Validity of Labor Productivity: Imprint of Financial Development and Capital Accumulation in Sub-Saharan Africa

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ABSTRACT

Checking the growing economic development and substantial regional shifts may have a momentous consequence on human development and well-being in several African countries. Thus, this recent study offers the opportunity to explore the nexus between unobserved labor productivity and capital accumulation in a panel of several African economies from 1990 to 2018. The basic outcomes from the (dynamic) common correlated effects estimator - mean group (CCEE-MG) through cross-section Autoregressive Distributed Lag (CS-ARDL) bearing in mind the presence of cross-section reliance and heterogeneity issues, most observed series are preliminarily confirmed stationary and co-integrated. Panel dynamic ordinary least square {PDOLS} and fully modified ordinary least square {FMOLS} and among other techniques were also adopted in our study where we calibrated the sample into the African sub-region to ensure robustness.

The findings reveal that financial progress in the region over time leads to an increase in labor productivity and capital accumulation. Furthermore, financial markets have a progressive impact on the productivity of labor within sub-Saharan African regions. We extend the very limited literature on the nexus between financial development and labor productivity by incorporating capital accumulation into our model which has not been previously studied. Thus, the study recommends that increased capital accumulation and the financial sector significantly impact labor productivity. Therefore, Sub-Saharan African nations must implement appropriate policies to enhance the financial sector and promote capital accumulation. Institutions that are necessary should be created to support the measures in the continents. Regionalizing

policies and involving the global community are essential since they will foster the expansion of the financial sector, which will also impact worker productivity.

Keywords: Productivity of Labor, Financial Development, CS-ARDL, PDOLS, Capital Accumulation, Sub-Saharan Africa.

ÖZ

Büyüyen ekonomik kalkınmayı ve önemli bölgesel değişimleri kontrol etmek, birçok Afrika ülkesinde insani gelişme ve refah üzerinde çok önemli sonuçlar doğurabilir. Bu nedenle, bu son çalışma, 1990-2018 arasını kapsayan çeşitli Afrika ekonomilerinden oluşan bir panelde gözlemlenmemiş emek verimliliği ile sermaye birikimi arasındaki bağı keşfetme fırsatı sunuyor. "(Dinamik) ortak korelasyonlu etkiler tahmincisi - ortalama grup (CCEE-MG) ile enine kesit Otoregresif Dağıtılmış Gecikme (CS-ARDL) aracılığıyla elde edilen temel sonuçlar, enine kesit güveni ve heterojenlik sorunlarının varlığını akılda tutarak, en çok gözlemlenen seri ön onayları durağandır ve eşbütünleşiktir. Panel dinamik sıradan en küçük kare {PDOLS} ve tamamen değiştirilmiş sıradan en küçük kare {FMOLS}" ve diğer tekniklerin yanı sıra, sağlamlığı sağlamak için numuneyi Afrika alt bölgesine kalibre ettiğimiz çalışmamızda da benimsendi.

Bulgular, bölgedeki finansal ilerlemenin zaman içinde emek verimliliğinde ve sermaye birikiminde artışa yol açtığını ortaya koymaktadır. Ayrıca, finans piyasalarının Sahra altı Afrika bölgelerindeki emeğin üretkenliği üzerinde ilerici bir etkisi vardır. Daha önce çalışılmamış olan modelimize sermaye birikimini dahil ederek, finansal gelişme ile emek verimliliği arasındaki bağa ilişkin çok sınırlı literatürü genişletiyoruz. Bu nedenle, Sahra Altı Afrika ülkeleri, finans endüstrisini geliştirmek ve sermaye birikimini teşvik etmek için uygun politikaları uygulamalıdır. Kıtalardaki önlemleri desteklemek için gerekli kurumlar oluşturulmalıdır. Politikaları bölgeselleştirmek ve küresel topluluğu dahil etmek, finans sektörünün genişlemesini

teşvik edeceğinden ve bu aynı zamanda çalışan üretkenliğini de etkileyeceğinden çok önemlidir.

Anahtar Kelimeler: İşgücü Verimliliği, Finansal Gelişme, CS-ARDL, PDOLS.

DEDICATION

To God Almighty for his mercies, guidance, and protections

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LIST OF SYMBOLS AND ABBREVIATIONS

ARDL	Autoregressive Distributive Lag
CAPTA	Capital Accumulation
CCEE-MG	Common Correlated Effects Estimator - Mean Group
CS-ARDL	Cross-sectional - Autoregressive Distributive Lag
CD	Cross-sectional Dependence
CUSUM	Cumulative Sum
CUSUMSQ	Cumulative Sum of Squares
DF(CADF)	Cross-Sectional Augmented Dickey-Fuller
DOLS	Dynamic Ordinary Least Square
ECM	Error Correction Model
FD	Financial Development
FDI	Foreign Direct Investment
FI	Financial Institution
FM	Financial Market
FMOLS	Fully Modified Ordinary Least Square
GCF	Gross Capital Formation
GDP	Gross Domestic Product
ILO	International Labor Organization
LNCAPTA	Log Capital Accumulation
LNPROD	Log Labor Productivity
MPL	Marginal Productivity of Labor
OPW	Output Per Worker
PDOLS	Panel Dynamic Ordinary Least Square

PROD	Labor Productivity
TFP	Total Factor Productivity
WDI	World Development Indicators

Chapter 1

INTRODUCTION

1.1 Background and Motivation of the Study

A number of scholars have identified the relationship between the financial sectors and capital appraisal with an attribute to increasing the productivity of labor towards enhancing growth in developing economies. Although the financial growth of sub-Saharan African nations has advanced significantly in recent years, there is still much potential for improvement, especially when compared to other regions. In fact, until around a decade ago, many Sub-Saharan African nations had actually made less financial development than they had in the early 1980s. However, it is widely recognized that economic activities cannot take place efficiently without an appropriately functioning financial system. Therefore, it is proclaimed that the financial sector is an antecedent to economic development and is convincing in the theoretical literature (Hirono 2021; Bernier & Plouffe 2019; Mlachila et al., 2016).

Africa also lags behind other continents in all areas of global financial development and in the development of human capital (labor productivity) taken into account in this argument. Capital accumulation and contracts are unclear, riskier, time-consuming, and more expensive when financial institutions are weak (Johan, & Ariawan, 2022; Li, & Liao, 2020; Samargandi, 2018).

Therefore, it is not possible to simply attribute Africa's weak institutional quality and dismal economic performance to coincidence.

