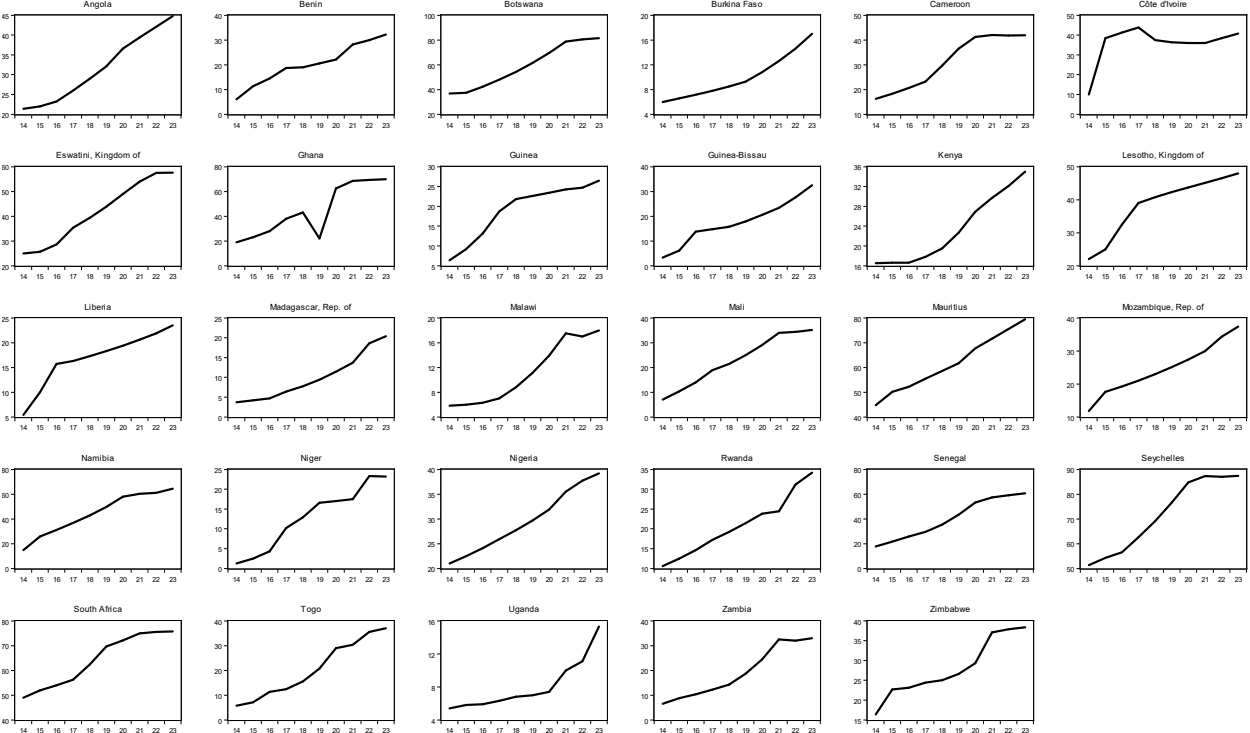


Source: Author's compilation using Eviews 13.

The chart trends in the share of population using the internet for the SSA countries are shown in Figure 4.2. All the graphs display upward trends which shows that there is growing internet adoption across all countries in the region. This suggests progressive digital inclusion which is largely driven by factors like mobile technology expansion, infrastructure investments, and economic development. There are however varying rates of increase and current levels. For instance, the Southern and Eastern SSA countries (e.g., South Africa, Kenya) generally outperform Central and Western ones (e.g., Chad, Guinea) in terms of internet usage. There are also common trends or patterns. For instance, most of the trends start near 0% in

2014 and curve upward with some showing S-shaped growth (slow initial adoption followed by rapid expansion). The chart shows that although there is significant progress in internet penetration in SSA, there are still large digital divides within the region. While the region as a whole is catching up, disparities could widen without targeted interventions.

Figure 4.2: Trends in Internet Usage for Selected SSA Countries

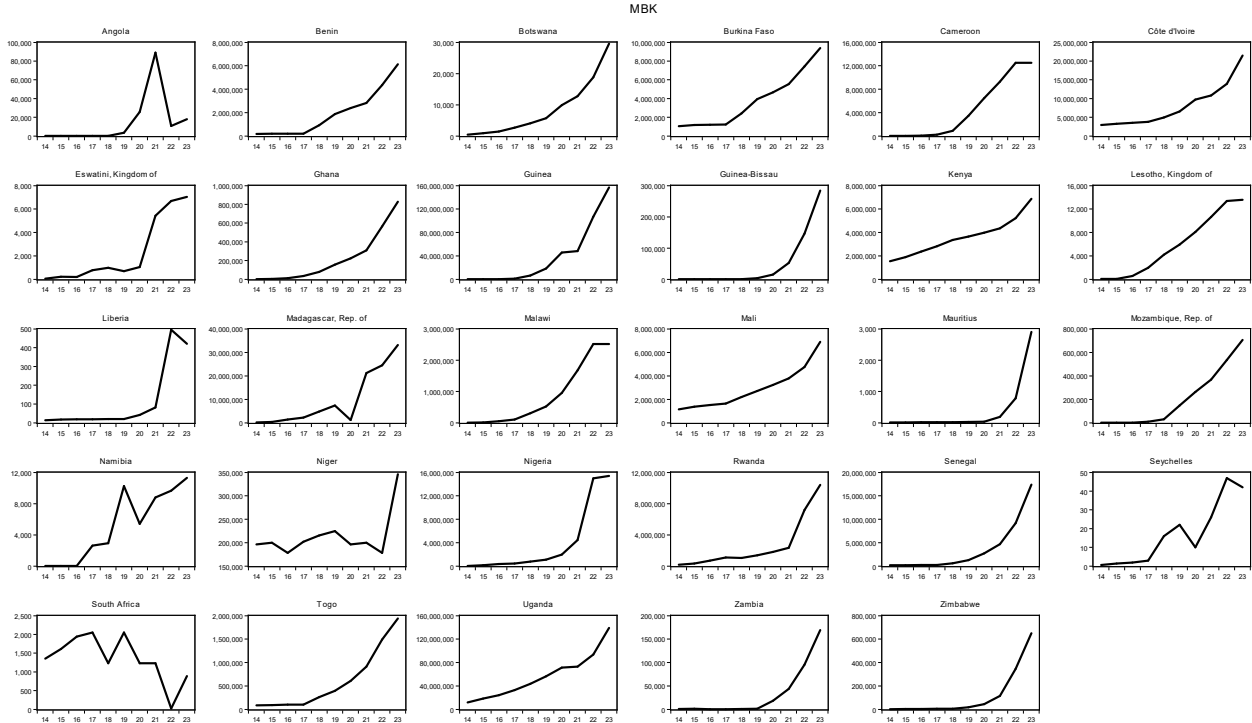


Source: Author’s compilation using Eviews 13.

The trends in mobile banking transactions in selected SSA countries are shown in Figure 4.3. The trend is similar to that of internet usage and suggests that internet usage and mobile banking services appear to move in the same direction for SSA countries. There is relatively smooth and sharp growth in the trend over the period for most of the countries. This indicates that pattern of growth in mobile banking services in the SSA region. This component of financial inclusion has provided one of the swiftest means of integrating the population into the formal financial system in most SSA countries (World Bank, 2025). Only countries like Angola, Namibia, and Niger experienced significant shocks and stall in the growth of

mobile money services in the region. Indeed, South Africa has experienced a significant decline in mobile banking services since 2018, which is an interesting outcome.

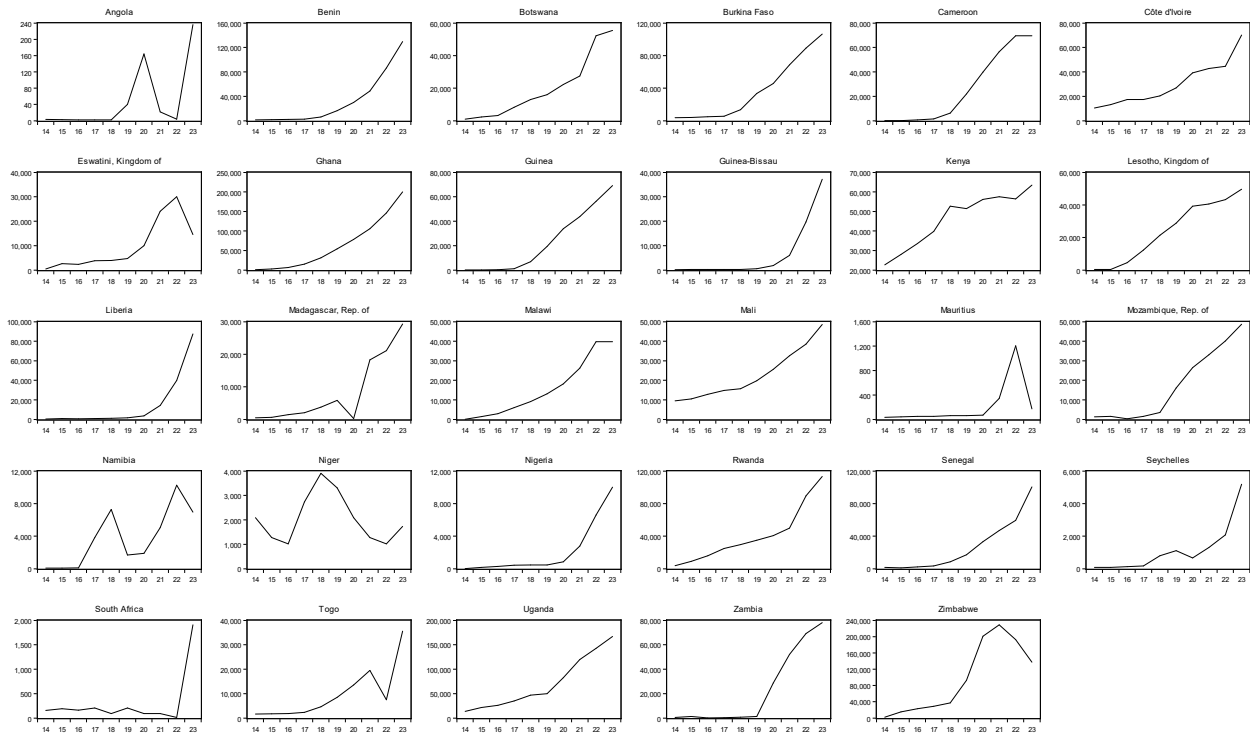
Figure 4.3: Trends in Mobile Banking Transactions in Selected SSA Countries



Source: Author’s compilation using Eviews 13.

In terms of POS agency, Figure 4.4 shows the trend in the number of POS agents in the countries. Like in other financial inclusion factors, most of the countries report significant and steady increases in the number over the study period. However, Niger, Namibia, and Angola exhibit sharp volatility in the trend over the years and show that they are some of the lagging countries in terms of digitally-driven financial inclusion among SSA countries. Other countries like Zimbabwe and Mauritius have experienced significant deep in POS agency in recent years. The general trend for SSA countries show that the POS agency segment of financial inclusion has thrived since 2014 for most SSA countries.

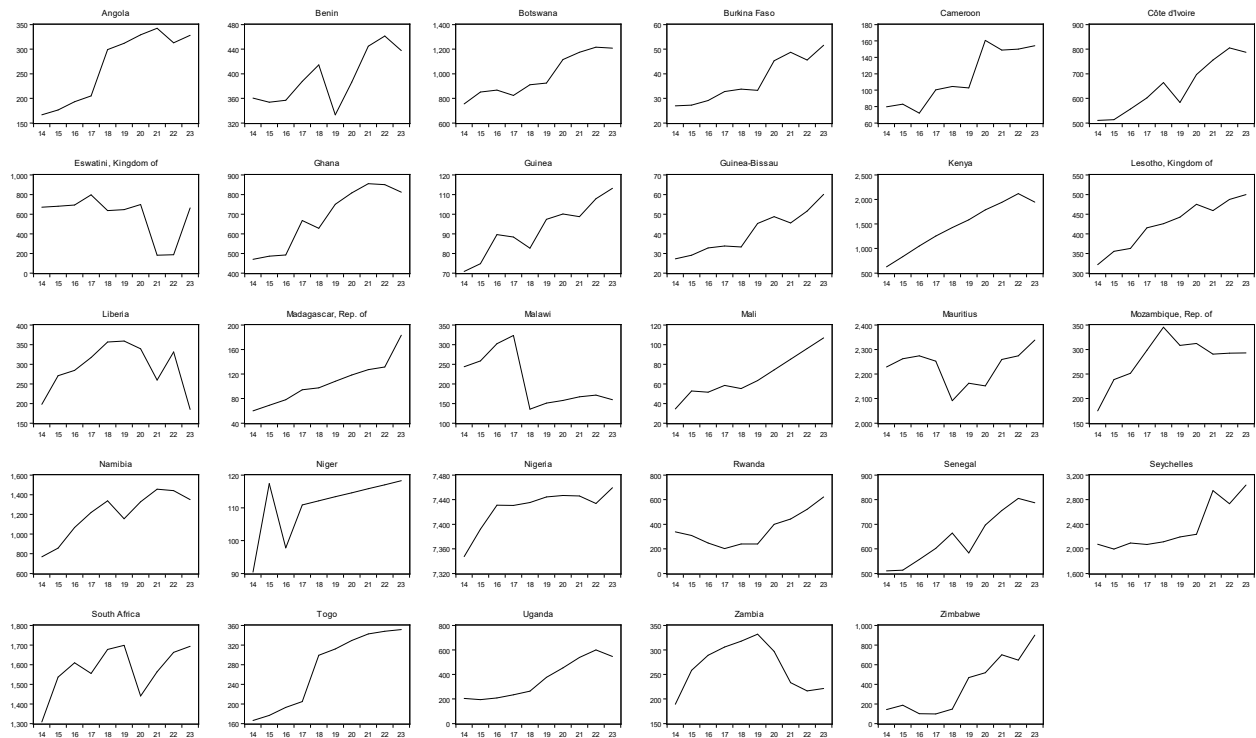
Figure 4.4: Trends in Number of POS Agents for Selected SSA Countries



Source: Author’s compilation using Eviews 13.

Figure 4.5 also shows the trends in bank account ownership among SSA countries. Many of the countries show steady rise in the trend over the study period, although the rate of increase is not as strong as other previously evaluated financial inclusion factors. Given that this trend directly shows financial inclusion in operation, there is evidence that financial technology may have grown much faster than financial inclusion in most SSA countries. There were decline in account ownership in countries like Liberia, Malawi and Zambia in recent years, while Niger has experienced a rather flat trend in this variable. In general, the trend in account ownership has flattened out in the last two years for most of the countries, which indicates some level of fatigue in banking services integration for most SSA countries.

Figure 4.5: Trends in Adult Account Ownership for Selected SSA Countries

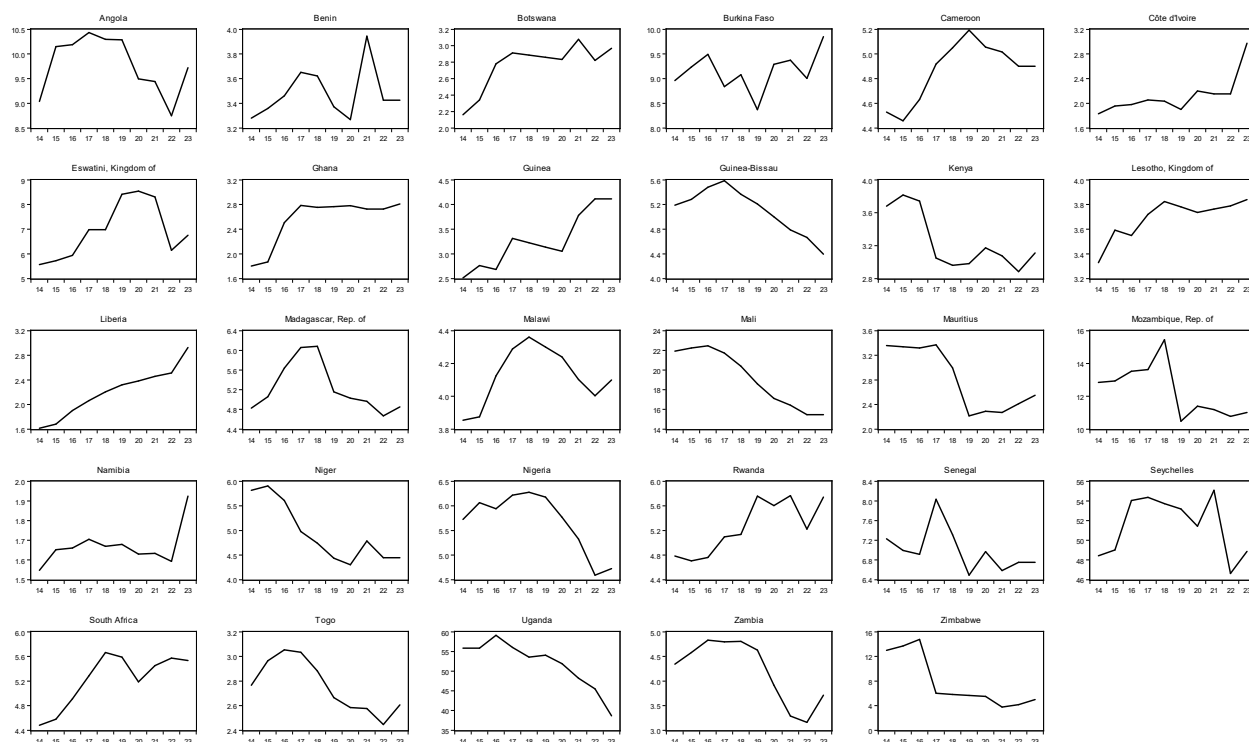


Source: Author’s compilation using Eviews 13.

The chart presents line graphs depicting the number of bank branches per 1,000 square kilometers in the SSA countries from 2014 to 2023. Unlike consistent growth patterns in other technology-related financial inclusion factors, the trends in bank branches penetration are characterised by volatility with many countries experiencing initial increases or peaks around 2016-2019 followed by notable declines toward 2023. This reflects a regional shift away from physical banking infrastructure which is mainly influenced by the rise of digital financial services, mobile money and overall Fintech innovations. These have led to reduction in the need for brick-and-mortar branches for providing banking services. Overall, branch density remains low across SSA countries compared to global standards averaging around 6 branches per 1,000 km² versus 34 in other non-SSA developing countries. The fluctuations may also stem from economic pressures on the banking sectors in SSA countries with tighter financing strategies and bank consolidations. By 2023, many countries show densities below their mid-period highs. This signals a

broader transition to digital inclusion amid challenges involved with physical access and high costs to the banks. Although the general decline in branch banking services in SSA region facilitates cost savings for banks, it risks excluding many unbanked populations who are without robust digital access.

Figure 4.6: Trends in number of Bank Branches per 1000sq km in Selected SSA Countries

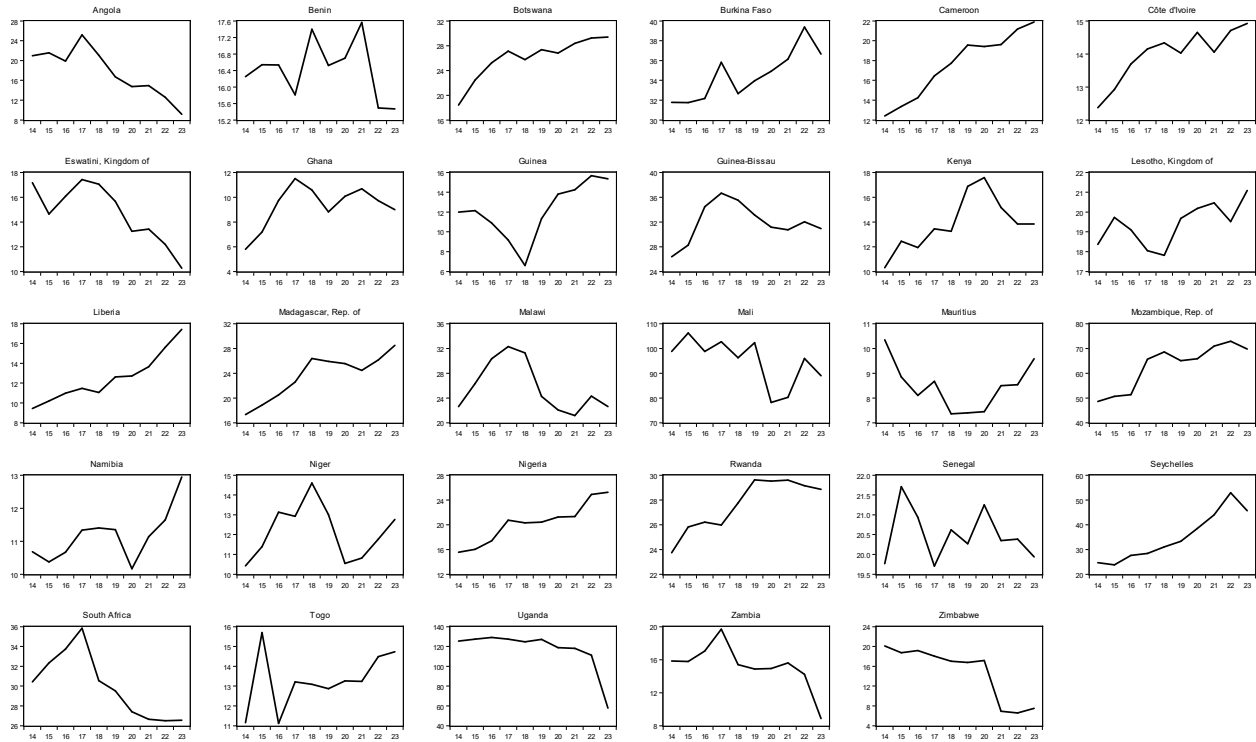


Source: Author's compilation using Eviews 13.

The chart in Figure 4.7 illustrates the trends in domestic credit to private sector as a percentage of GDP for the selected SSA countries over the study period. The trends are predominantly volatile, and characterised by fluctuations with peaks often occurring mid-period (around 2016-2019) and followed by declines or partial recoveries toward 2023. This reflects that credit supply in the SSA region is highly unstable and susceptible to significant macroeconomic and policy shocks which often disrupted credit expansion. While some growth occurred early in the decade for many of the countries, post-2020 dips align with rising incidence of significant crowding out of private credit. As shown in the chart recent reports suggest gradual recovery in provision amid improving profitability for banks. The volatility in credit supply in the SSA region effectively hampers financial inclusion strategies given that the main

channel where financial inclusion improves economic efficiency and provides relief from poverty is via access to cheap and easy credit.

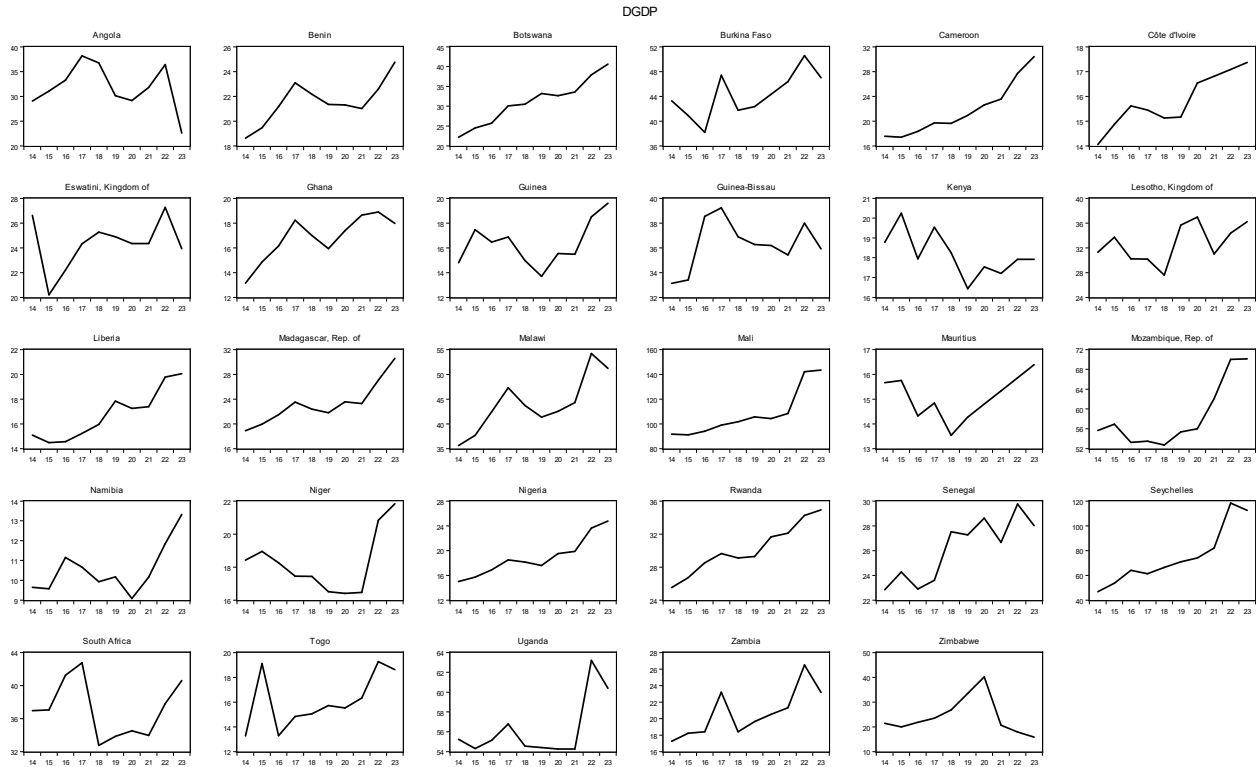
Figure 4.7: Trends in Credit to GDP Ratio in Selected SSA Countries



Source: Author’s compilation using Eviews 13.

The trend in the ratio of deposits to GDP for the SSA countries are also shown in Figure 4.8. It is seen that the trends are similar to those of credit services, although there is significant lower levels of volatility over the period. This shows that deposit services by the banks are more stable than credit services in most SSA countries. The deposit ratio has fallen recent in Kenya and Zimbabwe, but has taken sharp increase in countries like Benin, Cameroun, Guinea and Namibia. Considering that these are mainly countries with lower Fintech presence, the trend shows that deposit activities may not be mainly tied to Fintech among the countries.

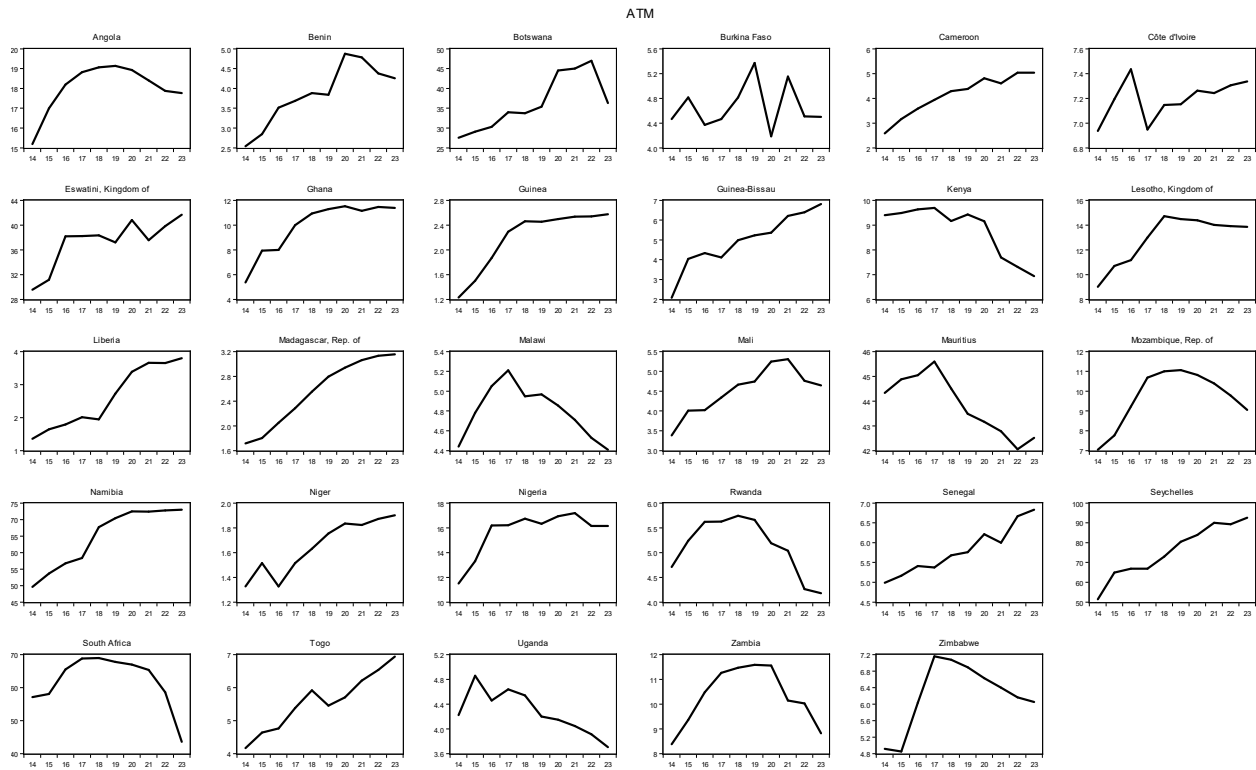
Figure 4.8: Trends in Deposit to GDP Ratio in Selected SSA Countries



Source: Author's computation using Eviews 13.

The trends in number of ATMs for the countries shown in Figure 4.9 indicates that the trend is declining significantly for most SSA countries. This is essentially driven by both supply (lower bank investment in ATM facilities) and demand (lower use of ATMs – many countries have moved into mobile banking and POS usage) factors. For the countries where ATM use is on the increase, the trend appears to be tailing out, except for Togo and Senegal that are still experiencing strong increases in the spread of ATM. In countries like Malawi and South Africa, ATM number per 100,000 adults have fallen to pre-2014 level, which show the level of decline in this financial inclusion indicator.

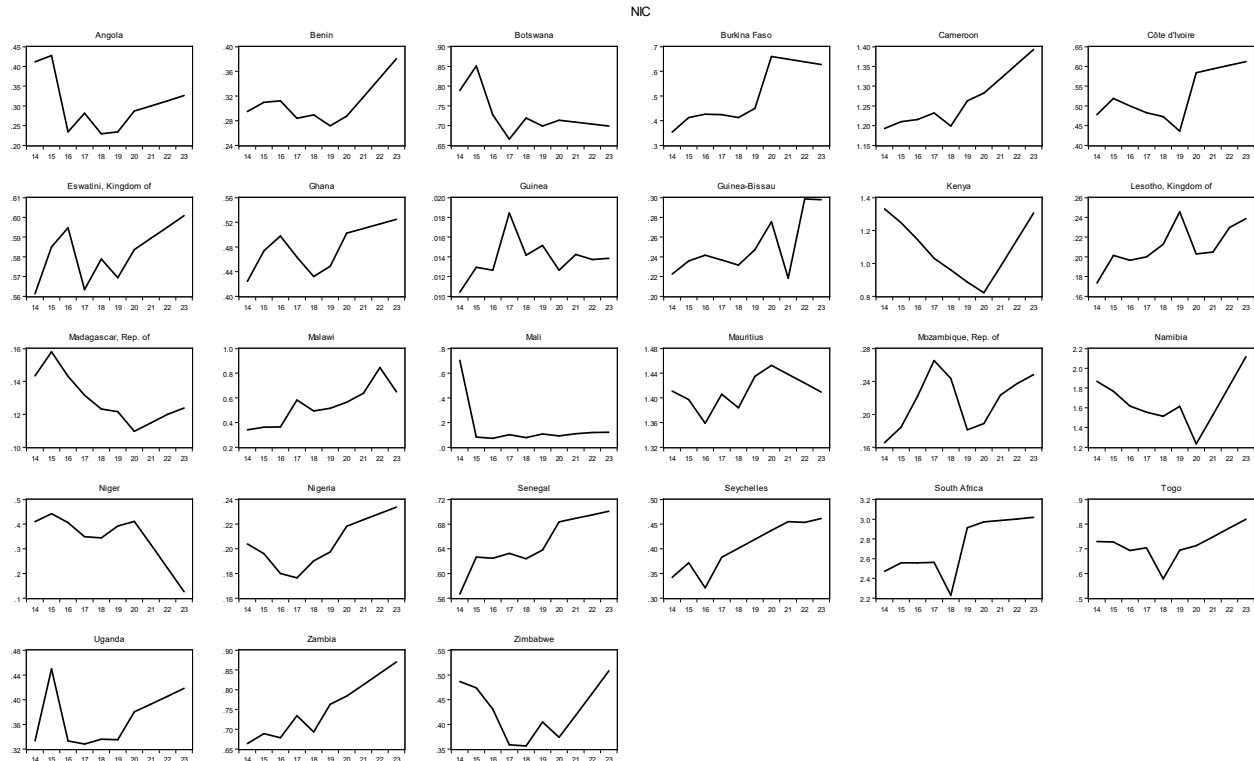
Figure 4.9: Trends in Number of ATMs per 100,000 adults in Selected SSA Countries



Source: Author's compilation using Eviews 13.

The trend in the number of insurance companies per 1,000 adults in various Sub-Saharan African countries is shown in Figure 4.10. The trends are marked by high volatility, with frequent peaks and troughs. The trends show frequent initial fluctuations or minor increases mid-period (around 2016-2019) followed by declines or stabilisation at lower levels by 2023. Fluctuations in the trends generally stem from market entries/exits (note that the insurance market in most SSA countries are still at very low development stages). There are also many instances of consolidations such as Nigeria's post-2007 reforms that reduced the total number of insurers from 117 to about 50. Macroeconomic shocks have also contracted premiums in some of the countries. The trend shows that many countries show net stability or slight declines over the period. For countries like Ghana that have shown significant positive trends, there is predominance of deliberate financial inclusion and deepening through growing digitisation and microinsurance efforts.

Figure 4.10: Trends in Number of Insurance Companies per adult population in Selected SSA Countries



Source: Author's compilation using Eviews 13.

4.3.2 Descriptive Statistics (Summary Statistics)

Table 4.1 provides key descriptive statistics for variables used in the study. Average real GDP per capita growth rate is 1.42 percent for the period which indicates a generally positive but very low economic growth over the years for the countries. Compared to historical standards, this is a slow growth rate for the SSA region especially given that population growth rate has been over 2 percent per annum on average over the last two decades (World Bank, 2024). Maximum growth rate in per capita GDP is quite high at 40.35 percent while minimum growth rate negative at -44.87 percent.

The wide range in growth rates suggests high volatility in per capita GDP growth over the period of analysis. This is confirmed by the generally high standard deviation of 12.31 (much higher than the mean value). This shows that growth rates across the economies over the period deviated from the mean by as much as ± 12.31 percentage points on average. This indicates significant variability in economic performance for the region. The variable is also positively skewed at 1.02 which also indicates that more

extreme positive growth episodes pull the tail to the right. The value of the Kurtosis (14.46) also confirms this outcome. The Jarque-Bera value is significant at 1 percent level which strongly rejects the null hypothesis of normality. This shows that there is heavy heterogeneity among the dataset. This also justifies the application of the panel-based non-linear ARDL framework for the analysis.

Table 4.1: Descriptive Statistics

| Variable | Mean | Max. | Min. | Std. Dev. | Skew. | Kurt. | J-B | Prob. | N |
|----------|--------|---------|--------|-----------|-------|-------|--------|-------|------|
| RGDPCG | 1.42 | 40.35 | -44.87 | 12.31 | 1.02 | 14.46 | 1474.8 | 0.00 | 1160 |
| IUI | 30.33 | 87.40 | 1.25 | 19.85 | 0.91 | 3.19 | 40.6 | 0.00 | 1160 |
| MBK | 4.89 | 157.00 | 0.64 | 17.16 | 5.98 | 43.62 | 216.6 | 0.00 | 1160 |
| POS | 23.36 | 228.88 | 2.23 | 36.73 | 2.71 | 11.87 | 1304.3 | 0.00 | 1160 |
| ACOW | 822.77 | 7459.37 | 26.93 | 1399.32 | 3.69 | 17.37 | 3153.8 | 0.00 | 1160 |
| NBB | 421.93 | 3407.75 | 34.94 | 515.54 | 2.69 | 11.88 | 1303.4 | 0.00 | 1160 |
| CGDP | 26.63 | 129.17 | 5.80 | 24.88 | 2.64 | 9.68 | 876.7 | 0.00 | 1160 |
| DGDP | 31.38 | 143.48 | 9.08 | 21.60 | 2.39 | 9.96 | 860.5 | 0.00 | 1160 |
| ATM | 16.39 | 92.53 | 1.23 | 20.77 | 1.84 | 5.37 | 231.5 | 0.00 | 1160 |
| NIC | 0.63 | 3.02 | 0.01 | 0.58 | 2.09 | 7.90 | 467.0 | 0.00 | 1080 |
| TOP | 70.04 | 222.18 | 20.72 | 34.87 | 1.75 | 6.61 | 306.3 | 0.00 | 1160 |

Source: Author's computation using Eviews 13.

In terms of direct digital technology, average number of internet users as a share of population (IUI) is 30.33 percent. This shows that internet penetration is low on average in the region and the ratio is about half of the average global rate of 64.5 percent in 2023. This underscores significant digital exclusion among individuals, households and businesses in SSA despite mobile connectivity leaps in recent years. Essentially, limited internet connectivity hampers Fintech adoption and can lower overall financial inclusion effort. The standard deviation of 19.85, which is lower than the mean score shows that the average rate is similar among countries.

Average amount mobile banking transactions per annum is \$4.89 billion. This high amount aligns with recent trend of SSA countries' leadership in mobile money and mobile banking services. This is effectively boosting financial inclusion for the unbanked in the region. The average number of POS agents is 23,360 which is a high level. Compared to just under 15,000 in Europe, this is quite large for SSA countries. This shows a modest density of POS agents with the SSA region. Also with a higher than mean standard deviation of 36,730. It means that the average number of POS agents across the SSA region varies and not uniform.

Among the technology and the financial access variables of financial inclusion, the table shows that average number of adults with savings accounts (ACOW) is 822.77 for the countries. This average indicates roughly 823 adults per capita hold savings accounts. This shows limited formal savings penetration in SSA. Compared to global financial account ownership of approximately 79 percent of all adults in 2023-2025 period, the SSA average lags significantly. Savings in SSA countries are often informal or absent due to both operational and technical barriers. The standard deviation is 1,399.32 which is 1.7 times the mean. This high SD reveals extreme dispersion in account ownership across SSA countries with values ranging from a minimum of 26.93 to a maximum of 7,459.37. The positive skew (3.69) and high kurtosis (17.37) suggest that outliers drive variability in the ACOW variable, likely from Fintech hubs (e.g., Kenya's M-Pesa ecosystem) versus conflict zones (e.g., South Sudan).

In terms of the number of bank branches per 100,000 adults, the average is 9.01 which is a low bank branch density among SSA countries. This is also below the global average of 18 per 100,000 adults. As noted earlier, the low score indicates shift in banking services to digital methods. It can however, imply significant physical banking exclusion for rural populations, especially those that are experiencing limitations in mobile connectivity.

In terms of the financial usage variables of financial inclusion, the average credit to GDP ratio (CGDP) for the countries is 26.26 percent, which is only a moderate ratio. The average is essentially pulled up by

the averages of financially deep countries like South Africa and Mauritius. This can be seen from the low minimum value of 5.80 percent and a high standard deviation score. Overall, SSA's mean credit to GDP ratio remains low compared to global benchmarks averaging of around 36-39 percent in recent years versus over 147 percent worldwide. This indicates that financial sectors in many SSA countries are still underdeveloped with limited private sector financing.

The other variable of financial usage is the average deposit to GDP ratio. The average deposit to GDP ratio (DGDGP) is 31.38 percent which is generally low (although higher than average credit to GDP ratio). This ratio reflects shallow deposit mobilisation among SSA countries which is far below global levels of 60-70 percent. This suggests that financial inclusion that involves intermediation between banks and households/business is low, with implications for lower capacity for lending. This low ratio also signals conditions of savings leakage to informal sectors which can directly constrain credit availability and economic expansion. The standard deviation of 21.60 is lower than the mean score and suggests that the moderately low deposit to GDP ratio is common among most SSA countries.

In terms of the financial quality of financial inclusion, the average number of ATMs per 100,000 adults is 16.39 with a standard deviation of 20.77 which is much higher than the mean score. The score shows modest density of ATM penetration among SSA countries and indicates some level of underdeveloped cash access infrastructure. This is especially considering that global average in ATM access is 40 ATMs per 100,000 adults in 2023. This low mean implies reliance on costly alternatives like informal transport for cash and POS transactions which can indirectly stifle small businesses and daily transactions. It may also contribute to a "cash trap" where limited liquidity hampers economic formalization and domestic trade efficiency. The high standard deviation also suggests that there are wide variations in ATM access across the region.

The other measure of financial quality is the number of insurance firms in the country. The average number of insurance firms per 100,000 adults is 0.63 which is low. This average score shows the typically

small number of insurers by adult population in SSA countries. It highlights the underdeveloped and fragmented nature of the insurance markets in SSA countries. In most countries, insurance company counts remain below 50 per relative to population size. This results in densities that are far below global averages.

Trade openness at 70.04 percent and standard deviation at 34.87 shows a burgeoning trade environment.

The average scores obtained from the descriptive statistics generally point to moderate but essentially underdeveloped financial ecosystems in SSA when compared to global benchmarks. This highlights grounds for persistent financial exclusion, especially in terms of traditional banking services provision in the region. High standard deviations relative to means also highlight strong heterogeneity that reflect disparities in terms of financial inclusion across the SSA countries. This variability and disparities are also evident in the skewness and kurtosis outcomes for the variables. In particular, the Jarque-Bera coefficients for all the variables are significant at the 1 percent level. This shows non-normal distribution of the panel data which are evidence of strong cross-country heterogeneity. Thus, the application of a panel data framework for the estimation analysis is justified in the study.

Further to the descriptive statistics, the correlations among the variables are also computed and the results are reported in Table 4.2. The focus is on the explanatory variables because they provide information about interactions. Among the financial inclusion and financial technology variables, the strongest positive correlation is between NBB and CGDP at 0.70 and between NBB and DGDP at 0.61. These strong positive correlations clearly demonstrate that physical banking presence significantly correlates with more credit supply and deposit mobilisation. It shows that financial inclusion that involves physical bank branches are the most related to increased credit and deposit activities in the banking system in SSA, especially when compared with digital-based banking services. There is also positive correlation between ATM and ACOW which shows that account ownership increases with more ATM presence. There is also strong positive correlation between ATM and NIC. In terms of technology and digital influences, there is strong positive correlation between IUI and both ATM and NIC which shows that better internet access is

associated with more ATM and insurance penetration. POS and MBK also have significant positive correlation at 0.37.

Table 4.2: Correlation Results

| Variable | RGDPPC | ACOW | ATM | CGDP | DGDP | IUI | MBK | NBB | NIC | POS |
|----------|-----------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|-----|
| RGDPPC | 1 | | | | | | | | | |
| ACOW | 0.37 (0.00) | 1 | | | | | | | | |
| ATM | 0.87 (0.00) | 0.34 0.00 | 1 | | | | | | | |
| CGDP | -0.12 (0.04) | -0.12 0.05 | -0.11 0.08 | 1 | | | | | | |
| DGDP | 0.12 (0.06) | -0.10 0.10 | 0.10 0.11 | 0.76 0.00 | 1 | | | | | |
| IUI | 0.72 (0.00) | 0.32 0.00 | 0.75 0.00 | -0.20 0.00 | 0.06 0.34 | 1 | | | | |
| MBK | -0.14 (0.02) | -0.06 0.32 | -0.18 0.00 | 0.32 0.00 | 0.08 0.17 | -0.15 0.01 | 1 | | | |
| NBB | 0.35 (0.00) | 0.05 0.40 | 0.24 0.00 | 0.70 0.00 | 0.61 0.00 | 0.06 0.37 | 0.31 0.00 | 1 | | |
| NIC | 0.40 (0.00) | 0.11 0.08 | 0.57 0.00 | -0.20 0.00 | -0.21 0.00 | 0.46 0.00 | -0.15 0.01 | -0.19 0.00 | 1 | |
| POS | -0.21 (0.00) | -0.12 0.05 | -0.25 0.00 | 0.10 0.10 | 0.05 0.37 | 0.08 0.17 | 0.37 0.00 | 0.05 0.38 | -0.09 0.12 | 1 |

Source: Author's computation using Eviews 13. Note: probability values in parentheses.

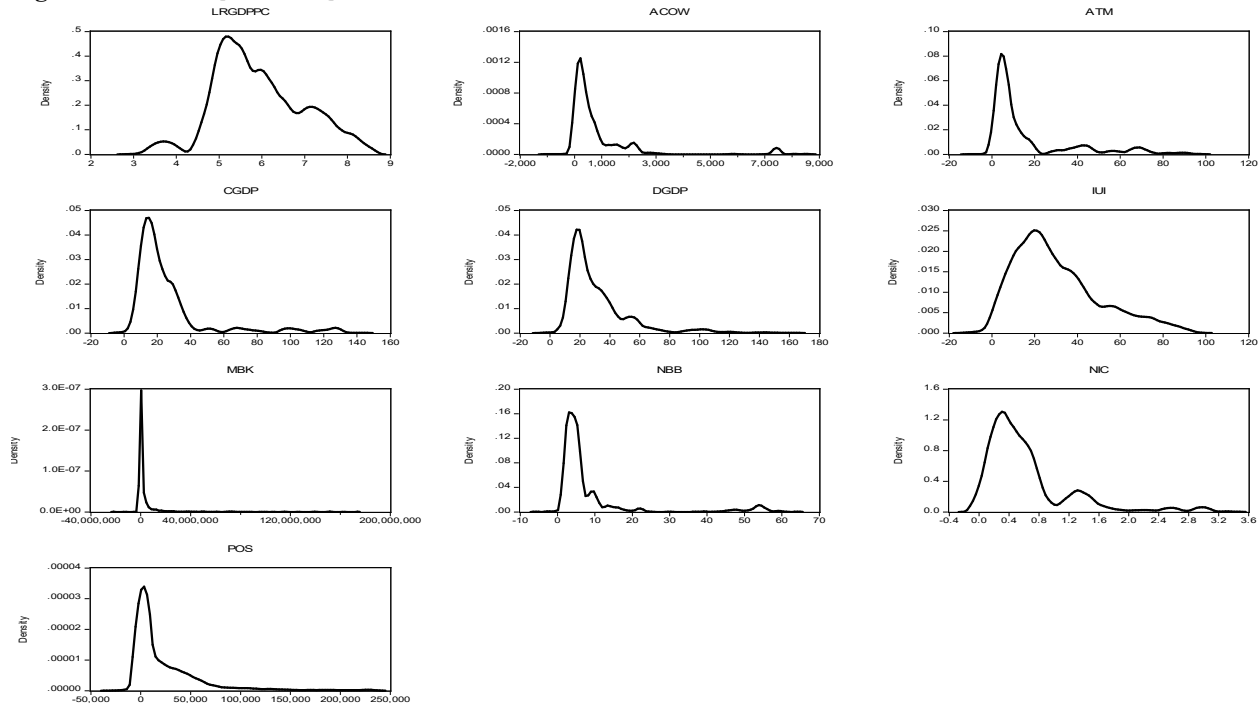
4.4 Tests of Time Series and Cross-sectional Properties of the Panel Data

4.4.1 Test for Normality

In this section, we present the cross-sectional characteristics of our data to assess its suitability for analysis. Figure 4.11 displays the Kernel density tests for normality across all variables. Properly normally distributed variables would exhibit smooth, bell-shaped density functions concentrated at the center of the plot. However, our examination reveals that none of the variables demonstrates normal distribution - the kernel plots are predominantly skewed away from the center and show considerable dispersion. This non-normality is anticipated given our dataset's composition, which pools observations from different banks across multiple time periods. Consequently, Ordinary Least Squares (OLS)

estimation would be inappropriate for our analysis. Instead, a panel-based estimation framework is more suitable to address the cross-sectional heterogeneity present in our data.

Figure 4.11: The Quantile-Quantile Plots for Variables



Source: Author's compilation using Eviesel3.

4.4.2 Panel Unit Root and Cointegration Tests

Financial inclusion in most of the countries in this study show significant differences which is evident from the descriptive statistics. This diversity suggests the panel data used in the empirical analysis contains both country-specific and common characteristics. In order to accurately test for stationarity two types of panel unit root tests are therefore employed. These methods account for the influences of heterogeneity across countries and homogeneity within the countries. First, the Levin, Lin and Chu (LLC) test is applied which assumes the panel is homogeneous and that all countries share the same characteristics. However, since each country's financial systems may differ, we also used heterogeneous panel unit root tests based on the Im, Pesaran and Shin (IPS) test and the Augmented Dickey-Fuller (ADF) – Fisher test outcomes. These tests are better suited for our data because they allow for individual country differences. We conducted these tests on the variables in their original form (levels) and after

transforming them (first differences). The results for the variables in levels are shown in Table 4.3. This comprehensive approach ensures a thorough and robust examination of the stationarity of the panel data.

Table 4.3: Panel Unit Root Test Results

| Variables | Homogeneous Unit Root Process | | Heterogeneous Unit Root Process | | | |
|-------------|-------------------------------|----------------------|---------------------------------|------------|----------------------|------------|
| | Level | 1 st Diff | Level | | 1 st Diff | |
| | LLC | LLC | IPS | ADF-Fisher | IPS | ADF-Fisher |
| RGDPC | 0.716 | -10.04** | -1.572 | 13.75 | -15.80** | 278.4** |
| <i>IUI</i> | -2.781** | | 0.345 | 57.16** | | |
| <i>MBK</i> | 4.398** | | 0.587 | 167.1** | | |
| <i>POS</i> | 2.888 | 5.722 | 1.772 | 80.96 | -3.525** | 185.6** |
| <i>NBB</i> | 2.393** | | -4.249** | -4.249** | | |
| <i>ACOW</i> | | | | | | |
| <i>CGDP</i> | | | | | | |
| <i>DGDP</i> | | | | | | |
| ATM | | | | | | |
| NIC | -0.690 | | -4.296** | 118.3** | | |
| TOP | | | | | | |

Source: Author's computations using Eviesel3.

The result in Table 4.3 shows that most of the variables (especially the Fintech and financial inclusion variables) are stationary at their levels. This means that most of the variables are integrated of order one or I(1). As for the dependent variable and POS, they are non-stationary in levels but become stationary after their first difference. This indicates they are integrated of order one or I(1). Both the homogeneous (LLC) and the heterogeneous (IPS, ADF-Fisher) tests support these findings. These mixed results validate the use of an ARDL-based dynamic panel estimation technique such as the panel non-linear ARDL approach to cointegration analysis which is adopted in this study. This approach is well-suited for a mix of stationary and non-stationary variables and can effectively capture long-run relationships.

In Table 4.4, the results of cointegration tests for the economic growth equation in the study is presented. Both the Pedroni and Kao panel cointegration tests are employed into analysing the panel data. The

Pedroni test is used to account for heterogeneity while the Kao test is used to account for random relationships across different sections of the data (Wooldridge, 2010). Based on the Panel PP and Panel ADF statistics, both the within-group and between-group tests show that we can reject the null hypothesis of no cointegration for the relationships that involve economic growth and financial inclusion variables and economic growth with financial technology variable at a 5 percent significance level. Note that the within-dimension tests assume that the autoregressive (AR) parameter, which measures how quickly a system returns to equilibrium after a shock, is the same across all countries. The panel PP-Stat and Panel ADF-Stat under this section both show highly significant results. This indicates a strong rejection of the no cointegration hypothesis. The between-dimension tests, on the other hand, allow the AR parameter to vary across different countries. The W-t-stat for the PP-Stat and ADF-Stat also show highly significant negative values. This corroborates the findings from the within-dimension tests and suggests that even with individual-specific dynamics, a long-run relationship exists. This means that a significant long-run relationship is demonstrated among the variables in both sets of growth equations. The findings from the Pedroni tests are also supported by the Kao tests which also indicate that cointegration exists among the variables.

Table 4.4: Cointegration Test Result

| Test | <i>H1: common coefs. (within-dimension)</i> | | <i>H1: individual coefs. (between-dimension)</i> | | | |
|--|---|-------|--|-------|---------|-------|
| | t-Stat. | Prob. | W- t-stat. | Prob. | t-stat. | Prob. |
| <i>Model: with Fintech factors</i> | | | | | | |
| PP-Stat. | -12.78 | 0.00 | -13.59 | 0.00 | -16.50 | 0.00 |
| ADF-Stat. | -3.927 | 0.00 | -5.498 | 0.00 | -4.539 | 0.00 |
| Kao | -6.323 (0.00) | | | | | |
| <i>Model: with financial inclusion factors</i> | | | | | | |
| PP-Stat. | -14.90 | 0.00 | -14.42 | 0.00 | -26.12 | 0.00 |
| ADF-Stat. | -5.056 | 0.00 | -6.255 | 0.00 | -7.259 | 0.00 |
| Kao | -11.12 (0.00) | | | | | |

Source: Author's computation using Eviews 13.

4.5 Regression Analysis

In this section, the models specified in the previous chapter are estimated and the results are presented and analysed. The analysis of the estimates is also for evaluating the hypotheses of the study. As noted earlier both pre- and post-estimation tests are conducted on the panel data to ensure the suitability of our models as well as the robustness of the estimates. The method of analysis adopted in this study is the panel non-linear autoregressive distributed lags (PNARDL) approach. The NARDL framework is particularly useful since it allows for potential asymmetries in how positive and negative changes in financial technology and financial inclusion variables influence economic growth in SSA. It therefore captures nonlinear dynamics that standard linear models might miss. In order to provide robust evaluations of the relationships the results of the linear ARDL estimates (based on the PMG) methodology are also included for each relationship.

The results of the estimates that show the direct effect of digital technology access on economic growth is reported in Table 4.5. Panel A reports symmetric models (no asymmetry), while Panel B incorporates asymmetries by decomposing the internet usage variable into positive (IUI^+) and negative (IUI^-) components which represent cumulative increases and decreases respectively. The results in panel A assume a symmetric relationship which means that the effect of internet usage on economic growth in SSA does not differ depending on whether the variable increases or decreases. The upper portion of the results show the long run estimates, while the lower portion (with Δ indicators) reveal the short run relationships. In the long run result, the coefficient of internet usage as a proportion of the population (IUI) is positive and significant at the 1 percent level. This shows that an increase in the proportion of the population using the internet is associated growth in real GDP per capita in SSA countries in the long run. This result highlights the importance of internet penetration as a direct driver of economic growth. Increased internet access can facilitate improvements in productivity gains as well as innovation (especially in the financial sector). The coefficient of trade openness is also significant and positive which shows that better international trade leads to increased long run economic growth in SSA.

The coefficient of the error correction term (ECM_{t-1}) has the expected negative sign and is significant at the 1 percent level. This shows the presence of long run stability in the model. The coefficient is however small at -0.100 which indicates that only 10 percent of the deviation from the long-run equilibrium in real GDP per capita is corrected in the first quarter. Essentially, this suggests a relatively slow adjustment to equilibrium. This slow adjustment is typical in developing economies where structural rigidities may delay the full impact of technological changes over time. The log-likelihood measures the goodness-of-fit of the model. The value is sufficiently large at 2145.323 and indicates a strong fit for the model, since higher values indicate better explanatory power of the model.

Table 4.5: Results for NARDL Estimates of Internet Usage and Economic Growth

| Variable | Coefficient | Prob. |
|------------------------------------|-------------|-------|
| <i>A: Models without asymmetry</i> | | |
| IUI | 0.232 | 0.000 |
| TOP | 1.357 | 0.000 |
| ΔIUI | 0.187 | 0.179 |
| ΔIUI_{t-1} | 0.036 | 0.471 |
| Constant | -0.090 | 0.083 |
| ECM_{t-1} | -0.100 | 0.002 |
| Log likelihood | 2145.323 | |
| <i>B. Models with asymmetry</i> | | |
| IUI^+ | 0.092 | 0.003 |
| IUI^- | -2.003 | 0.000 |
| TOP | 0.890 | 0.000 |
| ΔIUI^+ | 0.257 | 0.053 |
| ΔIUI_{t-1}^+ | 0.063 | 0.509 |
| ΔIUI^- | -0.521 | 0.554 |
| ΔIUI_{t-1}^- | 0.099 | 0.842 |
| TOP | 0.208 | 0.318 |
| Constant | -1.894 | 0.008 |
| ECM_{t-1} | -0.165 | 0.002 |

Source: Author's computation using Eviews 13.

The lower panel of the estimates in Table 4.5 report the estimates of the relationships with asymmetry – the panel NARDL estimates. These results incorporate the asymmetric effects of increases and decrease in internet usage (IUI^+ and IUI^-) and their changes (ΔIUI^+ and ΔIUI^-) on economic growth when these

effects are allowed to differ. This is particularly relevant for capturing non-linear dynamics where positive and negative shocks may have distinct impacts. In interpreting the asymmetric results, two issues are of critical relevance. First is the coefficient sign and significance of the positive and negative shock effects. These show how positive versus negative shocks to the variable affect economic growth. Secondly, there is also the focus on the relative size of both of the coefficients. The large value of the coefficients is shown to exert the dominant effect on the dependent variable.

The results in the lower panel of Table 4.5 also contain the long run estimates and the short run estimates (with Δ). In the long run results, the coefficient of positive changes in internet usage (IUI^+) is positive and significant at the 1 percent level. This shows that a positive change (an increase) in the spread of internet usage among the population significantly promotes economic growth in the long run. In particular, a 1 percent increase in internet usage (a positive shock) is associated with a 0.092 percent increase in real GDP per capita. This shows that increases in internet usage have a positive but relatively modest effect on economic growth over time in SSA. Thus, expanding internet access contributes to long run economic growth. This positive contribution is however experienced in diminishing returns when the results of the symmetric model is taken into cognisance.

The coefficient of the negative shock to internet usage (IUI^-) is negative and significant at the 1 percent level. This shows that negative shocks or decline in internet usage significantly reduces long run growth in SSA. The size of the coefficient indicates that a 1 percent drop in internet usage (a negative shock) leads to a substantial 2.003 percent decrease in real GDP per capita in the long run for the SSA region. Notice that in absolute terms, the coefficient of the effect of positive shocks to internet usage is much lesser than the coefficient of negative shock to internet usage. This therefore indicates that reductions in internet usage have a disproportionately severe impact on economic growth compared to the positive effect of increased internet usage in SSA countries.

For the control variable of trade openness (TOP), the coefficient is significant and positive and shows that increases in trade openness significantly contributes to economic growth in SSA. In terms of the short run

relationships, only the coefficient of ΔIUI^+ is significant at the 5 percent level and is positive. This shows that in the short run, only positive shocks to internet access (that lead to increased access) significantly contributes to economic growth. Short run declines in internet usage does not significantly affect economic growth in SSA.

The coefficient of the error correction term (ECM_{t-1}) in the NARDL estimates is also significant at the 1 percent level and is negative. This shows that long run equilibrium will be restored after any short run shocks in the system. The coefficient of -0.165 indicates that the adjustment to long run equilibrium is slow since just 16.5 percent of the deviation from equilibrium is corrected in the first period. This adjustment speed is however faster than that of the symmetric estimation. This suggests that the asymmetric estimation better captures the non-linear dynamics of internet usage on economic growth in SSA countries.

The result of the panel NARDL estimates for the effects of financial technology application on economic growth among the sampled SSA countries are presented in Table 4.6. The two variables used to capture financial technology applications are mobile banking (MBK) and POS agency. For the models without asymmetry (reported in Panel A), the long run result shows that the coefficients of both MBK and POS are significant at the 1 percent level and they are positive. These clearly show that any increase in mobile banking and POS financial services directly lead to long run growth in the economies of SSA countries. The coefficient of TOP is also significant which supports the finding that trade is good for expanding long run growth in SSA. In terms of the short run estimates, none of the coefficients is significant, indicating that from a symmetric perspective, changes in financial technology applications do not have significant short-term effects on economic growth in SSA. The coefficient of the error correction term is negative and significant for both models. This confirms the existence of a long-run stability and adjustment for the models. The low coefficients in both cases imply that adjustment to long run equilibrium is slow.

Table 4.6: Results for NARDL Estimates of Financial Technology Application and Economic Growth

| Variable | Coefficient | Prob. | Coefficient | Prob. |
|--|-------------|-------|-------------|-------|
| <i>A: Models without asymmetry</i> | | | | |
| MBK | 0.060 | 0.000 | | |
| POS | | | 0.071 | 0.000 |
| TOP | 0.553 | 0.000 | 0.786 | 0.000 |
| Δ MBK | -0.096 | 0.110 | | |
| Δ MBK _{t-1} | -0.053 | 0.360 | | |
| Δ POS | | | -0.025 | 0.640 |
| Δ POS _{t-1} | | | -0.009 | 0.702 |
| Constant | 0.127 | 0.157 | 0.110 | 0.154 |
| ECM _{t-1} | -0.071 | 0.034 | -0.107 | 0.004 |
| Log likelihood | 2125.3 | | 2133.0 | |
| <i>B. Models with asymmetry</i> | | | | |
| MBK^+ | 0.185 | 0.000 | | |
| MBK^- | -0.721 | 0.000 | | |
| POS^+ | | | 0.002 | 0.982 |
| POS^- | | | -0.172 | 0.007 |
| TOP | 0.092 | 0.315 | 1.930 | 0.000 |
| Δ MBK ⁺ | -0.086 | 0.269 | | |
| Δ MBK ⁺ _{t-1} | -0.282 | 0.093 | | |
| Δ MBK ⁻ | -0.165 | 0.457 | | |
| Δ MBK ⁻ _{t-1} | 0.136 | 0.257 | | |
| Δ POS ⁺ | | | 0.056 | 0.481 |
| Δ POS ⁺ _{t-1} | | | -0.070 | 0.159 |
| Δ POS ⁻ | | | -0.526 | 0.168 |
| Δ POS ⁻ _{t-1} | | | 0.195 | 0.076 |
| Δ TOP | 0.455 | 0.319 | 0.396 | 0.314 |
| Constant | -7.070 | 0.036 | -1.174 | 0.006 |
| ECM _{t-1} | -0.115 | 0.013 | -0.119 | 0.009 |

Source: Author's computation using Eviews

The non-linear effects of the two financial technology variables on economic growth are observed based on the models with asymmetry (in Panel B). These models investigate whether positive and negative changes in the variables have different effects on real GDP per capita in SSA. The coefficients for the positive and negative changes are presented separately. For the long run results, the coefficient of positive shock or changes in mobile banking (MBK^+) is highly significant and positive at 0.185 while the coefficient of negative changes (MBK^-) is highly significant and negative at -0.721. These outcomes show that positive changes in mobile banking affect significant long run economic growth-enhancing effects in

SSA, while negative changes exert significant growth-declining effect. The significant difference in magnitude suggests a strong asymmetric effect. This indicates that a positive shock in mobile banking transactions has a positive but smaller impact than the negative impact of a negative shock. Apparently much more significant economic costs are incurred when there is a decline in mobile banking than the positive boosts during increases.

The coefficient of both POS^+ and POS^- are both significant at 0.002 and -0.172 respectively. This shows that positive change in POS has a significant effect on economic growth in the long run while negative change has a significant negative effect. Again, the coefficient of the negative shock is larger (in absolute terms) to that of the positive shock. This indicates an asymmetric effect where a decrease in the number of POS agents has a stronger detrimental impact on economic growth than the beneficial growth impact of increase in POS agency among SSA countries. The coefficient of TOP is also significant in the result, which shows that trade is beneficial to long run growth in SSA.

Just like the symmetric estimates, none of the coefficients of the variables is significant in the short-run estimates. This clearly shows that the short-run effects of financial technology application variables on economic growth in SSA are not statistically robust. The coefficient of the error correction term for the asymmetric estimates is also significant and negative for both estimates (-0.115 and -0.119). This also confirms the long-run stability of the models even after accounting for asymmetric effects. The magnitude of the coefficients suggests a faster speed of adjustment toward growth equilibrium in SSA countries when asymmetric effects are taken into cognisance.

The result of the panel NARDL estimates for the effects of financial access on economic growth among the sampled SSA countries are presented in Table 4.7. Financial access is measured in terms of bank savings account ownership (ACOW) and the density of bank branches (NBB). For the models without asymmetry (reported in Panel A), the long run result shows that the coefficients of both ACOW and NBB are both significant at the 1 percent level and they are positive. These reveal that any increase in account ownership with banks and number of bank branches directly lead to long run growth in the economies of

SSA countries. The coefficient of TOP is also significant which supports the finding that trade is good for expanding long run growth in SSA. In terms of the short run estimates, none of the coefficients is significant at the 6 percent level, just like in other estimations. This shows that a symmetric perspective, changes in finance access do not have significant short-term effects on economic growth in SSA. The coefficient of the error correction terms for both equations are negative and significant at the 1 percent level. These outcomes confirm the existence of a long-run stability and adjustment for the models. The low coefficients in both cases imply that adjustment to long run equilibrium is slow.

The non-linear effects of the two finance access variables on economic growth are observed based on the models with asymmetry (in Panel B). In the long run results, the coefficient of positive shock or changes in bank branches (NBB^+) is highly significant and positive at 0.738 while the coefficient of negative changes (NBB^-) is highly significant and negative at -0.328. These outcomes show that positive changes in number of bank branches exert significant positive long run impact on economic growth in SSA, while negative changes exert significant negative growth effects. In the case of NBB, the coefficient of the positive shock is much larger than that of the negative shock (in absolute terms). This indicates a strong asymmetric effect. Thus, a positive shock in mobile banking transactions has much larger positive impact on long run growth in SSA than the negative impact of a negative shock.

Table 4.7: Results for NARDL Estimates of Financial Access and Economic Growth

| Variable | Coefficient | Prob. | Coefficient | Prob. |
|---|-------------|-------|-------------|-------|
| <i>A: Models without asymmetry</i> | | | | |
| NBB | -1.016 | 0.000 | | |
| ACOW | | | 0.655 | 0.000 |
| TOP | 0.324 | 0.005 | 2.266 | 0.000 |
| Δ NBB | 0.073 | 0.572 | | |
| Δ NBB _{t-1} | -0.013 | 0.911 | | |
| Δ ACOW | | | 0.175 | 0.043 |
| Δ ACOW _{t-1} | | | -0.002 | 0.961 |
| Δ TOP | 5.388 | 0.335 | -25.31 | 0.313 |
| Constant | 0.728 | 0.007 | -0.466 | 0.001 |
| ECM _{t-1} | -0.124 | 0.008 | -0.062 | 0.002 |
| Log likelihood | 2047.928 | | 2182.0 | |
| <i>B. Models with asymmetry</i> | | | | |
| NBB^+ | 0.738 | 0.000 | | |
| NBB^- | -0.328 | 0.001 | | |
| $ACOW^+$ | | | 0.154 | 0.012 |
| $ACOW^-$ | | | -1.525 | 0.000 |
| TOP | 0.033 | 0.513 | 1.110 | 0.000 |
| Δ NBB ⁺ | 0.484 | 0.338 | | |
| Δ NBB ⁺ _{t-1} | -0.689 | 0.111 | | |
| Δ NBB ⁻ | 0.406 | 0.271 | | |
| Δ NBB ⁻ _{t-1} | -0.045 | 0.753 | | |
| Δ ACOW ⁺ | | | 0.189 | 0.069 |
| Δ ACOW ⁺ _{t-1} | | | 0.075 | 0.433 |
| Δ ACOW ⁻ | | | 0.209 | 0.268 |
| Δ ACOW ⁻ _{t-1} | | | 0.206 | 0.070 |
| Δ TOP | 0.284 | 0.309 | 0.221 | 0.328 |
| Constant | -1.814 | 0.068 | -2.071 | 0.010 |
| ECM _{t-1} | -0.160 | 0.003 | -0.104 | 0.016 |

Source: Author's computation using Eviews 13.

The coefficient of $ACOW^+$ and $ACOW^-$ are both significant at 0.154 and -1.525 respectively. This shows that positive changes in bank account ownership has a significant effect on economic growth in the long run while negative changes have significant negative effects. In this case, the coefficient of the negative shock is larger (in absolute terms) to that of the positive shock. This indicates an asymmetric effect where a decrease in the number of bank account ownership has a stronger detrimental impact on economic growth than the beneficial growth impact of increased bank account ownership among SSA countries.

The coefficient of TOP is also significant in the result, which shows that trade is beneficial to long run growth in SSA.

Just like the symmetric estimates, none of the coefficients of the variables is significant in the short-run estimates. This clearly shows that the short-run effects of financial technology application variables on economic growth in SSA are not statistically robust. The coefficient of the error correction term for the asymmetric estimates is also significant and negative for both estimates (-0.160 and -0.104). This also confirms the long-run stability of the models even after accounting for asymmetric effects. The magnitude of the coefficients suggests a faster speed of adjustment toward growth equilibrium in SSA countries when asymmetric effects are taken into cognisance.

Table 4.8 presents the results of the panel NARDL estimates that assess the impact of finance usage – measured as private sector credit to GDP ratio (CGDP) and bank deposits to GDP ratio (DGDP) – on economic growth in SSA. These proxies capture financial depth and intermediation efficiency, with CGDP reflecting credit allocation and DGDP indicating savings mobilisation. Panel A reports results of estimates that assume symmetry (equal but opposite effects from increases and decreases), indicating that average only effects are estimated without distinguishing directions of change. The results in the Table provide separate equations for CGDP and DGDP. The symmetric results show that CGDP has a significant but negative effect on economic growth in the long run. A 1 percent increase in private sector credit to GDP is linked to a 1.020 percent long-run decrease in real GDP per capita. This highly significant negative elasticity challenges conventional supply-leading hypotheses that demonstrate that finance mobilises savings for investment. The coefficient of DGDP is also negative and significant in the symmetric estimates, which show that as deposit ratio increases, economic growth declines in the long run in SSA. This is an interesting outcome and shows that deposits can weaken long run growth in SSA.

Table 4.8: Results for NARDL Estimates of Financial Usage and Economic Growth in SSA

| Variable | Coefficient | Prob. | Coefficient | Prob. |
|------------------------------------|-------------|-------|-------------|-------|
| <i>A: Models without asymmetry</i> | | | | |
| LCGDP | -1.020 | 0.000 | | |
| LDGDP | | | -0.494 | 0.000 |
| LTOP | 0.123 | 0.181 | 0.598 | 0.000 |
| D(LCGDP) | 0.085 | 0.521 | | |
| D(LCGDP(-1)) | 0.029 | 0.701 | | |
| D(LDGDP) | | | -0.333 | 0.022 |
| D(LDGDP(-1)) | | | -0.011 | 0.884 |
| Δ TOP | 10.472 | 0.318 | 10.952 | 0.325 |
| Constant | 1.016 | 0.009 | 0.684 | 0.005 |
| ECM _{t-1} | -0.118 | 0.009 | -0.139 | 0.006 |
| Log likelihood | 2032.8 | | 2025.6 | |
| <i>B. Models with asymmetry</i> | | | | |
| $CGDP^+$ | -0.160 | 0.222 | | |
| $CGDP^-$ | -1.178 | 0.000 | | |
| $DGDP^+$ | | | -0.469 | 0.000 |
| $DGDP^-$ | | | -1.745 | 0.000 |
| TOP | 1.454 | 0.000 | 0.815 | 0.000 |
| $\Delta CGDP^+$ | 0.453 | 0.030 | | |
| $\Delta CGDP_{t-1}^+$ | 0.109 | 0.453 | | |
| $\Delta CGDP^-$ | -0.147 | 0.593 | | |
| $\Delta CGDP_{t-1}^-$ | 0.098 | 0.619 | | |
| $\Delta DGDP^+$ | | | 0.034 | 0.889 |
| $\Delta DGDP_{t-1}^+$ | | | -0.142 | 0.463 |
| $\Delta DGDP^-$ | | | -0.396 | 0.148 |
| $\Delta DGDP_{t-1}^-$ | | | -0.207 | 0.434 |
| Δ TOP | 0.177 | 0.317 | 0.379 | 0.318 |
| Constant | -1.623 | 0.013 | -1.865 | 0.008 |
| ECM _{t-1} | -0.124 | 0.005 | -0.160 | 0.002 |

Source: Author's computation using Eviews 13.

The error correction terms are negative and significant across the two models. This shows long run stability in the relationships. Both coefficients are also generally small and indicate slow and gradual adjustment to long-run equilibrium. There is however faster adjustment (at 13.9 percent per quarter) with deposit effects than with credit effects suggesting that deposit-growth disequilibria resolve quicker. Short-

run dynamics (Δ terms) are all insignificant (except for the lag of CDGP) and show that finance usage does not have short run effects on economic growth in SSA.

The results in Panel B for Table 4.8 test asymmetries in the relationships by decomposing CGDP and DGDP into positive (cumulative increases) and negative (cumulative decreases) components. These reveal nonlinearity effects of both variables on economic growth. In the long run results the coefficient of positive shock to credit ratio (CGDP⁺) is negative but is insignificant. This shows that cumulative credit increases have no significant long-run growth impact in SSA. This neutrality implies credit expansions in SSA often fail to translate into sustainable growth in the long run. On the other hand, the coefficient of (CGDP⁻) is significant but negative. This shows that for a 1 percent credit decrease, economic growth rises by 1.178 percentage points. This asymmetry shows that contractions in credit boost economic growth more than expansions in credit hinder growth.

The asymmetry results also show that both the coefficient of positive shocks to the deposit ratio (DGDP⁺) and that of negative shock (DGDP⁻) are negative and significant. This shows that significant build-up in deposit increases lead to reduction in long run economic growth. This indicates that direct build-up of in the savings pool tend to harm long-run output in SSA. This can be linked to idle deposits in risk-averse banks that often result to funding safe but low-yield assets (treasuries) amid high lending risks. The result also shows that deposit decreases lead to significant rise in the rate of economic growth. The coefficient of the negative shock has a larger magnitude in comparison to that of positive shocks. This shows that deposit contractions spur economic growth more than increases in deposit. In many SSA countries where dual economic systems prevail, cumulative decreases in deposits signal mistrust in formal banking systems. Indeed, such reduction may signal encouragement of entrepreneurial self-financing, especially in the predominantly informal sector.

The error correction terms are negative and significant across the two models. This shows long run stability in the relationships. Both coefficients are also generally small and indicate slow and gradual adjustment to long-run equilibrium. The short-run dynamics (Δ terms) indicate that none of the credit

supply or deposit factors exert significant short run effects on economic growth in SSA. These shows that even when asymmetries are considered, finance usage does not have short run effects on economic growth in SSA.

Finally, the results of the effects of finance quality on economic growth are presented in Table 4.9. The quality of financial services is measured as ATM penetration and number of insurance companies per 100,000 adults. In Panel A, which reports symmetric models, the coefficient of ATM is significant and positive in the long run estimates, indicating that increases in the number of ATMs per 100,000 adults is associated with surge in real GDP per capita growth in SSA. This highly significant positive coefficient underscores the role of banking infrastructure in fostering economic growth in SSA. ATMs enhance financial access by reducing transaction costs and enabling easier savings mobilisation particularly in regions with limited brick-and-mortar banking. Thus, it shows that improved quality of banking services fosters financial inclusion and ensure long run economic growth in SSA.

Given that formal financial penetration is generally low in SSA countries, the results show that expanding ATM networks can directly catalyse productivity gains in the long run. The coefficient of NIC is also significant and positive at 0.430. This shows that a 1 percent increase in the number of insurance companies per 100,000 adults leads to a 0.430 percent long-run growth in GDP per capita in SSA. This coefficient, just like that of ATM, indicates that insurance market depth is a strong pillar of financial inclusion in SSA and also promotes economic growth. The result shows that more insurance providers tend to mitigate uncertainties and encourage risk-taking for businesses.

The error correction terms in both estimates are significant and negative. These indicate that there is effective adjustment to long run equilibrium following any initial disequilibria. This also supports the validity of the model and the stability of the finance quality-growth nexus in SSA.

Table 4.9: Results for NARDL Estimates of Financial Quality and Economic Growth in SSA

| Variable | Coefficient | Prob. | Coefficient | Prob. |
|------------------------------------|-------------|-------|-------------|-------|
| <i>A: Models without asymmetry</i> | | | | |
| ATM | 0.436 | 0.000 | | |
| NIC | | | 0.430 | 0.030 |
| TOP | 0.916 | 0.000 | 2.592 | 0.000 |
| Δ ATM | 0.336 | 0.006 | | |
| Δ NIC | | | 0.043 | 0.897 |
| Δ TOP | 5.365 | 0.325 | 8.456 | 0.327 |
| Constant | 0.084 | 0.066 | -0.334 | 0.002 |
| ECM _{t-1} | -0.105 | 0.022 | -0.055 | 0.002 |
| Log likelihood | 2231.2 | | 1935.0 | |
| <i>B. Models with asymmetry</i> | | | | |
| ATM^+ | 0.900 | 0.000 | | |
| ATM^- | -0.335 | 0.144 | | |
| NIC^+ | | | 0.398 | 0.000 |
| NIC^- | | | -0.449 | 0.003 |
| TOP | 2.339 | 0.000 | 0.628 | 0.000 |
| ΔATM^+ | 1.469 | 0.228 | | |
| ΔATM_{t-1}^+ | -1.241 | 0.286 | | |
| ΔATM^- | 0.717 | 0.046 | | |
| ΔATM_{t-1}^- | 0.089 | 0.616 | | |
| ΔNIC^+ | | | 0.319 | 0.424 |
| ΔNIC_{t-1}^+ | | | 0.244 | 0.617 |
| ΔNIC^- | | | 0.346 | 0.504 |
| ΔNIC_{t-1}^- | | | -0.131 | 0.693 |
| Δ TOP | 0.349 | 0.319 | 0.281 | 0.321 |
| _cons | -1.369 | 0.017 | -0.639 | 0.055 |
| ECM _{t-1} | -0.051 | 0.021 | -0.187 | 0.002 |

Source: Author's computation using Eviews 13.

The results in Panel B in Table 4.9 incorporate asymmetries by decomposing ATM and NIC into positive (ATM^+ , NIC^+) and negative (ATM^- , NIC^-) components. The asymmetry results show that the coefficient of positive shocks to ATM is significant and positive, while the coefficient of negative shock to ATM is negative but insignificant. This shows that cumulative increases in number of ATMs significant boost economic growth in the long run. On the other hand, cumulative decreases in number of ATM does not affect long run economic growth in SSA. Thus, there is evidence that, unlike many financial inclusion factors, ATM penetration does not have asymmetric effect on economic growth. Only positive changes in

this factor drives growth – it does not matter to growth whether the number of ATM declines over time. The coefficient of both positive and negative shocks to NIC are significant. While the coefficient of positive shock is positive, that of negative shock is negative. This shows that cumulative increases in the number of insurers in SSA lead to growth in the economies in the long run, while cumulative decreases in this number significantly lead to decline in long run economic growth. This demonstrates asymmetric effects of insurance on economic growth in SSA. The coefficients of the positive and negative shocks are similar in magnitude, indicating that both upward and downward trends in the number of insurers in SSA exert similar outcomes on economic growth in either direction respectively.

4.6 Robustness Asymmetry Tests

For the panel Nonlinear Autoregressive Distributed Lag (NARDL) model, post-estimation tests are crucial for validating the model's robustness and confirming the statistical significance of the estimated results. Note that the primary purpose of the NARDL model is to investigate asymmetric effects. Thus, there is need to conduct empirical tests for asymmetry to determine whether the effects of positive and negative shocks of an independent variable on the dependent variable are statistically different. The results of the tests for asymmetry are presented in Table 4.10.

Table 4.10: Test for Asymmetry

| Hypothesis | <i>Wald Coefficient</i> | |
|---------------------------------------|-------------------------|------------------|
| | Long run | Short run |
| IUI ⁺ = IUI ⁻ | 124.80 (0.00) | 0.79 (0.61) |
| MBK ⁺ = MBK ⁻ | 173.19 (0.00) | 0.10 (0.75) |
| POS ⁺ = POS ⁻ | 201.52 (0.00) | 1.87 (0.49) |
| ACOW ⁺ = ACOW ⁻ | 87.81 (0.00) | 0.01 (0.93) |
| NBB ⁺ = NBB ⁻ | 219.21 (0.00) | 0.02 (0.88) |
| CGDP ⁺ = CGDP ⁻ | 227.21 (0.00) | 272 (0.00) |
| DGDP ⁺ = CGDP ⁻ | 129.77 (0.00) | 1.34 (0.25) |
| ATM ⁺ = ATM ⁻ | 183.87 (0.00) | 0.69 (0.53) |
| NIC ⁺ = NIC ⁻ | 139.18 (0.00) | 0.010.96) |

Source: Author's computation using Eviews 13.

The Wald test for long-run asymmetry examines the null hypothesis that the long-run coefficients of the positive and negative components of the independent variable are equal. Thus, a rejection of the null hypothesis indicates that there is long-run asymmetry. The result in the table below shows that for the long run estimates, the null hypothesis is rejected for all the variables. This shows that there is a significant difference between the respective positive change and negative change coefficients for each variable. Thus, there is evidence of asymmetry in the relationships between each of the variables and economic growth.

The Wald test for short-run asymmetry is also similar to the long-run test. It is seen that asymmetry in the short run effect is only observed for the CGDP variable. This shows that, in general, financial technology and financial inclusion factors have no asymmetric short run effects on economic growth in SSA. The asymmetry of effects is mainly a long-term affair.

4.7 Discussion of Findings

First, the result from the study shows that the rate of internet usage is an effective growth driver in SSA. This is in line with findings by Andrianaivo and Kpodar (2012), Jean-Claude *et al.* (2023) and Gürbüz *et al.* (2024) in demonstrating that elements of information-communication technologies offer significant pathways for boosting economic growth in the long run. The study however finds asymmetric effect of internet access on economic growth which reveal that disruptions in information and communication technology (ICT) infrastructure and use can have disproportionately large negative impacts on growth over time. In particular, in absolute terms, the coefficient of the effect of positive shocks to internet usage is much lesser than the coefficient of negative shock to internet usage. This therefore indicates that reductions in internet usage have a disproportionately severe impact on economic growth compared to the positive effect of increased internet usage in SSA countries. This asymmetry suggests that losing internet access (due to infrastructure failures or policy restrictions, for instance) is far more detrimental to long run economic growth in SSA than the benefits gained from equivalent increases in internet access as also

shown in Jiaqi (2024). This reflects the critical role of internet connectivity in modern economies in SSA as well as the increasing dependence of economic performance on technology among the countries.

The study also revealed that financial technology significantly promotes economic growth in SSA. Several other studies have found similar outcomes like Ngong *et al.* (2024), Boachie and Adu-Darko (2024), Jean-Claude *et al.* (2023), Doku *et al.* (2023), Akwam *et al.* (2023). In these studies, financial technology, is shown to be the main drivers of financial inclusion which then translates to economic growth over time. The most critical outcome of the study is in terms of asymmetric effects of financial technology where the debilitating effects of negative shocks are much larger than the beneficial effects of positive shocks in SSA. This suggests that it would be a mistake to assume a linear relationship. On the other hand, measures aimed at preventing declines in financial technology infrastructure are the most relevant in supporting sustainable economic growth in the region. Thus, as IMF (2024) have noted, the cost of a decline in financial technology in SSA is high which indicates that a differentiated policy approach that stabilises and protects existing financial technology infrastructure while also proactively promoting increased Fintech investment is the optimal path for SSA countries.

Strong asymmetric effects were also found for the effects of financial access on economic growth. In this case, the economic benefits of increased bank branches were found to be much more significant than the economic costs associated with lower bank branches in SSA. This positive outcome clearly shows that financial inclusion that involve traditional banking activities are still among the most effective in driving growth in SSA. Jallow *et al.* (2024) and Adeniji *et al.* (2024) found similar outcome which can be attributed to the low level of digital inclusion in many SSA countries. This study has shown that these aspects of digital inclusion are critical for fostering long term growth in SSA countries.

Furthermore, the result from the study demonstrated that both credit and deposits (resource mobilisation) exert strong negative effects on growth in SSA. These results invert traditional finance-led growth paradigms and empirical findings (e.g., Alabdulrazag *et al.*, 2022; Odumusor, *et al.*, 2024). The result implies that for the SSA region, expanded credit may fuel inefficiencies like misallocation to non-

productive sectors (including consumption loans or elite capture) or it may create bubbles without corresponding productivity gains. The high rate of informality in the region may also lead to failure of credit to reach the most productive SMEs in the most efficient manner. The implication of increase aggregate credit ratio would therefore be to exacerbate inequality in finance access and economic productivity.

The result also suggests that there is some form of “cleansing” effects of credit deployment in SSA that ensures that reducing credit helps to prune inefficient loans and reallocate resources to more productive uses. In particular, in SSA, credit reductions tend to curb over-lending risks and helps to prevent crises that amplify economic downturns. Moreover, the results show that credit buildups tend to create vulnerabilities like spikes in non-performing loans while credit drawdowns tend to foster economic resilience.

The finding that deposit ratio increases lead to lower economic growth in the long run in SSA is counterintuitive given that deposits typically signal savings for intermediation (Peng *et al.*, 2025). IMF (2024) has however shown that in SSA high deposits may reflect precautionary hoarding for smoothing long term volatility. This weakens efficient channeling of deposits into loans with attendant liquidity traps and low investment returns. Similarly, poor banking infrastructure and risk aversion suggests that much of the deposits may be used to fund government securities rather than direct private ventures. This can indirectly stifle economic growth in the long run. This echoes findings where financial depth proxies like deposits fail to stimulate growth due to underdeveloped markets. Moreover, the result of this study aligns with those of Udensi and Akintunde (2024) who find no significant effect of credit and deposit on economic growth and Jallow *et al.* (2024) who find that credit depth significantly weakens growth for a group of developing countries.

The asymmetric pattern of ATM effects where only positive changes matter significantly suggests a form of ratchet effects on economic growth. It demonstrates that the gains from ATM penetration are sticky and transformative in SSA countries by building financial networks that endure contractions. This result

is in line with studies by Iwegbu and Nwokoma (2022), Gehrung (2020) and Dinh *et al.* (2019). This outcome also aligns with the current status of investments in ATM infrastructure with high yields and irreversible growth returns (Gehrung, 2020). For insurance market, the results show that positive and negative shocks are similar in magnitude. This suggests that both upward and downward trends in the number of insurers in SSA exert similar outcomes on economic growth in either direction respectively. This result further demonstrates that improved quality of financial inclusion in SSA can guarantee growth as also demonstrated by Apergis and Poufinas (2020) and Dawd and Benlagha (2023). The results reveal slight bidirectional asymmetry for insurance compared to ATM in relation to financial quality. This suggests significant levels of fragility in the insurance market in SSA as a tool for driving growth. The result reveal that the insurance ecosystems are harder to rebuild post-contraction was is demonstrated in Nigeria and other SSA countries (IMF, 2024).

CHAPTER FIVE

SUMMARY, RECOMMENDATIONS AND CONCLUSION

5.1 Introduction

This chapter consider the summary of the entire work, draws the final conclusion, makes recommendations, presents contributions to knowledge and suggests areas for further study.

5.2 Summary of Findings

In this study the relative effects of financial technology and financial inclusion on economic growth in Sub-Saharan African (SSA) countries was examined. In particular, the study considered the roles of digital and internet access (which is driver of financial technology) as well as both financial technology and financial inclusion measures on economic growth in the region. Financial technology is measured in the form of mobile banking services, POS agency and ATM technology, while financial inclusion is measured in terms of financial access (using bank account ownership and number of bank branches), financial usage (using credit to GDP ratio and deposit to GDP ratio), and financial quality (using ATM presence and number of insurance companies). Data used included twenty-nine (29) selected sub-Saharan African countries over the period of 2014 to 2023. A major focus of the study was to evaluate how cumulative decreases and increases in the financial technology and inclusion factors affect economic growth in SSA. Hence, a panel non-linear autoregressive distributed lags (PNARDL) framework was devised in the empirical analysis of the study. This technique evaluates asymmetries in the dynamic relationships among the variables of the study. Specifically, the following findings were made:

1. That average number of Internet users as a share of population which represents digital and internet penetration has a significant positive effect on economic growth in SSA. The effects are however asymmetric with negative shocks to digital and internet penetration exerting stronger growth-reduction effect than positive shocks.

2. That amount of Mobile Banking Transactions in a country which represents financial technology application has a significant positive effects on economic growth in SSA. Also, that the number of Point-of-sale Agents in a country which represents financial technology application has a significant positive effects on economic growth in SSA.
3. That the number of adults with savings account which represent the access of financial services has a significant positive effect on economic growth in SSA. The positive effects of positive shocks are shown to either outweighs or be just equal to the outcome of the negative effects in SSA countries. In addition, the findings also showed that the average number of Bank Branches per 100,000 adults which represent financial access has a significant positive effect on economic growth in SSA. The asymmetric effect however shows that generally, financial access in the form of increased number of bank branches in SSA countries has stronger positive effect on economic growth than the negative effect of decreases in number of bank branches.
4. That credit to Gross Domestic Product ratio which represents financial usage have a significant negative effect on economic growth in SSA. Both the symmetric and asymmetric effects show that financial usage in the form of credit supply increase or decrease, the effect is to create significant economic shocks in the long run. Also, that the deposits to GDP ratio which represents financial usage have a significant negative effect on economic growth in SSA. Both the symmetric and asymmetric effects show that whether financial usage in the form of deposits increase or decrease, the effect is to create significant economic shocks in the long run.
5. That the average number of Automated Teller Machine per 100,000 adults which represent financial quality has a significant positive effect on economic growth in SSA. The asymmetric effect however shows that generally, financial quality in the form of increased number of bank branches in SSA countries has stronger positive effect on economic growth than the negative effect of decreases in number of bank branches. Additionally, that average number of insurance firms per 100,000 adults which represent the quality of financial services has a significant

positive effect on economic growth in SSA. The positive effects of positive shocks are shown to either outweighs or be just equal to the outcome of the negative effects in SSA countries.

The study showed that financial technology has the strongest asymmetry in terms of its effect on economic growth. Cumulative decline in financial technology are shown to lead to greater negative effects on economic growth than the positive effects that cumulative increases in financial technology delivers.

5.3 Recommendations

Based on the findings of this study, the following recommendations are made:

First, the study has found that digital technology has a direct significant effect on economic growth in SSA. There is need to therefore focus on more investment in digital infrastructure in SSA. The study however found that the effects are asymmetric, with negative shock exerting more devastating effects than positive shocks. This calls for a combination of measures in addressing the digital deficits in SSA. While investment is needed to boost infrastructure, there is need to employ other social means to ensure that digital services are stabilised and efficiently used over time to prevent costly disruptions.

The result from the study has shown that the application of financial technology significantly boosts long run economic growth in SSA. This suggests that increasing the use of technology in the financial sector can help to that increase access to financial services. The technology-based financial inclusion strategy therefore needs to be considered as a valid strategy for boosting economic growth in the long run among SSA countries. Thus, there is the need for the countries to investment more in financial technology infrastructure. Given that financial inclusion is better driven by the private sector with support from government, an enabling environment to boost investment in these innovative technologies need to be put in place.

The asymmetric results for the financial technology variables indicate that the growth benefits of raising financial technology in SSA is lower than the resulting debilitating long run economic effects arising

from negative shocks to the variables. Thus, there is need to focus more on preventing decline in the spread of financial technology in SSA countries. In particular, there is need to focus on stabilizing and securing existing infrastructure for mobile banking and POS networks in SSA. It appears that the economic effects of massive loss of these infrastructures are generally irreversible. There is also need to developing robust regulatory frameworks to prevent market failures or shocks that could cause a decline in financial technology adoption in the region. All measures to guarantee user trust and continuity in the form of consumer protection laws and public awareness campaigns should be set in place.

The study also found that that financial inclusion that involve traditional banking activities such as increased bank branches are still among the most effective in driving growth in SSA. Thus, there is need for financial institutions to intensity the creation of more branches, especially in rural areas where digital technology may be low and widely underutilized.

Given the negative effects of finance use on economic growth as shown from the study, there is need for SSA countries to prioritise quality over quantity in terms of increasing use of financial services. There is need to enhance credit allocation via more efficient means rather than blindly expanding usage. Finance institutions should also focus on real-sector management in terms of finance mobilisation and allocation among SSA countries. This way, economic growth can be more positively linked to the use of financial services in the region.

The study finds that although financial technology is an effective instrument for enhancing economic growth in SSA, the most critical policy dimension is acknowledging and addressing the asymmetric effects that these factors pose to growth. There is need to avoid the error of assuming a linear relationship between financial technology and economic growth, rather policy measures must focus more on ensuring that reversal in financial technology growth do not occur in SSA. This highlights the importance of policy measures aimed at preventing declines in financial technology infrastructure to support long run economic growth in SSA.

Finally, both the symmetric and asymmetric estimations reveal that the effects of financial inclusion and financial technology on economic growth are largely observed only in the long run. This is a crucial outcome in this study and shows that policy measures aimed at driving economic growth through financial inclusion need to target long-term outcomes rather than short-term benefits. Essentially, policy makers need to know that financial inclusion is not a tool for promoting short-term economic growth or for smoothening the business cycle among SSA countries.

5.4 Conclusion

Technology remains the major driver of modern economic progress. This is also the case for countries in the sub-Saharan Africa region. This technology has been mainly considered as a tool for democratizing economic access towards the reach of vulnerable groups. In this study the effects of financial technology and financial inclusion on economic growth was examined. The overall findings in this study support endogenous growth models that claim improvement in financial access, use and quality spurs further innovation and overall economic growth in the long run. The results however reveal SSA-specific twists in the analysis given that asymmetries reflect underdevelopment threshold where cumulative positive changes unlock potential while cumulative negative changes mainly reinforce traps in the finance market. This suggests significant jeopardy for SSA countries in managing technology-driven financial inclusion in the region. While green investments in financial technology are critical for driving growth, it should be noted that slack in such investment can deliver devastating growth outcomes over time in the region.

5.5 Contributions to Knowledge

1. The study successfully covered financial technology, financial inclusion and economic growth in SSA countries by disaggregating Fintech and financial inclusion into three and four components respectively and also including trade openness index in the analysis.

This has provided robustness in the empirical measurement of the role of financial technology and financial inclusion in economic growth in SSA.

2. The study applied the NARDL framework to the analysis of the financial technology, financial inclusion and economic growth nexus. It thereby captured not only the symmetric variations in the data but also the asymmetric movements of the independent variables thereby improving forecasting accuracy when asymmetry exists, and yielding better in-sample results.
3. In addition, just as the traditional Autoregressive Distributed Lag Model (ARDL) model on which the NARDL is founded, this analysis has also been able to distinguish between the short-run variations and the long-run equilibrium effects of financial technology and financial inclusion on economic growth in SSA.
4. The study also identified financial technology and financial inclusion as key drivers of economic growth in SSA. In particular, the role of asymmetric movement in financial technology in creating devastating shocks in the economies of SSA countries was highlighted.
5. Offered key insights to regional governments to help identify which variables enhanced and potentially could also cause devastating harm to economies if improperly managed.

5.6 Suggestions for Further Studies

1. Financial sector development in each of the countries also need to be included in future studies. The financial environment within which Fintech operates tends to provide the background conditions for long term economic growth, especially in the areas of investment and expansion capacity. These areas were not taken into consideration in the study.

2. Need to consider the influences of institutional factors on Fintech and financial inclusion. Various regulatory and market policies have been observed to have extensive influences on the capacity of Fintechs and financial inclusion to drive growth in developing countries. This area was not explored in the current study and needs more empirical investigation.
3. The study aside the payment technologies, did not capture some other Fintech applications such as blockchain and cryptocurrencies, regulatory technology (RegTech), insurance technology (InsurTech), Peer-to-Peer (P2P) lending and wealth management (WealthTech). Incorporating these variables will no doubt make the analysis more robust.