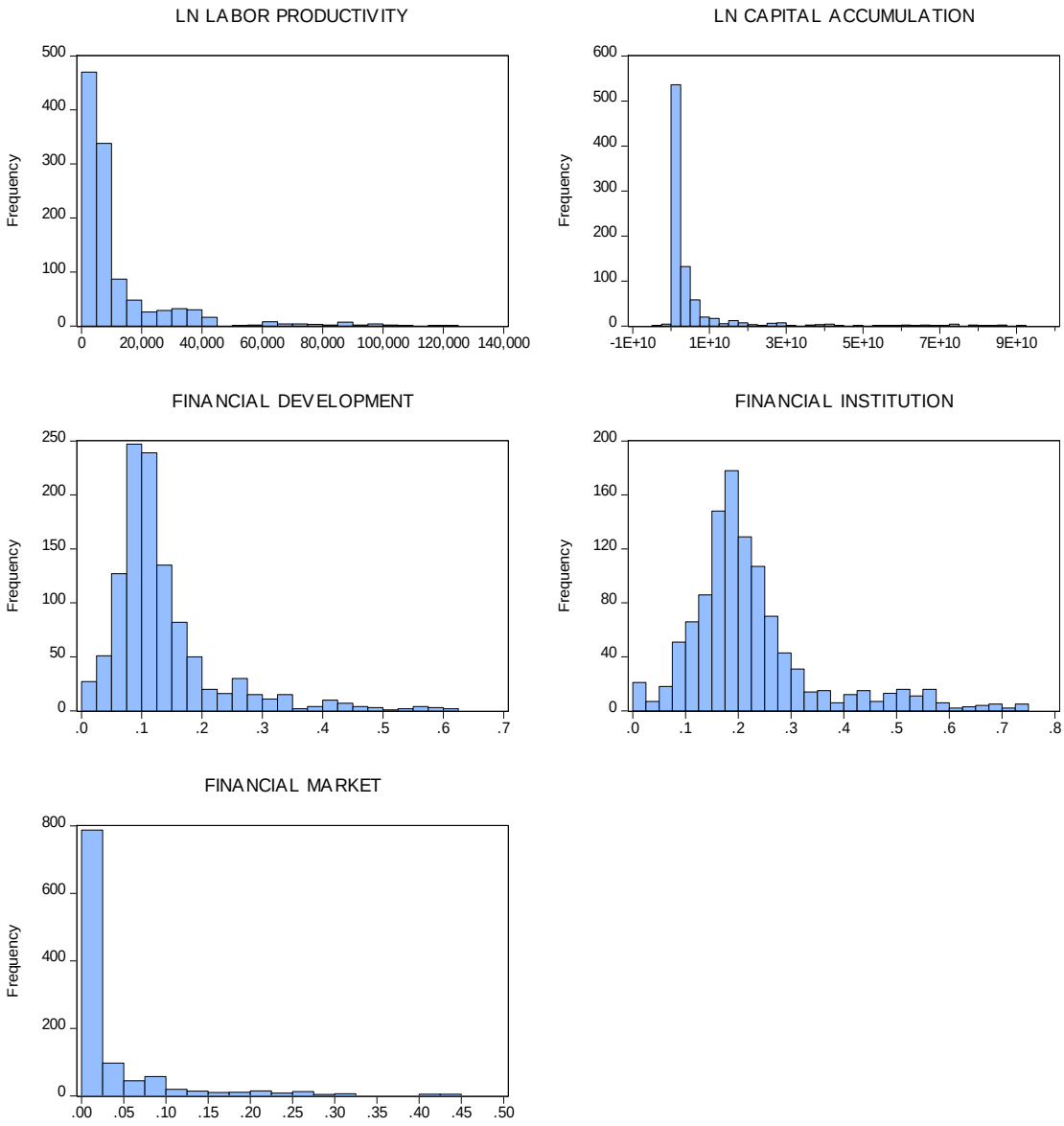


Figure 1: Information on productivity, financial development (FD), financial institutions (FI), financial markets development index (FM), and capital accumulation (LNCAPTA) from 1990 to 2018 for a subset of African countries

This study is novel and will contribute to the literature as it is among the few or even the first that has endeavored to examine the connection between capital accumulation and financial development and labor market outcomes with an emphasis on sub-Saharan Africa. Financial development refers to the improvement in the number,

value, and effectiveness of financial intermediate services. Using this notion as a foundation, some theoretical viewpoints have been developed linking financial development to the outcome of the labor market in an economy and vice versa. The means of investment and savings are typically expected to be the linking conduits. To foresee the nature of employment in connection to financial institutions and development, a specific theoretical framework hasn't yet been developed. The degrees of development, employment, and unemployment are anticipated to operate from different frequencies in the discussion of the following segment, and the overall outcome is likely to be unpredictable. Although the study aimed to conduct estimations beyond the current study period of 1990 to 2018, this was not possible due to incomplete data for some of the variables in some countries.

Data from the International Labour Organization (ILO) and the World Bank's World Development Indicators, however, reveal that the rise in labor productivity in Africa follows a pattern that is consistent with the regions' financial development (FD), capital accumulation (CAPTA) proxies by Gross Capital Formation, financial institutions (FI), and financial market vs development index (FM). In this graph, which was created to show the trends and movements among the variables under investigation, it can be seen that both capital accumulation and financial development (as measured by gross capital format Zion) move in ways that are similar to those of financial institutions and financial markets, indicating that the variables are. This is displayed in fig 1.

Furthermore, some researchers have drawn alternative conclusions from some well-established findings, implying that market credit failures may play an important role in collective concepts of dynamic operation involving labor and divergent investment

flows. Our study is unique in that it examines the connections between financial development, capital accumulation, and labor productivity using conventional theory. The research demonstrates why the conventional explanation, which focuses little on credit market friction and falls short of explaining the wider significance of changes in unemployment throughout business cycles, has to do with the nature of unemployment and part of equilibrium (Iheonu et al., 2020; Fontaine et al., 2020; Petrosky et al., 2013).

1.2 Statement of the Research Problem

The impact of capital accumulation and financial growth on labor productivity has been established. The impact of financial growth on productivity in Sub-Saharan Africa, however, is not given much attention. The relationship between financial development and productivity is well documented in both theoretical and empirical research, which benefits economic outcomes. The factors that influence financial flows have drawn the attention of researchers and policymakers. However, little research has been done on the impact of financial development and capital accumulation on labor productivity. The limited studies that have been done in this field have focused on how financial institutions affect employment in certain nations and areas. The growth of the financial sector and the accumulation of capital have very little effect on labor productivity in Sub-Saharan Africa. African nations, meanwhile, fall behind the rest of the globe in terms of the improvement of their financial institutions and the caliber of their human resources (Teipen, 2016; Johan, & Ariawan, 2022).

Studies concerning financial development, labor market, and aggregate productivity find that reform in financial institutions positively affects productivity. For example, Fonseca and Doornik (2022), Le, et al., (2022), Baharin, et al., (2020), Zhou, et al.,

(2019), Duarte, & Doornik, (2019), Samargandi, (2018), Sayfolahi, & Hazeri, (2017), Seifollahi, and Hazeri, (2017), Han, & Shen, (2015), Moretti, (2014), Aghion, et al., (2009), Guillaumont et al., (2006) and Shan, et al., (2001) discovered that financial institutions have a beneficial effect on productivity and that powerful financial institution attracts more human capital and increase labor productivity.

However, research on the situation in Sub-Saharan Africa is still pending. None of the studies previously cited use the proper methods or pay particular attention to how capital accumulation and financial growth affect labor productivity in the Sub-Saharan African region. Given Sub-Saharan Africa's features in terms of financial development and capital accumulation, it is essential to provide honest explanations of how financial development affects labor productivity in that region. Additionally, the studies do not examine how capital accumulation affects labor productivity. In order for the Sub-Saharan African region and other less developed countries to fully benefit, it is crucial to research both financial development and capital accumulation as factors of labor productivity. Additionally, the studies did not assess how financial institutions affected the labor productivity of emerging economies and low-income nations in Africa. The impact could differ greatly depending on the countries' income levels. Additionally, the research did not adequately take into consideration labor's marginal productivity and overall financial growth (MPL). As a result, their predictions and conclusions are flawed (Tabaghchi, et al., 2021; Wang, & Yin, 2021; Li, & Liao, 2020).

1.3 Objectives of the Study

This study's main goal is to investigate the mechanisms by which capital accumulation and financial growth in sub-Saharan Africa relate to labor productivity.

Other specific objectives include:

i. Analyzing how Sub-Saharan Africa's financial development affects worker productivity

ii. Examining how capital accumulation affects the creation of jobs in Sub-Saharan Africa

iii. Analyze the effect of financial institutions on Sub-Saharan Africa's labor productivity.

iv. Examine how the financial sector affects Sub-Saharan Africa's labor productivity.

v. Analyze the variation in how Sub-Saharan Africa's financial development affects labor productivity.

1.4 Research Questions

Many research problems in the field of financial and development economics remain unresolved, thus the research question was formed from the study's aims. As a result, this study posed the following research issues about how capital accumulation and financial growth in Sub-Saharan Africa affect worker productivity.

i. Does Sub-Saharan Africa's financial development affect labor productivity?

ii. Is the creation of capital important for creating jobs in Sub-Saharan Africa?

iii. Does Sub-Saharan Africa's financial sector experience the same effects of labor productivity across all financial institution types?

iii. Is the effect of worker productivity consistent across all Sub-Saharan African financial markets?

v. Does Sub-Saharan Africa's financial development have a similar impact on productivity across all income classes?

1.5 Contributions and Significance of the Study

This thesis investigates the impact of capital accumulation and financial development on labor productivity in Sub-Saharan African nations. The thesis, though, has a lot to offer. First, the productivity of labor should take into account both financial institutions and the financial market while accumulating capital. Even though there are connections between financial institutions and the financial market, advances in each have different effects on how policies are implemented. Since both are thought to be weak in Sub-Saharan Africa, it is crucial to evaluate each of their independent effects on labor productivity.

Second, rather than only using the overall index, financial development indicators are broken down into their component parts. The financial market and financial institutions both have several facets. Therefore, the use of general metrics of financial development may make it difficult for certain policymakers to appreciate the relationship between financial expansion and both capital accumulation and labor productivity. Third, it captures heterogeneity in the effects of productivity by considering all the variables and emerging Sub-Saharan African countries. Decision-makers and other interested parties will be able to use this information to align the components of financial development, capital growth, and labor productivity in their policy frameworks for the countries at various income levels and economic sectors.

Additional intriguing aspects of this study include: Fourth, this study used a relatively wide sample of sub-Saharan countries, performing estimations for each of the 39 sub-Saharan African nations and sub-regions (South Africa, West Africa, East Africa, and Central Africa). This was done to guarantee the validity of the study's findings and

outcomes. Fifth, our study used the cross-section Autoregressive Distributed Lag (CS-ARDL), the second-generation unit root test, the panel dynamic ordinary least square (PDOLS) and fully modified ordinary least square (FMOLS) estimation approaches, among others, in order to achieve the empirical output.

This method allows the problems of heteroscedasticity and endogeneity to be solved, which are common issues associated with micro panel data. Additionally, this analysis employed panel data to accurately represent the slowly varying dynamics of labor productivity and financial growth in the continent as opposed to the consecutive year data used in other studies.

As a result, the thesis makes a significant contribution to the literature and offers policy conclusions that are helpful for policymaking in Africa. This is crucial since African nations are in dire need of increasing their economic growth and worker productivity. Designing a desirable labor productivity policy for the continent will be challenging, if not impossible, without a thorough knowledge of the key forces behind financial development and capital accumulation. The policy recommendations made by this thesis can also help other developing economies that have traits in common with the African nations.

1.6 Outline of the Thesis

The thesis is divided into five chapters. The first chapter is the Introduction (background of the study), which quickly summarizes the thesis' main argument. The research challenge is also stated in chapter one. It describes the study's objectives and outlines the key problems, and research needs. The inability of earlier research to concentrate on Sub-Saharan Africa and other inadequacies are highlighted here.

However, the research questions and aims are underlined, and the contributions and relevance of the study are briefly described in chapter one. Chapter 2 presents the theoretical literature. The discussion of the current theoretical models makes appropriate connections to the thesis's major topic. In chapter three, the empirical literature review pertinent to the thesis issue is assessed. The empirical investigation, which covers the empirical model and the methods of estimation in this thesis, is covered in chapter four. The empirical results are presented and discussed in chapter four, and the summary, conclusion, and policy implications are fully covered in chapter five.

Chapter 2

THEORETICAL LITERATURE REVIEW

2.1 Theoretical Review

In the past century, theoretical and empirical studies relating to financial development, capital accumulation, and labor market outcomes have been conducted around the world.

Labor productivity is a way to gauge a nation's economy's hourly output. It shows how much real gross domestic product (GDP) is produced in a given hour of labor. Three main variables affect the rise of labor productivity: physical capital investment and saving, new technology, and human capital. Labor productivity is the amount of value that each employee generates per unit of input. For example, a Turkish worker can produce twenty sandwiches in one hour, whereas an Iranian worker can only make five sandwiches in the same period. The Turkish worker is more productive in this hypothetical scenario. More productivity means that more can be accomplished in the same amount of time. This frees up resources that can be put to better use elsewhere (Lewis,. 2022; Joyce & Tong 2020).

There are theories that have developed throughout the years with a primary focus on economic development patterns, financial development, and labor productivity that are acknowledged as an engine of progress. With respect to them, two well-known

economists, Joseph A. Schumpeter and John Maynard Keynes defend growth theories from various angles.

Financial institutions are cited as the key factors of economic expansion and growth in contemporary studies. This provided fresh perspectives for the literature on financial development. The early theories' identified variables were direct contributors to productivity. Institutions are important factors in determining productivity, according to this. The older growth theories, however, did not discount the part played by financial institutions in determining worker productivity trends. Instead, the theories by definition presupposed the existence of a well-functioning organization. Schumpeter, for example, believed that the financial sector is represented by variations in productivity between developed and less developed nations. He stated that industrialized economies with stronger financial sectors indicate that the former (North) are more productive in institutionally dependent sector(s) than the latter (South).

In the 1930s, John Maynard Keynes noted, saving and investing were typically carried out by different people. Savings motivation may not always lead to investment. If savers attempt to set aside a larger amount of their income than they previously did (thereby consuming less) and if this is not followed by a commensurate growth in others' desire to invest, total expenditure will decline (Keynes et al., 1971).

The business's natural response will be to reduce production, which will lower the earnings generated by manufacturing. The end result could be a cumulative shift downward as long as there isn't enough demand to use all of the labor. This interruption in the cyclical flow of income and spending increases the probability of periods of

severe and prolonged unemployment (when there is full employment and the economy wants to save more than it wants to invest) and periods of high inflation (when the inequality is reversed). Historically, industrialized economies had not experienced this circumstance until the early 1970s. The many development theories will be discussed in the discussion that follows with some focus on how they explain this significant historical fact.