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APPENDICES

APPENDIX A: SAMPLE SELECTION OF SSA COUNTRIES AND THEIR RESPECTIVE DATA SETS

| Country | Year | Quarter | RGDPPC | IUI | ACOW | ATM | MBK | CGDP | DGDP | NBB | NIC | POS | TOP |
|---------|------|---------|---------|-------|--------|-------|---------|-------|-------|-------|------|-------|-------|
| Angola | 2014 | 1 | 1217.59 | 21.31 | 163.98 | 14.38 | 103.94 | 20.26 | 28.31 | 8.39 | 0.35 | 3.83 | 87.01 |
| Angola | 2014 | 2 | 1234.86 | 21.34 | 165.24 | 14.95 | 101.38 | 20.82 | 28.79 | 8.87 | 0.4 | 3.58 | 81.6 |
| Angola | 2014 | 3 | 1249.27 | 21.42 | 166.92 | 15.47 | 99.08 | 21.24 | 29.28 | 9.28 | 0.43 | 3.36 | 76.63 |
| Angola | 2014 | 4 | 1260.83 | 21.53 | 169.01 | 15.96 | 97.05 | 21.52 | 29.78 | 9.62 | 0.45 | 3.15 | 72.08 |
| Angola | 2015 | 1 | 1269.55 | 21.68 | 171.52 | 16.41 | 95.27 | 21.66 | 30.28 | 9.9 | 0.46 | 2.97 | 67.97 |
| Angola | 2015 | 2 | 1275.41 | 21.87 | 174.44 | 16.82 | 93.76 | 21.67 | 30.8 | 10.11 | 0.45 | 2.81 | 64.3 |
| Angola | 2015 | 3 | 1278.43 | 22.09 | 177.77 | 17.2 | 92.51 | 21.53 | 31.33 | 10.26 | 0.43 | 2.67 | 61.05 |
| Angola | 2015 | 4 | 1278.6 | 22.36 | 181.52 | 17.53 | 91.53 | 21.26 | 31.87 | 10.33 | 0.39 | 2.55 | 58.24 |
| Angola | 2016 | 1 | 1343.61 | 22.5 | 187.48 | 17.83 | 91.25 | 19.42 | 32.02 | 10.14 | 0.27 | 2.44 | 55.63 |
| Angola | 2016 | 2 | 1311 | 22.9 | 191.34 | 18.09 | 90.61 | 19.44 | 32.73 | 10.17 | 0.23 | 2.37 | 53.77 |
| Angola | 2016 | 3 | 1248.47 | 23.4 | 194.89 | 18.32 | 90.05 | 19.9 | 33.62 | 10.2 | 0.21 | 2.31 | 52.44 |
| Angola | 2016 | 4 | 1156 | 24 | 198.14 | 18.52 | 89.57 | 20.8 | 34.67 | 10.25 | 0.21 | 2.28 | 51.64 |
| Angola | 2017 | 1 | 936.65 | 24.92 | 187.46 | 18.64 | 96.92 | 24.7 | 37.31 | 10.41 | 0.28 | 2.33 | 50.3 |
| Angola | 2017 | 2 | 823.12 | 25.63 | 195.54 | 18.78 | 93.52 | 25.43 | 38.14 | 10.45 | 0.28 | 2.32 | 50.97 |
| Angola | 2017 | 3 | 718.44 | 26.36 | 208.77 | 18.89 | 87.1 | 25.58 | 38.58 | 10.46 | 0.28 | 2.3 | 52.6 |
| Angola | 2017 | 4 | 622.63 | 27.09 | 227.15 | 18.97 | 77.66 | 25.13 | 38.62 | 10.45 | 0.28 | 2.29 | 55.18 |
| Angola | 2018 | 1 | 481.06 | 27.86 | 276.19 | 19 | 87.12 | 22.64 | 38.1 | 10.32 | 0.24 | 3.69 | 64.63 |
| Angola | 2018 | 2 | 424.8 | 28.62 | 294.64 | 19.05 | 812.65 | 21.59 | 37.42 | 10.29 | 0.23 | 1.33 | 66.74 |
| Angola | 2018 | 3 | 399.25 | 29.38 | 308.03 | 19.08 | 841.74 | 20.52 | 36.41 | 10.28 | 0.23 | 3.41 | 67.44 |
| Angola | 2018 | 4 | 404.41 | 30.15 | 316.34 | 19.11 | 783.05 | 19.45 | 35.08 | 10.27 | 0.22 | 10.53 | 66.72 |
| Angola | 2019 | 1 | 531.45 | 30.72 | 306.28 | 19.15 | 754.02 | 17.98 | 31.7 | 10.42 | 0.22 | 12.54 | 58.43 |
| Angola | 2019 | 2 | 561.53 | 31.58 | 309.79 | 19.15 | 1281.65 | 17.04 | 30.4 | 10.37 | 0.22 | 27.41 | 57.34 |
| Angola | 2019 | 3 | 585.84 | 32.53 | 313.57 | 19.13 | 4493.75 | 16.25 | 29.45 | 10.27 | 0.23 | 47.64 | 57.28 |
| Angola | 2019 | 4 | 604.38 | 33.57 | 317.61 | 19.1 | 8882.29 | 15.61 | 28.85 | 10.12 | 0.24 | 73.25 | 58.27 |

| | | | | | | | | | | | | | |
|--------|------|---|--------|-------|--------|-------|----------|-------|-------|-------|------|---------|-------|
| Angola | 2020 | 1 | 624.19 | 35.18 | 323.16 | 19.05 | 10993.95 | 15.15 | 28.95 | 9.67 | 0.28 | 159.21 | 62.83 |
| Angola | 2020 | 2 | 628.37 | 36.2 | 327.23 | 18.98 | 19116.69 | 14.79 | 28.93 | 9.52 | 0.29 | 173.55 | 64.89 |
| Angola | 2020 | 3 | 623.97 | 37.11 | 331.05 | 18.88 | 29797.2 | 14.57 | 29.14 | 9.41 | 0.3 | 171.27 | 66.97 |
| Angola | 2020 | 4 | 610.97 | 37.92 | 334.64 | 18.77 | 43035.48 | 14.49 | 29.57 | 9.35 | 0.3 | 152.37 | 69.07 |
| Angola | 2021 | 1 | 579.41 | 38.37 | 344.1 | 18.6 | 87316.01 | 15.28 | 30.47 | 9.56 | 0.3 | 55.88 | 73.34 |
| Angola | 2021 | 2 | 553.24 | 39.06 | 344.77 | 18.47 | 94276.02 | 15.17 | 31.25 | 9.51 | 0.3 | 28.11 | 74.64 |
| Angola | 2021 | 3 | 522.47 | 39.75 | 342.76 | 18.33 | 92400.01 | 14.91 | 32.16 | 9.41 | 0.3 | 8.08 | 75.11 |
| Angola | 2021 | 4 | 487.11 | 40.43 | 338.07 | 18.2 | 81687.96 | 14.48 | 33.2 | 9.28 | 0.3 | 34.19 | 74.75 |
| Angola | 2022 | 1 | 395.04 | 41.09 | 317.01 | 18 | 26690.2 | 13.66 | 37.56 | 8.75 | 0.3 | 28.48 | 71.15 |
| Angola | 2022 | 2 | 371.34 | 41.76 | 312.43 | 17.9 | 12485.98 | 13 | 37.57 | 8.68 | 0.31 | 47.33 | 70.09 |
| Angola | 2022 | 3 | 363.89 | 42.44 | 310.65 | 17.82 | 3625.6 | 12.27 | 36.42 | 8.72 | 0.31 | 9.47 | 69.16 |
| Angola | 2022 | 4 | 372.68 | 43.11 | 311.67 | 17.77 | 109.07 | 11.48 | 34.12 | 8.85 | 0.32 | 51.94 | 68.37 |
| Angola | 2023 | 1 | 397.73 | 43.79 | 315.48 | 17.74 | 1936.39 | 10.61 | 30.66 | 9.1 | 0.32 | 110.08 | 67.7 |
| Angola | 2023 | 2 | 439.03 | 44.46 | 322.09 | 17.74 | 9107.55 | 9.68 | 26.05 | 9.44 | 0.33 | 183.87 | 67.17 |
| Angola | 2023 | 3 | 496.58 | 45.14 | 331.49 | 17.77 | 21622.56 | 8.68 | 20.28 | 9.89 | 0.33 | 273.33 | 66.78 |
| Angola | 2023 | 4 | 570.38 | 45.81 | 343.69 | 17.83 | 39481.42 | 7.62 | 13.36 | 10.45 | 0.34 | 378.45 | 66.51 |
| Benin | 2014 | 1 | 265.08 | 3.55 | 365.33 | 2.5 | 181415.8 | 16.08 | 18.49 | 3.25 | 0.28 | 1189.2 | 70.81 |
| Benin | 2014 | 2 | 274.46 | 5.27 | 361.7 | 2.51 | 184311.4 | 16.2 | 18.54 | 3.27 | 0.29 | 1364.91 | 66.67 |
| Benin | 2014 | 3 | 282.83 | 6.86 | 358.71 | 2.55 | 186924.8 | 16.31 | 18.65 | 3.29 | 0.29 | 1520.53 | 63.2 |
| Benin | 2014 | 4 | 290.2 | 8.32 | 356.35 | 2.6 | 189256 | 16.41 | 18.81 | 3.31 | 0.3 | 1656.05 | 60.4 |
| Benin | 2015 | 1 | 296.56 | 9.64 | 354.63 | 2.68 | 191305 | 16.48 | 19.02 | 3.33 | 0.31 | 1771.47 | 58.27 |
| Benin | 2015 | 2 | 301.91 | 10.83 | 353.55 | 2.78 | 193071.8 | 16.53 | 19.28 | 3.35 | 0.31 | 1866.79 | 56.82 |
| Benin | 2015 | 3 | 306.25 | 11.9 | 353.11 | 2.9 | 194556.4 | 16.57 | 19.6 | 3.37 | 0.31 | 1942.01 | 56.03 |
| Benin | 2015 | 4 | 309.58 | 12.83 | 353.3 | 3.04 | 195758.8 | 16.58 | 19.97 | 3.39 | 0.31 | 1997.14 | 55.92 |
| Benin | 2016 | 1 | 319.04 | 13.14 | 351.48 | 3.34 | 195279.6 | 16.64 | 20.5 | 3.41 | 0.31 | 1941.59 | 58.11 |
| Benin | 2016 | 2 | 317.5 | 14.01 | 354.01 | 3.47 | 196477.4 | 16.6 | 20.94 | 3.44 | 0.31 | 1992.75 | 58.69 |
| Benin | 2016 | 3 | 312.11 | 14.93 | 358.23 | 3.58 | 197952.9 | 16.51 | 21.39 | 3.48 | 0.31 | 2060.04 | 59.28 |
| Benin | 2016 | 4 | 302.85 | 15.92 | 364.16 | 3.65 | 199706.1 | 16.37 | 21.86 | 3.52 | 0.3 | 2143.46 | 59.88 |
| Benin | 2017 | 1 | 271.57 | 17.73 | 376.6 | 3.62 | 92130.56 | 15.72 | 22.82 | 3.61 | 0.29 | 1759.75 | 60.89 |

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|----------|------|---|---------|-------|--------|-------|----------|-------|-------|------|------|----------|--------|
| Benin | 2017 | 2 | 261.86 | 18.54 | 383.99 | 3.67 | 138281.4 | 15.68 | 23.12 | 3.65 | 0.28 | 2068.74 | 61.37 |
| Benin | 2017 | 3 | 255.56 | 19.1 | 391.14 | 3.71 | 228552.4 | 15.79 | 23.24 | 3.67 | 0.28 | 2587.16 | 61.72 |
| Benin | 2017 | 4 | 252.66 | 19.42 | 398.07 | 3.76 | 362943.6 | 16.05 | 23.19 | 3.67 | 0.28 | 3315.03 | 61.94 |
| Benin | 2018 | 1 | 260.23 | 18.7 | 421.03 | 3.84 | 613405.9 | 17.19 | 22.49 | 3.67 | 0.29 | 3740.34 | 61.44 |
| Benin | 2018 | 2 | 261.33 | 18.85 | 420.98 | 3.88 | 807256.8 | 17.43 | 22.27 | 3.64 | 0.29 | 5091.87 | 61.61 |
| Benin | 2018 | 3 | 263 | 19.08 | 414.18 | 3.9 | 1016447 | 17.52 | 22.05 | 3.61 | 0.29 | 6857.64 | 61.89 |
| Benin | 2018 | 4 | 265.26 | 19.38 | 400.64 | 3.9 | 1240978 | 17.46 | 21.83 | 3.56 | 0.29 | 9037.63 | 62.26 |
| Benin | 2019 | 1 | 267.46 | 19.92 | 342.51 | 3.69 | 1589823 | 16.68 | 21.51 | 3.44 | 0.27 | 12185.07 | 66.21 |
| Benin | 2019 | 2 | 271.14 | 20.3 | 330.62 | 3.74 | 1801442 | 16.53 | 21.36 | 3.39 | 0.27 | 14972.25 | 65.39 |
| Benin | 2019 | 3 | 275.66 | 20.69 | 327.13 | 3.87 | 1984812 | 16.44 | 21.25 | 3.34 | 0.27 | 17952.37 | 63.27 |
| Benin | 2019 | 4 | 281.02 | 21.08 | 332.03 | 4.06 | 2139931 | 16.42 | 21.2 | 3.31 | 0.27 | 21125.43 | 59.85 |
| Benin | 2020 | 1 | 294.1 | 20.8 | 365.49 | 4.66 | 2207897 | 16.53 | 21.36 | 3.19 | 0.28 | 24173.84 | 48.45 |
| Benin | 2020 | 2 | 298.39 | 21.48 | 379.13 | 4.85 | 2330076 | 16.61 | 21.34 | 3.21 | 0.29 | 27859.84 | 45.12 |
| Benin | 2020 | 3 | 300.75 | 22.44 | 393.1 | 4.96 | 2447567 | 16.74 | 21.3 | 3.28 | 0.29 | 31865.82 | 43.16 |
| Benin | 2020 | 4 | 301.2 | 23.68 | 407.4 | 5.01 | 2560368 | 16.92 | 21.24 | 3.4 | 0.3 | 36191.78 | 42.59 |
| Benin | 2021 | 1 | 291.41 | 26.58 | 429.44 | 4.86 | 2485552 | 17.7 | 20.84 | 3.87 | 0.31 | 38620.93 | 46.9 |
| Benin | 2021 | 2 | 291.36 | 27.84 | 441.44 | 4.82 | 2662147 | 17.73 | 20.88 | 3.97 | 0.32 | 44473.59 | 47.68 |
| Benin | 2021 | 3 | 292.72 | 28.83 | 450.81 | 4.76 | 2907224 | 17.58 | 21.04 | 3.99 | 0.32 | 51532.96 | 48.44 |
| Benin | 2021 | 4 | 295.49 | 29.55 | 457.55 | 4.68 | 3220784 | 17.24 | 21.31 | 3.93 | 0.33 | 59799.04 | 49.18 |
| Benin | 2022 | 1 | 301.01 | 29.26 | 461.36 | 4.49 | 3735288 | 15.95 | 21.89 | 3.53 | 0.34 | 71484.47 | 50.23 |
| Benin | 2022 | 2 | 306.08 | 29.74 | 462.96 | 4.4 | 4132827 | 15.56 | 22.32 | 3.44 | 0.35 | 81278.92 | 50.8 |
| Benin | 2022 | 3 | 312.02 | 30.24 | 462.06 | 4.34 | 4545864 | 15.3 | 22.78 | 3.37 | 0.35 | 91395.01 | 51.21 |
| Benin | 2022 | 4 | 318.84 | 30.76 | 458.66 | 4.29 | 4974397 | 15.16 | 23.29 | 3.34 | 0.36 | 101832.8 | 51.47 |
| Benin | 2023 | 1 | 326.54 | 31.31 | 452.75 | 4.26 | 5418428 | 15.16 | 23.83 | 3.34 | 0.37 | 112592.2 | 51.58 |
| Benin | 2023 | 2 | 335.11 | 31.89 | 444.33 | 4.25 | 5877956 | 15.28 | 24.42 | 3.37 | 0.38 | 123673.2 | 51.53 |
| Benin | 2023 | 3 | 344.56 | 32.49 | 433.41 | 4.25 | 6352981 | 15.53 | 25.04 | 3.44 | 0.38 | 135075.9 | 51.33 |
| Benin | 2023 | 4 | 354.89 | 33.11 | 419.99 | 4.28 | 6843504 | 15.91 | 25.71 | 3.53 | 0.39 | 146800.3 | 50.97 |
| Botswana | 2014 | 1 | 1614.06 | 37.44 | 700.7 | 26.95 | 279.51 | 16.58 | 21.07 | 2.15 | 0.73 | 255.65 | 120.7 |
| Botswana | 2014 | 2 | 1599.73 | 36.76 | 740.29 | 27.37 | 392.1 | 17.84 | 21.86 | 2.15 | 0.78 | 731.05 | 120.14 |

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|----------|------|---|---------|-------|---------|-------|----------|-------|-------|------|------|----------|--------|
| Botswana | 2014 | 3 | 1591.08 | 36.36 | 774.76 | 27.77 | 506.11 | 19.02 | 22.59 | 2.16 | 0.81 | 1168.77 | 119.22 |
| Botswana | 2014 | 4 | 1588.12 | 36.24 | 804.13 | 28.15 | 621.53 | 20.12 | 23.24 | 2.19 | 0.84 | 1568.81 | 117.94 |
| Botswana | 2015 | 1 | 1590.85 | 36.39 | 828.39 | 28.53 | 738.37 | 21.13 | 23.82 | 2.23 | 0.86 | 1931.17 | 116.29 |
| Botswana | 2015 | 2 | 1599.26 | 36.81 | 847.54 | 28.88 | 856.63 | 22.07 | 24.33 | 2.29 | 0.86 | 2255.85 | 114.27 |
| Botswana | 2015 | 3 | 1613.36 | 37.51 | 861.57 | 29.23 | 976.31 | 22.93 | 24.78 | 2.37 | 0.85 | 2542.85 | 111.89 |
| Botswana | 2015 | 4 | 1633.13 | 38.49 | 870.5 | 29.56 | 1097.4 | 23.71 | 25.15 | 2.46 | 0.83 | 2792.17 | 109.15 |
| Botswana | 2016 | 1 | 1726.78 | 40.33 | 870.9 | 29.47 | 1106.75 | 24.35 | 24.8 | 2.66 | 0.77 | 2246.29 | 106.08 |
| Botswana | 2016 | 2 | 1730.66 | 41.62 | 870.98 | 29.94 | 1275.94 | 24.99 | 25.3 | 2.75 | 0.74 | 2723.25 | 102.59 |
| Botswana | 2016 | 3 | 1712.95 | 42.94 | 867.32 | 30.55 | 1491.82 | 25.57 | 25.99 | 2.83 | 0.72 | 3465.54 | 98.71 |
| Botswana | 2016 | 4 | 1673.64 | 44.31 | 859.92 | 31.32 | 1754.37 | 26.1 | 26.88 | 2.88 | 0.7 | 4473.16 | 94.46 |
| Botswana | 2017 | 1 | 1499.55 | 45.69 | 818.65 | 33.21 | 2147.32 | 26.92 | 29.04 | 2.88 | 0.68 | 6470.31 | 85.11 |
| Botswana | 2017 | 2 | 1462.35 | 47.13 | 815.81 | 33.89 | 2469.74 | 27.19 | 29.88 | 2.91 | 0.67 | 7718.9 | 81.98 |
| Botswana | 2017 | 3 | 1448.83 | 48.62 | 821.28 | 34.32 | 2805.36 | 27.25 | 30.48 | 2.92 | 0.67 | 8943.12 | 80.36 |
| Botswana | 2017 | 4 | 1459.01 | 50.15 | 835.06 | 34.5 | 3154.18 | 27.11 | 30.83 | 2.93 | 0.67 | 10142.99 | 80.24 |
| Botswana | 2018 | 1 | 1561.78 | 51.7 | 889.74 | 33.55 | 3528.89 | 25.81 | 29.99 | 2.9 | 0.71 | 11526.36 | 86.93 |
| Botswana | 2018 | 2 | 1591.77 | 53.33 | 907.09 | 33.61 | 3899.01 | 25.65 | 30.25 | 2.89 | 0.72 | 12594.37 | 87.7 |
| Botswana | 2018 | 3 | 1617.88 | 55.02 | 919.7 | 33.79 | 4277.24 | 25.68 | 30.64 | 2.89 | 0.72 | 13554.87 | 87.84 |
| Botswana | 2018 | 4 | 1640.12 | 56.76 | 927.59 | 34.09 | 4663.58 | 25.9 | 31.16 | 2.88 | 0.72 | 14407.88 | 87.37 |
| Botswana | 2019 | 1 | 1650.8 | 58.56 | 890.92 | 33.64 | 4669.15 | 27.1 | 32.67 | 2.87 | 0.7 | 14377.37 | 84.89 |
| Botswana | 2019 | 2 | 1668.36 | 60.42 | 905.26 | 34.52 | 5227.27 | 27.37 | 33.14 | 2.86 | 0.7 | 15325.78 | 83.74 |
| Botswana | 2019 | 3 | 1685.12 | 62.33 | 930.79 | 35.86 | 5949.06 | 27.5 | 33.41 | 2.86 | 0.7 | 16477.08 | 82.51 |
| Botswana | 2019 | 4 | 1701.07 | 64.3 | 967.51 | 37.67 | 6834.51 | 27.5 | 33.49 | 2.85 | 0.7 | 17831.29 | 81.22 |
| Botswana | 2020 | 1 | 1733.72 | 66.29 | 1064.25 | 42.44 | 8503.25 | 26.7 | 32.65 | 2.8 | 0.71 | 20045.4 | 77.11 |
| Botswana | 2020 | 2 | 1741.08 | 68.38 | 1103.83 | 44.18 | 9468.18 | 26.69 | 32.61 | 2.81 | 0.71 | 21542.6 | 76.79 |
| Botswana | 2020 | 3 | 1740.63 | 70.55 | 1135.07 | 45.38 | 10348.94 | 26.82 | 32.66 | 2.84 | 0.71 | 22979.9 | 77.5 |
| Botswana | 2020 | 4 | 1732.39 | 72.78 | 1157.98 | 46.04 | 11145.51 | 27.08 | 32.8 | 2.88 | 0.71 | 24357.3 | 79.24 |
| Botswana | 2021 | 1 | 1718.7 | 76.42 | 1154.2 | 44.6 | 11146.26 | 27.91 | 32.73 | 3.07 | 0.71 | 22483.14 | 86.82 |
| Botswana | 2021 | 2 | 1693.92 | 78.25 | 1167.78 | 44.82 | 12059.13 | 28.25 | 33.17 | 3.1 | 0.71 | 25017.39 | 88.71 |
| Botswana | 2021 | 3 | 1660.4 | 79.62 | 1180.37 | 45.13 | 13172.49 | 28.55 | 33.82 | 3.1 | 0.71 | 28768.41 | 89.7 |

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|--------------|------|---|---------|-------|---------|-------|----------|-------|-------|------|------|----------|-------|
| Botswana | 2021 | 4 | 1618.13 | 80.51 | 1191.97 | 45.53 | 14486.32 | 28.81 | 34.68 | 3.06 | 0.71 | 33736.18 | 89.81 |
| Botswana | 2022 | 1 | 1460.13 | 79.87 | 1208.09 | 48.24 | 15764.37 | 29.01 | 36.53 | 2.85 | 0.7 | 46329.28 | 88.92 |
| Botswana | 2022 | 2 | 1443.18 | 80.25 | 1215.49 | 47.94 | 17573.66 | 29.18 | 37.51 | 2.81 | 0.7 | 51167.15 | 87.28 |
| Botswana | 2022 | 3 | 1460.29 | 80.59 | 1219.69 | 46.85 | 19677.94 | 29.3 | 38.39 | 2.8 | 0.7 | 54658.34 | 84.79 |
| Botswana | 2022 | 4 | 1511.47 | 80.88 | 1220.69 | 44.97 | 22077.19 | 29.39 | 39.17 | 2.81 | 0.7 | 56802.87 | 81.45 |
| Botswana | 2023 | 1 | 1596.7 | 81.13 | 1218.49 | 42.3 | 24771.42 | 29.43 | 39.86 | 2.85 | 0.7 | 57600.73 | 77.27 |
| Botswana | 2023 | 2 | 1715.99 | 81.34 | 1213.09 | 38.83 | 27760.64 | 29.42 | 40.44 | 2.91 | 0.7 | 57051.92 | 72.23 |
| Botswana | 2023 | 3 | 1869.35 | 81.5 | 1204.49 | 34.58 | 31044.84 | 29.38 | 40.93 | 3 | 0.7 | 55156.45 | 66.34 |
| Botswana | 2023 | 4 | 2056.76 | 81.62 | 1192.69 | 29.53 | 34624.02 | 29.29 | 41.33 | 3.12 | 0.7 | 51914.3 | 59.6 |
| Burkina Faso | 2014 | 1 | 179.56 | 5.8 | 27.15 | 4.16 | 9577.84 | 31.87 | 44.09 | 8.85 | 0.32 | 3657.58 | 58.4 |
| Burkina Faso | 2014 | 2 | 182.43 | 5.93 | 26.94 | 4.39 | 10139.12 | 31.79 | 43.55 | 8.92 | 0.34 | 3705.41 | 58.74 |
| Burkina Faso | 2014 | 3 | 184.92 | 6.07 | 26.82 | 4.58 | 10629.28 | 31.73 | 42.99 | 9 | 0.36 | 3771.38 | 58.99 |
| Burkina Faso | 2014 | 4 | 187.06 | 6.2 | 26.81 | 4.71 | 11048.32 | 31.7 | 42.41 | 9.07 | 0.38 | 3855.47 | 59.15 |
| Burkina Faso | 2015 | 1 | 188.83 | 6.34 | 26.89 | 4.8 | 11396.26 | 31.69 | 41.81 | 9.14 | 0.39 | 3957.69 | 59.22 |
| Burkina Faso | 2015 | 2 | 190.23 | 6.48 | 27.06 | 4.84 | 11673.09 | 31.71 | 41.19 | 9.21 | 0.41 | 4078.05 | 59.19 |
| Burkina Faso | 2015 | 3 | 191.28 | 6.62 | 27.34 | 4.83 | 11878.8 | 31.76 | 40.55 | 9.27 | 0.42 | 4216.54 | 59.08 |
| Burkina Faso | 2015 | 4 | 191.96 | 6.77 | 27.71 | 4.77 | 12013.41 | 31.84 | 39.89 | 9.34 | 0.42 | 4373.16 | 58.87 |
| Burkina Faso | 2016 | 1 | 196.85 | 6.91 | 28.15 | 4.45 | 11899.19 | 31.5 | 37.31 | 9.54 | 0.43 | 4607.41 | 57.94 |
| Burkina Faso | 2016 | 2 | 194.97 | 7.06 | 28.73 | 4.38 | 11962.66 | 31.8 | 37.38 | 9.54 | 0.43 | 4776.49 | 57.8 |
| Burkina Faso | 2016 | 3 | 190.9 | 7.22 | 29.42 | 4.33 | 12026.09 | 32.31 | 38.2 | 9.49 | 0.43 | 4939.9 | 57.82 |
| Burkina Faso | 2016 | 4 | 184.64 | 7.37 | 30.21 | 4.32 | 12089.5 | 33.03 | 39.76 | 9.39 | 0.43 | 5097.63 | 58 |
| Burkina Faso | 2017 | 1 | 164.11 | 7.54 | 31.79 | 4.39 | 10333.15 | 35.52 | 46.25 | 8.94 | 0.42 | 4076.59 | 58.76 |
| Burkina Faso | 2017 | 2 | 158.3 | 7.7 | 32.53 | 4.42 | 11124.39 | 36.01 | 47.63 | 8.84 | 0.42 | 4692.22 | 59.1 |
| Burkina Faso | 2017 | 3 | 155.13 | 7.87 | 33.11 | 4.48 | 12643.5 | 36.07 | 48.08 | 8.79 | 0.42 | 5771.43 | 59.44 |
| Burkina Faso | 2017 | 4 | 154.59 | 8.05 | 33.53 | 4.55 | 14890.48 | 35.71 | 47.6 | 8.79 | 0.42 | 7314.2 | 59.78 |
| Burkina Faso | 2018 | 1 | 162.83 | 8.22 | 33.6 | 4.65 | 19171.38 | 33.14 | 42.9 | 9.14 | 0.41 | 8619.53 | 60.34 |
| Burkina Faso | 2018 | 2 | 165.12 | 8.41 | 33.76 | 4.75 | 22351.66 | 32.63 | 41.88 | 9.14 | 0.41 | 11369.84 | 60.58 |
| Burkina Faso | 2018 | 3 | 167.59 | 8.59 | 33.83 | 4.86 | 25737.37 | 32.39 | 41.25 | 9.08 | 0.41 | 14864.13 | 60.72 |
| Burkina Faso | 2018 | 4 | 170.24 | 8.78 | 33.81 | 4.99 | 29328.51 | 32.44 | 41 | 8.96 | 0.42 | 19102.38 | 60.77 |

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|--------------|------|---|--------|-------|-------|------|----------|-------|-------|-------|------|----------|-------|
| Burkina Faso | 2019 | 1 | 172.66 | 8.86 | 31.51 | 5.43 | 34857.33 | 33.51 | 41.89 | 8.38 | 0.41 | 27150.62 | 60.4 |
| Burkina Faso | 2019 | 2 | 175.85 | 9.1 | 32.17 | 5.46 | 38166.45 | 33.82 | 42.12 | 8.31 | 0.43 | 31650.42 | 60.39 |
| Burkina Faso | 2019 | 3 | 179.39 | 9.39 | 33.61 | 5.39 | 40988.11 | 34.1 | 42.45 | 8.33 | 0.46 | 35667.78 | 60.4 |
| Burkina Faso | 2019 | 4 | 183.29 | 9.72 | 35.83 | 5.2 | 43322.32 | 34.37 | 42.86 | 8.46 | 0.5 | 39202.71 | 60.45 |
| Burkina Faso | 2020 | 1 | 191.35 | 10.18 | 42.09 | 4.29 | 43740.65 | 34.52 | 43.58 | 9.08 | 0.62 | 39379.13 | 60.41 |
| Burkina Faso | 2020 | 2 | 194.43 | 10.58 | 44.55 | 4.13 | 45671.3 | 34.77 | 44.09 | 9.25 | 0.65 | 43099.62 | 60.57 |
| Burkina Faso | 2020 | 3 | 196.34 | 11 | 46.48 | 4.1 | 47685.87 | 35.05 | 44.59 | 9.38 | 0.68 | 47488.12 | 60.82 |
| Burkina Faso | 2020 | 4 | 197.07 | 11.43 | 47.88 | 4.21 | 49784.34 | 35.34 | 45.1 | 9.45 | 0.69 | 52544.61 | 61.16 |
| Burkina Faso | 2021 | 1 | 191.04 | 11.89 | 48.46 | 5.04 | 50592.63 | 35.38 | 45.29 | 9.41 | 0.65 | 60303.72 | 61.67 |
| Burkina Faso | 2021 | 2 | 191.67 | 12.36 | 48.91 | 5.18 | 53408.56 | 35.81 | 45.93 | 9.4 | 0.65 | 65882.37 | 62.14 |
| Burkina Faso | 2021 | 3 | 193.35 | 12.83 | 48.95 | 5.22 | 56858.05 | 36.37 | 46.71 | 9.37 | 0.65 | 71315.17 | 62.65 |
| Burkina Faso | 2021 | 4 | 196.11 | 13.32 | 48.57 | 5.16 | 60941.08 | 37.05 | 47.63 | 9.3 | 0.65 | 76602.13 | 63.21 |
| Burkina Faso | 2022 | 1 | 202.63 | 13.79 | 45.3 | 4.65 | 67118.74 | 39.09 | 50.22 | 8.95 | 0.64 | 81900.91 | 64.31 |
| Burkina Faso | 2022 | 2 | 206.43 | 14.31 | 45.08 | 4.53 | 71884.44 | 39.52 | 50.78 | 8.93 | 0.64 | 86833.11 | 64.77 |
| Burkina Faso | 2022 | 3 | 210.21 | 14.86 | 45.44 | 4.45 | 76699.26 | 39.59 | 50.86 | 8.99 | 0.64 | 91556.39 | 65.07 |
| Burkina Faso | 2022 | 4 | 213.97 | 15.44 | 46.38 | 4.41 | 81563.19 | 39.28 | 50.46 | 9.13 | 0.64 | 96070.75 | 65.21 |
| Burkina Faso | 2023 | 1 | 217.71 | 16.04 | 47.89 | 4.41 | 86476.24 | 38.6 | 49.57 | 9.34 | 0.63 | 100376.2 | 65.21 |
| Burkina Faso | 2023 | 2 | 221.43 | 16.66 | 49.97 | 4.44 | 91438.41 | 37.55 | 48.19 | 9.63 | 0.63 | 104472.8 | 65.05 |
| Burkina Faso | 2023 | 3 | 225.13 | 17.31 | 52.63 | 4.52 | 96449.69 | 36.14 | 46.33 | 9.99 | 0.63 | 108360.4 | 64.74 |
| Burkina Faso | 2023 | 4 | 228.81 | 17.99 | 55.87 | 4.63 | 101510.1 | 34.35 | 43.99 | 10.44 | 0.63 | 112039.1 | 64.28 |
| Cameroon | 2014 | 1 | 52.9 | 15.46 | 75.18 | 2.33 | 17438.56 | 12.01 | 17.84 | 4.61 | 1.18 | 264.1 | 52.55 |
| Cameroon | 2014 | 2 | 51.5 | 15.94 | 78.7 | 2.5 | 8405.33 | 12.28 | 17.59 | 4.55 | 1.19 | 135.21 | 52.7 |
| Cameroon | 2014 | 3 | 50.13 | 16.44 | 81.33 | 2.67 | 2935.58 | 12.53 | 17.42 | 4.5 | 1.19 | 46.74 | 52.84 |
| Cameroon | 2014 | 4 | 48.79 | 16.96 | 83.07 | 2.82 | 1029.33 | 12.78 | 17.31 | 4.47 | 1.2 | 41.29 | 52.99 |
| Cameroon | 2015 | 1 | 47.46 | 17.48 | 83.92 | 2.97 | 2686.57 | 13.02 | 17.27 | 4.45 | 1.2 | 48.9 | 53.14 |
| Cameroon | 2015 | 2 | 46.16 | 18.02 | 83.88 | 3.1 | 7907.3 | 13.26 | 17.3 | 4.45 | 1.21 | 23.93 | 53.29 |
| Cameroon | 2015 | 3 | 44.89 | 18.57 | 82.95 | 3.23 | 16691.53 | 13.49 | 17.39 | 4.46 | 1.21 | 97.18 | 53.45 |
| Cameroon | 2015 | 4 | 43.64 | 19.13 | 81.13 | 3.34 | 29039.24 | 13.71 | 17.56 | 4.49 | 1.22 | 210.87 | 53.6 |
| Cameroon | 2016 | 1 | 41.94 | 19.69 | 70.09 | 3.43 | 42932.91 | 13.7 | 17.91 | 4.55 | 1.22 | 446.61 | 53.75 |

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|----------|------|---|-------|-------|--------|------|----------|-------|-------|------|------|----------|-------|
| Cameroon | 2016 | 2 | 40.93 | 20.28 | 69.81 | 3.53 | 63214.63 | 14.01 | 18.17 | 4.6 | 1.22 | 608.51 | 53.9 |
| Cameroon | 2016 | 3 | 40.14 | 20.9 | 71.97 | 3.63 | 87866.86 | 14.39 | 18.46 | 4.66 | 1.22 | 778.19 | 54.06 |
| Cameroon | 2016 | 4 | 39.56 | 21.53 | 76.56 | 3.72 | 116889.6 | 14.86 | 18.78 | 4.72 | 1.22 | 955.65 | 54.21 |
| Cameroon | 2017 | 1 | 39.3 | 21.62 | 93.39 | 3.81 | 79156.16 | 15.77 | 19.4 | 4.84 | 1.23 | 537.04 | 54.36 |
| Cameroon | 2017 | 2 | 39.11 | 22.51 | 98.93 | 3.9 | 145370.6 | 16.26 | 19.65 | 4.9 | 1.23 | 971.61 | 54.51 |
| Cameroon | 2017 | 3 | 39.11 | 23.65 | 102.99 | 3.98 | 244406.2 | 16.7 | 19.82 | 4.95 | 1.23 | 1655.49 | 54.65 |
| Cameroon | 2017 | 4 | 39.28 | 25.03 | 105.57 | 4.07 | 376263 | 17.08 | 19.89 | 4.99 | 1.23 | 2588.7 | 54.8 |
| Cameroon | 2018 | 1 | 39.85 | 27.22 | 103.92 | 4.2 | 323133.1 | 17.16 | 19.43 | 5 | 1.2 | 2667.3 | 54.96 |
| Cameroon | 2018 | 2 | 40.29 | 28.86 | 104.62 | 4.27 | 607755.4 | 17.52 | 19.5 | 5.03 | 1.2 | 4540.72 | 55.11 |
| Cameroon | 2018 | 3 | 40.81 | 30.52 | 104.93 | 4.33 | 1012322 | 17.91 | 19.65 | 5.07 | 1.2 | 7105.03 | 55.26 |
| Cameroon | 2018 | 4 | 41.42 | 32.2 | 104.84 | 4.36 | 1536833 | 18.33 | 19.9 | 5.1 | 1.21 | 10360.23 | 55.41 |
| Cameroon | 2019 | 1 | 44.28 | 34.28 | 94.05 | 4.28 | 2411789 | 19.18 | 20.38 | 5.18 | 1.24 | 15721.56 | 55.56 |
| Cameroon | 2019 | 2 | 44.2 | 35.85 | 97.3 | 4.33 | 3083989 | 19.52 | 20.73 | 5.2 | 1.26 | 19792.45 | 55.71 |
| Cameroon | 2019 | 3 | 43.34 | 37.28 | 104.3 | 4.39 | 3783933 | 19.73 | 21.11 | 5.2 | 1.27 | 23988.13 | 55.85 |
| Cameroon | 2019 | 4 | 41.71 | 38.59 | 115.03 | 4.48 | 4511621 | 19.82 | 21.5 | 5.18 | 1.27 | 28308.61 | 56 |
| Cameroon | 2020 | 1 | 35.38 | 40.05 | 149.71 | 4.75 | 5370770 | 19.42 | 22.09 | 5.09 | 1.27 | 33243.02 | 56.15 |
| Cameroon | 2020 | 2 | 33.76 | 40.98 | 159.83 | 4.81 | 6112460 | 19.41 | 22.46 | 5.07 | 1.28 | 37617.43 | 56.3 |
| Cameroon | 2020 | 3 | 32.93 | 41.67 | 165.6 | 4.84 | 6840408 | 19.41 | 22.79 | 5.05 | 1.28 | 41920.99 | 56.44 |
| Cameroon | 2020 | 4 | 32.89 | 42.11 | 167.02 | 4.84 | 7554614 | 19.44 | 23.07 | 5.03 | 1.29 | 46153.68 | 56.59 |
| Cameroon | 2021 | 1 | 35.36 | 41.86 | 151.21 | 4.59 | 8154044 | 19.33 | 22.68 | 5.05 | 1.31 | 50675.55 | 56.75 |
| Cameroon | 2021 | 2 | 36.21 | 41.99 | 149.08 | 4.58 | 8881178 | 19.47 | 23.12 | 5.03 | 1.32 | 54622.5 | 56.9 |
| Cameroon | 2021 | 3 | 37.15 | 42.07 | 147.76 | 4.6 | 9634983 | 19.69 | 23.76 | 5.01 | 1.33 | 58354.58 | 57.04 |
| Cameroon | 2021 | 4 | 38.19 | 42.08 | 147.23 | 4.67 | 10415458 | 19.99 | 24.6 | 4.99 | 1.34 | 61871.77 | 57.19 |
| Cameroon | 2022 | 1 | 40.93 | 41.83 | 149.06 | 4.95 | 11793747 | 20.73 | 26.37 | 4.93 | 1.35 | 66700.83 | 57.34 |
| Cameroon | 2022 | 2 | 41.53 | 41.8 | 149.52 | 5.03 | 12399107 | 21.06 | 27.32 | 4.9 | 1.36 | 69177.56 | 57.49 |
| Cameroon | 2022 | 3 | 41.59 | 41.78 | 150.17 | 5.08 | 12802680 | 21.35 | 28.17 | 4.89 | 1.36 | 70828.72 | 57.63 |
| Cameroon | 2022 | 4 | 41.11 | 41.79 | 151.01 | 5.11 | 13004466 | 21.58 | 28.94 | 4.88 | 1.37 | 71654.3 | 57.78 |
| Cameroon | 2023 | 1 | 40.09 | 41.82 | 152.03 | 5.11 | 13004466 | 21.76 | 29.62 | 4.88 | 1.38 | 71654.3 | 57.93 |
| Cameroon | 2023 | 2 | 38.54 | 41.86 | 153.23 | 5.08 | 12802680 | 21.88 | 30.2 | 4.89 | 1.39 | 70828.72 | 58.08 |

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|---------------|------|---|--------|-------|--------|------|----------|-------|-------|------|------|----------|-------|
| Cameroon | 2023 | 3 | 36.44 | 41.92 | 154.62 | 5.03 | 12399107 | 21.95 | 30.69 | 4.9 | 1.39 | 69177.56 | 58.22 |
| Cameroon | 2023 | 4 | 33.81 | 42 | 156.2 | 4.95 | 11793747 | 21.97 | 31.09 | 4.93 | 1.4 | 66700.83 | 58.37 |
| Côte d'Ivoire | 2014 | 1 | 386.74 | 6.25 | 518.14 | 6.84 | 2748736 | 12.21 | 13.73 | 1.76 | 0.45 | 9650.28 | 53.13 |
| Côte d'Ivoire | 2014 | 2 | 404.14 | 5.65 | 511.38 | 6.91 | 2863933 | 12.31 | 13.95 | 1.81 | 0.47 | 10119.77 | 53.67 |
| Côte d'Ivoire | 2014 | 3 | 421.02 | 15.95 | 507.14 | 6.97 | 2971234 | 12.42 | 14.16 | 1.86 | 0.49 | 10670.12 | 53.95 |
| Côte d'Ivoire | 2014 | 4 | 437.39 | 24.65 | 505.41 | 7.04 | 3070638 | 12.54 | 14.37 | 1.9 | 0.5 | 11301.31 | 53.97 |
| Côte d'Ivoire | 2015 | 1 | 453.25 | 31.75 | 506.2 | 7.1 | 3162145 | 12.68 | 14.58 | 1.93 | 0.51 | 12013.36 | 53.73 |
| Côte d'Ivoire | 2015 | 2 | 468.6 | 37.25 | 509.49 | 7.16 | 3245755 | 12.83 | 14.78 | 1.95 | 0.52 | 12806.26 | 53.22 |
| Côte d'Ivoire | 2015 | 3 | 483.44 | 41.15 | 515.3 | 7.22 | 3321468 | 13 | 14.97 | 1.97 | 0.52 | 13680.01 | 52.46 |
| Côte d'Ivoire | 2015 | 4 | 497.76 | 43.45 | 523.62 | 7.28 | 3389285 | 13.17 | 15.16 | 1.98 | 0.52 | 14634.61 | 51.43 |
| Côte d'Ivoire | 2016 | 1 | 526.05 | 40.18 | 540.39 | 7.45 | 3421311 | 13.45 | 15.47 | 1.96 | 0.51 | 16519.34 | 48.52 |
| Côte d'Ivoire | 2016 | 2 | 533.55 | 40.87 | 551.35 | 7.47 | 3484491 | 13.62 | 15.6 | 1.97 | 0.5 | 17295.93 | 47.63 |
| Côte d'Ivoire | 2016 | 3 | 534.76 | 41.54 | 562.45 | 7.44 | 3550932 | 13.78 | 15.67 | 1.98 | 0.5 | 17813.65 | 47.12 |
| Côte d'Ivoire | 2016 | 4 | 529.66 | 42.21 | 573.69 | 7.36 | 3620634 | 13.91 | 15.69 | 2 | 0.49 | 18072.52 | 47.01 |
| Côte d'Ivoire | 2017 | 1 | 493.12 | 44.22 | 582.85 | 7.02 | 3573570 | 14.02 | 15.53 | 2.05 | 0.49 | 16977.34 | 48.83 |
| Côte d'Ivoire | 2017 | 2 | 485.47 | 44.31 | 595.24 | 6.95 | 3697804 | 14.12 | 15.48 | 2.06 | 0.48 | 17156.55 | 48.87 |
| Côte d'Ivoire | 2017 | 3 | 481.57 | 43.85 | 608.64 | 6.91 | 3873309 | 14.2 | 15.41 | 2.07 | 0.48 | 17514.96 | 48.68 |
| Côte d'Ivoire | 2017 | 4 | 481.42 | 42.83 | 623.07 | 6.92 | 4100085 | 14.26 | 15.34 | 2.07 | 0.47 | 18052.59 | 48.26 |
| Côte d'Ivoire | 2018 | 1 | 492.19 | 39.07 | 663.38 | 7.11 | 4428480 | 14.34 | 15.18 | 2.06 | 0.48 | 18625.25 | 46.83 |
| Côte d'Ivoire | 2018 | 2 | 496.67 | 37.81 | 669.89 | 7.14 | 4737659 | 14.35 | 15.13 | 2.04 | 0.47 | 19578.96 | 46.25 |
| Côte d'Ivoire | 2018 | 3 | 502.04 | 36.87 | 667.46 | 7.17 | 5077969 | 14.34 | 15.09 | 2.02 | 0.47 | 20769.54 | 45.75 |
| Côte d'Ivoire | 2018 | 4 | 508.29 | 36.25 | 656.11 | 7.18 | 5449412 | 14.29 | 15.08 | 2 | 0.46 | 22197.01 | 45.33 |
| Côte d'Ivoire | 2019 | 1 | 514.98 | 36.61 | 583.13 | 7.13 | 5686161 | 13.99 | 14.94 | 1.88 | 0.42 | 23592.09 | 45.39 |
| Côte d'Ivoire | 2019 | 2 | 523.17 | 36.37 | 574.99 | 7.14 | 6186197 | 13.97 | 15.03 | 1.88 | 0.43 | 25601.01 | 44.96 |
| Côte d'Ivoire | 2019 | 3 | 532.43 | 36.18 | 579 | 7.15 | 6783695 | 14.01 | 15.21 | 1.9 | 0.44 | 27954.5 | 44.45 |
| Côte d'Ivoire | 2019 | 4 | 542.76 | 36.05 | 595.16 | 7.17 | 7478655 | 14.11 | 15.47 | 1.95 | 0.47 | 30652.56 | 43.85 |
| Côte d'Ivoire | 2020 | 1 | 564.11 | 36.07 | 662.21 | 7.24 | 8838644 | 14.6 | 16.19 | 2.14 | 0.55 | 35877.75 | 42.04 |
| Côte d'Ivoire | 2020 | 2 | 572.57 | 36.01 | 687.16 | 7.26 | 9501500 | 14.69 | 16.46 | 2.2 | 0.57 | 38391.95 | 41.73 |
| Côte d'Ivoire | 2020 | 3 | 578.12 | 35.97 | 708.75 | 7.27 | 10034790 | 14.69 | 16.67 | 2.23 | 0.59 | 40377.71 | 41.78 |