Joseph A. Schumpeter can be considered the father of modern growth theory. Unlike most Keynesian or pre-Keynesian theories, Schumpeter placed a great emphasis on the role of finance through the businessman or entrepreneur. Depending on how well he did, capital would either grow swiftly or slowly, and whether this expansion would involve innovation and change, i.e. the creation of new products and new manufacturing techniques. Variations in growth rates among nations and throughout time can be directly related to the level of entrepreneurship in every given nation. The historical and cultural ideas of the business elite in turn reflected these aspirations in the latter. Additionally, Schumpeter credited the entrepreneur for much of the expansion of technological advancement and the labor supply (Schumpeter, & Backhaus 2003).

According to Schumpeter & Backhaus (2003)., capitalism "sows the seeds of its own downfall" by virtue of its success. Alvin H. Hansen, an economist from the United States, claimed that capitalism in the country was in jeopardy for other reasons in the late 1930s. According to Hansen, the potential of stagnation has increased due to a decreased demand for investment due to the slowing population growth rate, the closing of the geographic frontier, and the capital-saving characteristics of recent technological advancements. At levels of full employment, the amount that the

economy would wish to invest would typically be greater than the savings that are available, and this gap would get bigger over time. Naturally, if the gap between demand and potential output grew, this circumstance would result in higher unemployment rates. Hansen's opinions were significantly influenced by the 1930s' economic climate. The successes of the three decades that followed World War II made a substantial contribution to eradicating depression-era pessimism.

2.2 Smith's Labor Productivity Theory

A significant part of Smith's core module of labor productivity is labor division. the Adam Smith book The Wealth of a Nation (1776). Therefore, his fundamental justification for An Inquiry into the Nature and Causes of the Wealth of Nations in his first book is as follows: Labor Division, Skill, Expertise, Experience, and Knowledge are the factors that boost labor productivity as well as the order in which its output is organically allocated among the various social classes. The basis for fundamental and beneficial production is this (Smith 2009).

Adam Smith illustrates his point about productivity via the manufacture of pins. Smith asserts that even if he started creating pins on his own and assumed that there would be no learning curve, a single worker would not be able to create twenty complete pins in a day. Additionally, he would be responsible for finishing all phases of the assignment alone. On the other hand, it can be seen that if there is a technical separation or even specialization of the various labor phases, a small workforce of only approximately ten persons can manage to generate up to forty-eight thousand pins each day. This alone demonstrates Smith's frequently reported claim that labor division boosts productivity.

Smith contends and demonstrates that professional specialization boosts productivity once it is possible to divide the various production flow processes in an industry. On the other side, this promotes diversification and the expansion of numerous sectors and professions (Smith 2009).

2.2.1 The key Concepts in Adam Smith's Theory of Labor

Smith contends that the division of work is the only factor that may increase labor productivity while using the same amount of labor. Its foundation consists of three elements: (Smith 2009).

i) The ability of the worker doing the task individually

ii) The avoidance of time waste when switching between separate tasks

iii) the utilization of tools that accelerate every stage of the production process, shorten the workday, and enable employees to complete tasks that would often require many personnel. The initial economic justification can be created using these key concepts from Smith's theory of labor productivity. His factors effectively represent the way that process optimization is done right now. The first three are specialization, time management, and technical development.

2.2.2 Critically Evaluating Smith's Labor Productivity

When the context and circumstances of labor and industrial practices of Adam Smith’s Day are made known, his tactics for boosting work productivity may be seen as paradigm-setting. It is also conceivable to draw the conclusion that Smith's theory had a substantial impact on the beginning of the industrial revolution since the middle of the 18th and the beginning of the 19th century. Despite the effects of applying Smith's theory to the industrial revolution and potentially for the higher riches of individuals, the key component of labor division can and must be acknowledged. There may be a

moral argument for Smith's claim that personal specialization leads to improvement in the individual and concurrent personal growth in the course of everyday employment.

Due to the consequent dullness and lack of logical demand, there is a strong risk that this specialization, the related labor division, and the repetitious tasks themselves are to blame for the working population's discontent and misery. Every current criticism must be assessed in the perspective of productive circumstances because Smith unquestionably has a significant impact on how productive factors are considered in the working process. Smith's contributions to biology and physics can be compared to those of Darwin or Newton, respectively. Butler (2001) It is evident that Smith's methods and discoveries may very well have favorable repercussions and implications for all parties involved in the economy, notwithstanding the criticisms leveled at his theory.

2.3 Marx's Theory of Labor Productivity

A change in the working process that reduces the amount of time the society as a whole must spend working to generate a good is how Marx defined an increase in labor productivity. As a result, less work is needed to get more useful results. In addition, he qualifies his claim by emphasizing the value he had contributed, saying that only a worker who contributes value to the capitalist or who exploits assets for personal gain is productive (Marx 1867).

Marx contends further that in order to study productive work, it is important to consider not only the connection between labor and productivity but also the conditions for social incorporation and the integration of the production processes. Marx therefore deduces the following: Being an effective employee is poor luck rather

than chance (Marx 1867) Marx compares the need to provide enough food for each worker to survive to the intrinsic worth of labor. Marx argues that any effort made above this equilibrium constitutes the so-called added value, which must be divided into the absolute added value and the relative added value.

Labor productivity can be attained in two separate ways, according to Marx. On the one hand, there is the absolute added value, and on the other, there is the relative added value. As a result, the productivity of the task will depend on the employee as well as the working and manufacturing conditions that the organization establishes.

2.3.1 The Main Ideas of Marx's Theory of Labor Productivity

According to their distinct situation-specific qualities, which may be constant or changing, Marx uses three influencing factors with direct effects to define added value. These are significant affecting factors:

(a) Working Day Length (b) Work Volume (c) The Typical Intensity of the Work. These significant facts are determining factors for a specific workload at a specific time. Therefore, the only method to change how productive the work is to improve work processes. Only this ensures that a certain number of things will be produced with fewer working hours. This suggests that using less input can result in an increase in output. (Marx 1867).

2.3.2 Marx's Labor Productivity: A Critical Analysis

Only the elements of labor and productivity should be discussed in the examination of Marx's labor productivity. This section of the study does not seek to evaluate the entire body of work. To evaluate and discuss this part of Marx's "Capital," it is crucial to comprehend the standards that he employed to distinguish between labor that is productive and nonproductive work. Marx argued that every work that adds value must

first be created. Nothing is fruitful work if it doesn't add value. Producing alone is no longer sufficient. There must be added value created. Only a worker who adds value for the capitalist or who uses the assets for self-exploitation is considered productive.

In contrast, the added value is a kind of labor that the employee performs that goes directly above and outside what is necessary to support him. Marx merely uses the absolute additional value as the basis for the longer working hours because this enhanced value is more than the labor necessary to ensure one's livelihood. (Marx 1867) From this perspective, Marx develops the idea that every increase in value is a capitalization of the worker; in doing so, he inadvertently submits to the assets. Marx argues that the growth of absolute added value is always a prerequisite for the growth of relative added value, therefore it is assumed that the productive effort is subordinated. He essentially argues that there are only two methods to enhance productivity:

i) Alter the production process to generate more, for example by using capital and equipment.

ii) All work is performed above and above what is required to support oneself.

As a result, according to Marx, with every new cooperative feature of the working process, the concept of industrious labor and its ally, the productive worker, must be broadened (Marx 1867).

2.4 Total Factor Productivity (TFP) Model

Total factor productivity is the average productivity of all factors, weighted according to their proportions in the total cost of production. Similar to the study developed by Li et al., (2021), Erken et al, (2018) and Comin (2010). Let's pretend for a moment

that output is expressed in tons or some other type of physical unit. The ratio of output Q to total input P is then used to calculate TFP:

$$\text{TFP} = \frac{\text{Q}}{\text{P}} \tag{1}$$

Given the number of inputs, X must be calculated through aggregation. According to the definition of the Divisia index, the growth rate of the aggregated input is the same as the weighted sum of the growth rates of the constituent inputs:

$$\frac{dP}{P} = \sum_{j=1}^{I} W_i \frac{dp_i}{p_i} \tag{2}$$

where w_i is the weight given to input i and p_i is the amount of input i.

$$\text{W}_\text{i} = \frac{\text{Unit cost of input i x Units of input i employed}}{\text{Total expenditures for all inpts}} \tag{3}$$

Take into account the fact that there are various outputs rather than simply one. Once more using Divisia indexes, it follows that

$$\frac{\text{dQ}}{\text{Q}} = \sum_{\text{j}=1}^{\text{i}} \text{V}_\text{i} \frac{\text{dq}_\text{i}}{\text{q}_\text{i}} \tag{4}$$

where q_i is the amount of the $_i$th output produced and Vj is the percentage of the total income that the jth output contributed. For TFP growth, (2) and (4) can be combined to produce the following expression:

$$\widehat{\text{TFP}} = \sum\nolimits_i V_j \widehat{q_\iota} - \sum\nolimits_j W_j \widehat{p_\iota} \tag{5}$$

where the weights are functions of the pertinent prices and quantities and the hats reflect growth rates:

$$V_i = \frac{g_j q_i}{\Sigma_i g_j q_i} \quad \& \quad W_j = \frac{t_j p_j}{\Sigma_j t_j p_j} \tag{6}$$

where the prices of the ith output and jth input, respectively, are g_i and t_j. The company is predicated to maximize earnings subject to the production technology's limitations, which are given by

$$(q_j, \ldots\ldots, q_i) = Y(p_j, \ldots\ldots, p_i) \tag{7}$$

where the following profits are given.

$$\pi = \sum g_j q_i - \sum t_i p_j \tag{8}$$

Consequently, if the production technique exhibits continuous returns to scale

$$\sum_i g_j q_i = \sum_j t_j p_j \tag{9}$$

The final equation is completely differentiable with regard to time, and the product of dividing both sides by the appropriate total value is

$$\sum_i V_i\{\hat{g}_i + \hat{q}_i\} = \sum_j W_j\{\hat{t}_j + \hat{p}_j\} \tag{10}$$

According to equation (5), the difference between the aggregate growth rates of inputs and outputs determines the rate of increase of TFP. Additionally, it may be demonstrated that when (10) is applied

$$\hat{TFP} = \sum_j W_j.\hat{t}_j - \sum_i V_i.\hat{g}_i \tag{11}$$

It means that the average rate of input price growth less than the average rate of output price growth determines the rate of TFP growth.

2.4.1 Relationship between Labor Productivity and TFP Growth

The following models are taken into account when examining the connection between labor productivity and TFP growth (Sargent, & Rodriguez, 2001). Therefore, the corresponding difference in logarithms is a good approximation of the rate of change from one-time period t to t + 1 for modest changes in a variable. in light of any variable Z.

$$\widehat{Y} = \frac{Y_{r+1} - Y_r}{Y_r} \approx \ln Y_{r+1} - \ln Y_r \tag{12}$$

This handy result allows us to reformulate our measure of TFP in (5) by substituting the equivalent log differences for all growth rates. Consequently, TFP's growth rate is

$$\hat{\mathrm{TFP}}_{\mathrm{r}} = \ln \mathrm{TFP}_{\mathrm{r}} - \ln \mathrm{TFP}_{\mathrm{r-1}} = \sum_{\mathrm{j}} \bar{\mathrm{W}}_{\mathrm{j,r}} \{\ln(\mathrm{Q}_{\mathrm{r}}/\mathrm{P}_{\mathrm{j,r}}) - \ln(\mathrm{Q}_{\mathrm{r-1}}/\mathrm{P}_{\mathrm{j,r-1}})\} \tag{13}$$

where the average spending share $\overline{W}_{j,r}$ is equal to $0.5(W_{j,r} + W_{j,r-1})$. Evidently, the weighted amount of all single component productivities' growth rates represents the rise of total factor productivity. Also, the average input growth rate plus the TFP growth rate equals output growth.

$$\hat{Q}_r = \sum_j \bar{W}_{j,r} \hat{P}_{j,r} + T\hat{F}P_r \tag{14}$$

Last, of all, the growth rates of the ratios of all other inputs to that input as well as the growth of TFP can be used to indicate the growth rate of productivity of any input. This suggests that in the case of labor productivity.

Labor productivity growth rate:

$$= \left(\ln Q_r - \ln P_{j,r}\right) - \left(\ln Q_{r-1} - P_{j,r-1}\right)$$
$$= \left(\ln Q_r - \ln Q_{r-1}\right) - \left(\ln P_{j,r} - \ln P_{j,r-1}\right)$$
$$= \sum_{r+1} \overline{W}_{j,r}\hat{P}_{j,r} - \left(1 - W_j\right)\hat{P}_{j.r} + T\hat{F}P_r$$
$$= \sum_{r+1} \overline{W}_{j,r}\left(\hat{P}_{j,r} - \hat{P}_{j,r}\right) + T\hat{F}P_r \quad (15)$$

where equation (14) leads to the second-to-last equality, and the final equality employs $1-\overline{W}_{j,r} = \sum_{j\neq 1} \overline{W}_{j,r.}$.

2.5 Theory of Financial Development and Growth

A financial system is composed of financial institutions, such as commercial banks, and financial marketplaces, such as the stock and bond markets. On a bigger scale, a sound and efficient financial system promotes growth by better allocating resources and ensuring that they are put to the best possible use. Growth can be accelerated by a more efficient and stable financial system by boosting general investment and saving rates, which hastens the accumulation of physical capital. Financial development promotes growth by enhancing competition and stimulating creative activities that improve dynamic efficiency (Khan, & Senhadji, 2000; De & Guidotti, 1995). The literature investigates how GDP expansion:

(i) The financial system's depth, which is assessed using metrics like the ratio of total liquid liabilities to GDP, the ratio of bank credit to GDP, or the ratio of stock market capitalization to GDP; and

(ii) The financial system's structure, which is assessed using metrics like the ratio of bank credit to stock market capitalization.

The vast bulk of evidence from empirical study strongly supports that financial depth has a significant positive influence on growth but that the financial structure (the relative importance of banks versus capital markets) has no observable effect on

growth. More specifically, the development of the stock market, banks, and other aspects of the financial sector all significantly boost growth. Countries with market-based financial systems do not fare better than those with bank-based systems, despite the fact that the transition from banks to capital markets is occasionally considered as a sign of financial development. The overall finding from the empirical research is that an economy's total financial growth, not the proportional weight of its constituent components, determines performance.

2.6 Capital Accumulation and Economics Development

Adam Smith wrote the classic treatise An Inquiry into the Nature and Causes of the Wealth of Nations in 1776. Some have interpreted this to mean that he was mostly focused on economic expansion. By doing so, Smith returned the Mercantilists' pet issue to economics and departed from the Cantillon-Physiocratic theory, which placed a strong emphasis on the "natural equilibrium" of circular flows (Kaldor, 1961).