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|---------------|------|---|---------|-------|--------|-------|----------|-------|-------|------|------|----------|-------|
| Côte d'Ivoire | 2020 | 4 | 580.74 | 35.95 | 726.99 | 7.27 | 10438515 | 14.62 | 16.81 | 2.24 | 0.6 | 41835.02 | 42.21 |
| Côte d'Ivoire | 2021 | 1 | 570.68 | 35.63 | 735.06 | 7.24 | 10075735 | 14.09 | 16.71 | 2.16 | 0.59 | 41757.64 | 43.12 |
| Côte d'Ivoire | 2021 | 2 | 571.37 | 35.78 | 749.31 | 7.24 | 10475105 | 14.02 | 16.78 | 2.15 | 0.59 | 42560.57 | 44.23 |
| Côte d'Ivoire | 2021 | 3 | 573.04 | 36.08 | 762.94 | 7.24 | 10999685 | 14.03 | 16.84 | 2.15 | 0.59 | 43237.56 | 45.67 |
| Côte d'Ivoire | 2021 | 4 | 575.7 | 36.53 | 775.93 | 7.25 | 11649475 | 14.11 | 16.92 | 2.14 | 0.59 | 43788.61 | 47.43 |
| Côte d'Ivoire | 2022 | 1 | 573.76 | 37.52 | 797.2 | 7.28 | 12034375 | 14.54 | 16.99 | 2.02 | 0.6 | 40148.42 | 51.74 |
| Côte d'Ivoire | 2022 | 2 | 580.62 | 38.11 | 805.37 | 7.29 | 13090625 | 14.67 | 17.06 | 2.07 | 0.6 | 42073.71 | 53.25 |
| Côte d'Ivoire | 2022 | 3 | 590.7 | 38.7 | 809.34 | 7.31 | 14428125 | 14.78 | 17.12 | 2.18 | 0.6 | 45499.17 | 54.18 |
| Côte d'Ivoire | 2022 | 4 | 604 | 39.28 | 809.13 | 7.32 | 16046875 | 14.86 | 17.19 | 2.33 | 0.6 | 50424.82 | 54.54 |
| Côte d'Ivoire | 2023 | 1 | 620.52 | 39.85 | 804.72 | 7.33 | 17946875 | 14.91 | 17.26 | 2.53 | 0.61 | 56850.65 | 54.33 |
| Côte d'Ivoire | 2023 | 2 | 640.26 | 40.42 | 796.11 | 7.34 | 20128125 | 14.94 | 17.33 | 2.79 | 0.61 | 64776.65 | 53.54 |
| Côte d'Ivoire | 2023 | 3 | 663.21 | 40.98 | 783.32 | 7.34 | 22590625 | 14.93 | 17.39 | 3.1 | 0.61 | 74202.83 | 52.18 |
| Côte d'Ivoire | 2023 | 4 | 689.39 | 41.54 | 766.33 | 7.35 | 25334375 | 14.9 | 17.46 | 3.46 | 0.61 | 85129.19 | 50.24 |
| Eswatini | 2014 | 1 | 1131.53 | 25.3 | 667.76 | 30.09 | 37.97 | 18.97 | 30.85 | 5.53 | 0.55 | 276.49 | 91.16 |
| Eswatini | 2014 | 2 | 1108.87 | 25 | 669.06 | 29.49 | 30.72 | 17.6 | 27.67 | 5.55 | 0.56 | 110.83 | 88.7 |
| Eswatini | 2014 | 3 | 1087.81 | 24.85 | 670.69 | 29.23 | 89.34 | 16.47 | 25.02 | 5.58 | 0.56 | 948.01 | 86.82 |
| Eswatini | 2014 | 4 | 1068.37 | 24.85 | 672.65 | 29.3 | 137.91 | 15.6 | 22.9 | 5.62 | 0.57 | 1635.04 | 85.52 |
| Eswatini | 2015 | 1 | 1050.53 | 25 | 674.93 | 29.71 | 176.41 | 14.97 | 21.3 | 5.65 | 0.57 | 2171.93 | 84.8 |
| Eswatini | 2015 | 2 | 1034.29 | 25.3 | 677.54 | 30.46 | 204.84 | 14.58 | 20.22 | 5.69 | 0.58 | 2558.68 | 84.67 |
| Eswatini | 2015 | 3 | 1019.67 | 25.75 | 680.48 | 31.54 | 223.22 | 14.45 | 19.67 | 5.74 | 0.58 | 2795.28 | 85.11 |
| Eswatini | 2015 | 4 | 1006.65 | 26.35 | 683.74 | 32.96 | 231.53 | 14.56 | 19.65 | 5.79 | 0.59 | 2881.74 | 86.14 |
| Eswatini | 2016 | 1 | 1005.6 | 26.9 | 674.18 | 36.65 | 115.56 | 15.55 | 21.43 | 5.73 | 0.59 | 2169.5 | 90.72 |
| Eswatini | 2016 | 2 | 991.65 | 27.88 | 683.36 | 37.97 | 149.44 | 15.9 | 21.94 | 5.84 | 0.59 | 2215.1 | 91.71 |
| Eswatini | 2016 | 3 | 975.15 | 29.09 | 698.13 | 38.85 | 218.94 | 16.25 | 22.45 | 5.99 | 0.59 | 2369.98 | 92.1 |
| Eswatini | 2016 | 4 | 956.12 | 30.53 | 718.49 | 39.29 | 324.06 | 16.59 | 22.98 | 6.2 | 0.59 | 2634.14 | 91.87 |
| Eswatini | 2017 | 1 | 924.21 | 33.19 | 799.98 | 38.2 | 609.19 | 17.18 | 23.72 | 6.75 | 0.56 | 3503.78 | 88.81 |
| Eswatini | 2017 | 2 | 904.23 | 34.71 | 809.31 | 38.21 | 727.81 | 17.41 | 24.18 | 6.95 | 0.56 | 3788.02 | 88.24 |
| Eswatini | 2017 | 3 | 885.84 | 36.06 | 802.02 | 38.23 | 824.31 | 17.54 | 24.56 | 7.08 | 0.56 | 3983.06 | 87.96 |
| Eswatini | 2017 | 4 | 869.04 | 37.24 | 778.1 | 38.25 | 898.69 | 17.55 | 24.87 | 7.14 | 0.56 | 4088.9 | 87.95 |

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|----------|------|---|---------|-------|--------|-------|---------|-------|-------|------|------|----------|-------|
| Eswatini | 2018 | 1 | 829.4 | 37.8 | 668.96 | 38.48 | 972.97 | 17.35 | 25.11 | 6.76 | 0.58 | 3764.48 | 89.46 |
| Eswatini | 2018 | 2 | 825.55 | 38.85 | 639.25 | 38.43 | 994.28 | 17.19 | 25.27 | 6.85 | 0.58 | 3828.35 | 89.51 |
| Eswatini | 2018 | 3 | 833.08 | 39.92 | 620.35 | 38.31 | 984.66 | 16.97 | 25.34 | 7.03 | 0.58 | 3939.44 | 89.33 |
| Eswatini | 2018 | 4 | 851.96 | 41.02 | 612.28 | 38.1 | 944.09 | 16.69 | 25.32 | 7.3 | 0.58 | 4097.77 | 88.94 |
| Eswatini | 2019 | 1 | 921.83 | 42.12 | 635.73 | 36.88 | 693.53 | 16.33 | 25.06 | 8.09 | 0.57 | 3726.82 | 87.61 |
| Eswatini | 2019 | 2 | 947.6 | 43.28 | 641.01 | 36.9 | 662.72 | 15.92 | 24.95 | 8.36 | 0.57 | 4210.19 | 87.07 |
| Eswatini | 2019 | 3 | 968.9 | 44.48 | 648.83 | 37.21 | 672.59 | 15.44 | 24.84 | 8.56 | 0.57 | 4971.39 | 86.59 |
| Eswatini | 2019 | 4 | 985.72 | 45.72 | 659.19 | 37.81 | 723.16 | 14.91 | 24.71 | 8.67 | 0.57 | 6010.4 | 86.18 |
| Eswatini | 2020 | 1 | 1002.49 | 47.1 | 767.1 | 40.53 | 290.66 | 13.75 | 24.46 | 8.55 | 0.58 | 6640.66 | 85.6 |
| Eswatini | 2020 | 2 | 1008.58 | 48.37 | 744.52 | 41 | 632.09 | 13.31 | 24.36 | 8.56 | 0.58 | 8509.96 | 85.41 |
| Eswatini | 2020 | 3 | 1008.4 | 49.63 | 686.47 | 41.05 | 1223.72 | 13.03 | 24.29 | 8.54 | 0.58 | 10931.72 | 85.39 |
| Eswatini | 2020 | 4 | 1001.98 | 50.89 | 592.94 | 40.66 | 2065.53 | 12.91 | 24.25 | 8.51 | 0.58 | 13905.93 | 85.52 |
| Eswatini | 2021 | 1 | 983.14 | 52.36 | 293.79 | 37.91 | 4267.06 | 13.58 | 23.87 | 8.69 | 0.59 | 20091.29 | 86.75 |
| Eswatini | 2021 | 2 | 966.66 | 53.52 | 197.38 | 37.44 | 5165.44 | 13.53 | 24.06 | 8.51 | 0.59 | 23106.94 | 86.82 |
| Eswatini | 2021 | 3 | 946.4 | 54.58 | 133.55 | 37.32 | 5870.19 | 13.4 | 24.42 | 8.21 | 0.59 | 25611.58 | 86.68 |
| Eswatini | 2021 | 4 | 922.34 | 55.55 | 102.32 | 37.54 | 6381.31 | 13.18 | 24.97 | 7.79 | 0.59 | 27605.19 | 86.31 |
| Eswatini | 2022 | 1 | 843.77 | 56.72 | 111.72 | 39.03 | 6359.59 | 12.76 | 27.14 | 6.52 | 0.6 | 31159.43 | 83.87 |
| Eswatini | 2022 | 2 | 832.41 | 57.38 | 142.44 | 39.58 | 6619.16 | 12.41 | 27.48 | 6.15 | 0.6 | 31302.35 | 83.81 |
| Eswatini | 2022 | 3 | 837.55 | 57.83 | 202.52 | 40.09 | 6820.78 | 12.01 | 27.43 | 5.96 | 0.6 | 30105.6 | 84.27 |
| Eswatini | 2022 | 4 | 859.18 | 58.07 | 291.96 | 40.58 | 6964.47 | 11.58 | 26.99 | 5.94 | 0.6 | 27569.18 | 85.25 |
| Eswatini | 2023 | 1 | 897.3 | 58.09 | 410.77 | 41.04 | 7050.22 | 11.09 | 26.16 | 6.09 | 0.6 | 23693.08 | 86.76 |
| Eswatini | 2023 | 2 | 951.92 | 57.91 | 558.95 | 41.48 | 7078.03 | 10.57 | 24.93 | 6.42 | 0.6 | 18477.31 | 88.79 |
| Eswatini | 2023 | 3 | 1023.04 | 57.51 | 736.49 | 41.89 | 7047.91 | 10 | 23.32 | 6.92 | 0.6 | 11921.86 | 91.35 |
| Eswatini | 2023 | 4 | 1110.65 | 56.89 | 943.39 | 42.27 | 6959.84 | 9.38 | 21.31 | 7.6 | 0.6 | 4026.75 | 94.42 |
| Ghana | 2014 | 1 | 254.89 | 17.72 | 462.14 | 3.84 | 1443.85 | 5.53 | 12.41 | 1.9 | 0.4 | 1252.89 | 54.42 |
| Ghana | 2014 | 2 | 352.37 | 18.53 | 467.74 | 4.96 | 568.48 | 5.66 | 12.92 | 1.81 | 0.41 | 1054.47 | 61.59 |
| Ghana | 2014 | 3 | 432.9 | 19.41 | 472.77 | 5.92 | 156.44 | 5.87 | 13.4 | 1.76 | 0.43 | 1036.13 | 67.42 |
| Ghana | 2014 | 4 | 496.47 | 20.34 | 477.23 | 6.72 | 207.71 | 6.14 | 13.86 | 1.74 | 0.44 | 1197.88 | 71.93 |
| Ghana | 2015 | 1 | 543.08 | 21.34 | 481.12 | 7.37 | 722.3 | 6.49 | 14.29 | 1.75 | 0.45 | 1539.7 | 75.1 |

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|-------|------|---|--------|-------|--------|-------|----------|-------|-------|------|------|----------|-------|
| Ghana | 2015 | 2 | 572.73 | 22.41 | 484.43 | 7.86 | 1700.2 | 6.91 | 14.69 | 1.81 | 0.47 | 2061.61 | 76.93 |
| Ghana | 2015 | 3 | 585.43 | 23.53 | 487.18 | 8.18 | 3141.42 | 7.4 | 15.06 | 1.9 | 0.48 | 2763.6 | 77.44 |
| Ghana | 2015 | 4 | 581.17 | 24.72 | 489.35 | 8.35 | 5045.96 | 7.96 | 15.41 | 2.02 | 0.48 | 3645.68 | 76.61 |
| Ghana | 2016 | 1 | 513.34 | 25.36 | 463.07 | 7.66 | 6408.19 | 8.9 | 15.53 | 2.33 | 0.5 | 4459.95 | 69.35 |
| Ghana | 2016 | 2 | 493.81 | 26.92 | 475.25 | 7.79 | 9641.61 | 9.48 | 15.9 | 2.46 | 0.5 | 5801.34 | 67.9 |
| Ghana | 2016 | 3 | 475.96 | 28.78 | 498.02 | 8.05 | 13740.6 | 10.02 | 16.33 | 2.58 | 0.5 | 7421.97 | 67.15 |
| Ghana | 2016 | 4 | 459.8 | 30.95 | 531.37 | 8.43 | 18705.16 | 10.51 | 16.8 | 2.67 | 0.5 | 9321.83 | 67.11 |
| Ghana | 2017 | 1 | 433.1 | 34.94 | 635.43 | 9.4 | 23614.19 | 11.26 | 17.97 | 2.73 | 0.47 | 11107.5 | 70.37 |
| Ghana | 2017 | 2 | 425.19 | 37.11 | 665.9 | 9.84 | 30678.32 | 11.53 | 18.28 | 2.77 | 0.46 | 13723.21 | 70.71 |
| Ghana | 2017 | 3 | 423.87 | 38.99 | 682.91 | 10.21 | 38976.44 | 11.64 | 18.39 | 2.8 | 0.46 | 16775.51 | 70.72 |
| Ghana | 2017 | 4 | 429.11 | 40.56 | 686.45 | 10.51 | 48508.57 | 11.57 | 18.29 | 2.82 | 0.45 | 20264.42 | 70.4 |
| Ghana | 2018 | 1 | 460.92 | 45.15 | 617.52 | 10.66 | 57004.8 | 11.05 | 17.43 | 2.76 | 0.43 | 24135.31 | 67.14 |
| Ghana | 2018 | 2 | 471.32 | 44.8 | 617.74 | 10.86 | 69912.89 | 10.76 | 17.13 | 2.75 | 0.43 | 28519.28 | 67.21 |
| Ghana | 2018 | 3 | 480.3 | 42.83 | 628.09 | 11.02 | 84962.95 | 10.43 | 16.84 | 2.75 | 0.43 | 33361.69 | 67.99 |
| Ghana | 2018 | 4 | 487.86 | 39.23 | 648.58 | 11.15 | 102155 | 10.04 | 16.56 | 2.75 | 0.43 | 38662.56 | 69.49 |
| Ghana | 2019 | 1 | 487.22 | 20.36 | 714.62 | 11.17 | 128402.2 | 9 | 15.92 | 2.75 | 0.44 | 45403.19 | 76.48 |
| Ghana | 2019 | 2 | 494.66 | 18.97 | 741.22 | 11.26 | 147112.8 | 8.75 | 15.82 | 2.76 | 0.44 | 51228.44 | 77.5 |
| Ghana | 2019 | 3 | 503.4 | 21.4 | 763.79 | 11.33 | 165200.1 | 8.68 | 15.87 | 2.76 | 0.45 | 57119.6 | 77.33 |
| Ghana | 2019 | 4 | 513.44 | 27.67 | 782.33 | 11.4 | 182664.1 | 8.81 | 16.07 | 2.77 | 0.46 | 63076.69 | 75.96 |
| Ghana | 2020 | 1 | 535.56 | 52.71 | 788.53 | 11.52 | 195011.5 | 9.7 | 16.87 | 2.78 | 0.49 | 68778.95 | 69.42 |
| Ghana | 2020 | 2 | 543.87 | 60.67 | 802.34 | 11.54 | 213026 | 9.97 | 17.23 | 2.78 | 0.5 | 74996.18 | 67.26 |
| Ghana | 2020 | 3 | 549.16 | 66.48 | 815.44 | 11.52 | 232214.5 | 10.21 | 17.57 | 2.78 | 0.51 | 81407.65 | 65.5 |
| Ghana | 2020 | 4 | 551.43 | 70.15 | 827.84 | 11.46 | 252576.8 | 10.4 | 17.89 | 2.77 | 0.51 | 88013.34 | 64.13 |
| Ghana | 2021 | 1 | 542.31 | 67.14 | 845.96 | 11.17 | 250695 | 10.7 | 18.33 | 2.74 | 0.51 | 93160.58 | 62.4 |
| Ghana | 2021 | 2 | 541.87 | 68.33 | 854.38 | 11.12 | 282772.4 | 10.75 | 18.58 | 2.73 | 0.51 | 100815.8 | 62.14 |
| Ghana | 2021 | 3 | 541.77 | 69.2 | 859.53 | 11.12 | 325391 | 10.71 | 18.77 | 2.73 | 0.51 | 109326.3 | 62.58 |
| Ghana | 2021 | 4 | 541.98 | 69.73 | 861.41 | 11.15 | 378550.8 | 10.57 | 18.89 | 2.72 | 0.51 | 118692.1 | 63.73 |
| Ghana | 2022 | 1 | 534.52 | 69.15 | 856.94 | 11.39 | 467035.7 | 10.04 | 18.98 | 2.72 | 0.52 | 129025.8 | 68.67 |
| Ghana | 2022 | 2 | 538.59 | 69.33 | 853.51 | 11.45 | 531364.2 | 9.82 | 18.97 | 2.72 | 0.52 | 140057.1 | 69.99 |

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|--------|------|---|--------|-------|--------|-------|----------|-------|-------|------|------|----------|--------|
| Ghana | 2022 | 3 | 546.18 | 69.49 | 848.05 | 11.48 | 596320.1 | 9.61 | 18.88 | 2.73 | 0.52 | 151898.8 | 70.78 |
| Ghana | 2022 | 4 | 557.3 | 69.63 | 840.54 | 11.48 | 661903.6 | 9.41 | 18.73 | 2.75 | 0.52 | 164550.7 | 71.04 |
| Ghana | 2023 | 1 | 571.94 | 69.76 | 831 | 11.46 | 728114.6 | 9.23 | 18.5 | 2.77 | 0.52 | 178013 | 70.77 |
| Ghana | 2023 | 2 | 590.11 | 69.87 | 819.42 | 11.42 | 794953.2 | 9.06 | 18.19 | 2.79 | 0.52 | 192285.5 | 69.97 |
| Ghana | 2023 | 3 | 611.8 | 69.95 | 805.8 | 11.35 | 862419.3 | 8.91 | 17.82 | 2.82 | 0.52 | 207368.3 | 68.64 |
| Ghana | 2023 | 4 | 637.03 | 70.02 | 790.14 | 11.25 | 930512.9 | 8.77 | 17.37 | 2.86 | 0.52 | 223261.3 | 66.78 |
| Guinea | 2014 | 1 | 682.14 | 5.59 | 71.67 | 1.15 | 25828.16 | 11.63 | 12.96 | 2.35 | 0.01 | 62.48 | 89.57 |
| Guinea | 2014 | 2 | 700.73 | 6.08 | 70.63 | 1.2 | 7865.59 | 11.93 | 14.33 | 2.47 | 0.01 | 27.03 | 87.53 |
| Guinea | 2014 | 3 | 717.26 | 6.65 | 70.27 | 1.25 | 7027.28 | 12.14 | 15.46 | 2.57 | 0.01 | 3.39 | 85.65 |
| Guinea | 2014 | 4 | 731.75 | 7.28 | 70.59 | 1.32 | 9850.47 | 12.26 | 16.37 | 2.65 | 0.01 | 8.42 | 83.93 |
| Guinea | 2015 | 1 | 744.18 | 7.98 | 71.58 | 1.38 | 9603.97 | 12.3 | 17.04 | 2.72 | 0.01 | 8.42 | 82.37 |
| Guinea | 2015 | 2 | 754.55 | 8.75 | 73.25 | 1.46 | 8287.78 | 12.25 | 17.48 | 2.76 | 0.01 | 3.39 | 80.97 |
| Guinea | 2015 | 3 | 762.88 | 9.58 | 75.61 | 1.54 | 9098.09 | 12.12 | 17.69 | 2.78 | 0.01 | 27.03 | 79.73 |
| Guinea | 2015 | 4 | 769.15 | 10.49 | 78.64 | 1.62 | 27553.66 | 11.89 | 17.67 | 2.78 | 0.01 | 62.48 | 78.65 |
| Guinea | 2016 | 1 | 773.71 | 11.37 | 86.56 | 1.72 | 32776.41 | 11.44 | 16.63 | 2.61 | 0.01 | 35.42 | 78.25 |
| Guinea | 2016 | 2 | 775.74 | 12.45 | 89.27 | 1.82 | 31760.66 | 11.1 | 16.46 | 2.63 | 0.01 | 124.24 | 77.29 |
| Guinea | 2016 | 3 | 775.59 | 13.64 | 90.96 | 1.92 | 136309.5 | 10.73 | 16.39 | 2.7 | 0.01 | 254.6 | 76.29 |
| Guinea | 2016 | 4 | 773.24 | 14.93 | 91.65 | 2.02 | 280870.2 | 10.33 | 16.4 | 2.81 | 0.01 | 426.5 | 75.25 |
| Guinea | 2017 | 1 | 766.02 | 16.99 | 89.51 | 2.17 | 189840.3 | 9.97 | 17.07 | 3.19 | 0.02 | 23.24 | 67.23 |
| Guinea | 2017 | 2 | 760.37 | 18.23 | 88.91 | 2.26 | 296857.3 | 9.49 | 17.03 | 3.3 | 0.02 | 497.03 | 68.88 |
| Guinea | 2017 | 3 | 753.61 | 19.32 | 88.04 | 2.33 | 1085680 | 8.95 | 16.84 | 3.37 | 0.02 | 1324.13 | 73.27 |
| Guinea | 2017 | 4 | 745.73 | 20.25 | 86.89 | 2.39 | 2176627 | 8.36 | 16.51 | 3.39 | 0.02 | 2458.04 | 80.38 |
| Guinea | 2018 | 1 | 709.12 | 21 | 81.59 | 2.42 | 3307342 | 6.43 | 15.57 | 3.26 | 0.01 | 3623.96 | 104.88 |
| Guinea | 2018 | 2 | 710.06 | 21.63 | 81.44 | 2.46 | 5107483 | 6.24 | 15.14 | 3.24 | 0.01 | 5481.45 | 111.6 |
| Guinea | 2018 | 3 | 720.94 | 22.12 | 82.56 | 2.48 | 7314691 | 6.51 | 14.74 | 3.22 | 0.01 | 7755.68 | 115.2 |
| Guinea | 2018 | 4 | 741.76 | 22.46 | 84.96 | 2.48 | 9928968 | 7.23 | 14.39 | 3.2 | 0.01 | 10446.66 | 115.68 |
| Guinea | 2019 | 1 | 800.78 | 22.3 | 93.69 | 2.44 | 11590698 | 9.91 | 13.68 | 3.17 | 0.02 | 14266.31 | 105.48 |
| Guinea | 2019 | 2 | 830.15 | 22.5 | 96.61 | 2.45 | 15562957 | 10.95 | 13.56 | 3.15 | 0.02 | 17506.02 | 102.73 |
| Guinea | 2019 | 3 | 858.15 | 22.7 | 98.78 | 2.45 | 20486129 | 11.85 | 13.63 | 3.13 | 0.02 | 20877.7 | 99.87 |

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|---------------|------|---|---------|-------|--------|------|----------|-------|-------|------|------|----------|--------|
| Guinea | 2019 | 4 | 884.76 | 22.9 | 100.2 | 2.46 | 26360215 | 12.61 | 13.9 | 3.11 | 0.02 | 24381.36 | 96.91 |
| Guinea | 2020 | 1 | 906.79 | 23.08 | 99.63 | 2.48 | 39468750 | 13.21 | 15.14 | 2.96 | 0.01 | 29073.26 | 93.31 |
| Guinea | 2020 | 2 | 931.94 | 23.29 | 100.06 | 2.5 | 44731250 | 13.7 | 15.49 | 2.98 | 0.01 | 32418.37 | 90.35 |
| Guinea | 2020 | 3 | 956.99 | 23.5 | 100.23 | 2.51 | 48431250 | 14.07 | 15.71 | 3.06 | 0.01 | 35472.97 | 87.5 |
| Guinea | 2020 | 4 | 981.96 | 23.72 | 100.16 | 2.51 | 50568750 | 14.3 | 15.82 | 3.2 | 0.01 | 38237.04 | 84.75 |
| Guinea | 2021 | 1 | 1017.49 | 24.04 | 97.59 | 2.52 | 38393750 | 13.93 | 15.02 | 3.57 | 0.01 | 39559.75 | 74.89 |
| Guinea | 2021 | 2 | 1038 | 24.23 | 97.92 | 2.53 | 42506250 | 14.1 | 15.2 | 3.73 | 0.01 | 42203.11 | 75.25 |
| Guinea | 2021 | 3 | 1054.16 | 24.4 | 98.89 | 2.53 | 50156250 | 14.33 | 15.57 | 3.86 | 0.01 | 45016.29 | 78.6 |
| Guinea | 2021 | 4 | 1065.95 | 24.53 | 100.52 | 2.54 | 61343750 | 14.63 | 16.13 | 3.97 | 0.01 | 47999.29 | 84.94 |
| Guinea | 2022 | 1 | 1049.1 | 24.33 | 104.99 | 2.53 | 86303125 | 15.41 | 17.67 | 4.04 | 0.01 | 51529.83 | 107.69 |
| Guinea | 2022 | 2 | 1061.9 | 24.52 | 107.03 | 2.54 | 1E+08 | 15.65 | 18.3 | 4.1 | 0.01 | 54701.36 | 114.66 |
| Guinea | 2022 | 3 | 1080.06 | 24.79 | 108.84 | 2.54 | 1.14E+08 | 15.79 | 18.82 | 4.14 | 0.01 | 57891.62 | 119.25 |
| Guinea | 2022 | 4 | 1103.58 | 25.16 | 110.42 | 2.55 | 1.27E+08 | 15.82 | 19.21 | 4.16 | 0.01 | 61100.6 | 121.48 |
| Guinea | 2023 | 1 | 1132.46 | 25.61 | 111.76 | 2.56 | 1.4E+08 | 15.75 | 19.49 | 4.16 | 0.01 | 64328.3 | 121.34 |
| Guinea | 2023 | 2 | 1166.7 | 26.14 | 112.87 | 2.56 | 1.52E+08 | 15.56 | 19.64 | 4.14 | 0.01 | 67574.73 | 118.83 |
| Guinea | 2023 | 3 | 1206.3 | 26.77 | 113.74 | 2.57 | 1.63E+08 | 15.27 | 19.68 | 4.1 | 0.01 | 70839.88 | 113.94 |
| Guinea | 2023 | 4 | 1251.26 | 27.48 | 114.39 | 2.59 | 1.74E+08 | 14.87 | 19.59 | 4.04 | 0.01 | 74123.76 | 106.69 |
| Guinea-Bissau | 2014 | 1 | 146.43 | 3.35 | 26.92 | 0.98 | 262.41 | 26.57 | 34.07 | 5.18 | 0.21 | 183.48 | 48.12 |
| Guinea-Bissau | 2014 | 2 | 148.87 | 3.13 | 27.07 | 1.78 | 284.34 | 26.25 | 33.24 | 5.18 | 0.22 | 185.55 | 45 |
| Guinea-Bissau | 2014 | 3 | 150.86 | 3.21 | 27.32 | 2.48 | 304.97 | 26.19 | 32.7 | 5.19 | 0.22 | 188.5 | 42.57 |
| Guinea-Bissau | 2014 | 4 | 152.41 | 3.59 | 27.68 | 3.07 | 324.28 | 26.4 | 32.47 | 5.21 | 0.23 | 192.35 | 40.84 |
| Guinea-Bissau | 2015 | 1 | 153.51 | 4.29 | 28.15 | 3.56 | 342.28 | 26.87 | 32.55 | 5.23 | 0.24 | 197.07 | 39.79 |
| Guinea-Bissau | 2015 | 2 | 154.16 | 5.29 | 28.73 | 3.95 | 358.97 | 27.62 | 32.92 | 5.26 | 0.24 | 202.69 | 39.44 |
| Guinea-Bissau | 2015 | 3 | 154.37 | 6.6 | 29.42 | 4.23 | 374.34 | 28.63 | 33.6 | 5.29 | 0.24 | 209.19 | 39.78 |
| Guinea-Bissau | 2015 | 4 | 154.12 | 8.22 | 30.21 | 4.41 | 388.41 | 29.91 | 34.58 | 5.34 | 0.24 | 216.57 | 40.82 |
| Guinea-Bissau | 2016 | 1 | 152.63 | 11.96 | 31.79 | 4.31 | 395.84 | 32.76 | 37.31 | 5.42 | 0.24 | 227.99 | 44.19 |
| Guinea-Bissau | 2016 | 2 | 151.82 | 13.47 | 32.53 | 4.35 | 409.41 | 34.06 | 38.32 | 5.46 | 0.24 | 235.89 | 45.95 |
| Guinea-Bissau | 2016 | 3 | 150.87 | 14.55 | 33.11 | 4.36 | 423.78 | 35.11 | 39.04 | 5.5 | 0.24 | 243.42 | 47.75 |
| Guinea-Bissau | 2016 | 4 | 149.8 | 15.22 | 33.53 | 4.34 | 438.97 | 35.91 | 39.49 | 5.54 | 0.24 | 250.58 | 49.59 |

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|---------------|------|---|--------|-------|-------|------|----------|-------|-------|------|------|----------|-------|
| Guinea-Bissau | 2017 | 1 | 145.32 | 14.44 | 33.6 | 4.03 | 449.66 | 36.35 | 39.44 | 5.6 | 0.24 | 255.89 | 52.74 |
| Guinea-Bissau | 2017 | 2 | 145.31 | 14.68 | 33.76 | 4.05 | 468.59 | 36.69 | 39.42 | 5.61 | 0.24 | 262.89 | 54.14 |
| Guinea-Bissau | 2017 | 3 | 146.48 | 14.92 | 33.83 | 4.13 | 490.47 | 36.82 | 39.21 | 5.59 | 0.24 | 270.1 | 55.07 |
| Guinea-Bissau | 2017 | 4 | 148.84 | 15.15 | 33.81 | 4.27 | 515.28 | 36.75 | 38.82 | 5.56 | 0.24 | 277.52 | 55.53 |
| Guinea-Bissau | 2018 | 1 | 154.61 | 15.16 | 31.51 | 4.75 | 171.16 | 36.15 | 37.5 | 5.44 | 0.23 | 244.81 | 53.91 |
| Guinea-Bissau | 2018 | 2 | 158.45 | 15.47 | 32.17 | 4.93 | 350.59 | 35.79 | 37.02 | 5.39 | 0.23 | 268.79 | 54.06 |
| Guinea-Bissau | 2018 | 3 | 162.59 | 15.85 | 33.61 | 5.07 | 681.72 | 35.35 | 36.65 | 5.34 | 0.23 | 309.13 | 54.38 |
| Guinea-Bissau | 2018 | 4 | 167.02 | 16.32 | 35.83 | 5.17 | 1164.53 | 34.83 | 36.39 | 5.3 | 0.23 | 365.82 | 54.86 |
| Guinea-Bissau | 2019 | 1 | 172.95 | 17.01 | 42.09 | 5.15 | 732.94 | 33.94 | 36.41 | 5.28 | 0.24 | 328.03 | 56.63 |
| Guinea-Bissau | 2019 | 2 | 177.49 | 17.59 | 44.55 | 5.21 | 1945.56 | 33.37 | 36.29 | 5.23 | 0.25 | 461.76 | 57.01 |
| Guinea-Bissau | 2019 | 3 | 181.83 | 18.19 | 46.48 | 5.26 | 3736.31 | 32.82 | 36.2 | 5.19 | 0.25 | 656.17 | 57.1 |
| Guinea-Bissau | 2019 | 4 | 185.98 | 18.81 | 47.88 | 5.3 | 6105.19 | 32.31 | 36.14 | 5.14 | 0.26 | 911.28 | 56.9 |
| Guinea-Bissau | 2020 | 1 | 193.94 | 19.48 | 48.46 | 5.21 | 6515.63 | 31.65 | 36.32 | 5.08 | 0.28 | 922.85 | 56.19 |
| Guinea-Bissau | 2020 | 2 | 196.11 | 20.15 | 48.91 | 5.29 | 11055.38 | 31.26 | 36.25 | 5.03 | 0.28 | 1421.01 | 55.53 |
| Guinea-Bissau | 2020 | 3 | 196.5 | 20.83 | 48.95 | 5.41 | 17187.88 | 30.96 | 36.15 | 4.97 | 0.28 | 2101.55 | 54.69 |
| Guinea-Bissau | 2020 | 4 | 195.1 | 21.54 | 48.57 | 5.58 | 24913.13 | 30.76 | 36 | 4.92 | 0.27 | 2964.46 | 53.67 |
| Guinea-Bissau | 2021 | 1 | 186.24 | 22.11 | 45.3 | 6 | 29307.69 | 30.63 | 35.17 | 4.85 | 0.22 | 2989.55 | 52.29 |
| Guinea-Bissau | 2021 | 2 | 183.53 | 22.92 | 45.08 | 6.17 | 42187.81 | 30.63 | 35.19 | 4.81 | 0.21 | 4625.29 | 50.96 |
| Guinea-Bissau | 2021 | 3 | 181.3 | 23.8 | 45.44 | 6.29 | 58630.06 | 30.74 | 35.42 | 4.77 | 0.22 | 6851.48 | 49.52 |
| Guinea-Bissau | 2021 | 4 | 179.55 | 24.77 | 46.38 | 6.38 | 78634.44 | 30.95 | 35.86 | 4.73 | 0.23 | 9668.12 | 47.95 |
| Guinea-Bissau | 2022 | 1 | 175.36 | 25.92 | 48.95 | 6.29 | 104363.3 | 31.9 | 37.76 | 4.74 | 0.28 | 13943.96 | 44.58 |
| Guinea-Bissau | 2022 | 2 | 175.74 | 27.01 | 50.61 | 6.35 | 130627 | 32.07 | 38.11 | 4.7 | 0.3 | 17594 | 43.45 |
| Guinea-Bissau | 2022 | 3 | 177.75 | 28.15 | 52.42 | 6.42 | 159587.8 | 32.09 | 38.18 | 4.65 | 0.31 | 21487 | 42.86 |
| Guinea-Bissau | 2022 | 4 | 181.41 | 29.33 | 54.38 | 6.51 | 191245.9 | 31.97 | 37.95 | 4.59 | 0.31 | 25622.96 | 42.83 |
| Guinea-Bissau | 2023 | 1 | 186.71 | 30.55 | 56.49 | 6.62 | 225601.2 | 31.69 | 37.43 | 4.52 | 0.31 | 30001.86 | 43.35 |
| Guinea-Bissau | 2023 | 2 | 193.66 | 31.82 | 58.74 | 6.74 | 262653.6 | 31.27 | 36.62 | 4.44 | 0.31 | 34623.73 | 44.42 |
| Guinea-Bissau | 2023 | 3 | 202.25 | 33.13 | 61.15 | 6.87 | 302403.2 | 30.7 | 35.51 | 4.35 | 0.3 | 39488.54 | 46.05 |
| Guinea-Bissau | 2023 | 4 | 212.49 | 34.49 | 63.7 | 7.02 | 344850 | 29.98 | 34.12 | 4.25 | 0.28 | 44596.31 | 48.22 |
| Kenya | 2014 | 1 | 315.71 | 16.44 | 55.15 | 9.36 | 1424148 | 8.93 | 17.39 | 3.58 | 1.35 | 20825.4 | 48.44 |

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|-------|------|---|--------|-------|---------|------|---------|-------|-------|------|------|----------|-------|
| Kenya | 2014 | 2 | 319.93 | 16.48 | 600.45 | 9.38 | 1495275 | 9.96 | 18.47 | 3.66 | 1.34 | 22057.87 | 46.91 |
| Kenya | 2014 | 3 | 324.56 | 16.52 | 650.46 | 9.4 | 1573034 | 10.83 | 19.31 | 3.72 | 1.32 | 23316.5 | 45.4 |
| Kenya | 2014 | 4 | 329.59 | 16.55 | 701.18 | 9.42 | 1657427 | 11.53 | 19.92 | 3.77 | 1.3 | 24601.31 | 43.92 |
| Kenya | 2015 | 1 | 335.03 | 16.58 | 752.61 | 9.44 | 1748452 | 12.06 | 20.29 | 3.8 | 1.28 | 25912.28 | 42.46 |
| Kenya | 2015 | 2 | 340.88 | 16.6 | 804.76 | 9.47 | 1846109 | 12.43 | 20.42 | 3.82 | 1.26 | 27249.41 | 41.02 |
| Kenya | 2015 | 3 | 347.13 | 16.61 | 857.62 | 9.5 | 1950400 | 12.63 | 20.32 | 3.83 | 1.24 | 28612.72 | 39.61 |
| Kenya | 2015 | 4 | 353.79 | 16.62 | 911.2 | 9.54 | 2061323 | 12.67 | 19.98 | 3.82 | 1.21 | 30002.19 | 38.22 |
| Kenya | 2016 | 1 | 366.03 | 16.41 | 968.91 | 9.6 | 2199510 | 11.81 | 18.2 | 3.87 | 1.18 | 31409.54 | 35.89 |
| Kenya | 2016 | 2 | 371.44 | 16.49 | 1022.54 | 9.63 | 2315446 | 11.8 | 17.87 | 3.81 | 1.15 | 32854.66 | 34.93 |
| Kenya | 2016 | 3 | 375.18 | 16.64 | 1075.52 | 9.66 | 2429762 | 11.93 | 17.78 | 3.71 | 1.13 | 34329.26 | 34.39 |
| Kenya | 2016 | 4 | 377.27 | 16.86 | 1127.83 | 9.67 | 2542458 | 12.18 | 17.94 | 3.58 | 1.1 | 35833.34 | 34.26 |
| Kenya | 2017 | 1 | 371.24 | 17.27 | 1183.6 | 9.76 | 2634614 | 13.15 | 19.39 | 3.22 | 1.07 | 36382.53 | 36 |
| Kenya | 2017 | 2 | 372.58 | 17.6 | 1232.96 | 9.74 | 2751638 | 13.42 | 19.61 | 3.08 | 1.04 | 38339.31 | 36.11 |
| Kenya | 2017 | 3 | 374.83 | 17.97 | 1280.01 | 9.68 | 2874611 | 13.59 | 19.65 | 2.98 | 1.02 | 40719.32 | 36.06 |
| Kenya | 2017 | 4 | 378 | 18.36 | 1324.75 | 9.58 | 3003532 | 13.64 | 19.51 | 2.92 | 1 | 43522.56 | 35.83 |
| Kenya | 2018 | 1 | 382.49 | 18.63 | 1363 | 9.23 | 3193364 | 12.72 | 18.82 | 2.98 | 0.99 | 50000.75 | 35.17 |
| Kenya | 2018 | 2 | 387.34 | 19.15 | 1404.81 | 9.15 | 3312197 | 12.91 | 18.46 | 2.96 | 0.97 | 52349.75 | 34.71 |
| Kenya | 2018 | 3 | 392.94 | 19.76 | 1446 | 9.12 | 3414994 | 13.33 | 18.07 | 2.95 | 0.95 | 53821.28 | 34.18 |
| Kenya | 2018 | 4 | 399.31 | 20.47 | 1486.56 | 9.14 | 3501754 | 14 | 17.65 | 2.95 | 0.93 | 54415.34 | 33.58 |
| Kenya | 2019 | 1 | 406.14 | 21.34 | 1518.47 | 9.41 | 3522544 | 15.97 | 16.66 | 2.95 | 0.92 | 51027.18 | 33.05 |
| Kenya | 2019 | 2 | 414.13 | 22.21 | 1560.99 | 9.45 | 3597206 | 16.69 | 16.38 | 2.96 | 0.9 | 51108.21 | 32.27 |
| Kenya | 2019 | 3 | 422.99 | 23.13 | 1606.09 | 9.45 | 3675805 | 17.23 | 16.29 | 2.99 | 0.88 | 51553.67 | 31.37 |
| Kenya | 2019 | 4 | 432.73 | 24.12 | 1653.78 | 9.41 | 3758341 | 17.59 | 16.39 | 3.02 | 0.86 | 52363.57 | 30.36 |
| Kenya | 2020 | 1 | 447.3 | 25.54 | 1717.89 | 9.44 | 3852238 | 17.8 | 17.34 | 3.14 | 0.81 | 54977.09 | 27.67 |
| Kenya | 2020 | 2 | 457.21 | 26.51 | 1765.22 | 9.3 | 3939680 | 17.78 | 17.53 | 3.17 | 0.81 | 55940.17 | 27.05 |
| Kenya | 2020 | 3 | 466.4 | 27.38 | 1809.59 | 9.08 | 4028091 | 17.57 | 17.62 | 3.19 | 0.82 | 56692.01 | 26.93 |
| Kenya | 2020 | 4 | 474.88 | 28.17 | 1851.02 | 8.79 | 4117471 | 17.17 | 17.63 | 3.18 | 0.84 | 57232.61 | 27.32 |
| Kenya | 2021 | 1 | 487.04 | 28.71 | 1878.12 | 8.07 | 4131115 | 15.92 | 17.16 | 3.13 | 0.92 | 57411.66 | 29.59 |
| Kenya | 2021 | 2 | 492.34 | 29.39 | 1918.2 | 7.77 | 4253112 | 15.38 | 17.14 | 3.1 | 0.96 | 57589.89 | 30.44 |

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|---------|------|---|--------|-------|---------|-------|---------|-------|-------|------|------|----------|--------|
| Kenya | 2021 | 3 | 495.17 | 30.04 | 1959.87 | 7.54 | 4406760 | 14.91 | 17.19 | 3.07 | 1 | 57616.99 | 31.25 |
| Kenya | 2021 | 4 | 495.53 | 30.66 | 2003.14 | 7.38 | 4592057 | 14.51 | 17.31 | 3.02 | 1.04 | 57492.97 | 32.01 |
| Kenya | 2022 | 1 | 480.7 | 31.12 | 2107.3 | 7.44 | 4765092 | 14.13 | 17.76 | 2.89 | 1.08 | 55561.61 | 33.31 |
| Kenya | 2022 | 2 | 481.2 | 31.75 | 2130.05 | 7.35 | 5031254 | 13.87 | 17.9 | 2.86 | 1.12 | 55797.82 | 33.75 |
| Kenya | 2022 | 3 | 484.31 | 32.42 | 2130.67 | 7.25 | 5346630 | 13.7 | 17.99 | 2.87 | 1.16 | 56545.4 | 33.91 |
| Kenya | 2022 | 4 | 490.04 | 33.11 | 2109.18 | 7.16 | 5711220 | 13.62 | 18.03 | 2.9 | 1.2 | 57804.33 | 33.79 |
| Kenya | 2023 | 1 | 498.38 | 33.83 | 2065.56 | 7.07 | 6125026 | 13.62 | 18.03 | 2.96 | 1.24 | 59574.62 | 33.39 |
| Kenya | 2023 | 2 | 509.33 | 34.59 | 1999.82 | 6.98 | 6588046 | 13.7 | 17.99 | 3.04 | 1.29 | 61856.27 | 32.71 |
| Kenya | 2023 | 3 | 522.89 | 35.38 | 1911.96 | 6.9 | 7100280 | 13.87 | 17.9 | 3.15 | 1.33 | 64649.29 | 31.75 |
| Kenya | 2023 | 4 | 539.07 | 36.2 | 1801.98 | 6.81 | 7661729 | 14.13 | 17.76 | 3.29 | 1.38 | 67953.66 | 30.51 |
| Lesotho | 2014 | 1 | 312.33 | 21.86 | 302.75 | 8.09 | 169.18 | 17.42 | 29.02 | 3.17 | 0.15 | 1328.28 | 158.66 |
| Lesotho | 2014 | 2 | 304.17 | 21.77 | 316.15 | 8.75 | 74.53 | 18.13 | 30.76 | 3.29 | 0.17 | 567.58 | 152.62 |
| Lesotho | 2014 | 3 | 297.38 | 21.95 | 327.91 | 9.33 | 11.42 | 18.72 | 32.12 | 3.39 | 0.18 | 60.45 | 147.19 |
| Lesotho | 2014 | 4 | 291.97 | 22.42 | 338.02 | 9.83 | 20.13 | 19.18 | 33.1 | 3.47 | 0.19 | 93.12 | 142.37 |
| Lesotho | 2015 | 1 | 287.94 | 23.17 | 346.49 | 10.26 | 20.13 | 19.52 | 33.72 | 3.54 | 0.19 | 93.12 | 138.16 |
| Lesotho | 2015 | 2 | 285.29 | 24.2 | 353.32 | 10.6 | 11.42 | 19.74 | 33.96 | 3.59 | 0.2 | 60.45 | 134.56 |
| Lesotho | 2015 | 3 | 284.01 | 25.52 | 358.5 | 10.87 | 74.53 | 19.83 | 33.83 | 3.61 | 0.2 | 567.58 | 131.57 |
| Lesotho | 2015 | 4 | 284.12 | 27.11 | 362.04 | 11.07 | 169.18 | 19.8 | 33.33 | 3.62 | 0.2 | 1328.28 | 129.19 |
| Lesotho | 2016 | 1 | 291.97 | 29.84 | 352.85 | 10.78 | 237.08 | 19.4 | 30.98 | 3.53 | 0.2 | 2403.24 | 127.3 |
| Lesotho | 2016 | 2 | 292.28 | 31.66 | 357.54 | 10.98 | 418.16 | 19.22 | 30.32 | 3.54 | 0.2 | 3646.8 | 126.19 |
| Lesotho | 2016 | 3 | 291.42 | 33.41 | 365.03 | 11.26 | 654.12 | 19.01 | 29.88 | 3.55 | 0.2 | 5119.65 | 125.73 |
| Lesotho | 2016 | 4 | 289.39 | 35.09 | 375.3 | 11.63 | 944.96 | 18.77 | 29.65 | 3.58 | 0.2 | 6821.8 | 125.93 |
| Lesotho | 2017 | 1 | 286.25 | 37.3 | 401.81 | 12.31 | 1289.95 | 18.31 | 30.58 | 3.67 | 0.2 | 9095.87 | 127.94 |
| Lesotho | 2017 | 2 | 281.86 | 38.63 | 412.29 | 12.76 | 1690.83 | 18.09 | 30.41 | 3.7 | 0.2 | 11119.54 | 128.99 |
| Lesotho | 2017 | 3 | 276.27 | 39.67 | 420.19 | 13.21 | 2146.88 | 17.93 | 30.09 | 3.74 | 0.2 | 13235.46 | 130.25 |
| Lesotho | 2017 | 4 | 269.49 | 40.41 | 425.51 | 13.65 | 2658.1 | 17.82 | 29.6 | 3.77 | 0.2 | 15443.61 | 131.7 |
| Lesotho | 2018 | 1 | 250.56 | 40.17 | 420.91 | 14.38 | 3446.23 | 17.57 | 26.89 | 3.81 | 0.2 | 18263.73 | 133.31 |
| Lesotho | 2018 | 2 | 245.77 | 40.6 | 423.99 | 14.69 | 3979.09 | 17.64 | 26.91 | 3.83 | 0.21 | 20448.47 | 135.17 |
| Lesotho | 2018 | 3 | 244.17 | 41.02 | 427.42 | 14.88 | 4478.42 | 17.85 | 27.6 | 3.84 | 0.21 | 22517.56 | 137.25 |