Smith proposed a growth model that was supply-side oriented. We can summarize the plot using the most basic production techniques:

$$Y = \| f(L, K, T) \quad (16)$$

If Y is the output, then L, K, and T represent the inputs of labor, capital, and land respectively. As a result, gains in general productivity (g|| *f*), investment growth (gK), land growth (gT), and population growth (gL) were the main drivers of output growth (gY). Succinctly:

$$gY = \varphi(g \| f, gK, gL, gT) \quad (17)$$

He considered income distribution to be one of the most significant factors in determining how quickly (or slowly) a country would grow because capitalist savings

are what spur investment and thus growth. Savings, however, are influenced by stock profits to some extent. According to Smith, as a nation's capital stock rises, profit declines—not because marginal productivity is falling but rather because of the competition among capitalists for employees, which will drive up wages (Iwaisako, & Futagami, 2013). Therefore, decreasing worker living conditions was yet another means of sustaining or enhancing growth (although the counter-effect would be to reduce labor supply growth).

2.6.1 Marxist Theories on the Accumulation of Capital

The focus of the Marxist theory of capital accumulation is on how company profit is invested in additional capital. As a result, capitalists are able to amass more wealth and control over society. Marx also thought that capitalism was vulnerable to crises since there would be instances where profit would exceed what capitalists could invest in.

According to contemporary economist Thomas Piketty, if the process of capital accumulation is left unchecked, it may result in a rise in social inequality. According to Piketty et al., (2019), capital can be invested in other assets such as homes, stocks, and bonds instead of just the firm.

Picketty contends that wealth generally increases more quickly than economic production. He uses the equation $r > g$, where r stands for the rate of wealth return while g for the rate of economic expansion. This is mostly because of the process of capital accumulation and the ability to reinvest returns from assets.

2.6.2 Ricardo’s Theory on Capital Accumulation

Ricardo's theory of economic growth gave capital accumulation a high priority. Ricardo believed that capital accumulation resulted from profit as well as the owners' willingness and ability to invest in more capital. Developing countries are usually

advised to amass wealth to increase their long-term development rates. In order to increase capital accumulation, it is important to:

✓ Maintain a sound lending and banking system.

✓ Decrease corruption

✓ A good infrastructure will increase the return on investment.

Ricardo claims that capital accumulation is the result of profit since it encourages people to save money, which is then utilized to create capital. Capital accumulation is influenced by two elements: The ability to save comes first, followed by the desire to save In the process of accumulating capital, saving ability is more crucial. This is dependent on society's net income, which is the surplus remaining after paying for workers' subsistence. The capacity to save will increase with the size of the excess (Casarosa, 1978).

Economic growth, in Ricardo's view, rests on the gap between output and consumption. He places emphasis on raising production and consumption as a result. However, technological advancements and improved organization may boost labor productivity. Capital accumulation can also be accelerated in this way. But when more machines are used, fewer workers will be needed. Reduced salaries and unemployment will result from this. Ricardo views technical advancements as inevitable and ongoing since they deteriorate the economic situation of the workforce.

2.7 Theoretical Perspective and Views

Fonseca and Doornik (2022) examined theoretical evidence comparing changes in outcomes on financial constraints of a firm, labor market, and productivity, where the results indicated that a positive relationship exists among the various variables with an

increase in the number of employments, especially within the skilled workers. Also, some studies have proposed that financial stability and development are particularly vital in attaining ongoing productivity, promoting capital in the financial market as well as attaining financial growth in developing countries (Manasseh et al., 2022; Büyükkarabacak & Valev, 2010).

According to Karl Marx's economic theory, capital accumulation is the process by which income is reinvested in the economy, hence raising the total amount of capital. Marx described capital as increasing value, or, to put it another way, a sum of capital, typically expressed in dollars, that is changed into a higher value and extracted as profits through labor by humans. The value of an economic or commercial asset that capitalists use to create additional value (surplus value) is known as capital (Alves, 2022). Capital accumulation, which refers to an increase in assets as a result of investments or earnings, is one of the pillars of a capitalist economy. As a return on investment, the goal is to increase the value of the initial investment through appreciation, rent, capital gains, or interest. By investing earned income and savings, capital accumulation aims to expand existing wealth. This investment is concentrated in different ways across the economy. One method of raising funds is to buy actual things that produce output. Machines and other tangible items can be included. Research and development are part of human capital, which can also increase productivity. Investing in financial assets such as stocks and bonds, which appreciate in value, is another approach to accumulate capital. Another essential component of wealth building is appreciation (Brady, 2020; Nakamura et al., 2019).

Expansion of the financial sector is crucial for economic growth, according to a large body of research. Economic growth can be encouraged through capital accumulation

and technological advancement by increasing the savings rate, mobilizing and pooling funds, producing investment information, facilitating and encouraging foreign capital inflows, and optimizing capital allocation (Fonseca & Doornik, (2022). In accordance with market law and ethics, a disparity exists in terms of financial market development among various countries. Market transparency in China has developed intensely due to the upgrading of its financial sector. It was suggested that the 2005 national trade reform increased market openness and reduced evidence asymmetry, which decreased the underpricing of tradable shares. The change that took place between 2005 and 2006 in China involved a large number of tradable commodities (Cattaneo et al. 2015).

Chapter 3

EMPIRICAL LITERATURE REVIEW

3.1 Empirical Review

The empirical literature is separated into three groups. The first part of the chapter focuses on the relationship between financial development and financial institutions, as well as the relationship between the financial market and capital accumulation, and the research gap. This is done to clearly define the gap in the literature and to discover the research trend in both strands of literature.

3.2 Financial Development, Financial Institutions, and Productivity of Labor

With the productivity reform on finance and the consequent extension of bank credit, financially constrained enterprises should see bigger employment effects. We test this hypothesis using the data using firm age and business size as proxy for financial constraints. According to both financial constraint indicators, the share of skilled workers increases more at financially constrained businesses in high-enforcement areas than it does at organizations that are not financially restricted. Additionally, we find that the rise in the proportion of skilled workers at constrained firms is entirely the result of skilled workers who were previously employed by an unconstrained firm, indicating that constrained firms are now able to entice skilled workers from their unconstrained rivals as a result of the reform (Hadlock and Pierce, 2010).

Phiri (2015) claims that there is a skewed relationship between growth and financial development. It was believed that the development of the stock market was influenced by economic expansion, with banking activity playing a crucial role in this development. Shahid et al. (2015) assert that there is a strong positive relationship between financial development and economic growth. Research by Bai et al. (2018) and Caggese et al. (2019) found that financial development has an impact on productivity and firm-level hiring decisions, which in turn has an impact on both the allocation of labor among producers and overall unemployment rates. By providing evidence that having access to outside finance affects the types of personnel a company hires, both in terms of profession and degree of education, as well as the internal returns to skill, we contribute to the literature. We further provide empirical evidence that the shift in skill intensity and the rise in the skill premium brought about by improved access to credit are at least largely explained by the complementarities between capital and skill.

Sarwar et al. (2020) examine key elements of financial development and human capital, as well as how these two factors interact to affect economic growth and labor productivity, from the perspective of developing economies. The World Bank's global development indicators were used to compile data for this study, which covered the years 2002 to 2017. The data came from 83 developing countries and covered the period. In order to analyze the effects across time and across different countries, this study uses the endogenous growth model and the two-step system generalized technique of moments. The study's conclusions show that financial development influences economic growth in a good and significant way. Human capital also has a favorable effect on economic growth in developing nations. Economic growth in

emerging economies is considerably and positively impacted by the interaction between financial development and human capital.

The stock of real physical capital, financial development, and human capital are all factors that Munir and Arshad (2018) used the endogenous growth model to analyze their long- and short-term effects on Pakistan's economic growth. The study's findings, which are in line with the endogenous growth model, show that when real physical capital and human capital are built up, GDP per worker rises, raising employment levels, per capita incomes, labor productivity, and the sources of economic growth along with them. A 2018 study by Rosendo Silva et al. examined how human capital affects economic growth. According to the findings, because healthy workers are more productive at work, greater health also has a significant, favorable impact on economic growth.

In their study of labor productivity in East Asia, Li and Liang (2010) found a substantial correlation between stock and financial growth. The stock of health capital is significantly more significant to growth than the stock of education capital, though. The long- and short-term advantages of the relationship between human capital and economic growth are examined by Neeliah and Seetanah (2016). The study found that there are conflicting effects between growth and human capital. The key finding is that, because any shock to human capital's development might stymie economic growth, it must be taken into account when making policy decisions.

An astute financial institution is crucial to the country's economic growth because it works to reduce risk and uncertainty through organized risk management procedures, efficient sharing, and use of savings by lowering transaction costs and expanding

access to financial institutions, monitoring transactions through appropriate regulatory bodies to encourage an effective market and comfort in trade by exchanging goods, services, and knowledge, and reducing risk through increased access to financial institutions (Levine, 1997) Human capital is equally as important to the growth process as financial development. While human capital is present in all countries, it is more abundant in some than others. This means that the effects of financial development may not be the same in many countries. As a result, the effects of financial development may not be felt equally by all countries. The limitations of diminishing returns are loosened and long-term increase in per capita income is supported, even in the absence of external technological advancements, according to Barro (2001), provided capital is broadly defined as human capital. According to a study by Barro and Lee (1996) using life expectancy and education as proxy variables, human capital has an effect on labor productivity and economic growth. It also demonstrates how the stock of human capital and one's degree of education affect labor productivity, which in turn has a big impact on the growth rate.

In their initial study, King and Levine (1993) conducted a cross-country analysis based on Schumpeter's theory that the form of financial institutions can foster economic growth. Numerous financial development predictors point to a strong link between real GDP per capita and financial development. The relationship between the operation of the financial system and the growth of the economy was investigated and uncovered by Levine in 2005. There is evidence that intermediary institutions and the financial market work together to support the expansion of a financial system. The study also suggested that a well-developed financial system could ease and clarify constraints on

external financing that businesses might experience as a means of fostering economic growth.

Insignificant attention has been paid in recent literature on the impression of financial development, the productivity of labor and its impact on employment. Still, the anticipated discontinuities mediating the relationship between financial development and labor productivity have been comprehensively studied in existing empirical investigations. For instance, (Ibrahim & Alagidedeb 2018; Atiase, et al., 2019) examined the impact of finance on job creation, which applied the verge estimation and sample splitting technique to explain the initial level of per-capita income, human capital in nations, and financial development for twenty-nine African nations within the sub-Saharan region over the period of 1980-2014. According to their findings, economic development and financial development are favorably and strongly related. Findings and policy recommendations derived from the conclusion, however, showed that, in addition to the general level of human capital and income, which is vitally significant, a rise in the financial development level is necessary in the long run.

Other studies carried out on financial institutions have applied the variance decomposition VAR method and another causality test which assumes that the existence of financial institutions aids in promoting trade and commercial activities within the economy where there is linear correlation and the activities are normally distributed. However, it was contrary to others because of the weakness in their financial system, whereby the reappearance of financial institutions did not observe the normal distribution aspect. Therefore, this tends to exhibit the nonlinear connection among the financial institutions (Hong et al., 2021; Li et al 2018). Bernier &Plouffe (2019) studied the development spending in the financial sector and financial

innovation research by using a panel of the twenty-three countries during the period 1996 to 2014. It was discovered that the results validated a net positive correlation between gross capital formation and financial innovation; however, to assess the effect of macro provident policy and to measure the net relationship among financial innovation, productivity and economic development, the results of using the traditional ARDL method demonstrated that financial innovation had no net detrimental impact on the economy.

In developing countries, there is a considerable and advantageous relationship between financial development and human capital development, according to Sarwar et al. (2020). According to Yu et al. (2012), numerous research has shown that the impact of financial sector development differs between countries. As a result, different approaches and policies must be taken to prevent any financial institution crises. The influence of financial sector development is significantly stronger in richer nations with strong financial institutions than in poor countries with inadequate financial institutions, according to a strident argument made by Rousseau & Wachtel (2011). The Cobb-Douglas production function, which includes financial development as the primary factor of production, was used to examine the relationship between financial institutions, output, and the unindustrialized sector in Pakistan in other studies by Barucca et al. (2021) and Shahbaz, Shabbir, and Butt (2011). These studies covered the years 1971 to 2011 and were conducted in Pakistan. The ARDL limits test technique for cointegration was employed to look at the long-term relationship between the variables. According to the study outcomes, the researcher recommended that to increase the effectiveness in the financial sector, the government needs to encourage output development, particularly in the agricultural sector.

3.3 Capital Accumulation, Financial Market, and Labor Productivity

Mendez-Guerra (2017) investigates the cross-section dynamics of the three primary factors that affect labor productivity: aggregate efficiency, human capital, and physical capital. It first shows that while cross-country differences have significantly grown, the median country's labor productivity has mostly remained constant over the 1950–2010 period using a panel data set for 74 nations. Analyzing close sources reveals a similar pattern of stagnation and growing disparity in both aggregate efficiency and physical capital. The only factor where median advancement and inequality reduction can be shown is human capital. The following section of the study demonstrates how the percentage of the variance in labor productivity that can be explained by physical capital is repeatedly overestimated by typical regression methods.

A neo-classical growth model method was used by Knowles et al. (2002) and includes capital accumulation and distinct human capital education for men and women. The study's conclusions show that investing more in female human capital than in male human capital is necessary to increase labor productivity. Similar to this, Sehrawat and Giri (2017) examine the economic development of India's human capital in terms of male and female human capital. The statistical results demonstrate that female human capital is statistically significant, advantageous to development, and increases both short- and long-term labor productivity. On the other hand, however positively, male human capital unexpectedly makes little contribution to growth. The study found that physical capital, human capital, and gender had a long-term causal link with growth variables.

The theoretical and empirical relationships between market- and bank-based financial development and economic growth in both developed and developing countries were investigated by Nyasha and Odhiambo (2015) in review research that was released in 2015. Their findings show that the methodology, data sets, and particular traits of the analyzed countries have a significant impact on the direction of the casualty relationship. According to Jalles (2016), there is growing interest in the importance and efficiency of financial institutions in the process of development. Corruption is the main obstacle to economic success, and removing it or enhancing high-quality institutions promotes financial development, which in turn promotes growth. Masoud & Hardaker (2012) conduct additional analysis using the endogenous growth model on the impacts of financial development in developing countries. When the expansion of the financial sector is looked at, it is discovered that the growth of the stock market and financial growth have a continuous, long-term link.