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|---------|------|---|--------|-------|--------|-------|----------|-------|-------|------|------|----------|--------|
| Lesotho | 2018 | 4 | 245.76 | 41.41 | 431.2 | 14.94 | 4944.23 | 18.18 | 28.95 | 3.84 | 0.22 | 24471 | 139.55 |
| Lesotho | 2019 | 1 | 257.58 | 41.75 | 433.74 | 14.55 | 5229.44 | 19.18 | 33.69 | 3.8 | 0.25 | 25533.56 | 144.47 |
| Lesotho | 2019 | 2 | 262.73 | 42.12 | 438.86 | 14.5 | 5687.01 | 19.56 | 35.28 | 3.79 | 0.25 | 27565.77 | 146.24 |
| Lesotho | 2019 | 3 | 268.25 | 42.48 | 444.97 | 14.45 | 6169.89 | 19.86 | 36.46 | 3.77 | 0.25 | 29792.43 | 147.25 |
| Lesotho | 2019 | 4 | 274.15 | 42.84 | 452.07 | 14.42 | 6678.06 | 20.07 | 37.21 | 3.76 | 0.25 | 32213.52 | 147.52 |
| Lesotho | 2020 | 1 | 287.94 | 43.18 | 470.19 | 14.46 | 7204.62 | 20.02 | 37.62 | 3.75 | 0.21 | 36741.1 | 145.47 |
| Lesotho | 2020 | 2 | 291.57 | 43.53 | 475.25 | 14.42 | 7766.16 | 20.14 | 37.5 | 3.74 | 0.2 | 38786.25 | 144.86 |
| Lesotho | 2020 | 3 | 292.56 | 43.88 | 477.28 | 14.36 | 8355.77 | 20.24 | 36.92 | 3.74 | 0.2 | 40261 | 144.13 |
| Lesotho | 2020 | 4 | 290.92 | 44.23 | 476.29 | 14.28 | 8973.45 | 20.32 | 35.88 | 3.74 | 0.19 | 41165.37 | 143.27 |
| Lesotho | 2021 | 1 | 283.42 | 44.58 | 457.69 | 14.1 | 9666.41 | 20.56 | 31.79 | 3.75 | 0.2 | 39868.67 | 141.28 |
| Lesotho | 2021 | 2 | 277.79 | 44.93 | 456.49 | 14.02 | 10321.34 | 20.55 | 30.88 | 3.76 | 0.2 | 40284.54 | 140.59 |
| Lesotho | 2021 | 3 | 270.81 | 45.28 | 458.09 | 13.96 | 10985.47 | 20.47 | 30.56 | 3.76 | 0.2 | 40782.29 | 140.17 |
| Lesotho | 2021 | 4 | 262.47 | 45.63 | 462.5 | 13.92 | 11658.78 | 20.31 | 30.82 | 3.77 | 0.21 | 41361.94 | 140.04 |
| Lesotho | 2022 | 1 | 239.41 | 45.96 | 479.31 | 13.95 | 12762.84 | 19.48 | 33.36 | 3.78 | 0.22 | 41640.31 | 141.27 |
| Lesotho | 2022 | 2 | 233.72 | 46.32 | 485.5 | 13.93 | 13285.91 | 19.4 | 34.11 | 3.78 | 0.23 | 42536.99 | 141.26 |
| Lesotho | 2022 | 3 | 232.03 | 46.68 | 490.65 | 13.91 | 13649.53 | 19.48 | 34.76 | 3.79 | 0.23 | 43668.82 | 141.09 |
| Lesotho | 2022 | 4 | 234.33 | 47.05 | 494.78 | 13.89 | 13853.72 | 19.71 | 35.32 | 3.81 | 0.24 | 45035.8 | 140.77 |
| Lesotho | 2023 | 1 | 240.63 | 47.42 | 497.88 | 13.88 | 13898.47 | 20.11 | 35.78 | 3.82 | 0.24 | 46637.93 | 140.3 |
| Lesotho | 2023 | 2 | 250.93 | 47.8 | 499.95 | 13.87 | 13783.78 | 20.66 | 36.14 | 3.83 | 0.24 | 48475.21 | 139.66 |
| Lesotho | 2023 | 3 | 265.23 | 48.19 | 501 | 13.85 | 13509.66 | 21.36 | 36.41 | 3.85 | 0.24 | 50547.64 | 138.87 |
| Lesotho | 2023 | 4 | 283.52 | 48.58 | 501.01 | 13.84 | 13076.09 | 22.23 | 36.58 | 3.86 | 0.24 | 52855.22 | 137.93 |
| Liberia | 2014 | 1 | 150.04 | 3.93 | 157.71 | 1.21 | 10.14 | 9.17 | 15.45 | 1.62 | | 252.01 | 86.88 |
| Liberia | 2014 | 2 | 158.23 | 4.87 | 187 | 1.31 | 12.23 | 9.35 | 15.18 | 1.61 | | 415.88 | 96.02 |
| Liberia | 2014 | 3 | 165.21 | 5.88 | 212.58 | 1.4 | 14.05 | 9.53 | 14.94 | 1.6 | | 552.24 | 102.79 |
| Liberia | 2014 | 4 | 170.99 | 6.96 | 234.46 | 1.48 | 15.58 | 9.72 | 14.75 | 1.61 | | 661.07 | 107.19 |
| Liberia | 2015 | 1 | 175.56 | 8.11 | 252.64 | 1.55 | 16.83 | 9.9 | 14.6 | 1.63 | | 742.38 | 109.21 |
| Liberia | 2015 | 2 | 178.93 | 9.32 | 267.12 | 1.62 | 17.8 | 10.09 | 14.49 | 1.66 | | 796.17 | 108.87 |
| Liberia | 2015 | 3 | 181.09 | 10.61 | 277.89 | 1.67 | 18.48 | 10.29 | 14.43 | 1.69 | | 822.43 | 106.16 |
| Liberia | 2015 | 4 | 182.05 | 11.96 | 284.96 | 1.72 | 18.89 | 10.48 | 14.4 | 1.74 | | 821.18 | 101.08 |

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|---------|------|---|--------|-------|--------|------|--------|-------|-------|------|--|----------|-------|
| Liberia | 2016 | 1 | 179.2 | 14.36 | 276 | 1.72 | 18.29 | 10.73 | 14.44 | 1.83 | | 672.66 | 86.11 |
| Liberia | 2016 | 2 | 178.79 | 15.47 | 280.59 | 1.76 | 18.41 | 10.91 | 14.49 | 1.88 | | 664.26 | 79.29 |
| Liberia | 2016 | 3 | 178.23 | 16.25 | 286.41 | 1.81 | 18.54 | 11.07 | 14.59 | 1.93 | | 676.24 | 73.11 |
| Liberia | 2016 | 4 | 177.51 | 16.72 | 293.45 | 1.86 | 18.68 | 11.21 | 14.72 | 1.97 | | 708.59 | 67.57 |
| Liberia | 2017 | 1 | 174.81 | 16.01 | 303.77 | 1.97 | 18.77 | 11.43 | 14.97 | 2 | | 824.58 | 63.66 |
| Liberia | 2017 | 2 | 174.5 | 16.19 | 312.44 | 2.01 | 18.94 | 11.49 | 15.14 | 2.04 | | 872.38 | 58.99 |
| Liberia | 2017 | 3 | 174.76 | 16.39 | 321.51 | 2.03 | 19.13 | 11.5 | 15.32 | 2.08 | | 915.26 | 54.57 |
| Liberia | 2017 | 4 | 175.59 | 16.61 | 330.99 | 2.03 | 19.36 | 11.46 | 15.49 | 2.12 | | 953.21 | 50.38 |
| Liberia | 2018 | 1 | 179.9 | 16.93 | 347.72 | 1.84 | 19.76 | 10.9 | 15.49 | 2.15 | | 909.65 | 43.56 |
| Liberia | 2018 | 2 | 180.71 | 17.18 | 355.25 | 1.88 | 19.97 | 10.93 | 15.74 | 2.18 | | 968.38 | 41 |
| Liberia | 2018 | 3 | 180.94 | 17.43 | 360.45 | 1.97 | 20.15 | 11.07 | 16.07 | 2.22 | | 1052.83 | 39.83 |
| Liberia | 2018 | 4 | 180.58 | 17.68 | 363.3 | 2.11 | 20.28 | 11.34 | 16.47 | 2.25 | | 1162.98 | 40.05 |
| Liberia | 2019 | 1 | 177.82 | 17.91 | 361.33 | 2.46 | 16.94 | 12.27 | 17.52 | 2.28 | | 1122.56 | 43.61 |
| Liberia | 2019 | 2 | 177 | 18.17 | 360.5 | 2.64 | 18.39 | 12.57 | 17.84 | 2.31 | | 1354.65 | 45.83 |
| Liberia | 2019 | 3 | 176.31 | 18.43 | 358.31 | 2.82 | 21.17 | 12.78 | 18 | 2.33 | | 1682.95 | 48.66 |
| Liberia | 2019 | 4 | 175.75 | 18.7 | 354.78 | 2.99 | 25.3 | 12.9 | 18.01 | 2.35 | | 2107.48 | 52.11 |
| Liberia | 2020 | 1 | 176.72 | 18.97 | 355.91 | 3.19 | 31.35 | 12.56 | 17.35 | 2.35 | | 1537.14 | 57.85 |
| Liberia | 2020 | 2 | 175.86 | 19.25 | 347.28 | 3.33 | 37.93 | 12.64 | 17.25 | 2.37 | | 2590.56 | 61.85 |
| Liberia | 2020 | 3 | 174.58 | 19.54 | 334.88 | 3.45 | 45.62 | 12.77 | 17.19 | 2.39 | | 4176.63 | 65.78 |
| Liberia | 2020 | 4 | 172.87 | 19.83 | 318.73 | 3.54 | 54.43 | 12.95 | 17.17 | 2.41 | | 6295.35 | 69.64 |
| Liberia | 2021 | 1 | 171.01 | 20.13 | 265.83 | 3.6 | 8.79 | 13.14 | 16.97 | 2.43 | | 7924.01 | 80.04 |
| Liberia | 2021 | 2 | 168.34 | 20.44 | 255.37 | 3.65 | 42.04 | 13.44 | 17.14 | 2.45 | | 11517.15 | 81.14 |
| Liberia | 2021 | 3 | 165.14 | 20.75 | 254.34 | 3.69 | 98.63 | 13.8 | 17.46 | 2.47 | | 16052.04 | 79.54 |
| Liberia | 2021 | 4 | 161.4 | 21.07 | 262.74 | 3.7 | 178.54 | 14.22 | 17.92 | 2.48 | | 21528.68 | 75.24 |
| Liberia | 2022 | 1 | 150.07 | 21.37 | 338.17 | 3.63 | 416.22 | 14.89 | 19.21 | 2.44 | | 26891.92 | 39.4 |
| Liberia | 2022 | 2 | 148.09 | 21.71 | 342.43 | 3.64 | 489.03 | 15.37 | 19.68 | 2.47 | | 34674.13 | 41.23 |
| Liberia | 2022 | 3 | 148.39 | 22.07 | 333.09 | 3.65 | 531.41 | 15.84 | 20.01 | 2.53 | | 43820.16 | 51.89 |

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|------------|------|---|--------|-------|--------|------|----------|-------|-------|------|------|----------|--------|
| Liberia | 2022 | 4 | 150.99 | 22.45 | 310.16 | 3.68 | 543.34 | 16.31 | 20.22 | 2.61 | | 54330 | 71.39 |
| Liberia | 2023 | 1 | 155.87 | 22.85 | 273.64 | 3.72 | 524.84 | 16.77 | 20.28 | 2.71 | | 66203.65 | 99.71 |
| Liberia | 2023 | 2 | 163.04 | 23.27 | 223.52 | 3.77 | 475.91 | 17.22 | 20.22 | 2.84 | | 79441.12 | 136.87 |
| Liberia | 2023 | 3 | 172.5 | 23.71 | 159.81 | 3.82 | 396.53 | 17.67 | 20.02 | 2.98 | | 94042.41 | 182.86 |
| Liberia | 2023 | 4 | 184.25 | 24.17 | 82.51 | 3.89 | 286.72 | 18.11 | 19.68 | 3.15 | | 110007.5 | 237.68 |
| Madagascar | 2014 | 1 | 122.18 | 3.54 | 56.49 | 1.71 | 276322.1 | 16.76 | 18.56 | 4.82 | 0.12 | 603.85 | 51.67 |
| Madagascar | 2014 | 2 | 125.09 | 3.64 | 58.8 | 1.7 | 160310.7 | 17.11 | 18.75 | 4.81 | 0.14 | 502.92 | 52.24 |
| Madagascar | 2014 | 3 | 127.5 | 3.75 | 61.09 | 1.71 | 97676.28 | 17.48 | 18.96 | 4.83 | 0.15 | 446.54 | 52.94 |
| Madagascar | 2014 | 4 | 129.41 | 3.87 | 63.38 | 1.72 | 88418.97 | 17.85 | 19.2 | 4.86 | 0.15 | 434.7 | 53.75 |
| Madagascar | 2015 | 1 | 130.81 | 3.98 | 65.66 | 1.74 | 132538.7 | 18.23 | 19.47 | 4.92 | 0.16 | 467.41 | 54.68 |
| Madagascar | 2015 | 2 | 131.72 | 4.1 | 67.92 | 1.77 | 230035.5 | 18.63 | 19.77 | 5 | 0.16 | 544.67 | 55.73 |
| Madagascar | 2015 | 3 | 132.13 | 4.23 | 70.18 | 1.82 | 380909.4 | 19.03 | 20.1 | 5.1 | 0.16 | 666.48 | 56.89 |
| Madagascar | 2015 | 4 | 132.03 | 4.36 | 72.44 | 1.87 | 585160.3 | 19.43 | 20.45 | 5.22 | 0.16 | 832.83 | 58.18 |
| Madagascar | 2016 | 1 | 132.21 | 4.33 | 73.52 | 1.96 | 1007632 | 19.81 | 20.83 | 5.45 | 0.15 | 1199.43 | 60.86 |
| Madagascar | 2016 | 2 | 130.8 | 4.53 | 76.22 | 2.02 | 1252699 | 20.26 | 21.24 | 5.58 | 0.14 | 1392.6 | 61.87 |
| Madagascar | 2016 | 3 | 128.58 | 4.81 | 79.37 | 2.08 | 1485207 | 20.72 | 21.69 | 5.71 | 0.14 | 1568.04 | 62.47 |
| Madagascar | 2016 | 4 | 125.55 | 5.16 | 82.97 | 2.14 | 1705154 | 21.21 | 22.17 | 5.82 | 0.13 | 1725.75 | 62.68 |
| Madagascar | 2017 | 1 | 116.92 | 5.82 | 90.23 | 2.19 | 1602632 | 21.5 | 23.26 | 5.97 | 0.13 | 1639.18 | 61.45 |
| Madagascar | 2017 | 2 | 114.18 | 6.22 | 93.47 | 2.25 | 1921423 | 22.13 | 23.56 | 6.05 | 0.13 | 1852.05 | 61.28 |
| Madagascar | 2017 | 3 | 112.54 | 6.6 | 95.88 | 2.31 | 2351616 | 22.86 | 23.68 | 6.1 | 0.13 | 2137.8 | 61.14 |
| Madagascar | 2017 | 4 | 112 | 6.96 | 97.46 | 2.37 | 2893213 | 23.71 | 23.59 | 6.13 | 0.13 | 2496.44 | 61.02 |
| Madagascar | 2018 | 1 | 114.15 | 7.2 | 94.92 | 2.45 | 3838069 | 25.61 | 22.7 | 6.22 | 0.12 | 3055.94 | 60.21 |
| Madagascar | 2018 | 2 | 115.17 | 7.56 | 96.18 | 2.52 | 4485730 | 26.3 | 22.45 | 6.17 | 0.12 | 3509.17 | 60.42 |
| Madagascar | 2018 | 3 | 116.67 | 7.93 | 97.94 | 2.58 | 5128053 | 26.71 | 22.23 | 6.05 | 0.12 | 3984.09 | 60.93 |
| Madagascar | 2018 | 4 | 118.63 | 8.32 | 100.2 | 2.65 | 5765037 | 26.86 | 22.05 | 5.88 | 0.12 | 4480.71 | 61.76 |
| Madagascar | 2019 | 1 | 123.4 | 8.71 | 104.36 | 2.72 | 7730398 | 26.05 | 21.63 | 5.38 | 0.12 | 6251.73 | 63.96 |
| Madagascar | 2019 | 2 | 125.36 | 9.14 | 107.05 | 2.78 | 7823218 | 25.94 | 21.63 | 5.2 | 0.12 | 6290.67 | 64.96 |
| Madagascar | 2019 | 3 | 126.86 | 9.6 | 109.66 | 2.83 | 7377212 | 25.83 | 21.78 | 5.07 | 0.12 | 5850.22 | 65.84 |
| Madagascar | 2019 | 4 | 127.89 | 10.08 | 112.21 | 2.87 | 6392380 | 25.74 | 22.08 | 4.99 | 0.12 | 4930.38 | 66.59 |

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|------------|------|---|--------|-------|--------|------|----------|-------|-------|------|------|----------|-------|
| Madagascar | 2020 | 1 | 127.65 | 10.6 | 114.7 | 2.89 | 549974.9 | 25.78 | 23.21 | 5.07 | 0.11 | 1366.22 | 68.11 |
| Madagascar | 2020 | 2 | 128.07 | 11.12 | 117.11 | 2.92 | 444978.6 | 25.64 | 23.53 | 5.04 | 0.11 | 1285.87 | 68.25 |
| Madagascar | 2020 | 3 | 128.34 | 11.66 | 119.45 | 2.96 | 1288671 | 25.46 | 23.72 | 5.02 | 0.11 | 274.06 | 67.91 |
| Madagascar | 2020 | 4 | 128.47 | 12.22 | 121.72 | 2.99 | 4650974 | 25.24 | 23.78 | 4.99 | 0.11 | 3313.55 | 67.08 |
| Madagascar | 2021 | 1 | 130.03 | 12.43 | 124.43 | 3.02 | 16317288 | 24.41 | 22.75 | 5.02 | 0.11 | 13917.98 | 65.87 |
| Madagascar | 2021 | 2 | 129.24 | 13.17 | 126.35 | 3.05 | 20266755 | 24.32 | 22.93 | 4.99 | 0.11 | 17482.47 | 64.04 |
| Madagascar | 2021 | 3 | 127.67 | 14.07 | 128 | 3.07 | 23174734 | 24.39 | 23.37 | 4.94 | 0.11 | 20092.38 | 61.68 |
| Madagascar | 2021 | 4 | 125.33 | 15.13 | 129.38 | 3.09 | 25041223 | 24.64 | 24.06 | 4.89 | 0.11 | 21747.72 | 58.81 |
| Madagascar | 2022 | 1 | 116.73 | 17.25 | 122.39 | 3.11 | 22434375 | 25.39 | 25.68 | 4.71 | 0.12 | 19226.02 | 51.01 |
| Madagascar | 2022 | 2 | 115.03 | 18.28 | 126.45 | 3.13 | 23590625 | 25.86 | 26.61 | 4.66 | 0.12 | 20261.2 | 48.85 |
| Madagascar | 2022 | 3 | 114.75 | 19.12 | 133.48 | 3.14 | 25078125 | 26.36 | 27.52 | 4.65 | 0.12 | 21630.78 | 47.93 |
| Madagascar | 2022 | 4 | 115.89 | 19.76 | 143.48 | 3.15 | 26896875 | 26.91 | 28.42 | 4.66 | 0.12 | 23334.76 | 48.25 |
| Madagascar | 2023 | 1 | 121.27 | 22.28 | 162.56 | 2.95 | 36390445 | 28.88 | 29.02 | 4.97 | 0.09 | 32047.08 | 53.99 |
| Madagascar | 2023 | 2 | 124.12 | 21.71 | 176.04 | 3.04 | 35934267 | 28.96 | 30 | 4.94 | 0.1 | 31750.32 | 55.1 |
| Madagascar | 2023 | 3 | 127.26 | 20.11 | 190.03 | 3.2 | 32871911 | 28.52 | 31.07 | 4.84 | 0.13 | 29118.4 | 55.78 |
| Madagascar | 2023 | 4 | 130.7 | 17.49 | 204.53 | 3.44 | 27203377 | 27.56 | 32.23 | 4.66 | 0.17 | 24151.32 | 56.01 |
| Malawi | 2014 | 1 | 139.92 | 8.99 | 227.9 | 4.11 | 7240367 | 23.31 | 34.2 | 4.07 | 0.29 | 6238.01 | 55.02 |
| Malawi | 2014 | 2 | 141.75 | 6.27 | 240.1 | 4.37 | 1034797 | 22.44 | 35.27 | 3.88 | 0.33 | 845.03 | 54.68 |
| Malawi | 2014 | 3 | 141.68 | 4.47 | 249.47 | 4.57 | 3101633 | 22.18 | 36.16 | 3.76 | 0.36 | 2638.68 | 54.22 |
| Malawi | 2014 | 4 | 139.71 | 3.59 | 256.01 | 4.71 | 5168922 | 22.51 | 36.85 | 3.7 | 0.38 | 4213.12 | 53.63 |
| Malawi | 2015 | 1 | 127.4 | 5.92 | 248.16 | 4.66 | 811.43 | 24.91 | 36.46 | 3.83 | 0.35 | 857.72 | 53.83 |
| Malawi | 2015 | 2 | 125.01 | 5.97 | 253.69 | 4.74 | 4652.71 | 25.86 | 37.14 | 3.85 | 0.36 | 1207.41 | 52.62 |
| Malawi | 2015 | 3 | 124.11 | 6.03 | 261.02 | 4.82 | 10482.8 | 26.82 | 37.99 | 3.88 | 0.36 | 1571.97 | 50.93 |
| Malawi | 2015 | 4 | 124.68 | 6.09 | 270.16 | 4.89 | 18301.7 | 27.8 | 39.01 | 3.93 | 0.37 | 1951.39 | 48.74 |
| Malawi | 2016 | 1 | 131.34 | 6.13 | 289.17 | 4.97 | 29885 | 29.15 | 40.6 | 4.04 | 0.34 | 2154.39 | 41.95 |
| Malawi | 2016 | 2 | 133.04 | 6.23 | 298.69 | 5.03 | 40971.29 | 30.02 | 41.8 | 4.1 | 0.35 | 2640.05 | 40.42 |
| Malawi | 2016 | 3 | 134.38 | 6.35 | 306.79 | 5.08 | 53336.14 | 30.77 | 43 | 4.15 | 0.38 | 3217.09 | 40.05 |
| Malawi | 2016 | 4 | 135.37 | 6.5 | 313.46 | 5.13 | 66979.57 | 31.39 | 44.21 | 4.2 | 0.42 | 3885.51 | 40.82 |
| Malawi | 2017 | 1 | 139.02 | 6.57 | 347.79 | 5.22 | 63748.47 | 32.04 | 46.76 | 4.24 | 0.55 | 4855.04 | 47.54 |

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|--------|------|---|--------|-------|--------|------|----------|-------|-------|-------|------|----------|-------|
| Malawi | 2017 | 2 | 138.1 | 6.81 | 339.99 | 5.23 | 87210.28 | 32.34 | 47.45 | 4.28 | 0.58 | 5622.32 | 48.7 |
| Malawi | 2017 | 3 | 135.61 | 7.12 | 319.14 | 5.22 | 119211.9 | 32.46 | 47.61 | 4.31 | 0.6 | 6397.09 | 49.09 |
| Malawi | 2017 | 4 | 131.55 | 7.5 | 285.23 | 5.18 | 159753.3 | 32.39 | 47.25 | 4.33 | 0.59 | 7179.35 | 48.72 |
| Malawi | 2018 | 1 | 116.74 | 8.05 | 173.87 | 5 | 226872.4 | 32.6 | 44.84 | 4.35 | 0.51 | 7875.79 | 45.06 |
| Malawi | 2018 | 2 | 113.24 | 8.53 | 139.62 | 4.96 | 277278.3 | 31.97 | 44.02 | 4.36 | 0.49 | 8710.34 | 44.17 |
| Malawi | 2018 | 3 | 111.86 | 9.04 | 118.07 | 4.93 | 329009 | 30.96 | 43.28 | 4.36 | 0.48 | 9589.69 | 43.51 |
| Malawi | 2018 | 4 | 112.6 | 9.58 | 109.23 | 4.91 | 382064.3 | 29.59 | 42.62 | 4.36 | 0.48 | 10513.86 | 43.1 |
| Malawi | 2019 | 1 | 121.07 | 10.16 | 146.16 | 4.98 | 406317.1 | 26.15 | 41.67 | 4.32 | 0.5 | 11397.74 | 42.9 |
| Malawi | 2019 | 2 | 123.8 | 10.77 | 149.5 | 4.98 | 474072.7 | 24.7 | 41.3 | 4.31 | 0.5 | 12445.55 | 42.99 |
| Malawi | 2019 | 3 | 126.41 | 11.4 | 152.33 | 4.97 | 555203.8 | 23.54 | 41.16 | 4.29 | 0.51 | 13572.21 | 43.34 |
| Malawi | 2019 | 4 | 128.89 | 12.07 | 154.64 | 4.95 | 649710.5 | 22.69 | 41.23 | 4.28 | 0.52 | 14777.7 | 43.94 |
| Malawi | 2020 | 1 | 130.6 | 12.73 | 154.8 | 4.9 | 745938.5 | 22.7 | 41.99 | 4.28 | 0.54 | 15807.16 | 45.99 |
| Malawi | 2020 | 2 | 133.1 | 13.48 | 156.73 | 4.87 | 871858 | 22.23 | 42.32 | 4.26 | 0.55 | 17272.28 | 46.64 |
| Malawi | 2020 | 3 | 135.73 | 14.28 | 158.79 | 4.83 | 1015815 | 21.83 | 42.69 | 4.23 | 0.57 | 18918.19 | 47.06 |
| Malawi | 2020 | 4 | 138.5 | 15.13 | 160.99 | 4.8 | 1177809 | 21.52 | 43.09 | 4.2 | 0.59 | 20744.89 | 47.27 |
| Malawi | 2021 | 1 | 142.07 | 16.79 | 164.51 | 4.77 | 1383060 | 20.85 | 42.34 | 4.15 | 0.59 | 22340.3 | 47.64 |
| Malawi | 2021 | 2 | 144.84 | 17.43 | 166.51 | 4.73 | 1571041 | 20.87 | 43.29 | 4.11 | 0.62 | 24693.4 | 47.25 |
| Malawi | 2021 | 3 | 147.47 | 17.82 | 168.17 | 4.69 | 1766970 | 21.15 | 44.74 | 4.08 | 0.65 | 27392.12 | 46.49 |
| Malawi | 2021 | 4 | 149.97 | 17.95 | 169.5 | 4.65 | 1970849 | 21.68 | 46.71 | 4.06 | 0.7 | 30436.45 | 45.35 |
| Malawi | 2022 | 1 | 153.03 | 16.95 | 172.08 | 4.59 | 2334941 | 23.86 | 52.47 | 4.01 | 0.84 | 36809.16 | 41.44 |
| Malawi | 2022 | 2 | 154.98 | 16.92 | 172.11 | 4.55 | 2493812 | 24.35 | 54.14 | 3.99 | 0.86 | 39351.62 | 40.52 |
| Malawi | 2022 | 3 | 156.52 | 16.98 | 171.16 | 4.51 | 2599725 | 24.53 | 55 | 3.99 | 0.86 | 41046.59 | 40.18 |
| Malawi | 2022 | 4 | 157.65 | 17.14 | 169.25 | 4.48 | 2652682 | 24.42 | 55.06 | 4.01 | 0.84 | 41894.08 | 40.42 |
| Malawi | 2023 | 1 | 153.1 | 19.5 | 181.7 | 4.6 | 2735753 | 11.08 | 45.51 | 1.3 | 0.68 | 44513.1 | 42.42 |
| Malawi | 2023 | 2 | 155.51 | 19 | 171.71 | 4.51 | 2649568 | 15.53 | 47.48 | 2.43 | 0.65 | 42618 | 43.36 |
| Malawi | 2023 | 3 | 159.61 | 17.75 | 154.62 | 4.37 | 2477197 | 24.84 | 52.16 | 4.67 | 0.63 | 38827.81 | 44.42 |
| Malawi | 2023 | 4 | 165.4 | 15.75 | 130.42 | 4.17 | 2218642 | 39.02 | 59.56 | 8.01 | 0.63 | 33142.52 | 45.59 |
| Mali | 2014 | 1 | 180.8 | 8.89 | 58.93 | 3.52 | 1407032 | 80.97 | 82.89 | 17.96 | 0.8 | 15932.84 | 47.13 |
| Mali | 2014 | 2 | 186.82 | 7.03 | 36.6 | 3.36 | 1162854 | 95.72 | 90.44 | 21.32 | 0.77 | 10309.08 | 48.43 |

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|------|------|---|--------|-------|-------|------|----------|--------|--------|-------|------|----------|-------|
| Mali | 2014 | 3 | 191.35 | 6.07 | 23.23 | 3.31 | 1019238 | 106.18 | 95.41 | 23.59 | 0.7 | 6641.94 | 49.75 |
| Mali | 2014 | 4 | 194.42 | 6 | 18.84 | 3.37 | 976184.2 | 112.34 | 97.82 | 24.76 | 0.58 | 4931.42 | 51.09 |
| Mali | 2015 | 1 | 191.76 | 9 | 48.91 | 3.87 | 1297248 | 105.8 | 90.67 | 22.13 | 0.22 | 9846.64 | 53.82 |
| Mali | 2015 | 2 | 193.57 | 9.85 | 52.27 | 3.99 | 1349897 | 106.73 | 90.74 | 22.21 | 0.1 | 10181.73 | 54.64 |
| Mali | 2015 | 3 | 195.61 | 10.73 | 54.4 | 4.07 | 1397687 | 106.72 | 91.03 | 22.28 | 0.02 | 10605.79 | 54.94 |
| Mali | 2015 | 4 | 197.86 | 11.63 | 55.31 | 4.11 | 1440616 | 105.78 | 91.56 | 22.34 | 0.02 | 11118.84 | 54.72 |
| Mali | 2016 | 1 | 206.15 | 12.43 | 50.63 | 3.97 | 1471943 | 99.76 | 92.6 | 22.54 | 0.07 | 12009.05 | 51.84 |
| Mali | 2016 | 2 | 206.52 | 13.43 | 50.84 | 3.99 | 1507851 | 98.6 | 93.48 | 22.53 | 0.07 | 12584.78 | 51.4 |
| Mali | 2016 | 3 | 204.79 | 14.5 | 51.56 | 4.03 | 1541597 | 98.15 | 94.47 | 22.47 | 0.07 | 13134.23 | 51.28 |
| Mali | 2016 | 4 | 200.96 | 15.65 | 52.81 | 4.09 | 1573180 | 98.42 | 95.58 | 22.34 | 0.08 | 13657.38 | 51.48 |
| Mali | 2017 | 1 | 185.03 | 17.44 | 57.5 | 4.22 | 1529400 | 102.82 | 97.45 | 22.09 | 0.1 | 14261.1 | 53.12 |
| Mali | 2017 | 2 | 180.99 | 18.51 | 58.61 | 4.3 | 1585939 | 103.16 | 98.53 | 21.87 | 0.1 | 14688.93 | 53.51 |
| Mali | 2017 | 3 | 178.86 | 19.44 | 59.06 | 4.38 | 1669597 | 102.85 | 99.48 | 21.61 | 0.1 | 15047.74 | 53.78 |
| Mali | 2017 | 4 | 178.62 | 20.21 | 58.86 | 4.46 | 1780372 | 101.89 | 100.3 | 21.31 | 0.1 | 15337.51 | 53.91 |
| Mali | 2018 | 1 | 184.28 | 20.29 | 54.56 | 4.58 | 1991048 | 96.7 | 100.43 | 20.97 | 0.08 | 14895.85 | 54.25 |
| Mali | 2018 | 2 | 186.24 | 20.98 | 54.43 | 4.64 | 2126946 | 95.87 | 101.18 | 20.61 | 0.08 | 15312.52 | 54 |
| Mali | 2018 | 3 | 188.49 | 21.75 | 55.02 | 4.69 | 2260849 | 95.83 | 102 | 20.22 | 0.08 | 15925.11 | 53.48 |
| Mali | 2018 | 4 | 191.05 | 22.58 | 56.34 | 4.73 | 2392757 | 96.57 | 102.91 | 19.8 | 0.08 | 16733.64 | 52.71 |
| Mali | 2019 | 1 | 194.05 | 23.57 | 59.76 | 4.64 | 2517436 | 104.77 | 104.9 | 19.23 | 0.11 | 17931.66 | 50.2 |
| Mali | 2019 | 2 | 197.14 | 24.5 | 61.96 | 4.69 | 2647446 | 104.41 | 105.55 | 18.8 | 0.11 | 19054.61 | 49.51 |
| Mali | 2019 | 3 | 200.46 | 25.47 | 64.34 | 4.76 | 2777554 | 102.16 | 105.86 | 18.38 | 0.11 | 20296.05 | 49.14 |
| Mali | 2019 | 4 | 204.02 | 26.46 | 66.9 | 4.86 | 2907760 | 98.02 | 105.85 | 17.99 | 0.11 | 21655.99 | 49.11 |
| Mali | 2020 | 1 | 211.4 | 27.44 | 70.04 | 5.13 | 3034636 | 83.19 | 103.81 | 17.54 | 0.09 | 23264.37 | 49.92 |
| Mali | 2020 | 2 | 214 | 28.51 | 72.77 | 5.23 | 3166409 | 78.8 | 103.81 | 17.22 | 0.09 | 24809.33 | 50.35 |
| Mali | 2020 | 3 | 215.39 | 29.64 | 75.49 | 5.3 | 3299650 | 76.03 | 104.15 | 16.95 | 0.09 | 26420.81 | 50.92 |
| Mali | 2020 | 4 | 215.58 | 30.81 | 78.22 | 5.34 | 3434361 | 74.9 | 104.84 | 16.73 | 0.09 | 28098.82 | 51.61 |
| Mali | 2021 | 1 | 211.6 | 32.87 | 80.94 | 5.38 | 3508053 | 77.34 | 102.1 | 16.72 | 0.1 | 30170.79 | 52.96 |
| Mali | 2021 | 2 | 210.58 | 33.81 | 83.67 | 5.36 | 3670697 | 78.69 | 104.99 | 16.53 | 0.11 | 31850.87 | 53.71 |
| Mali | 2021 | 3 | 209.53 | 34.47 | 86.39 | 5.3 | 3859806 | 80.9 | 109.74 | 16.33 | 0.11 | 33466.49 | 54.37 |

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|-----------|------|---|---------|-------|---------|-------|---------|--------|--------|-------|------|----------|--------|
| Mali | 2021 | 4 | 208.47 | 34.85 | 89.12 | 5.2 | 4075380 | 83.96 | 116.34 | 16.11 | 0.12 | 35017.65 | 54.96 |
| Mali | 2022 | 1 | 204.38 | 34.2 | 91.84 | 4.9 | 4197734 | 93.55 | 134.5 | 15.69 | 0.12 | 35702.23 | 55.49 |
| Mali | 2022 | 2 | 204.49 | 34.32 | 94.57 | 4.79 | 4514109 | 96.05 | 140.92 | 15.51 | 0.12 | 37445.33 | 55.91 |
| Mali | 2022 | 3 | 205.78 | 34.46 | 97.29 | 4.7 | 4904823 | 97.14 | 145.32 | 15.39 | 0.12 | 39444.83 | 56.25 |
| Mali | 2022 | 4 | 208.26 | 34.62 | 100.02 | 4.65 | 5369874 | 96.82 | 147.69 | 15.33 | 0.12 | 41700.73 | 56.51 |
| Mali | 2023 | 1 | 111.33 | 33.43 | 227.06 | 1.54 | 7511006 | 102.75 | 163.15 | 17.37 | 0.08 | 54016.25 | 48.15 |
| Mali | 2023 | 2 | 22.82 | 34.17 | 192.42 | 0.92 | 7484037 | 96.54 | 155.42 | 16.62 | 0 | 52863.64 | 51.65 |
| Mali | 2023 | 3 | 287.45 | 35.47 | 174.14 | 5.87 | 6890708 | 85.84 | 139.61 | 15.1 | 0.16 | 48046.14 | 58.47 |
| Mali | 2023 | 4 | 682.57 | 37.33 | 572.62 | 13.3 | 5731021 | 70.67 | 115.73 | 12.83 | 0.4 | 39563.74 | 68.61 |
| Mauritius | 2014 | 1 | 1844.41 | 41.85 | 1759.05 | 35.56 | 11.66 | 27.78 | 43.61 | 6.01 | 1.13 | 10660.7 | 99.34 |
| Mauritius | 2014 | 2 | 2246.01 | 44 | 2158.97 | 43.04 | 12.59 | 12.95 | 19.65 | 3.74 | 1.37 | 1550.81 | 109.23 |
| Mauritius | 2014 | 3 | 2523.61 | 45.87 | 2428.39 | 48.07 | 13.47 | 2.93 | 3.68 | 2.22 | 1.53 | 4521.69 | 115.53 |
| Mauritius | 2014 | 4 | 2677.2 | 47.47 | 2567.31 | 50.65 | 14.34 | 2.26 | 14.29 | 1.46 | 1.61 | 7556.78 | 118.25 |
| Mauritius | 2015 | 1 | 2391.77 | 48.61 | 2252.87 | 44.73 | 11.66 | 9.29 | 15.95 | 3.35 | 1.41 | 39.39 | 108.81 |
| Mauritius | 2015 | 2 | 2423.36 | 49.74 | 2259.97 | 44.85 | 12.59 | 8.96 | 15.88 | 3.34 | 1.4 | 41.54 | 107.8 |
| Mauritius | 2015 | 3 | 2456.96 | 50.66 | 2265.73 | 44.94 | 13.47 | 8.68 | 15.71 | 3.34 | 1.4 | 43.55 | 106.65 |
| Mauritius | 2015 | 4 | 2492.56 | 51.39 | 2270.15 | 45 | 14.28 | 8.44 | 15.45 | 3.33 | 1.39 | 45.4 | 105.35 |
| Mauritius | 2016 | 1 | 2592.22 | 51.24 | 2275.2 | 44.92 | 14.71 | 8.17 | 14.55 | 3.32 | 1.36 | 47.45 | 102.65 |
| Mauritius | 2016 | 2 | 2607.01 | 51.83 | 2276.15 | 44.98 | 15.53 | 8.07 | 14.32 | 3.32 | 1.36 | 48.86 | 101.56 |
| Mauritius | 2016 | 3 | 2598.99 | 52.5 | 2274.98 | 45.07 | 16.41 | 8.05 | 14.2 | 3.32 | 1.36 | 49.97 | 100.82 |
| Mauritius | 2016 | 4 | 2568.15 | 53.23 | 2271.67 | 45.19 | 17.35 | 8.11 | 14.21 | 3.33 | 1.36 | 50.79 | 100.44 |
| Mauritius | 2017 | 1 | 2406.03 | 54.2 | 2282.71 | 45.64 | 19.01 | 8.75 | 14.93 | 3.42 | 1.4 | 49.59 | 101.77 |
| Mauritius | 2017 | 2 | 2372.94 | 55 | 2268.55 | 45.67 | 19.82 | 8.78 | 14.95 | 3.4 | 1.41 | 50.52 | 101.55 |
| Mauritius | 2017 | 3 | 2360.42 | 55.8 | 2245.67 | 45.61 | 20.45 | 8.68 | 14.85 | 3.36 | 1.41 | 51.84 | 101.14 |
| Mauritius | 2017 | 4 | 2368.47 | 56.6 | 2214.07 | 45.44 | 20.88 | 8.47 | 14.63 | 3.29 | 1.41 | 53.57 | 100.54 |
| Mauritius | 2018 | 1 | 2432.18 | 57.42 | 2115.64 | 44.9 | 20.22 | 7.63 | 13.7 | 3.2 | 1.38 | 57.92 | 99.03 |
| Mauritius | 2018 | 2 | 2467.33 | 58.21 | 2089.84 | 44.63 | 20.63 | 7.39 | 13.5 | 3.08 | 1.38 | 59.57 | 98.34 |
| Mauritius | 2018 | 3 | 2509.01 | 59 | 2078.57 | 44.37 | 21.2 | 7.23 | 13.43 | 2.93 | 1.38 | 60.72 | 97.74 |
| Mauritius | 2018 | 4 | 2557.22 | 59.78 | 2081.83 | 44.11 | 21.95 | 7.15 | 13.49 | 2.76 | 1.39 | 61.39 | 97.25 |

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|------------|------|---|---------|-------|---------|-------|---------|-------|-------|-------|------|---------|--------|
| Mauritius | 2019 | 1 | 2631.2 | 60.08 | 2148.74 | 43.76 | 22.86 | 7.38 | 14.03 | 2.37 | 1.43 | 59.05 | 98.51 |
| Mauritius | 2019 | 2 | 2684.78 | 61.04 | 2161.39 | 43.55 | 23.95 | 7.39 | 14.2 | 2.23 | 1.44 | 59.75 | 97.54 |
| Mauritius | 2019 | 3 | 2737.21 | 62.18 | 2168.92 | 43.39 | 25.22 | 7.41 | 14.36 | 2.14 | 1.45 | 60.98 | 96.01 |
| Mauritius | 2019 | 4 | 2788.48 | 63.5 | 2171.31 | 43.26 | 26.65 | 7.42 | 14.5 | 2.11 | 1.45 | 62.74 | 93.91 |
| Mauritius | 2020 | 1 | 2876.4 | 65.78 | 2137.18 | 43.3 | 5.27 | 7.28 | 14.6 | 2.28 | 1.45 | 25.22 | 86.26 |
| Mauritius | 2020 | 2 | 2910.23 | 67.15 | 2141.88 | 43.22 | 16.25 | 7.35 | 14.73 | 2.29 | 1.45 | 43.94 | 85.02 |
| Mauritius | 2020 | 3 | 2927.78 | 68.38 | 2154.01 | 43.13 | 36.59 | 7.49 | 14.87 | 2.3 | 1.45 | 79.1 | 85.21 |
| Mauritius | 2020 | 4 | 2929.05 | 69.49 | 2173.58 | 43.03 | 66.3 | 7.69 | 15 | 2.3 | 1.45 | 130.7 | 86.83 |
| Mauritius | 2021 | 1 | 2957.61 | 70.14 | 2233.79 | 42.98 | 59.68 | 8.25 | 15.13 | 2.25 | 1.45 | 147.76 | 92.16 |
| Mauritius | 2021 | 2 | 2908.89 | 71.11 | 2254.94 | 42.86 | 126.4 | 8.45 | 15.26 | 2.26 | 1.44 | 252.63 | 95.71 |
| Mauritius | 2021 | 3 | 2826.45 | 72.09 | 2270.23 | 42.72 | 220.76 | 8.59 | 15.4 | 2.27 | 1.44 | 394.34 | 99.78 |
| Mauritius | 2021 | 4 | 2710.3 | 73.06 | 2279.67 | 42.56 | 342.77 | 8.66 | 15.53 | 2.3 | 1.43 | 572.88 | 104.35 |
| Mauritius | 2022 | 1 | 2380.26 | 74.02 | 2260.81 | 42.15 | 323.84 | 8.37 | 15.66 | 2.36 | 1.43 | 1175.94 | 115.52 |
| Mauritius | 2022 | 2 | 2268.76 | 75 | 2267.52 | 42.04 | 568.57 | 8.44 | 15.79 | 2.39 | 1.42 | 1273.08 | 118.68 |
| Mauritius | 2022 | 3 | 2195.61 | 75.99 | 2277.37 | 42.01 | 908.36 | 8.58 | 15.93 | 2.43 | 1.42 | 1251.97 | 119.92 |
| Mauritius | 2022 | 4 | 2160.83 | 76.98 | 2290.34 | 42.05 | 1343.23 | 8.78 | 16.06 | 2.46 | 1.41 | 1112.62 | 119.23 |
| Mauritius | 2023 | 1 | 2590.48 | 89.2 | 2662.4 | 47.96 | 2700.11 | 3.26 | 10.14 | 0.91 | 1.61 | 213.35 | 110.49 |
| Mauritius | 2023 | 2 | 2461.99 | 85.72 | 2539.26 | 45.83 | 2994.35 | 5.89 | 12.69 | 1.58 | 1.53 | 94.18 | 108.41 |
| Mauritius | 2023 | 3 | 2201.44 | 77.76 | 2276.86 | 41.45 | 3052.88 | 10.9 | 17.67 | 2.88 | 1.37 | 113.45 | 106.86 |
| Mauritius | 2023 | 4 | 1808.82 | 65.32 | 1875.2 | 34.83 | 2875.71 | 18.28 | 25.06 | 4.82 | 1.14 | 271.14 | 105.84 |
| Mozambique | 2014 | 1 | 625.86 | 25.7 | 638.15 | 14.69 | 1601.75 | 39.75 | 46.86 | 10.57 | 0.44 | 1070.86 | 105.82 |
| Mozambique | 2014 | 2 | 232.41 | 13.37 | 236.45 | 8.08 | 1297.6 | 47.19 | 54.29 | 12.51 | 0.21 | 1303.97 | 105.67 |
| Mozambique | 2014 | 3 | 229.79 | 5.63 | 326.04 | 3.74 | 1102.19 | 52.32 | 59.36 | 13.81 | 0.05 | 1474.08 | 105.85 |
| Mozambique | 2014 | 4 | 160.75 | 2.49 | 149.32 | 1.65 | 1015.5 | 55.14 | 62.05 | 14.47 | 0.02 | 1581.17 | 106.38 |
| Mozambique | 2015 | 1 | 167.49 | 16.08 | 222.53 | 7.37 | 1336.92 | 50.07 | 57.2 | 12.83 | 0.17 | 1679.09 | 107.54 |
| Mozambique | 2015 | 2 | 167.82 | 17.27 | 235.3 | 7.6 | 1347.94 | 50.5 | 57.21 | 12.88 | 0.18 | 1638.63 | 108.63 |
| Mozambique | 2015 | 3 | 168.22 | 18.19 | 244.92 | 7.87 | 1347.94 | 50.84 | 56.92 | 12.97 | 0.18 | 1513.63 | 109.93 |
| Mozambique | 2015 | 4 | 168.67 | 18.86 | 251.37 | 8.19 | 1336.92 | 51.1 | 56.31 | 13.08 | 0.19 | 1304.09 | 111.46 |
| Mozambique | 2016 | 1 | 173.01 | 18.57 | 241.53 | 8.67 | 58.26 | 48.97 | 54.03 | 13.39 | 0.2 | 431.04 | 117.59 |

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|------------|------|---|--------|-------|--------|-------|----------|-------|-------|-------|------|----------|--------|
| Mozambique | 2016 | 2 | 172.05 | 18.98 | 246.93 | 9.04 | 527.84 | 49.99 | 53.36 | 13.5 | 0.21 | 284 | 117.79 |
| Mozambique | 2016 | 3 | 169.61 | 19.41 | 254.42 | 9.4 | 1489.05 | 51.86 | 52.94 | 13.59 | 0.23 | 284 | 116.46 |
| Mozambique | 2016 | 4 | 165.7 | 19.84 | 264.01 | 9.77 | 2941.88 | 54.58 | 52.75 | 13.64 | 0.24 | 431.04 | 113.6 |
| Mozambique | 2017 | 1 | 159.65 | 20.29 | 280.94 | 10.31 | 4118.53 | 62.02 | 53.55 | 13.31 | 0.26 | 960.95 | 100.79 |
| Mozambique | 2017 | 2 | 153.06 | 20.76 | 292.62 | 10.6 | 6861.73 | 64.88 | 53.54 | 13.45 | 0.27 | 1307.75 | 98.22 |
| Mozambique | 2017 | 3 | 145.26 | 21.23 | 304.3 | 10.83 | 10403.69 | 67.03 | 53.48 | 13.69 | 0.27 | 1707.26 | 97.47 |
| Mozambique | 2017 | 4 | 136.27 | 21.72 | 315.97 | 10.98 | 14744.41 | 68.47 | 53.35 | 14.03 | 0.27 | 2159.49 | 98.55 |
| Mozambique | 2018 | 1 | 115.44 | 22.23 | 340.73 | 10.93 | 6649.67 | 68.44 | 52.48 | 15.83 | 0.26 | 1165.31 | 108.57 |
| Mozambique | 2018 | 2 | 108.28 | 22.74 | 347.16 | 10.99 | 17881.56 | 68.77 | 52.51 | 15.86 | 0.25 | 2322.61 | 110.46 |
| Mozambique | 2018 | 3 | 104.17 | 23.25 | 348.36 | 11.04 | 35205.89 | 68.71 | 52.74 | 15.47 | 0.24 | 4132.28 | 111.34 |
| Mozambique | 2018 | 4 | 103.11 | 23.77 | 344.32 | 11.07 | 58622.65 | 68.24 | 53.19 | 14.65 | 0.22 | 6594.32 | 111.19 |
| Mozambique | 2019 | 1 | 112.31 | 24.28 | 315.52 | 11.1 | 103773.9 | 65.7 | 54.68 | 11.43 | 0.19 | 11652.03 | 103.82 |
| Mozambique | 2019 | 2 | 114.45 | 24.82 | 308.82 | 11.09 | 133118.7 | 65.1 | 55.22 | 10.55 | 0.18 | 14641.47 | 104.13 |
| Mozambique | 2019 | 3 | 116.75 | 25.37 | 304.69 | 11.07 | 162299.1 | 64.76 | 55.63 | 10.04 | 0.17 | 17505.95 | 105.9 |
| Mozambique | 2019 | 4 | 119.2 | 25.93 | 303.14 | 11.02 | 191315.1 | 64.68 | 55.91 | 9.9 | 0.17 | 20245.46 | 109.15 |
| Mozambique | 2020 | 1 | 123.71 | 26.49 | 314.61 | 10.94 | 221364.2 | 64.85 | 54.92 | 11.22 | 0.18 | 23149.91 | 123.46 |
| Mozambique | 2020 | 2 | 125.72 | 27.08 | 314.02 | 10.87 | 249572.5 | 65.31 | 55.42 | 11.38 | 0.19 | 25523.54 | 125.8 |
| Mozambique | 2020 | 3 | 127.14 | 27.7 | 311.83 | 10.78 | 277137.5 | 66.04 | 56.26 | 11.47 | 0.19 | 27656.26 | 125.78 |
| Mozambique | 2020 | 4 | 127.97 | 28.33 | 308.02 | 10.69 | 304059.1 | 67.04 | 57.44 | 11.49 | 0.2 | 29548.05 | 123.4 |
| Mozambique | 2021 | 1 | 128.96 | 28.76 | 294.87 | 10.58 | 319059.8 | 69.48 | 59.49 | 11.29 | 0.21 | 30522.97 | 110.64 |
| Mozambique | 2021 | 2 | 128.28 | 29.52 | 290.95 | 10.46 | 349205.8 | 70.56 | 61.13 | 11.22 | 0.22 | 32203.31 | 106.72 |
| Mozambique | 2021 | 3 | 126.7 | 30.38 | 288.52 | 10.33 | 383219.5 | 71.44 | 62.88 | 11.15 | 0.22 | 33913.11 | 103.63 |
| Mozambique | 2021 | 4 | 124.22 | 31.35 | 287.58 | 10.19 | 421100.9 | 72.12 | 64.74 | 11.06 | 0.23 | 35652.38 | 101.38 |
| Mozambique | 2022 | 1 | 115 | 32.88 | 292.16 | 10.03 | 471953.9 | 72.92 | 68.25 | 10.83 | 0.23 | 37259.01 | 99.25 |
| Mozambique | 2022 | 2 | 113.05 | 33.88 | 292.58 | 9.87 | 513929.2 | 73.09 | 69.75 | 10.77 | 0.24 | 39122.04 | 98.95 |
| Mozambique | 2022 | 3 | 112.54 | 34.8 | 292.87 | 9.7 | 556130.8 | 72.95 | 70.76 | 10.75 | 0.24 | 41079.38 | 99.76 |
| Mozambique | 2022 | 4 | 113.47 | 35.65 | 293.04 | 9.53 | 598558.5 | 72.48 | 71.28 | 10.77 | 0.25 | 43131.01 | 101.68 |
| Mozambique | 2023 | 1 | 94.94 | 40.25 | 218.45 | 2.88 | 778709.9 | 79.63 | 79.55 | 12.44 | 0.01 | 54457.5 | 110.82 |
| Mozambique | 2023 | 2 | 6.84 | 39.42 | 248.22 | 5.28 | 766591.1 | 75.35 | 75.8 | 11.89 | 0.1 | 53025.51 | 112.54 |

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|------------|------|---|---------|-------|---------|-------|----------|-------|-------|-------|------|----------|--------|
| Mozambique | 2023 | 3 | 167.01 | 36.98 | 307.7 | 10.26 | 699699.5 | 67.58 | 68.25 | 10.74 | 0.3 | 48015.59 | 112.94 |
| Mozambique | 2023 | 4 | 426.6 | 32.94 | 396.91 | 17.82 | 578035.2 | 56.31 | 56.92 | 8.98 | 0.61 | 39427.76 | 112.01 |
| Namibia | 2014 | 1 | 1223.77 | 18.04 | 650.52 | 40.11 | 154392.8 | 23.64 | 22.89 | 3.6 | 1.53 | 10714.25 | 105.96 |
| Namibia | 2014 | 2 | 1474.12 | 14.48 | 745.3 | 47.97 | 22065.08 | 12.55 | 11.55 | 1.84 | 1.83 | 1589.66 | 103.91 |
| Namibia | 2014 | 3 | 1629.47 | 13.02 | 815.93 | 53.54 | 66153.24 | 5.14 | 3.98 | 0.67 | 2.02 | 4493.74 | 102.05 |
| Namibia | 2014 | 4 | 1689.82 | 13.65 | 862.41 | 56.82 | 110262.2 | 1.39 | 0.18 | 0.09 | 2.1 | 7535.97 | 100.4 |
| Namibia | 2015 | 1 | 1392.9 | 22.49 | 805.72 | 52.25 | 11.64 | 10.39 | 9.33 | 1.63 | 1.82 | 59.37 | 99.03 |
| Namibia | 2015 | 2 | 1368.19 | 24.86 | 835.52 | 53.2 | 12.13 | 10.35 | 9.41 | 1.65 | 1.79 | 60.93 | 97.73 |
| Namibia | 2015 | 3 | 1353.4 | 26.89 | 872.78 | 54.08 | 12.65 | 10.35 | 9.6 | 1.66 | 1.76 | 65.12 | 96.59 |
| Namibia | 2015 | 4 | 1348.54 | 28.56 | 917.5 | 54.91 | 13.22 | 10.39 | 9.89 | 1.67 | 1.72 | 71.94 | 95.61 |
| Namibia | 2016 | 1 | 1404.19 | 28.93 | 996.94 | 55.77 | 392.76 | 10.5 | 10.88 | 1.65 | 1.66 | 490.3 | 96.68 |
| Namibia | 2016 | 2 | 1398.95 | 30.29 | 1045.68 | 56.45 | 229.48 | 10.6 | 11.15 | 1.66 | 1.63 | 249.58 | 95.27 |
| Namibia | 2016 | 3 | 1383.41 | 31.68 | 1090.97 | 57.04 | 96.47 | 10.72 | 11.28 | 1.66 | 1.6 | 222.43 | 93.26 |
| Namibia | 2016 | 4 | 1357.56 | 33.1 | 1132.81 | 57.54 | 585.09 | 10.86 | 11.29 | 1.67 | 1.58 | 925.73 | 90.67 |
| Namibia | 2017 | 1 | 1286.75 | 34.59 | 1168.2 | 56.51 | 2001.37 | 11.18 | 10.88 | 1.71 | 1.58 | 2484.48 | 83.93 |
| Namibia | 2017 | 2 | 1254.16 | 36.06 | 1204.37 | 57.4 | 2509.34 | 11.31 | 10.74 | 1.71 | 1.57 | 3400.68 | 81.57 |
| Namibia | 2017 | 3 | 1225.12 | 37.53 | 1238.29 | 58.78 | 2873.98 | 11.4 | 10.59 | 1.71 | 1.55 | 4298.51 | 80.04 |
| Namibia | 2017 | 4 | 1199.64 | 39.02 | 1269.98 | 60.64 | 3095.31 | 11.46 | 10.42 | 1.71 | 1.54 | 5177.96 | 79.33 |
| Namibia | 2018 | 1 | 1140.14 | 40.39 | 1340.59 | 65.24 | 1720.19 | 11.39 | 10.04 | 1.68 | 1.51 | 7406.16 | 81.42 |
| Namibia | 2018 | 2 | 1136.81 | 41.96 | 1351.34 | 67.17 | 2236.11 | 11.4 | 9.92 | 1.67 | 1.5 | 7702 | 81.58 |
| Namibia | 2018 | 3 | 1152.05 | 43.58 | 1343.4 | 68.69 | 3189.96 | 11.4 | 9.86 | 1.67 | 1.51 | 7432.62 | 81.79 |
| Namibia | 2018 | 4 | 1185.89 | 45.27 | 1316.75 | 69.78 | 4581.74 | 11.4 | 9.86 | 1.67 | 1.52 | 6598.01 | 82.05 |
| Namibia | 2019 | 1 | 1308.39 | 47 | 1169.61 | 69.52 | 9404.77 | 11.55 | 10.29 | 1.69 | 1.65 | 2877.36 | 83.57 |
| Namibia | 2019 | 2 | 1351.36 | 48.82 | 1146.28 | 70.16 | 10475.06 | 11.46 | 10.26 | 1.68 | 1.64 | 1840.62 | 83.42 |
| Namibia | 2019 | 3 | 1384.88 | 50.71 | 1144.95 | 70.75 | 10785.95 | 11.31 | 10.16 | 1.68 | 1.61 | 1166.98 | 82.83 |
| Namibia | 2019 | 4 | 1408.94 | 52.67 | 1165.64 | 71.29 | 10337.42 | 11.08 | 9.97 | 1.67 | 1.54 | 856.44 | 81.78 |
| Namibia | 2020 | 1 | 1430.98 | 55.75 | 1270 | 72.01 | 5950.1 | 10.27 | 9.15 | 1.64 | 1.27 | 1355.63 | 77.2 |
| Namibia | 2020 | 2 | 1433.17 | 57.42 | 1310.05 | 72.38 | 5254.51 | 10.11 | 9.01 | 1.63 | 1.21 | 1592.64 | 76.5 |
| Namibia | 2020 | 3 | 1422.94 | 58.73 | 1347.45 | 72.63 | 5071.25 | 10.08 | 9.01 | 1.63 | 1.2 | 2014.09 | 76.58 |

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|---------|------|---|---------|-------|---------|-------|----------|-------|-------|------|------|----------|--------|
| Namibia | 2020 | 4 | 1400.29 | 59.69 | 1382.2 | 72.74 | 5400.34 | 10.19 | 9.15 | 1.62 | 1.24 | 2620 | 77.44 |
| Namibia | 2021 | 1 | 1346.38 | 59.65 | 1429.97 | 72.32 | 7913.75 | 10.84 | 9.66 | 1.64 | 1.42 | 3550.66 | 79.66 |
| Namibia | 2021 | 2 | 1306.42 | 60.15 | 1453.15 | 72.33 | 8598.73 | 11.05 | 9.97 | 1.63 | 1.49 | 4469.33 | 81.87 |
| Namibia | 2021 | 3 | 1261.56 | 60.55 | 1467.41 | 72.38 | 9127.26 | 11.24 | 10.31 | 1.63 | 1.57 | 5516.32 | 84.65 |
| Namibia | 2021 | 4 | 1211.82 | 60.85 | 1472.75 | 72.45 | 9499.33 | 11.4 | 10.7 | 1.62 | 1.64 | 6691.63 | 87.98 |
| Namibia | 2022 | 1 | 1084.75 | 60.41 | 1458.84 | 72.66 | 9201.91 | 11.33 | 11.25 | 1.55 | 1.71 | 9647.58 | 94.06 |
| Namibia | 2022 | 2 | 1054.2 | 60.77 | 1450.47 | 72.75 | 9466.3 | 11.51 | 11.66 | 1.56 | 1.78 | 10418.6 | 97.64 |
| Namibia | 2022 | 3 | 1047.73 | 61.28 | 1437.33 | 72.82 | 9779.45 | 11.74 | 12.05 | 1.6 | 1.86 | 10657.02 | 100.9 |
| Namibia | 2022 | 4 | 1065.35 | 61.95 | 1419.4 | 72.88 | 10141.38 | 12.01 | 12.44 | 1.66 | 1.93 | 10362.83 | 103.84 |
| Namibia | 2023 | 1 | 1364.96 | 73.55 | 1567.45 | 84.1 | 17997.62 | 13.05 | 12.2 | 1.24 | 2.32 | 8449.6 | 117.29 |
| Namibia | 2023 | 2 | 1327.57 | 70.22 | 1471.65 | 79.66 | 6118.29 | 13.13 | 12.8 | 1.54 | 2.27 | 7524.77 | 115.27 |
| Namibia | 2023 | 3 | 1211.1 | 62.74 | 1302.76 | 70.73 | 17229.67 | 12.98 | 13.62 | 2.07 | 2.09 | 6501.92 | 108.6 |
| Namibia | 2023 | 4 | 1015.55 | 51.1 | 1060.78 | 57.31 | 52046.28 | 12.59 | 14.67 | 2.82 | 1.79 | 5381.03 | 97.28 |
| Niger | 2014 | 1 | 370.66 | 14.87 | 361.87 | 16.97 | 155372.4 | 10.83 | 17.22 | 4.95 | 0.78 | 3282.44 | 59.87 |
| Niger | 2014 | 2 | 165.05 | 3.11 | 127.25 | 3.55 | 190309.9 | 10.42 | 18.21 | 5.69 | 0.46 | 2317.36 | 47.83 |
| Niger | 2014 | 3 | 28.46 | 4.63 | 126.91 | 5.38 | 213899.8 | 10.23 | 18.91 | 6.19 | 0.25 | 1606.12 | 39.72 |
| Niger | 2014 | 4 | 39.12 | 8.35 | 100.62 | 9.82 | 226142 | 10.25 | 19.33 | 6.45 | 0.15 | 1148.72 | 35.54 |
| Niger | 2015 | 1 | 135.28 | 1.92 | 114.53 | 1.5 | 202671.8 | 10.92 | 18.94 | 5.93 | 0.44 | 1493.18 | 46.24 |
| Niger | 2015 | 2 | 136.56 | 2.27 | 118.36 | 1.52 | 201964.5 | 11.21 | 19 | 5.92 | 0.44 | 1324.25 | 45.53 |
| Niger | 2015 | 3 | 137.68 | 2.65 | 119.29 | 1.52 | 199655.3 | 11.55 | 18.98 | 5.9 | 0.44 | 1189.96 | 44.38 |
| Niger | 2015 | 4 | 138.63 | 3.07 | 117.31 | 1.5 | 195744.4 | 11.93 | 18.88 | 5.85 | 0.44 | 1090.29 | 42.77 |
| Niger | 2016 | 1 | 142.61 | 3 | 100.05 | 1.34 | 179041.5 | 12.78 | 18.54 | 5.77 | 0.43 | 802.79 | 37.89 |
| Niger | 2016 | 2 | 141.96 | 3.71 | 97.2 | 1.32 | 176403 | 13.09 | 18.36 | 5.68 | 0.42 | 861.37 | 36.51 |
| Niger | 2016 | 3 | 139.86 | 4.68 | 96.38 | 1.32 | 176638.8 | 13.29 | 18.17 | 5.56 | 0.41 | 1043.56 | 35.8 |
| Niger | 2016 | 4 | 136.32 | 5.89 | 97.61 | 1.34 | 179748.8 | 13.36 | 17.98 | 5.43 | 0.39 | 1349.37 | 35.77 |
| Niger | 2017 | 1 | 124.01 | 8.49 | 107.8 | 1.45 | 194530 | 12.71 | 17.63 | 5.16 | 0.36 | 2173.06 | 38.74 |
| Niger | 2017 | 2 | 120.53 | 9.76 | 110.32 | 1.49 | 199869.7 | 12.78 | 17.48 | 5.02 | 0.35 | 2568.39 | 39.13 |
| Niger | 2017 | 3 | 118.54 | 10.84 | 112.11 | 1.53 | 204564.8 | 12.96 | 17.37 | 4.91 | 0.34 | 2929.64 | 39.26 |
| Niger | 2017 | 4 | 118.04 | 11.71 | 113.17 | 1.56 | 208615.4 | 13.26 | 17.32 | 4.83 | 0.34 | 3256.79 | 39.14 |

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|---------|------|---|--------|-------|---------|-------|----------|-------|-------|------|------|---------|-------|
| Niger | 2018 | 1 | 122.71 | 11.72 | 111.67 | 1.59 | 211074.5 | 14.48 | 17.58 | 4.84 | 0.33 | 3740.09 | 37.94 |
| Niger | 2018 | 2 | 123.73 | 12.46 | 111.99 | 1.62 | 214214.7 | 14.7 | 17.52 | 4.78 | 0.34 | 3922.97 | 37.63 |
| Niger | 2018 | 3 | 124.77 | 13.26 | 112.3 | 1.65 | 217089.1 | 14.71 | 17.4 | 4.71 | 0.34 | 3995.67 | 37.38 |
| Niger | 2018 | 4 | 125.84 | 14.12 | 112.61 | 1.68 | 219697.7 | 14.51 | 17.23 | 4.64 | 0.35 | 3958.19 | 37.2 |
| Niger | 2019 | 1 | 125.62 | 15.73 | 112.9 | 1.71 | 227286.8 | 13.74 | 16.73 | 4.53 | 0.38 | 3634.17 | 37.44 |
| Niger | 2019 | 2 | 127.26 | 16.45 | 113.21 | 1.74 | 227265.2 | 13.29 | 16.55 | 4.46 | 0.39 | 3446.86 | 37.26 |
| Niger | 2019 | 3 | 129.46 | 16.96 | 113.51 | 1.76 | 224879.2 | 12.78 | 16.42 | 4.41 | 0.4 | 3219.92 | 37.01 |
| Niger | 2019 | 4 | 132.21 | 17.27 | 113.82 | 1.79 | 220128.8 | 12.22 | 16.34 | 4.36 | 0.4 | 2953.33 | 36.68 |
| Niger | 2020 | 1 | 139.59 | 16.83 | 114.12 | 1.82 | 202097.3 | 11.04 | 16.42 | 4.26 | 0.42 | 2483.83 | 35.62 |
| Niger | 2020 | 2 | 141.8 | 16.94 | 114.43 | 1.84 | 196984.9 | 10.59 | 16.41 | 4.26 | 0.42 | 2203.27 | 35.42 |
| Niger | 2020 | 3 | 142.94 | 17.05 | 114.73 | 1.85 | 193874.8 | 10.32 | 16.4 | 4.3 | 0.41 | 1948.38 | 35.41 |
| Niger | 2020 | 4 | 143 | 17.17 | 115.04 | 1.85 | 192767 | 10.22 | 16.41 | 4.38 | 0.39 | 1719.15 | 35.59 |
| Niger | 2021 | 1 | 138.09 | 16.48 | 115.34 | 1.82 | 202671.8 | 10.61 | 15.76 | 4.73 | 0.36 | 1493.18 | 37.58 |
| Niger | 2021 | 2 | 137.54 | 16.94 | 115.65 | 1.82 | 201964.5 | 10.72 | 16.05 | 4.8 | 0.33 | 1324.25 | 37.51 |
| Niger | 2021 | 3 | 137.46 | 17.73 | 115.95 | 1.82 | 199655.3 | 10.88 | 16.6 | 4.81 | 0.31 | 1189.96 | 36.98 |
| Niger | 2021 | 4 | 137.86 | 18.85 | 116.26 | 1.83 | 195744.4 | 11.07 | 17.43 | 4.78 | 0.28 | 1090.29 | 36.01 |
| Niger | 2022 | 1 | 139.44 | 22.05 | 116.56 | 1.85 | 156540.6 | 11.41 | 19.73 | 4.52 | 0.26 | 958.86 | 32.72 |
| Niger | 2022 | 2 | 140.49 | 23.13 | 116.87 | 1.87 | 162902.4 | 11.65 | 20.61 | 4.46 | 0.23 | 955.01 | 31.59 |
| Niger | 2022 | 3 | 141.73 | 23.84 | 117.17 | 1.88 | 181138.9 | 11.89 | 21.28 | 4.42 | 0.21 | 1012.34 | 30.77 |
| Niger | 2022 | 4 | 143.16 | 24.18 | 117.48 | 1.88 | 211250.1 | 12.14 | 21.74 | 4.4 | 0.18 | 1130.86 | 30.24 |
| Niger | 2023 | 1 | 62.75 | 23.57 | 1011.6 | 0.4 | 358287.2 | 12.11 | 22.68 | 4.25 | 0.14 | 1842.8 | 30.55 |
| Niger | 2023 | 2 | 97.36 | 23.41 | 1559.54 | 1 | 370127 | 12.47 | 22.44 | 4.33 | 0.13 | 1870.8 | 30.4 |
| Niger | 2023 | 3 | 164.96 | 23.12 | 344.28 | 2.2 | 351820.9 | 12.94 | 21.71 | 4.49 | 0.12 | 1747.09 | 30.35 |
| Niger | 2023 | 4 | 265.55 | 22.7 | 1699.85 | 4 | 303368.9 | 13.52 | 20.49 | 4.73 | 0.13 | 1471.68 | 30.38 |
| Nigeria | 2014 | 1 | 555.4 | 21.25 | 5759.22 | 9.11 | 82804 | 14.86 | 16.39 | 5.4 | 0.18 | 376.22 | 32.28 |
| Nigeria | 2014 | 2 | 659.48 | 20.93 | 7117.48 | 11.02 | 30846.96 | 15.41 | 15.16 | 5.66 | 0.2 | 64.73 | 31.77 |
| Nigeria | 2014 | 3 | 734.04 | 20.84 | 8026.68 | 12.45 | 5530.81 | 15.82 | 14.39 | 5.86 | 0.21 | 131.12 | 30.64 |
| Nigeria | 2014 | 4 | 779.1 | 20.98 | 8486.82 | 13.39 | 6855.55 | 16.08 | 14.1 | 6 | 0.21 | 211.34 | 28.87 |
| Nigeria | 2015 | 1 | 721.83 | 21.92 | 7376.04 | 12.46 | 88297.98 | 15.71 | 15.37 | 6.02 | 0.2 | 117.21 | 23.52 |

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|---------|------|---|--------|-------|---------|-------|----------|-------|-------|------|------|---------|-------|
| Nigeria | 2015 | 2 | 736.99 | 22.3 | 7386.79 | 12.98 | 121513.8 | 15.89 | 15.58 | 6.07 | 0.2 | 151 | 21.69 |
| Nigeria | 2015 | 3 | 751.77 | 22.69 | 7397.23 | 13.57 | 159979.7 | 16.12 | 15.81 | 6.1 | 0.2 | 183.15 | 20.41 |
| Nigeria | 2015 | 4 | 766.17 | 23.08 | 7407.34 | 14.22 | 203695.8 | 16.4 | 16.08 | 6.09 | 0.2 | 213.68 | 19.7 |
| Nigeria | 2016 | 1 | 808.34 | 23.47 | 7422.52 | 15.56 | 280279.3 | 16.57 | 16.38 | 5.92 | 0.18 | 232.78 | 19.97 |
| Nigeria | 2016 | 2 | 810.71 | 23.88 | 7429.84 | 16.1 | 323448.8 | 17.03 | 16.69 | 5.92 | 0.18 | 263.97 | 20.21 |
| Nigeria | 2016 | 3 | 801.42 | 24.31 | 7434.69 | 16.46 | 360821.6 | 17.62 | 17.04 | 5.94 | 0.18 | 297.46 | 20.84 |
| Nigeria | 2016 | 4 | 780.48 | 24.74 | 7437.07 | 16.64 | 392397.6 | 18.33 | 17.41 | 5.98 | 0.18 | 333.23 | 21.86 |
| Nigeria | 2017 | 1 | 719.29 | 25.23 | 7429.99 | 16.12 | 370649.5 | 20.07 | 18.17 | 6.15 | 0.18 | 397.91 | 24.08 |
| Nigeria | 2017 | 2 | 686.49 | 25.68 | 7430.21 | 16.16 | 409642.9 | 20.67 | 18.45 | 6.21 | 0.18 | 427.62 | 25.55 |
| Nigeria | 2017 | 3 | 653.49 | 26.13 | 7430.75 | 16.23 | 461850.5 | 21.03 | 18.61 | 6.25 | 0.18 | 448.97 | 27.09 |
| Nigeria | 2017 | 4 | 620.28 | 26.58 | 7431.61 | 16.33 | 527272.3 | 21.16 | 18.65 | 6.28 | 0.18 | 461.97 | 28.69 |
| Nigeria | 2018 | 1 | 573.37 | 26.99 | 7432.93 | 16.69 | 633952.2 | 20.36 | 18.3 | 6.28 | 0.19 | 449.44 | 31.4 |
| Nigeria | 2018 | 2 | 545.13 | 27.46 | 7434.37 | 16.76 | 714584.7 | 20.29 | 18.2 | 6.29 | 0.19 | 452.6 | 32.71 |
| Nigeria | 2018 | 3 | 522.08 | 27.93 | 7436.08 | 16.78 | 797213.7 | 20.25 | 18.09 | 6.28 | 0.19 | 454.27 | 33.67 |
| Nigeria | 2018 | 4 | 504.21 | 28.42 | 7438.06 | 16.73 | 881839.3 | 20.25 | 17.97 | 6.27 | 0.19 | 454.45 | 34.27 |
| Nigeria | 2019 | 1 | 489.38 | 28.92 | 7441.97 | 16.33 | 891519 | 20.27 | 17.42 | 6.27 | 0.19 | 384.03 | 34.14 |
| Nigeria | 2019 | 2 | 482.74 | 29.43 | 7443.8 | 16.29 | 1010915 | 20.35 | 17.44 | 6.22 | 0.2 | 408.89 | 34.19 |
| Nigeria | 2019 | 3 | 482.15 | 29.96 | 7445.23 | 16.31 | 1163084 | 20.47 | 17.61 | 6.16 | 0.2 | 459.91 | 34.05 |
| Nigeria | 2019 | 4 | 487.6 | 30.49 | 7446.24 | 16.4 | 1348027 | 20.63 | 17.93 | 6.07 | 0.21 | 537.1 | 33.7 |
| Nigeria | 2020 | 1 | 513.27 | 30.86 | 7446.35 | 16.76 | 1400334 | 21.04 | 19.03 | 5.93 | 0.22 | 469.09 | 31.7 |
| Nigeria | 2020 | 2 | 525.14 | 31.49 | 7446.76 | 16.89 | 1716988 | 21.2 | 19.4 | 5.83 | 0.22 | 667.14 | 31.54 |
| Nigeria | 2020 | 3 | 537.4 | 32.22 | 7446.96 | 16.99 | 2132578 | 21.31 | 19.69 | 5.72 | 0.22 | 959.9 | 31.77 |
| Nigeria | 2020 | 4 | 550.03 | 33.03 | 7446.96 | 17.08 | 2647104 | 21.37 | 19.88 | 5.61 | 0.22 | 1347.35 | 32.38 |
| Nigeria | 2021 | 1 | 582.25 | 34.37 | 7447.99 | 17.3 | 2239467 | 20.74 | 19.21 | 5.53 | 0.22 | 1771.72 | 34.93 |
| Nigeria | 2021 | 2 | 587.96 | 35.18 | 7447.09 | 17.28 | 3360308 | 20.98 | 19.52 | 5.4 | 0.22 | 2371.69 | 35.69 |
| Nigeria | 2021 | 3 | 586.36 | 35.91 | 7445.48 | 17.18 | 4988527 | 21.44 | 20.03 | 5.26 | 0.22 | 3089.49 | 36.21 |
| Nigeria | 2021 | 4 | 577.45 | 36.54 | 7443.16 | 17 | 7124123 | 22.12 | 20.76 | 5.09 | 0.22 | 3925.1 | 36.5 |
| Nigeria | 2022 | 1 | 533.19 | 36.98 | 7432.53 | 16.38 | 12624898 | 24.05 | 22.64 | 4.73 | 0.23 | 5234.2 | 35.99 |
| Nigeria | 2022 | 2 | 520.89 | 37.49 | 7431.87 | 16.18 | 14632128 | 24.75 | 23.42 | 4.6 | 0.23 | 6163.18 | 36.03 |

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|---------|------|---|--------|-------|---------|-------|----------|-------|-------|------|------|----------|-------|
| Nigeria | 2022 | 3 | 512.5 | 37.95 | 7433.55 | 16.05 | 16003615 | 25.24 | 24.03 | 4.53 | 0.23 | 7067.71 | 36.05 |
| Nigeria | 2022 | 4 | 508.03 | 38.37 | 7437.57 | 15.99 | 16739358 | 25.52 | 24.47 | 4.5 | 0.23 | 7947.79 | 36.05 |
| Nigeria | 2023 | 1 | 570.03 | 43.34 | 8566.5 | 17.94 | 17693468 | 25.4 | 24.39 | 4.68 | 0.23 | 10284.35 | 35.29 |
| Nigeria | 2023 | 2 | 548.37 | 41.83 | 8126.19 | 17.22 | 16816081 | 25.37 | 24.64 | 4.71 | 0.23 | 10523.16 | 35.56 |
| Nigeria | 2023 | 3 | 505.61 | 38.45 | 7239.22 | 15.79 | 14961307 | 25.23 | 24.88 | 4.73 | 0.23 | 10145.15 | 36.13 |
| Nigeria | 2023 | 4 | 441.74 | 33.18 | 5905.57 | 13.65 | 12129146 | 24.97 | 25.09 | 4.76 | 0.23 | 9150.31 | 36.98 |
| Rwanda | 2014 | 1 | 250.96 | 16.56 | 1900.44 | 7.13 | 3468823 | 23.74 | 25.15 | 4.79 | | 4148.89 | 39.21 |
| Rwanda | 2014 | 2 | 187.2 | 11.32 | 563.37 | 5.02 | 622198.1 | 23.59 | 25.37 | 4.8 | | 3276.33 | 40.2 |
| Rwanda | 2014 | 3 | 144.66 | 7.98 | 330.46 | 3.65 | 761504.7 | 23.66 | 25.62 | 4.79 | | 3142.86 | 41.03 |
| Rwanda | 2014 | 4 | 123.33 | 6.55 | 781.04 | 3.04 | 824284.8 | 23.96 | 25.89 | 4.78 | | 3748.48 | 41.72 |
| Rwanda | 2015 | 1 | 175.41 | 11.76 | 324.78 | 5.06 | 237081.7 | 25.3 | 26.17 | 4.71 | | 6687.26 | 42.03 |
| Rwanda | 2015 | 2 | 175.64 | 12.24 | 315.44 | 5.19 | 291257.2 | 25.72 | 26.51 | 4.7 | | 8133.44 | 42.51 |
| Rwanda | 2015 | 3 | 176.22 | 12.74 | 304.09 | 5.3 | 357465.8 | 26.03 | 26.89 | 4.69 | | 9681.09 | 42.93 |
| Rwanda | 2015 | 4 | 177.15 | 13.26 | 290.73 | 5.41 | 435707.4 | 26.23 | 27.3 | 4.7 | | 11330.2 | 43.29 |
| Rwanda | 2016 | 1 | 179.72 | 13.73 | 267.68 | 5.54 | 549670.6 | 26.16 | 27.95 | 4.69 | | 13021.71 | 43.43 |
| Rwanda | 2016 | 2 | 180.81 | 14.29 | 253.36 | 5.61 | 642502.9 | 26.22 | 28.36 | 4.73 | | 14897.38 | 43.74 |
| Rwanda | 2016 | 3 | 181.73 | 14.88 | 240.1 | 5.66 | 737892.7 | 26.24 | 28.72 | 4.78 | | 16898.15 | 44.05 |
| Rwanda | 2016 | 4 | 182.47 | 15.5 | 227.9 | 5.68 | 835840.2 | 26.22 | 29.04 | 4.84 | | 19024 | 44.37 |
| Rwanda | 2017 | 1 | 183.15 | 16.32 | 206.61 | 5.61 | 1013842 | 25.74 | 29.47 | 5.02 | | 22279.85 | 44.25 |
| Rwanda | 2017 | 2 | 183.5 | 16.93 | 200.58 | 5.62 | 1085906 | 25.81 | 29.64 | 5.09 | | 24253.93 | 44.76 |
| Rwanda | 2017 | 3 | 183.63 | 17.51 | 199.65 | 5.63 | 1129529 | 26 | 29.72 | 5.13 | | 25951.14 | 45.46 |
| Rwanda | 2017 | 4 | 183.54 | 18.04 | 203.84 | 5.66 | 1144711 | 26.32 | 29.69 | 5.16 | | 27371.48 | 46.34 |
| Rwanda | 2018 | 1 | 181.39 | 18.42 | 231.86 | 5.73 | 998275.6 | 27.07 | 29.2 | 5.03 | | 27676.77 | 47.89 |
| Rwanda | 2018 | 2 | 181.59 | 18.93 | 238.77 | 5.74 | 1009845 | 27.52 | 29.11 | 5.08 | | 28878.64 | 48.95 |
| Rwanda | 2018 | 3 | 182.3 | 19.46 | 243.31 | 5.75 | 1046244 | 27.98 | 29.07 | 5.16 | | 30138.92 | 50.01 |
| Rwanda | 2018 | 4 | 183.52 | 19.99 | 245.46 | 5.74 | 1107471 | 28.44 | 29.07 | 5.28 | | 31457.59 | 51.07 |
| Rwanda | 2019 | 1 | 187.14 | 20.54 | 214.17 | 5.75 | 1243096 | 29.23 | 28.88 | 5.65 | | 32970.53 | 52.43 |
| Rwanda | 2019 | 2 | 188.63 | 21.11 | 224 | 5.71 | 1334155 | 29.57 | 29.06 | 5.76 | | 34351.66 | 53.35 |

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|---------|------|---|--------|-------|--------|------|----------|-------|-------|------|------|----------|-------|
| Rwanda | 2019 | 3 | 189.88 | 21.68 | 243.87 | 5.64 | 1430215 | 29.79 | 29.38 | 5.81 | | 35736.83 | 54.14 |
| Rwanda | 2019 | 4 | 190.9 | 22.27 | 273.8 | 5.54 | 1531278 | 29.89 | 29.83 | 5.82 | | 37126.06 | 54.8 |
| Rwanda | 2020 | 1 | 190.11 | 23.18 | 357.08 | 5.32 | 1631630 | 29.52 | 31.06 | 5.61 | | 37964.08 | 54.98 |
| Rwanda | 2020 | 2 | 191.27 | 23.67 | 389.79 | 5.22 | 1744981 | 29.5 | 31.53 | 5.59 | | 39583.52 | 55.51 |
| Rwanda | 2020 | 3 | 192.82 | 24.04 | 415.22 | 5.14 | 1865619 | 29.5 | 31.89 | 5.59 | | 41429.11 | 56.05 |
| Rwanda | 2020 | 4 | 194.76 | 24.31 | 433.38 | 5.08 | 1993543 | 29.51 | 32.12 | 5.61 | | 43500.85 | 56.59 |
| Rwanda | 2021 | 1 | 200.76 | 23.21 | 420.5 | 5.19 | 1477286 | 29.66 | 31.67 | 5.81 | | 41605.34 | 57.93 |
| Rwanda | 2021 | 2 | 202 | 23.74 | 433.63 | 5.12 | 1880371 | 29.65 | 31.88 | 5.81 | | 45806.76 | 58.17 |
| Rwanda | 2021 | 3 | 202.15 | 24.67 | 448.99 | 5 | 2551331 | 29.6 | 32.21 | 5.76 | | 51911.7 | 58.1 |
| Rwanda | 2021 | 4 | 201.22 | 25.98 | 466.59 | 4.85 | 3490165 | 29.52 | 32.64 | 5.67 | | 59920.16 | 57.71 |
| Rwanda | 2022 | 1 | 193.37 | 29.24 | 488.92 | 4.44 | 5617097 | 29.29 | 33.67 | 5.26 | | 77041.02 | 55.94 |
| Rwanda | 2022 | 2 | 192.6 | 30.71 | 510 | 4.29 | 6723590 | 29.18 | 34.12 | 5.19 | | 85972.97 | 55.36 |
| Rwanda | 2022 | 3 | 193.07 | 31.93 | 532.32 | 4.18 | 7729866 | 29.09 | 34.47 | 5.19 | | 93924.9 | 54.9 |
| Rwanda | 2022 | 4 | 194.79 | 32.92 | 555.88 | 4.12 | 8635927 | 29 | 34.73 | 5.25 | | 100896.8 | 54.56 |
| Rwanda | 2023 | 1 | 182.66 | 36.12 | 616.55 | 4.07 | 11291089 | 30.33 | 36.67 | 5.39 | | 125637 | 53.84 |
| Rwanda | 2023 | 2 | 192.9 | 35.65 | 628.25 | 4.11 | 11256991 | 29.71 | 36.04 | 5.58 | | 123149.5 | 53.93 |
| Rwanda | 2023 | 3 | 210.43 | 33.97 | 626.84 | 4.2 | 10382951 | 28.54 | 34.62 | 5.84 | | 112182.7 | 54.34 |
| Rwanda | 2023 | 4 | 235.24 | 31.06 | 612.33 | 4.34 | 8668969 | 26.82 | 32.39 | 6.15 | | 92736.47 | 55.06 |
| Senegal | 2014 | 1 | 303.38 | 20.68 | 534.2 | 4.78 | 2418210 | 21.44 | 25.25 | 6.94 | 0.53 | 26266.58 | 57.58 |
| Senegal | 2014 | 2 | 328.34 | 17.84 | 513.68 | 4.94 | 503076.3 | 19.86 | 23.07 | 7.21 | 0.56 | 5279.43 | 58.34 |
| Senegal | 2014 | 3 | 346.16 | 16.28 | 500.26 | 5.06 | 773265.7 | 18.97 | 21.74 | 7.36 | 0.58 | 8769.32 | 58.82 |
| Senegal | 2014 | 4 | 356.85 | 16 | 493.94 | 5.14 | 1410816 | 18.77 | 21.25 | 7.41 | 0.6 | 15879.69 | 59.02 |
| Senegal | 2015 | 1 | 343.78 | 20.2 | 506.2 | 5.08 | 183790.1 | 21.4 | 24.16 | 7.05 | 0.62 | 994.82 | 58.81 |
| Senegal | 2015 | 2 | 346.84 | 21.2 | 509.49 | 5.13 | 186475.9 | 21.72 | 24.34 | 7 | 0.63 | 942.65 | 58.5 |
| Senegal | 2015 | 3 | 349.41 | 22.2 | 515.3 | 5.18 | 190606.8 | 21.87 | 24.35 | 6.97 | 0.64 | 1010.27 | 57.95 |
| Senegal | 2015 | 4 | 351.5 | 23.2 | 523.62 | 5.24 | 196182.7 | 21.85 | 24.19 | 6.94 | 0.64 | 1197.7 | 57.18 |
| Senegal | 2016 | 1 | 359.87 | 24.22 | 540.39 | 5.36 | 209470.7 | 21.3 | 23.09 | 6.76 | 0.62 | 1813.27 | 54.42 |
| Senegal | 2016 | 2 | 358.27 | 25.21 | 551.35 | 5.41 | 215430 | 21.08 | 22.88 | 6.82 | 0.62 | 2116.96 | 53.9 |

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|---------|------|---|--------|-------|--------|------|----------|-------|-------|------|------|----------|-------|
| Senegal | 2016 | 3 | 353.47 | 26.2 | 562.45 | 5.43 | 220327.7 | 20.83 | 22.79 | 6.95 | 0.62 | 2417.12 | 53.85 |
| Senegal | 2016 | 4 | 345.48 | 27.18 | 573.69 | 5.44 | 224163.6 | 20.55 | 22.84 | 7.15 | 0.62 | 2713.74 | 54.27 |
| Senegal | 2017 | 1 | 317.26 | 27.86 | 582.85 | 5.34 | 172470.3 | 19.83 | 22.83 | 7.9 | 0.63 | 2380.77 | 56.29 |
| Senegal | 2017 | 2 | 309.7 | 28.94 | 595.24 | 5.35 | 195969.9 | 19.65 | 23.21 | 8.06 | 0.63 | 2920.75 | 57.22 |
| Senegal | 2017 | 3 | 305.75 | 30.14 | 608.64 | 5.39 | 240194.8 | 19.61 | 23.79 | 8.11 | 0.63 | 3707.61 | 58.18 |
| Senegal | 2017 | 4 | 305.42 | 31.46 | 623.07 | 5.44 | 305145 | 19.71 | 24.57 | 8.05 | 0.63 | 4741.36 | 59.17 |
| Senegal | 2018 | 1 | 316.12 | 32.79 | 663.38 | 5.6 | 388297.3 | 20.47 | 26.7 | 7.61 | 0.62 | 6091.84 | 60.51 |
| Senegal | 2018 | 2 | 320.06 | 34.36 | 669.89 | 5.66 | 495707.4 | 20.62 | 27.42 | 7.42 | 0.62 | 7591.43 | 61.43 |
| Senegal | 2018 | 3 | 324.66 | 36.09 | 667.46 | 5.71 | 624852 | 20.7 | 27.88 | 7.23 | 0.62 | 9309.96 | 62.25 |
| Senegal | 2018 | 4 | 329.91 | 37.96 | 656.11 | 5.74 | 775731.2 | 20.69 | 28.08 | 7.03 | 0.62 | 11247.44 | 62.96 |
| Senegal | 2019 | 1 | 337.27 | 40.08 | 583.13 | 5.67 | 882860 | 20.19 | 27.12 | 6.6 | 0.63 | 12813.2 | 64.36 |
| Senegal | 2019 | 2 | 343.24 | 42.22 | 574.99 | 5.72 | 1103402 | 20.19 | 27.15 | 6.47 | 0.64 | 15424.85 | 64.56 |
| Senegal | 2019 | 3 | 349.29 | 44.47 | 579 | 5.78 | 1371873 | 20.27 | 27.29 | 6.43 | 0.64 | 18491.71 | 64.34 |
| Senegal | 2019 | 4 | 355.41 | 46.83 | 595.16 | 5.87 | 1688273 | 20.43 | 27.52 | 6.47 | 0.65 | 22013.8 | 63.71 |
| Senegal | 2020 | 1 | 366.48 | 50.51 | 662.21 | 6.14 | 2097125 | 21.18 | 28.62 | 6.93 | 0.67 | 27479.92 | 59.51 |
| Senegal | 2020 | 2 | 370.79 | 52.62 | 687.16 | 6.22 | 2491572 | 21.3 | 28.75 | 6.99 | 0.68 | 31316.92 | 59.31 |
| Senegal | 2020 | 3 | 373.21 | 54.35 | 708.75 | 6.25 | 2916137 | 21.31 | 28.67 | 7 | 0.68 | 35013.62 | 59.95 |
| Senegal | 2020 | 4 | 373.75 | 55.72 | 726.99 | 6.23 | 3370821 | 21.21 | 28.39 | 6.96 | 0.69 | 38570.01 | 61.44 |
| Senegal | 2021 | 1 | 365.68 | 56.13 | 735.06 | 5.94 | 3527382 | 20.54 | 26.59 | 6.64 | 0.69 | 41776.77 | 65.68 |
| Senegal | 2021 | 2 | 365.14 | 57 | 749.31 | 5.94 | 4173600 | 20.37 | 26.42 | 6.58 | 0.69 | 45136.28 | 68.09 |
| Senegal | 2021 | 3 | 365.4 | 57.73 | 762.94 | 6 | 4981233 | 20.27 | 26.56 | 6.55 | 0.69 | 48439.21 | 70.59 |
| Senegal | 2021 | 4 | 366.46 | 58.34 | 775.93 | 6.11 | 5950281 | 20.22 | 27.02 | 6.56 | 0.69 | 51685.57 | 73.17 |
| Senegal | 2022 | 1 | 365.98 | 58.57 | 797.2 | 6.5 | 6906444 | 20.45 | 29.34 | 6.71 | 0.7 | 50310.04 | 79.11 |
| Senegal | 2022 | 2 | 369.58 | 59.01 | 805.37 | 6.63 | 8268043 | 20.43 | 29.82 | 6.74 | 0.7 | 55269.36 | 80.54 |
| Senegal | 2022 | 3 | 374.92 | 59.42 | 809.34 | 6.74 | 9860778 | 20.38 | 29.99 | 6.77 | 0.7 | 61998.23 | 80.75 |
| Senegal | 2022 | 4 | 382 | 59.8 | 809.13 | 6.81 | 11684648 | 20.3 | 29.85 | 6.78 | 0.7 | 70496.64 | 79.72 |
| Senegal | 2023 | 1 | 217.64 | 61.75 | 590.59 | 2.16 | 18320620 | 19.3 | 25.46 | 0.24 | 0.76 | 107310.2 | 49.35 |
| Senegal | 2023 | 2 | 156.3 | 61.43 | 667.64 | 2.65 | 18774374 | 19.51 | 26.31 | 2.84 | 0.73 | 108729.5 | 57.11 |
| Senegal | 2023 | 3 | 495.36 | 60.44 | 826.14 | 8.24 | 17626877 | 20.05 | 28.43 | 8.05 | 0.69 | 101300 | 74.88 |

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|------------|------|---|---------|-------|---------|-------|----------|-------|-------|-------|------|----------|--------|
| Senegal | 2023 | 4 | 999.55 | 58.78 | 1066.1 | 16.6 | 14878129 | 20.9 | 31.84 | 15.87 | 0.62 | 85021.94 | 102.66 |
| Seychelles | 2014 | 1 | 2406.73 | 52.87 | 1804.04 | 39.5 | 3806250 | 23.78 | 41.6 | 39.21 | 0.41 | 22070.29 | 193.12 |
| Seychelles | 2014 | 2 | 2946.02 | 51.31 | 2040.3 | 48.7 | 543750.6 | 24.61 | 45.54 | 47.06 | 0.35 | 3224.76 | 219.86 |
| Seychelles | 2014 | 3 | 3355.27 | 50.52 | 2191.41 | 55.96 | 631249.3 | 25.08 | 48.74 | 52.35 | 0.31 | 9339.5 | 235.55 |
| Seychelles | 2014 | 4 | 3634.49 | 50.5 | 2257.37 | 61.28 | 7138749 | 25.21 | 51.2 | 55.06 | 0.29 | 5622.51 | 240.19 |
| Seychelles | 2015 | 1 | 3533.95 | 53.3 | 1998.06 | 61.63 | 1.12 | 23.35 | 50.49 | 48.1 | 0.37 | 70.6 | 199.5 |
| Seychelles | 2015 | 2 | 3653.01 | 54 | 1989.76 | 64.28 | 1.28 | 23.42 | 52.41 | 48.53 | 0.37 | 72.17 | 195.74 |
| Seychelles | 2015 | 3 | 3741.94 | 54.65 | 1992.35 | 66.22 | 1.43 | 23.78 | 54.56 | 49.23 | 0.37 | 77.05 | 194.64 |
| Seychelles | 2015 | 4 | 3800.73 | 55.25 | 2005.84 | 67.43 | 1.57 | 24.45 | 56.94 | 50.21 | 0.36 | 85.26 | 196.19 |
| Seychelles | 2016 | 1 | 3783.44 | 55.07 | 2076.44 | 66.4 | 1.57 | 26.65 | 62.12 | 52.89 | 0.32 | 104.69 | 213.71 |
| Seychelles | 2016 | 2 | 3800.34 | 55.86 | 2093.23 | 66.77 | 1.73 | 27.42 | 63.9 | 53.85 | 0.32 | 116.36 | 215.25 |
| Seychelles | 2016 | 3 | 3805.5 | 56.9 | 2102.41 | 67.03 | 1.92 | 27.99 | 64.86 | 54.52 | 0.32 | 128.19 | 214.12 |
| Seychelles | 2016 | 4 | 3798.89 | 58.18 | 2104 | 67.16 | 2.15 | 28.37 | 65 | 54.89 | 0.33 | 140.16 | 210.32 |
| Seychelles | 2017 | 1 | 3719.55 | 60.23 | 2068.6 | 65.94 | 0.62 | 27.76 | 61.07 | 54.39 | 0.36 | 63.39 | 194.17 |
| Seychelles | 2017 | 2 | 3713.84 | 61.79 | 2066.75 | 66.34 | 1.64 | 28.07 | 60.89 | 54.41 | 0.38 | 111.23 | 188.91 |
| Seychelles | 2017 | 3 | 3720.77 | 63.38 | 2069.07 | 67.11 | 3.41 | 28.49 | 61.2 | 54.37 | 0.39 | 194.77 | 184.85 |
| Seychelles | 2017 | 4 | 3740.33 | 65 | 2075.54 | 68.25 | 5.93 | 29.04 | 62 | 54.27 | 0.39 | 314.01 | 181.99 |
| Seychelles | 2018 | 1 | 3802.73 | 66.6 | 2090.31 | 70.5 | 12.2 | 30.09 | 64.66 | 53.94 | 0.39 | 605.12 | 179.73 |
| Seychelles | 2018 | 2 | 3835.5 | 68.3 | 2103.44 | 72.11 | 15.03 | 30.73 | 65.9 | 53.79 | 0.4 | 741.32 | 179.52 |
| Seychelles | 2018 | 3 | 3868.84 | 70.05 | 2119.08 | 73.8 | 17.42 | 31.34 | 67.09 | 53.64 | 0.4 | 858.77 | 180.77 |
| Seychelles | 2018 | 4 | 3902.74 | 71.85 | 2137.21 | 75.58 | 19.36 | 31.92 | 68.23 | 53.5 | 0.41 | 957.47 | 183.46 |
| Seychelles | 2019 | 1 | 3942.64 | 73.7 | 2170.49 | 78.28 | 22.56 | 31.93 | 69.37 | 53.57 | 0.41 | 1110.67 | 195.65 |
| Seychelles | 2019 | 2 | 3975.5 | 75.6 | 2188.56 | 79.89 | 22.94 | 32.68 | 70.38 | 53.36 | 0.42 | 1142.57 | 198.02 |
| Seychelles | 2019 | 3 | 4006.74 | 77.55 | 2204.08 | 81.26 | 22.19 | 33.61 | 71.33 | 53.07 | 0.42 | 1126.41 | 198.63 |
| Seychelles | 2019 | 4 | 4036.36 | 79.55 | 2217.03 | 82.37 | 20.31 | 34.74 | 72.2 | 52.71 | 0.43 | 1062.19 | 197.46 |
| Seychelles | 2020 | 1 | 4060.6 | 82.62 | 2116.63 | 82.2 | 10.13 | 36.49 | 72.06 | 51.24 | 0.43 | 658.59 | 190.2 |
| Seychelles | 2020 | 2 | 4088.51 | 84.31 | 2168.79 | 83.23 | 8.88 | 37.82 | 73.17 | 51.14 | 0.44 | 614.8 | 187.23 |
| Seychelles | 2020 | 3 | 4116.32 | 85.65 | 2262.71 | 84.42 | 9.38 | 39.16 | 74.58 | 51.38 | 0.44 | 639.48 | 184.23 |
| Seychelles | 2020 | 4 | 4144.03 | 86.63 | 2398.39 | 85.78 | 11.63 | 40.52 | 76.31 | 51.95 | 0.45 | 732.64 | 181.19 |

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|--------------|------|---|---------|-------|---------|-------|---------|-------|--------|-------|------|---------|--------|
| Seychelles | 2021 | 1 | 4377.34 | 86.8 | 2824.76 | 88.77 | 19.22 | 41.41 | 74.71 | 55.59 | 0.46 | 1045.8 | 179.21 |
| Seychelles | 2021 | 2 | 4322.56 | 87.25 | 2944.4 | 89.87 | 23.53 | 42.99 | 78.49 | 55.75 | 0.46 | 1215.31 | 175.66 |
| Seychelles | 2021 | 3 | 4185.39 | 87.53 | 3006.23 | 90.54 | 28.16 | 44.79 | 84.03 | 55.15 | 0.46 | 1392.68 | 171.63 |
| Seychelles | 2021 | 4 | 3965.83 | 87.63 | 3010.25 | 90.78 | 33.09 | 46.8 | 91.33 | 53.79 | 0.46 | 1577.93 | 167.13 |
| Seychelles | 2022 | 1 | 3232.37 | 87 | 2730.52 | 88.91 | 43.19 | 52.08 | 111.36 | 48.13 | 0.45 | 1425.73 | 153.11 |
| Seychelles | 2022 | 2 | 3020.65 | 86.97 | 2709.3 | 88.98 | 46.81 | 53.29 | 117.79 | 46.68 | 0.45 | 1764.84 | 151.26 |
| Seychelles | 2022 | 3 | 2899.14 | 86.98 | 2720.66 | 89.29 | 48.81 | 53.5 | 121.58 | 45.91 | 0.45 | 2249.94 | 152.56 |
| Seychelles | 2022 | 4 | 2867.86 | 87.04 | 2764.59 | 89.86 | 49.19 | 52.7 | 122.75 | 45.8 | 0.45 | 2881.04 | 156.99 |
| Seychelles | 2023 | 1 | 3376.27 | 93.31 | 3240.49 | 97.35 | 62.27 | 49.61 | 125.6 | 55.32 | 0.14 | 5294.95 | 196.56 |
| Seychelles | 2023 | 2 | 3345.64 | 90.99 | 3189.81 | 95.75 | 81.06 | 47.3 | 119.78 | 52.96 | 0.27 | 5563.31 | 194.47 |
| Seychelles | 2023 | 3 | 3225.45 | 86.24 | 3011.94 | 91.73 | 82.61 | 44.5 | 109.6 | 47.69 | 0.52 | 5322.93 | 182.73 |
| Seychelles | 2023 | 4 | 3015.69 | 79.06 | 2706.89 | 85.29 | 328.74 | 41.19 | 95.07 | 39.51 | 0.9 | 4573.81 | 161.32 |
| South Africa | 2014 | 1 | 2334 | 56.95 | 1650.96 | 64.69 | 1029.24 | 33.46 | 53.47 | 14.17 | 2.02 | 1252.73 | 87.12 |
| South Africa | 2014 | 2 | 2098.05 | 49.93 | 1341.02 | 58.11 | 1291.52 | 30.73 | 39.31 | 5.86 | 2.4 | 311.44 | 63.64 |
| South Africa | 2014 | 3 | 1925.5 | 45.49 | 1153.37 | 53.8 | 1487.5 | 29.06 | 29.88 | 0.32 | 2.66 | 313.28 | 47.76 |
| South Africa | 2014 | 4 | 1816.32 | 43.63 | 1088.01 | 51.76 | 1617.18 | 28.47 | 25.18 | 2.43 | 2.8 | 621.45 | 39.48 |
| South Africa | 2015 | 1 | 1918.97 | 50.94 | 1474.75 | 56.67 | 1502.5 | 31.69 | 36.37 | 4.51 | 2.54 | 188.55 | 57.47 |
| South Africa | 2015 | 2 | 1877.19 | 51.61 | 1522.05 | 57.31 | 1570.78 | 32.14 | 36.65 | 4.55 | 2.56 | 192.87 | 56.9 |
| South Africa | 2015 | 3 | 1839.42 | 52.24 | 1559.71 | 58.36 | 1643.98 | 32.55 | 37.19 | 4.6 | 2.57 | 193.11 | 56.44 |
| South Africa | 2015 | 4 | 1805.65 | 52.81 | 1587.74 | 59.82 | 1722.1 | 32.94 | 37.98 | 4.67 | 2.57 | 189.27 | 56.11 |
| South Africa | 2016 | 1 | 1797.02 | 53.2 | 1602.13 | 63.35 | 1852.44 | 33.1 | 40.11 | 4.78 | 2.56 | 158.96 | 56.41 |
| South Africa | 2016 | 2 | 1762.82 | 53.73 | 1612.49 | 64.96 | 1921.46 | 33.5 | 40.99 | 4.86 | 2.56 | 155.92 | 56.1 |
| South Africa | 2016 | 3 | 1724.19 | 54.27 | 1614.82 | 66.3 | 1976.48 | 33.94 | 41.7 | 4.95 | 2.56 | 157.75 | 55.71 |
| South Africa | 2016 | 4 | 1681.11 | 54.81 | 1609.12 | 67.39 | 2017.5 | 34.42 | 42.24 | 5.04 | 2.56 | 164.45 | 55.22 |
| South Africa | 2017 | 1 | 1611.16 | 54.75 | 1547.69 | 68.04 | 2154.65 | 36.2 | 43.98 | 5.15 | 2.61 | 213.56 | 53.9 |
| South Africa | 2017 | 2 | 1568.18 | 55.55 | 1545 | 68.67 | 2123.59 | 36.26 | 43.63 | 5.24 | 2.59 | 215 | 53.52 |
| South Africa | 2017 | 3 | 1529.74 | 56.6 | 1553.37 | 69.1 | 2034.47 | 35.86 | 42.57 | 5.34 | 2.55 | 206.31 | 53.35 |
| South Africa | 2017 | 4 | 1495.84 | 57.9 | 1572.78 | 69.34 | 1887.29 | 35 | 40.79 | 5.43 | 2.49 | 187.49 | 53.39 |
| South Africa | 2018 | 1 | 1420.42 | 59.9 | 1646.45 | 69.11 | 1280.31 | 31.86 | 34.77 | 5.59 | 2.2 | 96.98 | 54.37 |

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|--------------|------|---|---------|-------|---------|-------|----------|-------|-------|------|------|---------|-------|
| South Africa | 2018 | 2 | 1414.01 | 61.52 | 1670.69 | 69.07 | 1177.69 | 30.81 | 32.97 | 5.66 | 2.18 | 82.5 | 54.52 |
| South Africa | 2018 | 3 | 1430.56 | 63.21 | 1688.69 | 68.94 | 1177.69 | 30.02 | 31.86 | 5.69 | 2.22 | 82.5 | 54.56 |
| South Africa | 2018 | 4 | 1470.07 | 64.97 | 1700.46 | 68.72 | 1280.31 | 29.5 | 31.44 | 5.7 | 2.33 | 96.98 | 54.51 |
| South Africa | 2019 | 1 | 1616.7 | 67.73 | 1734.19 | 68.13 | 1998.69 | 30.08 | 33.5 | 5.67 | 2.75 | 198.35 | 54.52 |
| South Africa | 2019 | 2 | 1668.45 | 69.25 | 1722.22 | 67.85 | 2101.31 | 29.76 | 33.74 | 5.63 | 2.88 | 212.83 | 54.21 |
| South Africa | 2019 | 3 | 1709.5 | 70.46 | 1692.73 | 67.6 | 2101.31 | 29.37 | 33.96 | 5.57 | 2.98 | 212.83 | 53.75 |
| South Africa | 2019 | 4 | 1739.83 | 71.37 | 1645.74 | 67.37 | 1998.69 | 28.91 | 34.16 | 5.49 | 3.03 | 198.35 | 53.12 |
| South Africa | 2020 | 1 | 1759.01 | 71.12 | 1477.86 | 67.36 | 1408.59 | 27.99 | 34.46 | 5.24 | 2.95 | 115.08 | 50.62 |
| South Africa | 2020 | 2 | 1768.11 | 71.75 | 1437.19 | 67.11 | 1254.66 | 27.55 | 34.55 | 5.18 | 2.97 | 93.36 | 50.36 |
| South Africa | 2020 | 3 | 1766.68 | 72.42 | 1420.37 | 66.8 | 1152.03 | 27.19 | 34.57 | 5.16 | 2.98 | 78.88 | 50.63 |
| South Africa | 2020 | 4 | 1754.72 | 73.11 | 1427.38 | 66.45 | 1100.72 | 26.91 | 34.51 | 5.18 | 2.98 | 71.64 | 51.42 |
| South Africa | 2021 | 1 | 1728.86 | 74.29 | 1521.82 | 66.71 | 1417.28 | 26.84 | 33.49 | 5.37 | 2.98 | 102 | 53.51 |
| South Africa | 2021 | 2 | 1697.2 | 74.86 | 1551.07 | 65.99 | 1341.97 | 26.69 | 33.63 | 5.43 | 2.99 | 97.1 | 55.04 |
| South Africa | 2021 | 3 | 1656.36 | 75.29 | 1578.73 | 64.95 | 1191.34 | 26.57 | 34.04 | 5.48 | 2.99 | 87.29 | 56.8 |
| South Africa | 2021 | 4 | 1606.34 | 75.56 | 1604.79 | 63.59 | 965.41 | 26.5 | 34.72 | 5.52 | 3 | 72.57 | 58.77 |
| South Africa | 2022 | 1 | 1435.9 | 75.36 | 1635.65 | 62.41 | 152.74 | 26.53 | 36.52 | 5.55 | 2.99 | 67.67 | 62.8 |
| South Africa | 2022 | 2 | 1412.03 | 75.47 | 1655.96 | 60.21 | 219.26 | 26.51 | 37.42 | 5.57 | 3 | 63.95 | 64.47 |
| South Africa | 2022 | 3 | 1423.47 | 75.55 | 1672.11 | 57.49 | 262 | 26.5 | 38.25 | 5.58 | 3 | 63.12 | 65.61 |
| South Africa | 2022 | 4 | 1470.24 | 75.62 | 1684.11 | 54.25 | 24.52 | 26.5 | 39.02 | 5.58 | 3.01 | 413.54 | 66.23 |
| South Africa | 2023 | 1 | 1937.84 | 86.59 | 1925.07 | 52.99 | 2408.95 | 28.96 | 44.28 | 5.97 | 3.37 | 1526.6 | 64.35 |
| South Africa | 2023 | 2 | 1901.05 | 82.26 | 1835.51 | 47.71 | 7004.23 | 28 | 43.1 | 5.79 | 3.23 | 1867.98 | 64.72 |
| South Africa | 2023 | 3 | 1745.37 | 73.53 | 1648.55 | 40.91 | 3589.43 | 26.08 | 40.03 | 5.44 | 2.95 | 2076.98 | 65.37 |
| South Africa | 2023 | 4 | 1470.8 | 60.42 | 1364.19 | 32.58 | 19372.03 | 23.2 | 35.08 | 4.92 | 2.52 | 2153.6 | 66.28 |
| Togo | 2014 | 1 | 531.64 | 20.79 | 498.76 | 12.7 | 65303.77 | 13.81 | 18.33 | 3.34 | 1.23 | 1729.02 | 69.15 |
| Togo | 2014 | 2 | 237.6 | 7.75 | 213.07 | 5.35 | 81480.19 | 11.21 | 13.57 | 2.84 | 0.8 | 1688.42 | 69.93 |
| Togo | 2014 | 3 | 42.95 | 8.82 | 23.44 | 0.48 | 92861.48 | 9.85 | 10.88 | 2.52 | 0.52 | 1662.98 | 70.31 |
| Togo | 2014 | 4 | 52.29 | 4.93 | 70.12 | 1.89 | 99447.63 | 9.74 | 10.26 | 2.38 | 0.37 | 1652.69 | 70.28 |
| Togo | 2015 | 1 | 201.93 | 6.16 | 171.52 | 4.52 | 89250.39 | 15.42 | 18.74 | 2.91 | 0.74 | 1680.73 | 68.99 |
| Togo | 2015 | 2 | 205.46 | 6.68 | 174.44 | 4.61 | 91041.58 | 15.99 | 19.47 | 2.96 | 0.73 | 1691.48 | 68.5 |

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|------|------|---|--------|-------|--------|------|----------|-------|-------|------|------|----------|-------|
| Togo | 2015 | 3 | 208.37 | 7.38 | 177.77 | 4.69 | 92832.96 | 15.98 | 19.48 | 2.99 | 0.73 | 1708.12 | 67.96 |
| Togo | 2015 | 4 | 210.66 | 8.26 | 181.52 | 4.74 | 94624.51 | 15.41 | 18.75 | 3.02 | 0.72 | 1730.64 | 67.35 |
| Togo | 2016 | 1 | 215.42 | 10.21 | 187.48 | 4.64 | 97154.52 | 11.8 | 14.3 | 3.04 | 0.7 | 1714.5 | 67.35 |
| Togo | 2016 | 2 | 215.22 | 11.07 | 191.34 | 4.7 | 98651.11 | 11.07 | 13.31 | 3.05 | 0.69 | 1766.62 | 66.36 |
| Togo | 2016 | 3 | 213.15 | 11.73 | 194.89 | 4.79 | 99852.57 | 10.76 | 12.77 | 3.06 | 0.69 | 1842.45 | 65.03 |
| Togo | 2016 | 4 | 209.22 | 12.19 | 198.14 | 4.91 | 100758.9 | 10.86 | 12.7 | 3.06 | 0.69 | 1941.99 | 63.38 |
| Togo | 2017 | 1 | 194.08 | 11.68 | 187.46 | 5.16 | 75768.43 | 12.77 | 14.45 | 3.06 | 0.72 | 1834.63 | 59.37 |
| Togo | 2017 | 2 | 190.15 | 12.08 | 195.54 | 5.31 | 86325.13 | 13.16 | 14.76 | 3.04 | 0.71 | 2073.82 | 57.87 |
| Togo | 2017 | 3 | 188.1 | 12.6 | 208.77 | 5.45 | 106827.4 | 13.4 | 14.98 | 3.02 | 0.7 | 2428.95 | 56.85 |
| Togo | 2017 | 4 | 187.91 | 13.25 | 227.15 | 5.59 | 137275.1 | 13.51 | 15.12 | 2.99 | 0.68 | 2900.04 | 56.31 |
| Togo | 2018 | 1 | 194.28 | 14.01 | 276.19 | 5.87 | 207274.2 | 13.16 | 14.91 | 2.95 | 0.59 | 3545.4 | 57.6 |
| Togo | 2018 | 2 | 195.97 | 14.92 | 294.64 | 5.94 | 245770.6 | 13.13 | 14.99 | 2.9 | 0.57 | 4225.04 | 57.48 |
| Togo | 2018 | 3 | 197.67 | 15.95 | 308.03 | 5.95 | 282370.2 | 13.08 | 15.1 | 2.86 | 0.57 | 4997.29 | 57.3 |
| Togo | 2018 | 4 | 199.36 | 17.12 | 316.34 | 5.89 | 317073 | 13.03 | 15.24 | 2.81 | 0.59 | 5862.16 | 57.06 |
| Togo | 2019 | 1 | 199.81 | 18.27 | 306.28 | 5.51 | 332282.5 | 12.86 | 15.61 | 2.73 | 0.66 | 6855.91 | 56.5 |
| Togo | 2019 | 2 | 202.01 | 19.76 | 309.79 | 5.44 | 370230.3 | 12.84 | 15.72 | 2.68 | 0.68 | 7891.5 | 56.23 |
| Togo | 2019 | 3 | 204.7 | 21.45 | 313.57 | 5.41 | 413319.9 | 12.86 | 15.78 | 2.65 | 0.7 | 9005.18 | 56.01 |
| Togo | 2019 | 4 | 207.9 | 23.33 | 317.61 | 5.43 | 461551.3 | 12.92 | 15.78 | 2.62 | 0.71 | 10196.97 | 55.82 |
| Togo | 2020 | 1 | 216.14 | 26.98 | 323.16 | 5.57 | 513820.8 | 13.18 | 15.44 | 2.6 | 0.7 | 11529.89 | 55.36 |
| Togo | 2020 | 2 | 218.52 | 28.62 | 327.23 | 5.64 | 572777.4 | 13.25 | 15.45 | 2.58 | 0.71 | 12852.67 | 55.38 |
| Togo | 2020 | 3 | 219.58 | 29.82 | 331.05 | 5.74 | 637317.3 | 13.3 | 15.53 | 2.57 | 0.71 | 14228.34 | 55.56 |
| Togo | 2020 | 4 | 219.32 | 30.58 | 334.64 | 5.85 | 707440.5 | 13.31 | 15.67 | 2.57 | 0.72 | 15656.9 | 55.9 |
| Togo | 2021 | 1 | 212.4 | 29.2 | 338.63 | 6.05 | 754105.3 | 13.04 | 15.69 | 2.6 | 0.74 | 20071.32 | 55.91 |
| Togo | 2021 | 2 | 211.64 | 29.77 | 341.48 | 6.16 | 847011.8 | 13.11 | 16.03 | 2.59 | 0.75 | 20432.47 | 56.79 |
| Togo | 2021 | 3 | 211.69 | 30.58 | 343.85 | 6.27 | 957118.3 | 13.27 | 16.5 | 2.58 | 0.75 | 19673.31 | 58.03 |
| Togo | 2021 | 4 | 212.56 | 31.64 | 345.72 | 6.36 | 1084425 | 13.5 | 17.1 | 2.55 | 0.76 | 17793.86 | 59.64 |
| Togo | 2022 | 1 | 213.87 | 34.13 | 346.21 | 6.4 | 1291282 | 14.18 | 18.73 | 2.46 | 0.77 | 5727.73 | 64.4 |
| Togo | 2022 | 2 | 216.52 | 35.2 | 347.45 | 6.48 | 1428048 | 14.43 | 19.24 | 2.44 | 0.78 | 5234.23 | 65.62 |
| Togo | 2022 | 3 | 220.14 | 36.03 | 348.56 | 6.57 | 1557074 | 14.62 | 19.53 | 2.44 | 0.78 | 7246.98 | 66.1 |

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|--------|------|---|--------|-------|--------|------|----------|--------|-------|-------|------|----------|-------|
| Togo | 2022 | 4 | 224.72 | 36.64 | 349.54 | 6.67 | 1678359 | 14.74 | 19.59 | 2.46 | 0.79 | 11765.98 | 65.84 |
| Togo | 2023 | 1 | 242.69 | 41.61 | 373.38 | 7.28 | 318967.7 | 12.63 | 13.05 | 5.75 | 0.89 | 32877.42 | 66.29 |
| Togo | 2023 | 2 | 244.24 | 39.92 | 364.88 | 7.18 | 1013947 | 4.34 | 15.22 | 2.39 | 0.86 | 36774.44 | 63.94 |
| Togo | 2023 | 3 | 241.79 | 36.15 | 347.04 | 6.89 | 2290361 | 18.21 | 19.71 | 4.28 | 0.81 | 37543.24 | 60.26 |
| Togo | 2023 | 4 | 235.33 | 30.32 | 319.86 | 6.41 | 4148209 | 39 | 26.54 | 14.27 | 0.72 | 35183.82 | 55.24 |
| Uganda | 2014 | 1 | 207.43 | 12.25 | 238.86 | 4.72 | 8487503 | 100.97 | 47.38 | 44.17 | 0.42 | 17181.81 | 41.31 |
| Uganda | 2014 | 2 | 199.94 | 6.35 | 210.79 | 4.25 | 10748215 | 121.86 | 54.18 | 54.15 | 0.33 | 13571.68 | 36.65 |
| Uganda | 2014 | 3 | 195.44 | 2.45 | 191.18 | 3.99 | 12830356 | 135.94 | 58.64 | 60.81 | 0.29 | 11839.05 | 33.68 |
| Uganda | 2014 | 4 | 193.9 | 0.55 | 180.01 | 3.94 | 14733926 | 143.22 | 60.76 | 64.14 | 0.28 | 11983.94 | 32.41 |
| Uganda | 2015 | 1 | 200.64 | 5.7 | 194.49 | 4.78 | 16231250 | 126.71 | 54.38 | 55.34 | 0.44 | 19300.07 | 38.34 |
| Uganda | 2015 | 2 | 202.94 | 5.78 | 193.34 | 4.88 | 17868750 | 127.17 | 54.26 | 55.55 | 0.46 | 21082.49 | 38.25 |
| Uganda | 2015 | 3 | 206.09 | 5.84 | 193.77 | 4.91 | 19418750 | 127.63 | 54.25 | 55.97 | 0.46 | 22624.94 | 37.65 |
| Uganda | 2015 | 4 | 210.09 | 5.88 | 195.76 | 4.87 | 20881250 | 128.08 | 54.35 | 56.58 | 0.44 | 23927.42 | 36.54 |
| Uganda | 2016 | 1 | 221.43 | 5.82 | 201.41 | 4.52 | 21553125 | 129.04 | 54.7 | 58.89 | 0.36 | 23663.42 | 31.75 |
| Uganda | 2016 | 2 | 224.55 | 5.86 | 205.71 | 4.46 | 23121875 | 129.27 | 54.96 | 59.3 | 0.33 | 25016.54 | 30.88 |
| Uganda | 2016 | 3 | 225.94 | 5.92 | 210.76 | 4.43 | 24884375 | 129.28 | 55.27 | 59.32 | 0.32 | 26660.29 | 30.78 |
| Uganda | 2016 | 4 | 225.59 | 6 | 216.56 | 4.44 | 26840625 | 129.08 | 55.63 | 58.94 | 0.31 | 28594.67 | 31.43 |
| Uganda | 2017 | 1 | 222.18 | 6.13 | 224.58 | 4.62 | 29084375 | 128.31 | 56.77 | 57.06 | 0.33 | 31046.37 | 35.64 |
| Uganda | 2017 | 2 | 218.9 | 6.24 | 231.25 | 4.64 | 31390625 | 127.82 | 56.94 | 56.33 | 0.33 | 33471.31 | 36.68 |
| Uganda | 2017 | 3 | 214.4 | 6.35 | 238.08 | 4.65 | 33853125 | 127.25 | 56.86 | 55.63 | 0.33 | 36096.2 | 37.36 |
| Uganda | 2017 | 4 | 208.7 | 6.47 | 245.05 | 4.65 | 36471875 | 126.61 | 56.55 | 54.98 | 0.33 | 38921.04 | 37.68 |
| Uganda | 2018 | 1 | 193.97 | 6.66 | 239.29 | 4.62 | 39387500 | 124.85 | 55.05 | 54.02 | 0.34 | 43851.64 | 36.26 |
| Uganda | 2018 | 2 | 188.99 | 6.77 | 251.7 | 4.58 | 42262500 | 124.48 | 54.62 | 53.6 | 0.34 | 46314.03 | 36.39 |
| Uganda | 2018 | 3 | 185.93 | 6.85 | 269.42 | 4.52 | 45237500 | 124.44 | 54.33 | 53.36 | 0.34 | 48214.03 | 36.71 |
| Uganda | 2018 | 4 | 184.79 | 6.92 | 292.43 | 4.45 | 48312500 | 124.75 | 54.16 | 53.3 | 0.34 | 49551.65 | 37.2 |
| Uganda | 2019 | 1 | 189.81 | 6.89 | 339.53 | 4.28 | 51393750 | 127.97 | 54.44 | 54.3 | 0.33 | 44285.2 | 39.13 |
| Uganda | 2019 | 2 | 190.82 | 6.96 | 365.63 | 4.22 | 54706250 | 127.94 | 54.41 | 54.26 | 0.34 | 46914.71 | 39.5 |
| Uganda | 2019 | 3 | 192.05 | 7.03 | 389.51 | 4.17 | 58156250 | 127.21 | 54.37 | 54.05 | 0.34 | 51398.49 | 39.54 |
| Uganda | 2019 | 4 | 193.51 | 7.12 | 411.17 | 4.14 | 61743750 | 125.8 | 54.34 | 53.68 | 0.35 | 57736.56 | 39.27 |

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|--------|------|---|--------|-------|--------|-------|----------|--------|-------|-------|------|----------|-------|
| Uganda | 2020 | 1 | 195.64 | 6.91 | 423.98 | 4.18 | 67875000 | 120.8 | 54.28 | 52.97 | 0.37 | 69888.35 | 36.78 |
| Uganda | 2020 | 2 | 197.37 | 7.14 | 443.87 | 4.16 | 70775000 | 119.18 | 54.25 | 52.34 | 0.38 | 78351.2 | 36.63 |
| Uganda | 2020 | 3 | 199.15 | 7.52 | 464.21 | 4.14 | 72850000 | 118.03 | 54.24 | 51.6 | 0.38 | 87084.54 | 36.93 |
| Uganda | 2020 | 4 | 200.97 | 8.03 | 484.98 | 4.12 | 74100000 | 117.35 | 54.23 | 50.77 | 0.39 | 96088.39 | 37.66 |
| Uganda | 2021 | 1 | 203.19 | 9.26 | 511.23 | 4.08 | 69509375 | 119.25 | 52.86 | 49.43 | 0.38 | 108260 | 41.8 |
| Uganda | 2021 | 2 | 204.96 | 9.82 | 530.88 | 4.06 | 71115625 | 118.68 | 53.42 | 48.56 | 0.39 | 116645.9 | 42.24 |
| Uganda | 2021 | 3 | 206.64 | 10.28 | 548.95 | 4.03 | 73903125 | 117.73 | 54.54 | 47.76 | 0.39 | 124143.5 | 41.93 |
| Uganda | 2021 | 4 | 208.23 | 10.65 | 565.46 | 3.99 | 77871875 | 116.42 | 56.22 | 47.02 | 0.4 | 130752.6 | 40.87 |
| Uganda | 2022 | 1 | 208.99 | 10.2 | 594.09 | 3.97 | 82115625 | 121.11 | 61.69 | 47.15 | 0.4 | 134017.5 | 36.27 |
| Uganda | 2022 | 2 | 210.68 | 10.67 | 601.98 | 3.93 | 88809375 | 116.5 | 63.2 | 46.21 | 0.41 | 139832.3 | 34.84 |
| Uganda | 2022 | 3 | 212.57 | 11.33 | 602.81 | 3.89 | 97046875 | 108.96 | 63.96 | 45.02 | 0.41 | 145741 | 33.8 |
| Uganda | 2022 | 4 | 214.65 | 12.19 | 596.6 | 3.84 | 1.07E+08 | 98.51 | 63.99 | 43.57 | 0.42 | 151743.7 | 33.13 |
| Uganda | 2023 | 1 | 185.81 | 15.76 | 613.16 | 3.01 | 1.51E+08 | 76 | 67.74 | 45.52 | 0.38 | 187934.9 | 26.9 |
| Uganda | 2023 | 2 | 200.75 | 15.99 | 580.92 | 3.27 | 1.51E+08 | 63.34 | 64.51 | 42.09 | 0.4 | 182087.7 | 29.36 |
| Uganda | 2023 | 3 | 228.34 | 15.42 | 529.69 | 3.83 | 1.39E+08 | 51.41 | 58.77 | 36.95 | 0.43 | 164296.7 | 34.57 |
| Uganda | 2023 | 4 | 268.57 | 14.03 | 459.48 | 4.69 | 1.16E+08 | 40.21 | 50.51 | 30.09 | 0.47 | 134561.9 | 42.53 |
| Zambia | 2014 | 1 | 381.81 | 8.07 | 256.28 | 7.2 | 30406570 | 25.01 | 26.54 | 11.81 | 0.6 | 36867.14 | 66.24 |
| Zambia | 2014 | 2 | 423.21 | 6.56 | 193.7 | 8.14 | 4344207 | 17.14 | 18.52 | 5.39 | 0.65 | 5651 | 74.51 |
| Zambia | 2014 | 3 | 453.11 | 5.75 | 157.75 | 8.85 | 3030650 | 11.9 | 13.25 | 1.13 | 0.68 | 5102.58 | 80.32 |
| Zambia | 2014 | 4 | 471.52 | 5.63 | 148.43 | 9.33 | 2118003 | 9.27 | 10.73 | 2.97 | 0.7 | 5393.6 | 83.69 |
| Zambia | 2015 | 1 | 458.55 | 8.06 | 238.27 | 8.97 | 1166.63 | 15.59 | 17.98 | 4.49 | 0.69 | 1204.92 | 79.99 |
| Zambia | 2015 | 2 | 461.93 | 8.59 | 253.16 | 9.22 | 1217.38 | 15.66 | 18.17 | 4.55 | 0.69 | 1268.23 | 80.31 |
| Zambia | 2015 | 3 | 461.77 | 9.06 | 265.66 | 9.49 | 1166.38 | 15.82 | 18.32 | 4.61 | 0.69 | 1223.32 | 80.03 |
| Zambia | 2015 | 4 | 458.07 | 9.49 | 275.75 | 9.76 | 1013.63 | 16.05 | 18.41 | 4.67 | 0.69 | 1070.17 | 79.15 |
| Zambia | 2016 | 1 | 453.75 | 9.68 | 279.61 | 10.11 | 306.31 | 16.36 | 17.62 | 4.78 | 0.67 | 345.79 | 75.62 |
| Zambia | 2016 | 2 | 441.81 | 10.08 | 286.43 | 10.37 | 131.19 | 16.76 | 17.96 | 4.83 | 0.68 | 161.38 | 74.37 |
| Zambia | 2016 | 3 | 425.18 | 10.5 | 292.39 | 10.61 | 35.44 | 17.25 | 18.58 | 4.85 | 0.68 | 53.95 | 73.33 |
| Zambia | 2016 | 4 | 403.84 | 10.95 | 297.49 | 10.83 | 19.06 | 17.83 | 19.49 | 4.86 | 0.69 | 23.48 | 72.52 |
| Zambia | 2017 | 1 | 352.03 | 11.46 | 300.33 | 11.06 | 257.06 | 19.78 | 22.89 | 4.81 | 0.73 | 237.51 | 71.59 |

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|----------|------|---|--------|-------|--------|-------|----------|-------|-------|-------|------|----------|-------|
| Zambia | 2017 | 2 | 331.59 | 11.94 | 304.25 | 11.22 | 329.44 | 20.01 | 23.49 | 4.8 | 0.73 | 293.98 | 71.35 |
| Zambia | 2017 | 3 | 316.76 | 12.44 | 307.86 | 11.34 | 411.19 | 19.8 | 23.49 | 4.8 | 0.73 | 360.42 | 71.47 |
| Zambia | 2017 | 4 | 307.53 | 12.96 | 311.16 | 11.43 | 502.31 | 19.16 | 22.89 | 4.8 | 0.73 | 436.81 | 71.94 |
| Zambia | 2018 | 1 | 306.05 | 13.15 | 313.03 | 11.4 | 609.69 | 16.42 | 19.25 | 4.84 | 0.69 | 515.16 | 75.12 |
| Zambia | 2018 | 2 | 307.17 | 13.82 | 316.16 | 11.44 | 716.81 | 15.58 | 18.43 | 4.83 | 0.68 | 614.69 | 75.36 |
| Zambia | 2018 | 3 | 313.04 | 14.63 | 319.41 | 11.48 | 830.56 | 14.98 | 17.99 | 4.81 | 0.69 | 727.4 | 75.01 |
| Zambia | 2018 | 4 | 323.66 | 15.59 | 322.8 | 11.52 | 950.94 | 14.61 | 17.92 | 4.77 | 0.7 | 853.27 | 74.07 |
| Zambia | 2019 | 1 | 361.3 | 16.83 | 334.3 | 11.57 | 1507.46 | 14.98 | 19.23 | 4.78 | 0.74 | 874.36 | 68.5 |
| Zambia | 2019 | 2 | 372.5 | 18.02 | 334.76 | 11.59 | 1339.67 | 14.88 | 19.52 | 4.7 | 0.76 | 963.28 | 68 |
| Zambia | 2019 | 3 | 379.54 | 19.29 | 332.17 | 11.6 | 1868.89 | 14.82 | 19.78 | 4.59 | 0.77 | 2145.84 | 68.54 |
| Zambia | 2019 | 4 | 382.42 | 20.66 | 326.53 | 11.6 | 5118.24 | 14.8 | 20.02 | 4.44 | 0.78 | 7340 | 70.12 |
| Zambia | 2020 | 1 | 378.01 | 21.98 | 314.77 | 11.78 | 10723.78 | 14.82 | 20.19 | 4.16 | 0.77 | 19068.09 | 75.84 |
| Zambia | 2020 | 2 | 373.81 | 23.57 | 304.24 | 11.68 | 15528.53 | 14.88 | 20.41 | 3.99 | 0.78 | 25692.76 | 78.23 |
| Zambia | 2020 | 3 | 366.7 | 25.29 | 291.87 | 11.5 | 20847.91 | 14.97 | 20.62 | 3.82 | 0.78 | 32062.92 | 80.41 |
| Zambia | 2020 | 4 | 356.67 | 27.16 | 277.68 | 11.24 | 26681.9 | 15.09 | 20.82 | 3.66 | 0.79 | 38178.55 | 82.37 |
| Zambia | 2021 | 1 | 340.51 | 30.83 | 249.68 | 10.47 | 30221.94 | 15.66 | 20.33 | 3.45 | 0.8 | 44425.27 | 87.32 |
| Zambia | 2021 | 2 | 325.94 | 32.3 | 236.62 | 10.19 | 38208.61 | 15.7 | 20.81 | 3.32 | 0.81 | 49877.62 | 87.58 |
| Zambia | 2021 | 3 | 309.74 | 33.23 | 226.52 | 10 | 47833.34 | 15.61 | 21.56 | 3.23 | 0.81 | 54921.2 | 86.34 |
| Zambia | 2021 | 4 | 291.92 | 33.64 | 219.38 | 9.9 | 59096.11 | 15.39 | 22.58 | 3.16 | 0.82 | 59556.02 | 83.6 |
| Zambia | 2022 | 1 | 249.18 | 31.95 | 219.21 | 10.24 | 72598.99 | 15.35 | 25.89 | 3.1 | 0.83 | 63990.85 | 71.6 |
| Zambia | 2022 | 2 | 237.41 | 31.92 | 216.39 | 10.15 | 86897.05 | 14.76 | 26.65 | 3.11 | 0.84 | 67724.63 | 68.99 |
| Zambia | 2022 | 3 | 233.32 | 31.98 | 214.93 | 9.98 | 102592.4 | 13.91 | 26.88 | 3.17 | 0.84 | 70966.14 | 67.99 |
| Zambia | 2022 | 4 | 236.92 | 32.14 | 214.83 | 9.75 | 119684.9 | 12.82 | 26.58 | 3.26 | 0.85 | 73715.38 | 68.61 |
| Zambia | 2023 | 1 | 268.49 | 35.38 | 232.5 | 9.68 | 179633.4 | 8.27 | 24.17 | 2.14 | 0.92 | 88079.05 | 76.92 |
| Zambia | 2023 | 2 | 279.34 | 34.52 | 228.56 | 9.21 | 182936.9 | 7.96 | 23.43 | 2.82 | 0.9 | 85001.07 | 78.34 |
| Zambia | 2023 | 3 | 289.76 | 32.58 | 219.42 | 8.57 | 171054.2 | 8.7 | 22.79 | 4.05 | 0.86 | 76588.14 | 78.95 |
| Zambia | 2023 | 4 | 299.75 | 29.53 | 205.07 | 7.77 | 143985.2 | 10.47 | 22.25 | 5.82 | 0.79 | 62840.26 | 78.74 |
| Zimbabwe | 2014 | 1 | 309.57 | 19.05 | 153.69 | 5.78 | 37087.81 | 17.84 | 22.01 | 10.84 | 0.58 | 16360.02 | 77.47 |
| Zimbabwe | 2014 | 2 | 318.58 | 16.33 | 141.68 | 5.05 | 5503.25 | 19.86 | 21.59 | 12.62 | 0.5 | 2901.19 | 75.74 |

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|----------|------|---|--------|-------|--------|------|----------|-------|-------|-------|------|----------|-------|
| Zimbabwe | 2014 | 3 | 327.05 | 15.04 | 137.19 | 4.55 | 5410.67 | 21.09 | 21.19 | 13.87 | 0.45 | 4933.62 | 73.29 |
| Zimbabwe | 2014 | 4 | 334.98 | 15.18 | 140.24 | 4.3 | 5653.96 | 21.54 | 20.8 | 14.59 | 0.43 | 7144.43 | 70.13 |
| Zimbabwe | 2015 | 1 | 345.68 | 21.26 | 189.55 | 4.68 | 1475.92 | 18.93 | 19.95 | 13.38 | 0.48 | 11309.94 | 62.67 |
| Zimbabwe | 2015 | 2 | 351.2 | 22.47 | 192.16 | 4.74 | 1892.9 | 18.71 | 19.8 | 13.59 | 0.47 | 14330.69 | 59.52 |
| Zimbabwe | 2015 | 3 | 354.85 | 23.3 | 186.82 | 4.88 | 2299.5 | 18.6 | 19.85 | 13.81 | 0.47 | 16958.97 | 57.08 |
| Zimbabwe | 2015 | 4 | 356.64 | 23.77 | 173.51 | 5.1 | 2695.72 | 18.6 | 20.12 | 14.06 | 0.46 | 19194.8 | 55.37 |
| Zimbabwe | 2016 | 1 | 351.7 | 22.81 | 119.34 | 5.6 | 3138.74 | 19.26 | 21.17 | 15.91 | 0.45 | 20282.17 | 55.22 |
| Zimbabwe | 2016 | 2 | 351.69 | 22.97 | 103.27 | 5.89 | 3491.34 | 19.28 | 21.63 | 15.56 | 0.44 | 22035.49 | 54.6 |
| Zimbabwe | 2016 | 3 | 351.75 | 23.18 | 92.39 | 6.18 | 3810.7 | 19.2 | 22.07 | 14.6 | 0.42 | 23698.75 | 54.36 |
| Zimbabwe | 2016 | 4 | 351.89 | 23.45 | 86.72 | 6.46 | 4096.82 | 19.01 | 22.49 | 13.02 | 0.41 | 25271.96 | 54.5 |
| Zimbabwe | 2017 | 1 | 351.95 | 24.02 | 91.35 | 6.93 | 4241.8 | 18.45 | 22.59 | 7.96 | 0.38 | 26150.2 | 57.16 |
| Zimbabwe | 2017 | 2 | 352.29 | 24.3 | 94.02 | 7.13 | 4504.58 | 18.17 | 23.1 | 6.3 | 0.36 | 27785.26 | 57.2 |
| Zimbabwe | 2017 | 3 | 352.75 | 24.54 | 99.85 | 7.26 | 4777.28 | 17.9 | 23.72 | 5.18 | 0.35 | 29572.23 | 56.77 |
| Zimbabwe | 2017 | 4 | 353.34 | 24.73 | 108.82 | 7.32 | 5059.9 | 17.64 | 24.44 | 4.6 | 0.35 | 31511.1 | 55.87 |
| Zimbabwe | 2018 | 1 | 363.79 | 24.62 | 86.43 | 7.12 | 3653.01 | 17.28 | 25.02 | 5.89 | 0.35 | 26657.43 | 51.83 |
| Zimbabwe | 2018 | 2 | 360.74 | 24.83 | 115.5 | 7.09 | 4635.22 | 17.08 | 26.06 | 5.84 | 0.36 | 31677.9 | 51.04 |
| Zimbabwe | 2018 | 3 | 353.92 | 25.11 | 161.53 | 7.06 | 6307.1 | 16.92 | 27.31 | 5.8 | 0.36 | 39628.05 | 50.82 |
| Zimbabwe | 2018 | 4 | 343.33 | 25.44 | 224.5 | 7.02 | 8668.67 | 16.8 | 28.77 | 5.75 | 0.37 | 50507.9 | 51.19 |
| Zimbabwe | 2019 | 1 | 268.52 | 25.83 | 388.82 | 6.97 | 11269.75 | 16.75 | 30.98 | 5.7 | 0.4 | 63320.19 | 54.27 |
| Zimbabwe | 2019 | 2 | 274.58 | 26.3 | 451.93 | 6.92 | 15190.75 | 16.73 | 32.65 | 5.66 | 0.4 | 80458.31 | 54.96 |
| Zimbabwe | 2019 | 3 | 301.06 | 26.83 | 498.24 | 6.87 | 19981.5 | 16.75 | 34.31 | 5.62 | 0.4 | 100925 | 55.37 |
| Zimbabwe | 2019 | 4 | 347.96 | 27.44 | 527.74 | 6.81 | 25642 | 16.81 | 35.98 | 5.58 | 0.4 | 124720.3 | 55.52 |
| Zimbabwe | 2020 | 1 | 541.49 | 27.49 | 477.85 | 6.72 | 27377.56 | 18.68 | 41.7 | 5.79 | 0.37 | 172739.3 | 54.46 |
| Zimbabwe | 2020 | 2 | 578.74 | 28.48 | 498.76 | 6.66 | 36695.44 | 18.12 | 41.73 | 5.65 | 0.37 | 194833.8 | 54.45 |
| Zimbabwe | 2020 | 3 | 585.92 | 29.8 | 527.9 | 6.6 | 48800.94 | 16.89 | 40.12 | 5.41 | 0.37 | 211898.7 | 54.54 |
| Zimbabwe | 2020 | 4 | 563.03 | 31.43 | 565.26 | 6.54 | 63694.06 | 14.99 | 36.89 | 5.08 | 0.38 | 223934.2 | 54.75 |
| Zimbabwe | 2021 | 1 | 403.73 | 35.27 | 668.24 | 6.49 | 63366.84 | 9.21 | 25.34 | 4.06 | 0.4 | 228397.5 | 56.85 |
| Zimbabwe | 2021 | 2 | 363.24 | 36.78 | 699.09 | 6.43 | 91038.41 | 7.26 | 21.52 | 3.76 | 0.41 | 231391.2 | 56.56 |
| Zimbabwe | 2021 | 3 | 335.22 | 37.86 | 715.19 | 6.37 | 128700.8 | 5.94 | 18.74 | 3.6 | 0.43 | 230372.6 | 55.65 |

| | | | | | | | | | | | | | |
|----------|------|---|--------|-------|---------|------|----------|------|-------|------|------|----------|-------|
| Zimbabwe | 2021 | 4 | 319.68 | 38.49 | 716.56 | 6.31 | 176354 | 5.23 | 17 | 3.57 | 0.44 | 225341.6 | 54.14 |
| Zimbabwe | 2022 | 1 | 330.19 | 37.65 | 618.2 | 6.23 | 247490.9 | 6.51 | 18.79 | 3.95 | 0.44 | 209237.6 | 48.61 |
| Zimbabwe | 2022 | 2 | 334.16 | 37.83 | 624.09 | 6.18 | 309728.6 | 6.5 | 18.14 | 4.08 | 0.45 | 199006.2 | 47.24 |
| Zimbabwe | 2022 | 3 | 345.16 | 37.99 | 649.23 | 6.13 | 376559.8 | 6.58 | 17.55 | 4.23 | 0.47 | 187586.7 | 46.62 |
| Zimbabwe | 2022 | 4 | 363.2 | 38.13 | 693.64 | 6.1 | 447984.7 | 6.73 | 17 | 4.41 | 0.48 | 174979.1 | 46.76 |
| Zimbabwe | 2023 | 1 | 388.27 | 38.26 | 757.31 | 6.07 | 524003.2 | 6.96 | 16.5 | 4.61 | 0.49 | 161183.5 | 47.64 |
| Zimbabwe | 2023 | 2 | 420.39 | 38.37 | 840.23 | 6.05 | 604615.4 | 7.27 | 16.05 | 4.83 | 0.5 | 146199.8 | 49.28 |
| Zimbabwe | 2023 | 3 | 459.54 | 38.45 | 942.41 | 6.04 | 689821.2 | 7.65 | 15.64 | 5.08 | 0.52 | 130027.9 | 51.67 |
| Zimbabwe | 2023 | 4 | 505.73 | 38.52 | 1063.85 | 6.04 | 779620.6 | 8.12 | 15.29 | 5.35 | 0.53 | 112668 | 54.81 |

Source: World Bank Development Indicators (2019; 2024).

APPENDIX B: ESTIMATION RESULTS FROM EVIEWS 9.0

The results of the analysis are as presented below

```
. xtpmg d.LRGDPPC dLIUI_pos_diff L.dLIUI_pos_diff dLIUI_neg_diff L.dLIUI_neg_diff
d.TOP, lr(L.LRG
> DPPC LIUI_pos LIUI_neg LTOP) ec(ec) replace pmg
```

```
Iteration 0: log likelihood = 2092.3801 (not concave)
Iteration 1: log likelihood = 2098.7971 (not concave)
Iteration 2: log likelihood = 2101.3835 (not concave)
Iteration 3: log likelihood = 2117.2008
Iteration 4: log likelihood = 2121.8886
Iteration 5: log likelihood = 2122.5311
Iteration 6: log likelihood = 2123.2883
Iteration 7: log likelihood = 2123.2951
Iteration 8: log likelihood = 2123.2951
```

Pooled Mean Group Regression
(Estimate results saved as pmg)

```
Panel Variable (i): countryid      Number of obs      =      1102
Time Variable (t): qdate           Number of groups   =        29
                                   Obs per group: min =        38
                                   avg      =      38.0
                                   max      =        38
```

Log Likelihood = 2123.295

| D.LRGDPPC | | Coefficient | Std. err. | z | P> z | [95% conf. interval] | |
|----------------|----------|-------------|-----------|-------|-------|----------------------|-----------|
| ----- | | | | | | | |
| ec | | | | | | | |
| | LIUI_pos | .0915909 | .0304172 | 3.01 | 0.003 | .1512075 | .0319742 |
| | LIUI_neg | -2.003033 | .2388712 | -8.39 | 0.000 | -2.471212 | -1.534854 |
| | LTOP | .8896255 | .1232097 | 7.22 | 0.000 | .6481389 | 1.131112 |
| ----- | | | | | | | |
| SR | | | | | | | |
| | ec | -.1646335 | .051962 | -3.17 | 0.002 | -.2664772 | -.0627898 |
| dLIUI_pos_diff | | | | | | | |
| | --. | .2567603 | .1328726 | 1.93 | 0.053 | -.0036653 | .5171858 |
| | L1. | .062865 | .0952705 | 0.66 | 0.509 | -.1238616 | .2495917 |
| dLIUI_neg_diff | | | | | | | |
| | --. | -.5211936 | .8802816 | -0.59 | 0.554 | -2.246514 | 1.204127 |
| | L1. | .0994328 | .5000977 | 0.20 | 0.842 | -.8807408 | 1.079606 |
| | TOP | | | | | | |
| | D1. | .2079387 | .2080847 | 1.00 | 0.318 | -.1998997 | .6157772 |
| | _cons | -1.893615 | .7083193 | -2.67 | 0.008 | -3.281895 | -.5053344 |
| ----- | | | | | | | |

```
. test LIUI_pos = LIUI_neg
```

```
( 1) [ec]LIUI_pos - [ec]LIUI_neg = 0
```

```
      chi2( 1) =    124.80
      Prob > chi2 =    0.0000
```

```
. test dLIUI_pos_diff = dLIUI_neg_diff
```

```
( 1) [SR]dLIUI_pos_diff - [SR]dLIUI_neg_diff = 0

      chi2( 1) =      0.79
      Prob > chi2 =    0.3747
. xtpmg d.LRGDPPC dLMBK_pos_diff L.dLMBK_pos_diff dLMBK_neg_diff L.dLMBK_neg_diff
d.TOP, lr(L.LRG
> DPPC LMBK_pos LMBK_neg LTOP) ec(ec) replace pmg
```

```
Iteration 0: log likelihood = 2016.1676 (not concave)
Iteration 1: log likelihood = 2053.8765 (not concave)
Iteration 2: log likelihood = 2068.0397 (not concave)
Iteration 3: log likelihood = 2076.6324
Iteration 4: log likelihood = 2079.0214
Iteration 5: log likelihood = 2081.0524
Iteration 6: log likelihood = 2081.1223
Iteration 7: log likelihood = 2081.1223
```

Pooled Mean Group Regression
(Estimate results saved as pmg)

```
Panel Variable (i): countryid      Number of obs      =      1102
Time Variable (t): qdate           Number of groups   =       29
                                   Obs per group: min =       38
                                   avg      =      38.0
                                   max      =       38
```

Log Likelihood = 2081.122

| | D.LRGDPPC | Coefficient | Std. err. | z | P> z | [95% conf. interval] | |
|----------------|-----------|-------------|-----------|-------|-------|----------------------|-----------|
| ----- | | | | | | | |
| ec | | | | | | | |
| | LMBK_pos | .1851525 | .0151263 | 12.24 | 0.000 | .1555054 | .2147996 |
| | LMBK_neg | -.7208036 | .1401608 | -5.14 | 0.000 | -.9955138 | -.4460934 |
| | LTOP | .0920681 | .0916116 | 1.00 | 0.315 | -.0874874 | .2716236 |
| ----- | | | | | | | |
| SR | | | | | | | |
| | ec | -.1145747 | .0460803 | -2.49 | 0.013 | -.2048904 | -.0242589 |
| ----- | | | | | | | |
| dLMBK_pos_diff | | | | | | | |
| | --. | -.0859231 | .0777324 | -1.11 | 0.269 | -.2382758 | .0664296 |
| | L1. | -.2815231 | .1675499 | -1.68 | 0.093 | -.6099149 | .0468688 |
| ----- | | | | | | | |
| dLMBK_neg_diff | | | | | | | |
| | --. | -.1653372 | .2221878 | -0.74 | 0.457 | -.6008174 | .270143 |
| | L1. | .135605 | .1196098 | 1.13 | 0.257 | -.0988259 | .3700359 |
| ----- | | | | | | | |
| | TOP | | | | | | |
| | D1. | .4554341 | .4573398 | 1.00 | 0.319 | -.4409355 | 1.351804 |
| | _cons | -7.069633 | 3.363387 | -2.10 | 0.036 | -13.66175 | -.477515 |
| ----- | | | | | | | |

```
. test LMBK_pos = LMBK_neg
```

```
( 1) [ec]LMBK_pos - [ec]LMBK_neg = 0
```

```
      chi2( 1) =      173.19
      Prob > chi2 =    0.0000
```

```
. test dLMBK_pos_diff = dLMBK_neg_diff
```

```
( 1) [SR]dLMBK_pos_diff - [SR]dLMBK_neg_diff = 0
```

```

      chi2( 1) =      0.10
    Prob > chi2 =      0.7503

```

```

. xtpmg d.LRGDPPC dLPOS_pos_diff L.dLPOS_pos_diff dLPOS_neg_diff L.dLPOS_neg_diff
d.TOP, lr(L.LRG
> DPPC LPOS_pos LPOS_neg LTOP) ec(ec) replace pmg

```

```

Iteration 0: log likelihood = 2021.751 (not concave)
Iteration 1: log likelihood = 2034.1458 (not concave)
Iteration 2: log likelihood = 2037.4539
Iteration 3: log likelihood = 2039.3011
Iteration 4: log likelihood = 2039.4988
Iteration 5: log likelihood = 2039.5042
Iteration 6: log likelihood = 2039.5042

```

```

Pooled Mean Group Regression
(Estimate results saved as pmg)

```

```

Panel Variable (i): countryid      Number of obs      =      1102
Time Variable (t): qdate           Number of groups   =       29
                                   Obs per group: min =       38
                                   avg      =      38.0
                                   max      =       38

```

```

                                   Log Likelihood      = 2039.504

```

| | | Coefficient | Std. err. | z | P> z | [95% conf. interval] | |
|----------------|----------|-------------|-----------|-------|-------|----------------------|-----------|
| ----- | | | | | | | |
| ec | | | | | | | |
| | LPOS_pos | -.0002443 | .0106477 | -0.02 | 0.982 | -.0211135 | .0206248 |
| | LPOS_neg | -.1722698 | .0634843 | -2.71 | 0.007 | -.2966968 | -.0478428 |
| | LTOP | 1.929567 | .2924143 | 6.60 | 0.000 | 1.356446 | 2.502689 |
| ----- | | | | | | | |
| SR | | | | | | | |
| | ec | -.1186685 | .0454838 | -2.61 | 0.009 | -.2078151 | -.0295219 |
| ----- | | | | | | | |
| dLPOS_pos_diff | | | | | | | |
| | --. | .0558925 | .0792888 | 0.70 | 0.481 | -.0995107 | .2112958 |
| | L1. | -.0701219 | .0498377 | -1.41 | 0.159 | -.1678021 | .0275583 |
| ----- | | | | | | | |
| dLPOS_neg_diff | | | | | | | |
| | --. | -.5257762 | .3817762 | -1.38 | 0.168 | -1.274044 | .2224914 |
| | L1. | .1949804 | .1097689 | 1.78 | 0.076 | -.0201626 | .4101234 |
| ----- | | | | | | | |
| | TOP | | | | | | |
| | D1. | .3963382 | .3939755 | 1.01 | 0.314 | -.3758395 | 1.168516 |
| | _cons | -1.173725 | .4245294 | -2.76 | 0.006 | -2.005788 | -.3416628 |
| ----- | | | | | | | |

```

. test LPOS_pos = LPOS_neg

```

```

( 1) [ec]LPOS_pos - [ec]LPOS_neg = 0

```

```

      chi2( 1) =      201.52
    Prob > chi2 =      0.0000

```

```

. test dLPOS_pos_diff = dLPOS_neg_diff

```

```

( 1) [SR]dLPOS_pos_diff - [SR]dLPOS_neg_diff = 0

```

```

      chi2( 1) =      1.87
      Prob > chi2 =    0.1720

```

```

. xtpmg d.LRGDPPC dLNBB_pos_diff L.dLNBB_pos_diff dLNBB_neg_diff L.dLNBB_neg_diff
d.TOP, lr(L.LRG
> DPPC LNBB_pos LNBB_neg LTOP) ec(ec) replace pmg

```

```

Iteration 0: log likelihood = 2106.3607 (not concave)
Iteration 1: log likelihood = 2126.3311 (not concave)
Iteration 2: log likelihood = 2148.2563 (not concave)
Iteration 3: log likelihood = 2165.9641
Iteration 4: log likelihood = 2169.514
Iteration 5: log likelihood = 2176.6445
Iteration 6: log likelihood = 2177.1883
Iteration 7: log likelihood = 2177.2266
Iteration 8: log likelihood = 2177.2267

```

```

Pooled Mean Group Regression
(Estimate results saved as pmg)

```

```

Panel Variable (i): countryid      Number of obs      =      1102
Time Variable (t): qdate           Number of groups    =       29
                                   Obs per group: min =       38
                                   avg      =      38.0
                                   max      =       38

```

```

                                   Log Likelihood      = 2177.227

```

| | | Coefficient | Std. err. | z | P> z | [95% conf. interval] | |
|----------------|----------|-------------|-----------|-------|-------|----------------------|-----------|
| ----- | | | | | | | |
| ec | | | | | | | |
| | LNBB_pos | .7380413 | .0883823 | 8.35 | 0.000 | .5648152 | .9112675 |
| | LNBB_neg | -.3283291 | .0944537 | -3.48 | 0.001 | -.513455 | -.1432031 |
| | LTOP | .0325037 | .0496799 | 0.65 | 0.513 | -.0648672 | .1298746 |
| ----- | | | | | | | |
| SR | | | | | | | |
| | ec | -.1599707 | .054733 | -2.92 | 0.003 | -.2672454 | -.052696 |
| ----- | | | | | | | |
| dLNBB_pos_diff | | | | | | | |
| | --. | .4835552 | .5045935 | 0.96 | 0.338 | -.5054299 | 1.47254 |
| | L1. | -.6889077 | .432285 | -1.59 | 0.111 | -1.536171 | .1583553 |
| ----- | | | | | | | |
| dLNBB_neg_diff | | | | | | | |
| | --. | .4061239 | .3687182 | 1.10 | 0.271 | -.3165506 | 1.128798 |
| | L1. | -.04523 | .1437586 | -0.31 | 0.753 | -.3269917 | .2365316 |
| | TOP | | | | | | |
| | D1. | .2837537 | .2790247 | 1.02 | 0.309 | -.2631246 | .8306321 |
| | _cons | -1.814472 | .9928796 | -1.83 | 0.068 | -3.76048 | .1315363 |
| ----- | | | | | | | |

```

. test LNBB_pos = LNBB_neg
( 1) [ec]LNBB_pos - [ec]LNBB_neg = 0

```

```

      chi2( 1) =      219.21
      Prob > chi2 =    0.0000

```

```

. test dLNBB_pos_diff = dLNBB_neg_diff

```

(1) [SR]dLNBB_pos_diff - [SR]dLNBB_neg_diff = 0

chi2(1) = 0.02
 Prob > chi2 = 0.8989

. xtpmg d.LRGDPPC dLACOW_pos_diff L.dLACOW_pos_diff dLACOW_neg_diff L.dLACOW_neg_diff
 d.TOP, lr(L
 > .LRGDPPC LACOW_pos LACOW_neg LTOP) ec(ec) replace pmg

Iteration 0: log likelihood = 2190.4273 (not concave)
 Iteration 1: log likelihood = 2208.9292 (not concave)
 Iteration 2: log likelihood = 2213.0923
 Iteration 3: log likelihood = 2213.275
 Iteration 4: log likelihood = 2213.7897
 Iteration 5: log likelihood = 2213.7938
 Iteration 6: log likelihood = 2213.7938

Pooled Mean Group Regression
 (Estimate results saved as pmg)

Panel Variable (i): countryid Number of obs = 1102
 Time Variable (t): qdate Number of groups = 29
 Obs per group: min = 38
 avg = 38.0
 max = 38

Log Likelihood = 2213.794

| D.LRGDPPC | | Coefficient | Std. err. | z | P> z | [95% conf. interval] | |
|-----------------|-----------|-------------|-----------|-------|-------|----------------------|-----------|
| ----- | | | | | | | |
| ec | | | | | | | |
| | LACOW_pos | .1536767 | .0612654 | 2.51 | 0.012 | .0335988 | .2737546 |
| | LACOW_neg | -1.524839 | .2405358 | -6.34 | 0.000 | -1.996281 | -1.053398 |
| | LTOP | 1.109994 | .1525961 | 7.27 | 0.000 | .8109108 | 1.409076 |
| ----- | | | | | | | |
| SR | | | | | | | |
| | ec | -.1035139 | .0430052 | -2.41 | 0.016 | -.1878026 | -.0192252 |
| ----- | | | | | | | |
| dLACOW_pos_diff | | | | | | | |
| | --. | .1890574 | .103879 | 1.82 | 0.069 | -.0145418 | .3926566 |
| | L1. | .0750739 | .0957924 | 0.78 | 0.433 | -.1126758 | .2628236 |
| ----- | | | | | | | |
| dLACOW_neg_diff | | | | | | | |
| | --. | .2086204 | .1883866 | 1.11 | 0.268 | -.1606106 | .5778513 |
| | L1. | .2064307 | .1140846 | 1.81 | 0.070 | -.017171 | .4300323 |
| ----- | | | | | | | |
| TOP | | | | | | | |
| | D1. | .2212438 | .2261812 | 0.98 | 0.328 | -.2220632 | .6645507 |
| | _cons | -2.070644 | .8064186 | -2.57 | 0.010 | -3.651196 | -.4900929 |
| ----- | | | | | | | |

. test LACOW_pos = LACOW_neg

(1) [ec]LACOW_pos - [ec]LACOW_neg = 0

chi2(1) = 87.81
 Prob > chi2 = 0.000

. test dLACOW_pos_diff = dLACOW_neg_diff

(1) [SR]dLACOW_pos_diff - [SR]dLACOW_neg_diff = 0

```

      chi2( 1) =    0.01
    Prob > chi2 =    0.9275

```

```

. xtpmg d.LRGDPPC dLCGDP_pos_diff L.dLCGDP_pos_diff dLCGDP_neg_diff L.dLCGDP_neg_diff
d.TOP, lr(L
> .LRGDPPC LCGDP_pos LCGDP_neg LTOP) ec(ec) replace pmg

```

```

Iteration 0:  log likelihood = 2037.3073   (not concave)
Iteration 1:  log likelihood = 2056.5545
Iteration 2:  log likelihood = 2058.2209
Iteration 3:  log likelihood = 2058.661
Iteration 4:  log likelihood = 2058.9125
Iteration 5:  log likelihood = 2058.9134
Iteration 6:  log likelihood = 2058.9134

```

```

Pooled Mean Group Regression
(Estimate results saved as pmg)

```

```

Panel Variable (i): countryid      Number of obs   =    1102
Time Variable (t):  qdate          Number of groups =     29
                                      Obs per group: min =     38
                                      avg   =    38.0
                                      max   =     38

```

```

Log Likelihood = 2058.913

```

| D.LRGDPPC | | Coefficient | Std. err. | z | P> z | [95% conf. interval] | |
|-----------------|-----------|-------------|-----------|-------|-------|----------------------|-----------|
| ----- | | | | | | | |
| ec | | | | | | | |
| | LCGDP_pos | -.1603658 | .1312739 | -1.22 | 0.222 | -.417658 | .0969264 |
| | LCGDP_neg | -1.177985 | .1972298 | -5.97 | 0.000 | -1.564548 | -.7914217 |
| | LTOP | 1.454305 | .2692132 | 5.40 | 0.000 | .9266564 | 1.981953 |
| ----- | | | | | | | |
| SR | | | | | | | |
| | ec | -.1244417 | .0438225 | -2.84 | 0.005 | -.2103321 | -.0385512 |
| ----- | | | | | | | |
| dLCGDP_pos_diff | | | | | | | |
| | --. | .4528603 | .2091561 | 2.17 | 0.030 | .042922 | .8627986 |
| | L1. | .1094675 | .1459984 | 0.75 | 0.453 | -.1766842 | .3956192 |
| ----- | | | | | | | |
| dLCGDP_neg_diff | | | | | | | |
| | --. | -.1468505 | .2747053 | -0.53 | 0.593 | -.6852629 | .391562 |
| | L1. | .0983797 | .1978453 | 0.50 | 0.619 | -.2893901 | .4861494 |
| ----- | | | | | | | |
| TOP | | | | | | | |
| | D1. | .1769273 | .1766478 | 1.00 | 0.317 | -.1692961 | .5231506 |
| | _cons | -1.622822 | .6539573 | -2.48 | 0.013 | -2.904555 | -.3410898 |
| ----- | | | | | | | |

```

. test LCGDP_pos = LCGDP_neg

```

```

( 1) [ec]LCGDP_pos - [ec]LCGDP_neg = 0

```

```

      chi2( 1) =    227.21
    Prob > chi2 =    0.0892

```

```

. test dLCGDP_pos_diff = dLCGDP_neg_diff

```

```

( 1) [SR]dLCGDP_pos_diff - [SR]dLCGDP_neg_diff = 0

```

```

      chi2( 1) =    276.62
Prob > chi2 =    0.0000

```

```

. xtpmg d.LRGDPPC dLDGDP_pos_diff L.dLDGDP_pos_diff dLDGDP_neg_diff L.dLDGDP_neg_diff
d.TOP, lr(L
> .LRGDPPC LDGDP_pos LDGDP_neg LTOP) ec(ec) replace pmg

```

```

Iteration 0: log likelihood = 2072.6284 (not concave)
Iteration 1: log likelihood = 2095.2083
Iteration 2: log likelihood = 2108.0838
Iteration 3: log likelihood = 2108.188
Iteration 4: log likelihood = 2108.2463
Iteration 5: log likelihood = 2108.2464

```

```

Pooled Mean Group Regression
(Estimate results saved as pmg)

```

```

Panel Variable (i): countryid      Number of obs      =    1102
Time Variable (t): qdate          Number of groups   =     29
                                   Obs per group: min =     38
                                   avg      =    38.0
                                   max      =     38

```

```

Log Likelihood = 2108.246

```

| D.LRGDPPC | | Coefficient | Std. err. | z | P> z | [95% conf. interval] | |
|-----------------|-----------|-------------|-----------|-------|-------|----------------------|-----------|
| ----- | | | | | | | |
| ec | | | | | | | |
| | LDGDP_pos | -.4687125 | .1085925 | -4.32 | 0.000 | -.68155 | -.255875 |
| | LDGDP_neg | -1.744835 | .1875705 | -9.30 | 0.000 | -2.112467 | -1.377204 |
| | LTOP | .8152246 | .1248368 | 6.53 | 0.000 | .570549 | 1.0599 |
| ----- | | | | | | | |
| SR | | | | | | | |
| | ec | -.1595191 | .0520828 | -3.06 | 0.002 | -.2615995 | -.0574388 |
| dLDGDP_pos_diff | | | | | | | |
| | --. | .0340336 | .2443321 | 0.14 | 0.889 | -.4448485 | .5129156 |
| | L1. | -.1422878 | .1936929 | -0.73 | 0.463 | -.5219189 | .2373434 |
| dLDGDP_neg_diff | | | | | | | |
| | --. | -.395854 | .2736286 | -1.45 | 0.148 | -.9321563 | .1404482 |
| | L1. | -.2068851 | .2645749 | -0.78 | 0.434 | -.7254424 | .3116722 |
| | TOP | | | | | | |
| | D1. | .3785764 | .3788868 | 1.00 | 0.318 | -.3640281 | 1.121181 |
| | _cons | -1.864916 | .707929 | -2.63 | 0.008 | -3.252431 | -.4774007 |
| ----- | | | | | | | |

```

. test LDGDP_pos = LDGDP_neg

```

```

( 1) [ec]LDGDP_pos - [ec]LDGDP_neg = 0

```

```

      chi2( 1) =    129.77
Prob > chi2 =    0.0000

```

```

. test dLDGDP_pos_diff = dLDGDP_neg_diff

```

```

( 1) [SR]dLDGDP_pos_diff - [SR]dLDGDP_neg_diff = 0

```

```

chi2( 1) = 1.34
Prob > chi2 = 0.2477

```

```

. xtpmg d.LRGDPPC dLATM_pos_diff L.dLATM_pos_diff dLATM_neg_diff L.dLATM_neg_diff
d.TOP, lr(L.LRGDPPC LATM_pos LATM_neg LTOP) ec(ec) replace pmg

```

```

Iteration 0: log likelihood = 2385.9295 (not concave)
Iteration 1: log likelihood = 2405.7346
Iteration 2: log likelihood = 2410.276
Iteration 3: log likelihood = 2410.4986
Iteration 4: log likelihood = 2410.5064
Iteration 5: log likelihood = 2410.5064

```

```

Pooled Mean Group Regression
(Estimate results saved as pmg)

```

```

Panel Variable (i): countryid      Number of obs   = 1102
Time Variable (t): qdate           Number of groups = 29
                                   Obs per group: min = 38
                                   avg = 38.0
                                   max = 38

```

```

Log Likelihood = 2410.506

```

| D.LRGDPPC | | Coefficient | Std. err. | z | P> z | [95% conf. interval] | |
|----------------|----------|-------------|-----------|-------|-------|----------------------|-----------|
| ----- | | | | | | | |
| ec | | | | | | | |
| | LATM_pos | .9003276 | .2305684 | 3.90 | 0.000 | .4484219 | 1.352233 |
| | LATM_neg | -.3347002 | .2291551 | -1.46 | 0.144 | -.783836 | .1144355 |
| | LTOP | 2.338847 | .4739292 | 4.94 | 0.000 | 1.409963 | 3.267731 |
| ----- | | | | | | | |
| SR | | | | | | | |
| | ec | -.0509334 | .0220674 | -2.31 | 0.021 | -.0941848 | -.0076821 |
| ----- | | | | | | | |
| dLATM_pos_diff | | | | | | | |
| | --. | 1.469027 | 1.219793 | 1.20 | 0.228 | -.921724 | 3.859778 |
| | L1. | -1.241492 | 1.163383 | -1.07 | 0.286 | -3.521681 | 1.038697 |
| ----- | | | | | | | |
| dLATM_neg_diff | | | | | | | |
| | --. | .7167516 | .3597785 | 1.99 | 0.046 | .0115987 | 1.421905 |
| | L1. | .0894809 | .1783744 | 0.50 | 0.616 | -.2601264 | .4390882 |
| | TOP | | | | | | |
| | D1. | .3490244 | .3505696 | 1.00 | 0.319 | -.3380793 | 1.036128 |
| | _cons | -1.369283 | .5725045 | -2.39 | 0.017 | -2.491371 | -.2471951 |
| ----- | | | | | | | |

```

. test LATM_pos = LATM_neg

```

```

( 1) [ec]LATM_pos - [ec]LATM_neg = 0

```

```

chi2( 1) = 183.87
Prob > chi2 = 0.0000

```

```

. test dLATM_pos_diff = dLATM_neg_diff

```

```

( 1) [SR]dLATM_pos_diff - [SR]dLATM_neg_diff = 0

```

```

chi2( 1) = 0.69

```

Prob > chi2 = 0.4065

```
. xtpmg d.LRGDPPC dNIC_pos_diff L.dNIC_pos_diff dNIC_neg_diff L.dNIC_neg_diff d.TOP,  
lr(L.LRGDPPC NIC_pos NIC_neg LTOP) ec(ec) replace pmg
```

```
Iteration 0: log likelihood = 2042.9289 (not concave)  
Iteration 1: log likelihood = 2063.1313 (not concave)  
Iteration 2: log likelihood = 2067.4582  
Iteration 3: log likelihood = 2068.4397 (not concave)  
Iteration 4: log likelihood = 2071.9955  
Iteration 5: log likelihood = 2075.4338  
Iteration 6: log likelihood = 2075.6336  
Iteration 7: log likelihood = 2075.6338
```

Pooled Mean Group Regression
(Estimate results saved as pmg)

```
Panel Variable (i): countryid      Number of obs      =      1102  
Time Variable (t): qdate           Number of groups   =        29  
                                   Obs per group: min =        38  
                                   avg      =       38.0  
                                   max      =        38
```

Log Likelihood = 2075.634

| D.LRGDPPC | Coefficient | Std. err. | z | P> z | [95% conf. interval] | |
|---------------|-------------|-----------|-------|-------|----------------------|-----------|
| ----- | | | | | | |
| ec | | | | | | |
| NIC_pos | .3979696 | .098265 | 4.05 | 0.000 | .2053737 | .5905656 |
| NIC_neg | -.4494455 | .1526104 | -2.95 | 0.003 | -.7485564 | -.1503346 |
| LTOP | .6281075 | .0879875 | 7.14 | 0.000 | .4556553 | .8005598 |
| ----- | | | | | | |
| SR | | | | | | |
| ec | -.1866216 | .0593194 | -3.15 | 0.002 | -.3028855 | -.0703576 |
| dNIC_pos_diff | | | | | | |
| --. | .3192944 | .3995138 | 0.80 | 0.424 | -.4637382 | 1.102327 |
| L1. | .2438562 | .4882161 | 0.50 | 0.617 | -.7130298 | 1.200742 |
| dNIC_neg_diff | | | | | | |
| --. | .3459329 | .5176133 | 0.67 | 0.504 | -.6685706 | 1.360436 |
| L1. | -.131479 | .3326516 | -0.40 | 0.693 | -.7834643 | .5205062 |
| TOP | | | | | | |
| D1. | .2811423 | .2831878 | 0.99 | 0.321 | -.2738955 | .8361801 |
| _cons | -.6387044 | .3326882 | -1.92 | 0.055 | -1.290761 | .0133525 |
| ----- | | | | | | |

```
. test NIC_pos = NIC_neg
```

```
( 1) [ec]NIC_pos - [ec]NIC_neg = 0
```

```
      chi2( 1) = 139.18  
      Prob > chi2 = 0.0000
```

```
. test dNIC_pos_diff = dNIC_neg_diff
```

```
( 1) [SR]dNIC_pos_diff - [SR]dNIC_neg_diff = 0
```

chi2(1) = 0.00
 Prob > chi2 = 0.9669

Symmetric Results

Dependent Variable: D(LRGDPPC)

Method: ARDL

Date: 08/04/25 Time: 22:41

Sample: 2015Q1 2023Q4

Included observations: 1044

Maximum dependent lags: 1 (Automatic selection)

Model selection method: Akaike info criterion (AIC)

Dynamic regressors (4 lags, automatic): LIUI LTOP

Fixed regressors: C

Number of models evaluated: 4

Selected Model: ARDL(1, 4, 4)

Note: final equation sample is larger than selection sample

| Variable | Coefficient | Std. Error | t-Statistic | Prob.* |
|--------------------|-------------|-----------------------|-------------|--------|
| Long Run Equation | | | | |
| LIUI | 0.232221 | 0.041465 | 5.600476 | 0.0000 |
| LTOP | 1.357330 | 0.236187 | 5.746836 | 0.0000 |
| Short Run Equation | | | | |
| COINTEQ01 | -0.099560 | 0.031951 | -3.116042 | 0.0019 |
| D(LIUI) | 0.187423 | 0.139332 | 1.345151 | 0.1789 |
| D(LIUI(-1)) | 0.036459 | 0.050582 | 0.720779 | 0.4712 |
| D(LIUI(-2)) | 0.041298 | 0.064871 | 0.636618 | 0.5245 |
| D(LIUI(-3)) | -0.004646 | 0.118189 | -0.039310 | 0.9687 |
| D(LTOP) | 10.57569 | 10.73871 | 0.984819 | 0.3250 |
| D(LTOP(-1)) | -1.301859 | 1.598507 | -0.814422 | 0.4156 |
| D(LTOP(-2)) | 0.334326 | 0.621891 | 0.537596 | 0.5910 |
| D(LTOP(-3)) | -0.244461 | 0.208726 | -1.171203 | 0.2418 |
| C | -0.089551 | 0.051569 | -1.736539 | 0.0828 |
| Mean dependent var | 0.005764 | S.D. dependent var | 0.141589 | |
| S.E. of regression | 0.068732 | Akaike info criterion | -3.195385 | |
| Sum squared resid | 4.100562 | Schwarz criterion | -1.922624 | |
| Log likelihood | 2145.323 | Hannan-Quinn criter. | -2.715144 | |

*Note: p-values and any subsequent tests do not account for model selection.

Dependent Variable: D(LRGDPPC)
 Method: ARDL
 Date: 08/04/25 Time: 23:01
 Sample: 2014Q4 2023Q4
 Included observations: 1073
 Maximum dependent lags: 1 (Automatic selection)
 Model selection method: Akaike info criterion (AIC)
 Dynamic regressors (4 lags, automatic): LMBK LTOP
 Fixed regressors: C
 Number of models evaluated: 4
 Selected Model: ARDL(1, 3, 3)
 Note: final equation sample is larger than selection sample

| Variable | Coefficient | Std. Error | t-Statistic | Prob.* |
|--------------------|-------------|-----------------------|-------------|--------|
| Long Run Equation | | | | |
| LMBK | 0.059738 | 0.005833 | 10.24119 | 0.0000 |
| LTOP | 0.552822 | 0.090713 | 6.094166 | 0.0000 |
| Short Run Equation | | | | |
| COINTEQ01 | -0.070691 | 0.033206 | -2.128862 | 0.0335 |
| D(LMBK) | -0.096333 | 0.060159 | -1.601312 | 0.1096 |
| D(LMBK(-1)) | -0.052564 | 0.057422 | -0.915408 | 0.3602 |
| D(LMBK(-2)) | 0.054995 | 0.029310 | 1.876330 | 0.0609 |
| D(LTOP) | 12.54108 | 12.79314 | 0.980297 | 0.3272 |
| D(LTOP(-1)) | -1.110625 | 1.502234 | -0.739315 | 0.4599 |
| D(LTOP(-2)) | -0.192298 | 0.167363 | -1.148991 | 0.2509 |
| C | 0.126877 | 0.089576 | 1.416409 | 0.1570 |
| Mean dependent var | 0.007491 | S.D. dependent var | 0.145068 | |
| S.E. of regression | 0.062447 | Akaike info criterion | -3.260844 | |
| Sum squared resid | 3.611084 | Schwarz criterion | -2.240891 | |
| Log likelihood | 2125.289 | Hannan-Quinn criter. | -2.875993 | |

*Note: p-values and any subsequent tests do not account for model selection.

Dependent Variable: D(LRGDPPC)
 Method: ARDL
 Date: 08/04/25 Time: 23:05
 Sample: 2015Q1 2023Q4
 Included observations: 1044
 Maximum dependent lags: 1 (Automatic selection)
 Model selection method: Akaike info criterion (AIC)
 Dynamic regressors (4 lags, automatic): LPOS LTOP
 Fixed regressors: C
 Number of models evaluated: 4
 Selected Model: ARDL(1, 4, 4)
 Note: final equation sample is larger than selection sample

| Variable | Coefficient | Std. Error | t-Statistic | Prob.* |
|--------------------|-------------|-----------------------|-------------|--------|
| Long Run Equation | | | | |
| LPOS | 0.070642 | 0.006316 | 11.18473 | 0.0000 |
| LTOP | 0.786423 | 0.072883 | 10.79023 | 0.0000 |
| Short Run Equation | | | | |
| COINTEQ01 | -0.106977 | 0.036793 | -2.907546 | 0.0037 |
| D(LPOS) | -0.024530 | 0.052452 | -0.467662 | 0.6401 |
| D(LPOS(-1)) | -0.009105 | 0.023781 | -0.382878 | 0.7019 |
| D(LPOS(-2)) | 0.017820 | 0.013031 | 1.367577 | 0.1718 |
| D(LPOS(-3)) | 0.007915 | 0.019258 | 0.410986 | 0.6812 |
| D(LTOP) | 14.56276 | 14.59734 | 0.997631 | 0.3187 |
| D(LTOP(-1)) | 0.142425 | 0.373362 | 0.381467 | 0.7029 |
| D(LTOP(-2)) | 0.641150 | 0.946936 | 0.677079 | 0.4985 |
| D(LTOP(-3)) | -0.005973 | 0.128792 | -0.046381 | 0.9630 |
| C | 0.109568 | 0.076805 | 1.426564 | 0.1541 |
| Mean dependent var | 0.005764 | S.D. dependent var | 0.141589 | |
| S.E. of regression | 0.064091 | Akaike info criterion | -3.174076 | |
| Sum squared resid | 3.565454 | Schwarz criterion | -1.901315 | |
| Log likelihood | 2132.964 | Hannan-Quinn criter. | -2.693835 | |

*Note: p-values and any subsequent tests do not account for model selection.

Dependent Variable: D(LRGDPPC)
 Method: ARDL
 Date: 08/04/25 Time: 23:24
 Sample: 2014Q3 2023Q4
 Included observations: 1102
 Maximum dependent lags: 1 (Automatic selection)
 Model selection method: Akaike info criterion (AIC)
 Dynamic regressors (4 lags, automatic): LNBB LTOP
 Fixed regressors: C
 Number of models evaluated: 4
 Selected Model: ARDL(1, 2, 2)
 Note: final equation sample is larger than selection sample

| Variable | Coefficient | Std. Error | t-Statistic | Prob.* |
|--------------------|-------------|-----------------------|-------------|--------|
| Long Run Equation | | | | |
| LNBB | -1.016254 | 0.158502 | -6.411608 | 0.0000 |
| LTOP | 0.323773 | 0.113824 | 2.844495 | 0.0045 |
| Short Run Equation | | | | |
| COINTEQ01 | -0.124369 | 0.046439 | -2.678086 | 0.0075 |
| D(LNBB) | 0.072564 | 0.128244 | 0.565826 | 0.5716 |
| D(LNBB(-1)) | -0.013184 | 0.118180 | -0.111557 | 0.9112 |
| D(LTOP) | 5.388153 | 5.581395 | 0.965378 | 0.3346 |
| D(LTOP(-1)) | -5.216528 | 5.588307 | -0.933472 | 0.3508 |
| C | 0.728487 | 0.271416 | 2.684024 | 0.0074 |
| Mean dependent var | 0.004726 | S.D. dependent var | 0.161730 | |
| S.E. of regression | 0.095018 | Akaike info criterion | -3.227462 | |
| Sum squared resid | 8.883880 | Schwarz criterion | -2.460318 | |
| Log likelihood | 2047.928 | Hannan-Quinn criter. | -2.938002 | |

*Note: p-values and any subsequent tests do not account for model selection.

Dependent Variable: D(LRGDPPC)
Method: ARDL
Date: 08/04/25 Time: 23:28
Sample: 2014Q4 2023Q4
Included observations: 1073
Maximum dependent lags: 1 (Automatic selection)
Model selection method: Akaike info criterion (AIC)
Dynamic regressors (4 lags, automatic): LACOW LTOP
Fixed regressors: C
Number of models evaluated: 4
Selected Model: ARDL(1, 3, 3)
Note: final equation sample is larger than selection sample

| Variable | Coefficient | Std. Error | t-Statistic | Prob.* |
|--------------------|-------------|-----------------------|-------------|--------|
| Long Run Equation | | | | |
| LACOW | 0.655203 | 0.114344 | 5.730123 | 0.0000 |
| LTOP | 2.265556 | 0.342968 | 6.605736 | 0.0000 |
| Short Run Equation | | | | |
| COINTEQ01 | -0.062187 | 0.020251 | -3.070896 | 0.0022 |
| D(LACOW) | 0.175116 | 0.086406 | 2.026668 | 0.0430 |
| D(LACOW(-1)) | -0.001875 | 0.038643 | -0.048514 | 0.9613 |
| D(LACOW(-2)) | 0.030917 | 0.040209 | 0.768902 | 0.4421 |
| D(LTOP) | -25.31157 | 25.05401 | -1.010280 | 0.3126 |
| D(LTOP(-1)) | 2.430622 | 2.098236 | 1.158412 | 0.2470 |
| D(LTOP(-2)) | 28.53236 | 28.84678 | 0.989100 | 0.3229 |
| C | -0.466340 | 0.139446 | -3.344229 | 0.0009 |
| Mean dependent var | 0.007491 | S.D. dependent var | 0.145068 | |
| S.E. of regression | 0.064524 | Akaike info criterion | -3.358647 | |
| Sum squared resid | 3.855244 | Schwarz criterion | -2.338695 | |
| Log likelihood | 2182.015 | Hannan-Quinn criter. | -2.973797 | |

*Note: p-values and any subsequent tests do not account for model selection.

Dependent Variable: D(LRGDPPC)
Method: ARDL
Date: 08/05/25 Time: 09:55
Sample: 2014Q3 2023Q4
Included observations: 1102
Maximum dependent lags: 1 (Automatic selection)
Model selection method: Akaike info criterion (AIC)
Dynamic regressors (4 lags, automatic): LDGDP LTOP
Fixed regressors: C
Number of models evaluated: 4
Selected Model: ARDL(1, 2, 2)
Note: final equation sample is larger than selection sample

| Variable | Coefficient | Std. Error | t-Statistic | Prob.* |
|-------------------|-------------|------------|-------------|--------|
| Long Run Equation | | | | |

| | | | | |
|-------|-----------|----------|-----------|--------|
| LDGDP | -0.494335 | 0.085932 | -5.752626 | 0.0000 |
| LTOP | 0.598486 | 0.100025 | 5.983360 | 0.0000 |

Short Run Equation

| | | | | |
|--------------|-----------|----------|-----------|--------|
| COINTEQ01 | -0.139251 | 0.050255 | -2.770912 | 0.0057 |
| D(LDGDP) | -0.333114 | 0.145100 | -2.295751 | 0.0219 |
| D(LDGDP(-1)) | -0.010928 | 0.074734 | -0.146219 | 0.8838 |
| D(LTOP) | 10.95153 | 11.12912 | 0.984043 | 0.3253 |
| D(LTOP(-1)) | -9.811437 | 10.25493 | -0.956754 | 0.3389 |
| C | 0.683628 | 0.242296 | 2.821460 | 0.0049 |

| | | | |
|--------------------|----------|-----------------------|-----------|
| Mean dependent var | 0.004726 | S.D. dependent var | 0.161730 |
| S.E. of regression | 0.098074 | Akaike info criterion | -3.188944 |
| Sum squared resid | 9.464521 | Schwarz criterion | -2.421800 |
| Log likelihood | 2025.588 | Hannan-Quinn criter. | -2.899484 |

*Note: p-values and any subsequent tests do not account for model selection.

Dependent Variable: D(LRGDPPC)

Method: ARDL

Date: 08/05/25 Time: 10:10

Sample: 2014Q2 2023Q4

Included observations: 1131

Maximum dependent lags: 1 (Automatic selection)

Model selection method: Akaike info criterion (AIC)

Dynamic regressors (4 lags, automatic): LATM LTOP

Fixed regressors: C

Number of models evaluated: 4

Selected Model: ARDL(1, 1, 1)

Note: final equation sample is larger than selection sample

| Variable | Coefficient | Std. Error | t-Statistic | Prob.* |
|----------|-------------|------------|-------------|--------|
|----------|-------------|------------|-------------|--------|

Long Run Equation

| | | | | |
|------|----------|----------|----------|--------|
| LATM | 0.436409 | 0.032024 | 13.62771 | 0.0000 |
| LTOP | 0.915674 | 0.141766 | 6.459059 | 0.0000 |

Short Run Equation

| | | | | |
|-----------|-----------|----------|-----------|--------|
| COINTEQ01 | -0.105390 | 0.045941 | -2.294041 | 0.0220 |
| D(LATM) | 0.335810 | 0.122987 | 2.730457 | 0.0064 |
| D(LTOP) | 5.364658 | 5.445048 | 0.985236 | 0.3247 |
| C | 0.084249 | 0.045731 | 1.842266 | 0.0657 |

| | | | |
|--------------------|----------|-----------------------|-----------|
| Mean dependent var | 0.003239 | S.D. dependent var | 0.166887 |
| S.E. of regression | 0.077690 | Akaike info criterion | -3.643597 |
| Sum squared resid | 6.289166 | Schwarz criterion | -3.129261 |
| Log likelihood | 2231.286 | Hannan-Quinn criter. | -3.449527 |

*Note: p-values and any subsequent tests do not account for model selection.

Dependent Variable: D(LRGDPPC)
 Method: ARDL
 Date: 08/05/25 Time: 10:10
 Sample: 2014Q4 2023Q4
 Included observations: 999
 Maximum dependent lags: 1 (Automatic selection)
 Model selection method: Akaike info criterion (AIC)
 Dynamic regressors (4 lags, automatic): NIC LTOP
 Fixed regressors: C
 Number of models evaluated: 4
 Selected Model: ARDL(1, 3, 3)
 Note: final equation sample is larger than selection sample

| Variable | Coefficient | Std. Error | t-Statistic | Prob.* |
|--------------------|-------------|-----------------------|-------------|--------|
| Long Run Equation | | | | |
| NIC | 0.430259 | 0.198393 | 2.168714 | 0.0304 |
| LTOP | 2.592392 | 0.460943 | 5.624108 | 0.0000 |
| Short Run Equation | | | | |
| COINTEQ01 | -0.054561 | 0.017444 | -3.127837 | 0.0018 |
| D(NIC) | 0.043171 | 0.334503 | 0.129061 | 0.8973 |
| D(NIC(-1)) | 0.029846 | 0.123451 | 0.241761 | 0.8090 |
| D(NIC(-2)) | 0.169454 | 0.185879 | 0.911636 | 0.3622 |
| D(LTOP) | 8.455822 | 8.613117 | 0.981738 | 0.3265 |
| D(LTOP(-1)) | -0.939699 | 1.360460 | -0.690721 | 0.4899 |
| D(LTOP(-2)) | 2.029599 | 2.316088 | 0.876305 | 0.3811 |
| C | -0.333663 | 0.108242 | -3.082555 | 0.0021 |
| Mean dependent var | 0.007450 | S.D. dependent var | 0.149691 | |
| S.E. of regression | 0.066198 | Akaike info criterion | -3.179698 | |
| Sum squared resid | 3.777466 | Schwarz criterion | -2.173524 | |
| Log likelihood | 1935.037 | Hannan-Quinn criter. | -2.798713 | |

*Note: p-values and any subsequent tests do not account for model selection.

Panel unit root test: Summary

Series: ACOW

Date: 08/02/25 Time: 22:36

Sample: 2014Q1 2023Q4

Exogenous variables: Individual effects

User-specified lags: 1

Newey-West automatic bandwidth selection and Bartlett kernel

Balanced observations for each test

| Method | Statistic | Prob.** | Cross- sections | Obs |
|---|-----------|---------|--------------------|------|
| <u>Null: Unit root (assumes common unit root process)</u> | | | | |
| Levin, Lin & Chu t* | -0.94521 | 0.1723 | 29 | 1102 |
| <u>Null: Unit root (assumes individual unit root process)</u> | | | | |
| Im, Pesaran and Shin W-stat | -2.94519 | 0.0016 | 29 | 1102 |
| ADF - Fisher Chi-square | 137.135 | 0.0000 | 29 | 1102 |
| PP - Fisher Chi-square | 99.5552 | 0.0006 | 29 | 1131 |

** Probabilities for Fisher tests are computed using an asymptotic Chi-square distribution. All other tests assume asymptotic normality.

Panel unit root test: Summary

Series: ATM

Date: 08/02/25 Time: 22:37

Sample: 2014Q1 2023Q4

Exogenous variables: Individual effects

User-specified lags: 1

Newey-West automatic bandwidth selection and Bartlett kernel

Balanced observations for each test

| Method | Statistic | Prob.** | Cross- sections | Obs |
|---|-----------|---------|--------------------|------|
| <u>Null: Unit root (assumes common unit root process)</u> | | | | |
| Levin, Lin & Chu t* | -2.80007 | 0.0026 | 29 | 1102 |
| <u>Null: Unit root (assumes individual unit root process)</u> | | | | |
| Im, Pesaran and Shin W-stat | -5.08215 | 0.0000 | 29 | 1102 |
| ADF - Fisher Chi-square | 160.103 | 0.0000 | 29 | 1102 |
| PP - Fisher Chi-square | 186.900 | 0.0000 | 29 | 1131 |

** Probabilities for Fisher tests are computed using an asymptotic Chi-square distribution. All other tests assume asymptotic normality.

Panel unit root test: Summary

Series: MBK

Date: 08/02/25 Time: 22:42

Sample: 2014Q1 2023Q4

Exogenous variables: Individual effects

User-specified lags: 1

Newey-West automatic bandwidth selection and Bartlett kernel

Balanced observations for each test

| Method | Statistic | Prob.** | Cross-sections | Obs |
|---|-----------|---------|----------------|------|
| <u>Null: Unit root (assumes common unit root process)</u> | | | | |
| Levin, Lin & Chu t* | 4.39858 | 0.0000 | 29 | 1102 |
| <u>Null: Unit root (assumes individual unit root process)</u> | | | | |
| Im, Pesaran and Shin W-stat | 0.58749 | 0.7216 | 29 | 1102 |
| ADF - Fisher Chi-square | 167.195 | 0.0000 | 29 | 1102 |
| PP - Fisher Chi-square | 140.404 | 0.0000 | 29 | 1131 |

** Probabilities for Fisher tests are computed using an asymptotic Chi-square distribution. All other tests assume asymptotic normality.

Panel unit root test: Summary

Series: NBB

Date: 08/02/25 Time: 22:43

Sample: 2014Q1 2023Q4

Exogenous variables: Individual effects

User-specified lags: 1

Newey-West automatic bandwidth selection and Bartlett kernel

Balanced observations for each test

| Method | Statistic | Prob.** | Cross-sections | Obs |
|---|-----------|---------|----------------|------|
| <u>Null: Unit root (assumes common unit root process)</u> | | | | |
| Levin, Lin & Chu t* | 2.39377 | 0.0001 | 29 | 1102 |
| <u>Null: Unit root (assumes individual unit root process)</u> | | | | |
| Im, Pesaran and Shin W-stat | -4.24962 | 0.0000 | 29 | 1102 |
| ADF - Fisher Chi-square | 161.409 | 0.0000 | 29 | 1102 |
| PP - Fisher Chi-square | 122.315 | 0.0000 | 29 | 1131 |

** Probabilities for Fisher tests are computed using an asymptotic Chi-square distribution. All other tests assume asymptotic normality.

Panel unit root test: Summary

Series: NIC

Date: 08/02/25 Time: 22:43

Sample: 2014Q1 2023Q4

Exogenous variables: Individual effects

User-specified lags: 1

Newey-West automatic bandwidth selection and Bartlett kernel

Balanced observations for each test

| Method | Statistic | Prob.** | Cross- sections | Obs |
|--|-----------|---------|--------------------|------|
| <hr/> Null: Unit root (assumes common unit root process) | | | | |
| Levin, Lin & Chu t* | -0.69051 | 0.2449 | 27 | 1026 |
| <hr/> Null: Unit root (assumes individual unit root process) | | | | |
| Im, Pesaran and Shin W-stat | -4.29604 | 0.0000 | 27 | 1026 |
| ADF - Fisher Chi-square | 118.348 | 0.0000 | 27 | 1026 |
| PP - Fisher Chi-square | 103.921 | 0.0001 | 27 | 1053 |

** Probabilities for Fisher tests are computed using an asymptotic Chi-square distribution. All other tests assume asymptotic normality.

Panel unit root test: Summary

Series: POS

Date: 08/02/25 Time: 22:43

Sample: 2014Q1 2023Q4

Exogenous variables: Individual effects

User-specified lags: 1

Newey-West automatic bandwidth selection and Bartlett kernel

Balanced observations for each test

| Method | Statistic | Prob.** | Cross- sections | Obs |
|--|-----------|---------|--------------------|------|
| <hr/> Null: Unit root (assumes common unit root process) | | | | |
| Levin, Lin & Chu t* | 2.88844 | 0.9981 | 29 | 1102 |
| <hr/> Null: Unit root (assumes individual unit root process) | | | | |
| Im, Pesaran and Shin W-stat | 1.77223 | 0.9618 | 29 | 1102 |
| ADF - Fisher Chi-square | 80.9672 | 0.0249 | 29 | 1102 |
| PP - Fisher Chi-square | 63.9128 | 0.2767 | 29 | 1131 |

** Probabilities for Fisher tests are computed using an asymptotic Chi-square distribution. All other tests assume asymptotic normality.

Panel unit root test: Summary

Series: D(POS)

Date: 08/02/25 Time: 22:44

Sample: 2014Q1 2023Q4

Exogenous variables: Individual effects

User-specified lags: 1

Newey-West automatic bandwidth selection and Bartlett kernel

Balanced observations for each test

| Method | Statistic | Prob.** | Cross-sections | Obs |
|---|-----------|---------|----------------|------|
| <u>Null: Unit root (assumes common unit root process)</u> | | | | |
| Levin, Lin & Chu t* | 5.72205 | 0.0000 | 29 | 1073 |
| <u>Null: Unit root (assumes individual unit root process)</u> | | | | |
| Im, Pesaran and Shin W-stat | -3.52570 | 0.0002 | 29 | 1073 |
| ADF - Fisher Chi-square | 185.668 | 0.0000 | 29 | 1073 |
| PP - Fisher Chi-square | 189.070 | 0.0000 | 29 | 1102 |

** Probabilities for Fisher tests are computed using an asymptotic Chi-square distribution. All other tests assume asymptotic normality.

Panel unit root test: Summary

Series: LRGDPPC

Date: 08/02/25 Time: 22:47

Sample: 2014Q1 2023Q4

Exogenous variables: Individual effects

User-specified lags: 1

Newey-West automatic bandwidth selection and Bartlett kernel

Balanced observations for each test

| Method | Statistic | Prob.** | Cross-sections | Obs |
|---|-----------|---------|----------------|------|
| <u>Null: Unit root (assumes common unit root process)</u> | | | | |
| Levin, Lin & Chu t* | 0.71635 | 0.7631 | 29 | 1102 |
| <u>Null: Unit root (assumes individual unit root process)</u> | | | | |
| Im, Pesaran and Shin W-stat | -1.57212 | 0.0983 | 29 | 1102 |
| ADF - Fisher Chi-square | 13.7563 | 0.2432 | 29 | 1102 |
| PP - Fisher Chi-square | 18.4947 | 0.5108 | 29 | 1131 |

** Probabilities for Fisher tests are computed using an asymptotic Chi-square distribution. All other tests assume asymptotic normality.

Panel unit root test: Summary
 Series: D(LRGDPPC)
 Date: 08/02/25 Time: 22:48
 Sample: 2014Q1 2023Q4
 Exogenous variables: Individual effects
 User-specified lags: 1
 Newey-West automatic bandwidth selection and Bartlett kernel
 Balanced observations for each test

| Method | Statistic | Prob.** | Cross- sections | Obs |
|---|-----------|---------|--------------------|------|
| <u>Null: Unit root (assumes common unit root process)</u> | | | | |
| Levin, Lin & Chu t* | -10.0445 | 0.0000 | 29 | 1073 |
| <u>Null: Unit root (assumes individual unit root process)</u> | | | | |
| Im, Pesaran and Shin W-stat | -15.8047 | 0.0000 | 29 | 1073 |
| ADF - Fisher Chi-square | 278.456 | 0.0000 | 29 | 1073 |
| PP - Fisher Chi-square | 336.364 | 0.0000 | 29 | 1102 |

** Probabilities for Fisher tests are computed using an asymptotic Chi-square distribution. All other tests assume asymptotic normality.

Panel unit root test: Summary
 Series: IUI
 Date: 08/15/25 Time: 16:59
 Sample: 2014Q1 2023Q4
 Exogenous variables: Individual effects
 User-specified lags: 1
 Newey-West automatic bandwidth selection and Bartlett kernel
 Balanced observations for each test

| Method | Statistic | Prob.** | Cross- sections | Obs |
|---|-----------|---------|--------------------|------|
| <u>Null: Unit root (assumes common unit root process)</u> | | | | |
| Levin, Lin & Chu t* | -2.78157 | 0.0027 | 29 | 1102 |
| <u>Null: Unit root (assumes individual unit root process)</u> | | | | |
| Im, Pesaran and Shin W-stat | 0.34529 | 0.6351 | 29 | 1102 |
| ADF - Fisher Chi-square | 57.1611 | 0.5065 | 29 | 1102 |
| PP - Fisher Chi-square | 58.4529 | 0.4586 | 29 | 1131 |

** Probabilities for Fisher tests are computed using an asymptotic Chi-square distribution. All other tests assume asymptotic normality.