Growing concern exists regarding the relationship between the exploitation of financial resources and economic expansion. A recent study by Ibrahim (2018) examines the rise of Sub-Saharan Africa's human capital and financial development. He contends that the increase of financial and human capital is beneficial for both short-term and long-term economic progress. When the effects of financial development and human capital are combined, it is suggested that financial development generally fosters growth in sectors with strong human capital quality. Innovation and the adoption of new technologies are products of improved human capital accumulation, which supports global economic growth. Hakeem (2010) contends that growth requires a sufficient stock of both human and material capital.

To spur economic progress and fortify social systems in underdeveloped countries, the financial sector is essential for international development. The robust financial sector can sustain the rate of economic expansion by providing substantial financial assistance and maintaining macroeconomic equilibrium. In light of the importance of this industry, this study tried to evaluate the effects of Irish financial development on productivity, corporate tax, foreign reserves, and export. The study employed a vector autoregressive (VAR) model and covered the years 1980 to 2016. Financial development includes improvements to Ireland's financial institutions and financial market structure. On the other hand, Ireland's level of productivity, foreign reserves, and corporate taxes are not significantly impacted by financial development in the medium term (Ararso, 2021).

Awotunde (2018) assesses how capital accumulation affects the rise in worker productivity in Nigeria. The theories of efficiency wages and endogenous growth are used to explain the factors that affect worker productivity. The ordinary least squares method of estimation was applied to determine how capital accumulation between 1970 and 2014 affected labor productivity and job creation in Nigeria. The findings of this study indicate that investment in capital formation and education spending have a time-dependent growth in labor productivity, which investment in health care has a favorable effect on labor productivity growth, and that employee compensation has a negative effect on productivity growth in Nigeria.

Campbell and Agbiokoro (2014) found a positive association between population growth, technological development, and human capital with the growth of the Nigerian economy in their study on human capital and economic growth. Their model demonstrated that a population with sufficient training and employment boosts

economic growth. It also showed that Solow's theory regarding the relationship between high population growth and low productivity is not supported by the Nigerian experience. Time series data from 1975 to 2010 were used by Umoru and Yaqub (2013) to explore the determinants influencing labor productivity. The primary objective of the study was to analyze how health capital affects labor productivity in Nigeria. Kurre and Eiben (2013) looked into the reasons behind variations in labor productivity in the manufacturing industries between states in the United States of America in their paper, "Determinants of Labor Productivity for Detailed Manufacturing Industries." They examined the effects of agglomeration economies (both urbanization and localization), education, investments in human capital, public capital, and other potential variables. The most striking finding in their analysis was that capital had a considerable beneficial impact on productivity across all industries, but they also noted that education had no discernible effect on labor productivity.

In a groundbreaking initial study, King and Levine (1993) explore the relationship between financial health, as assessed by liquid liabilities, and three growth measures: real per-capita GDP growth, real per-capita capital stock growth, and total productivity growth, all averaged across the sample period. King and Levine use data from 77 nations between 1960 and 1989 to demonstrate a statistically significant positive correlation between financial depth and the three growth measures. Other studies have examined associations between the financial market and various factors of productivity such as the formation of capital, productivity and investment, where the outcomes showed that an improvement in finance and the availability of capital will lead to an increase in investment (Joyce and Tong 2020). The impact of financial sector development on domestic investment in several ECOWAS countries

was examined by Iheonu et al. in 2020. Cross-sectional dependency was taken into account by using the augmented mean group technique, and causality was tested in the absence of cross-sectional reliance using the Granger non-causality test. The results revealed that: (1) the impact of financial sector development on domestic investment varies depending on the measure of financial sector development used; (2) domestic credit to the private sector has a positive but insignificant impact on domestic investment in ECOWAS countries, whereas banking intermediation efficiency (i.e., banks' ability to convert deposits into credit) and broad money supply have a negative and significant impact on domestic investment. The paper makes the need for careful consideration of the financial development indicator utilized as a policy instrument to promote domestic investment. We also emphasize the necessity of employing nation-specific domestic investment methods as opposed to general ones. Domestic loans to the private sector should come first when planning for future domestic investment.

A great deal of household influence was established, as well as on the basis of mortgages, which sustained household investment in non-productive assets, such as applied to crowd out and residual properties on business finance "ventures on properties that can be assigned to production level and innovation. Suitable improvements in the financial sector are capable of encouraging financial market activities, thereby accelerating the accumulation of capital and improving the level of productivity (Dumitrache et al., 2021). According to the studies of Bukhari et al., (2020) and Atiase et al., (2019) on the accumulation of capital and the productivity of labor, in various countries where the banking industry is generally owned by the state. commercial banks have historically been saddled with the responsibility of channeling financial capital funds into private businesses and governmental projects, thereby

boosting the accumulation of capital in order to encourage productivity in their regions.

The different means of capital accumulation and capital income can be applied in the developmental process towards productivity and have various effects on disbursement policies as well as investment across the lifecycle of businesses. These have different asymmetric impacts on the valuation of the market in current and new businesses, from this end it will help the policies that consider the economic benefit and social responsibility of the businesses (Erosa & Gonzalez 2019). Additionally, it is revealed that in the period before the financial crisis, banks assigned funds improperly by loaning them to households at the expense of businesses. This behavior encouraged the level of development in the economy whereby the rise in the GDP level was separated from that of the real household incomes; although the GDP appeared to be rising in this situation, there was a reduction in real household income coupled with a rise in the levels of debt.

Bertay et al., (2017) researched the effect of capital accumulation, securitization, and economic development, and their findings revealed that enterprise debt and household securitization have diverse effects on development, also a positive outcome was applied to the securitization of household and is negatively connected to economic development. Some economic enactment indicators were also considered in their study; including GDP per capita growth, new business density, and capital formation. Therefore, the improved request for domestic securitization nurtures the investment cost for enterprises; thus, the venture to consumption proportion is reduced. The subsequent circumstances are not different from those that caused the prodigious financial crisis. The results from this study also indicated that financial revolutions

which have an age for consumption over investment exhibit a negative impact on economic activities, whereas more demands for investment than for a high level of consumption would improve the level of economic activities.

On the other hand, in their recent study, Ibrahim & Alagidede (2017) found that for the period between 1985 and 2004, finance market legal policies in the different sub-Saharan regions were considered to be underdeveloped, which resulted in policy loopholes in financial development within the sector. Thus, the short fall of development in the scholar hypothesis, financial sector by means of data generated from world development indicators (WDI) applauds that, domestic credit progressively increased.

Consequently, some recent studies on financial market development with an emphasis on European countries propose that financial market development could hinder inequality if more consideration is given to it development; hence, countries with financial markets that are more developed are considered to have better social equality compared to countries that have less developed financial systems (Baiardi et al., 2019). In their recent empirical studies, which proposed that finance had a declining and ultimately negative market improvement, the view suggested by Bukhari et al., (2020) supported the results produced by King and Levine for the period from 1960 to 1989 (King & Lavine, 1993); however, emphasis was also placed on the positive effect of financial complexity and growth within the financial markets of developing economies. Based on this evidence, questions have been raised regarding whether financial freedom might obstruct rather than guarantee a viable increase in GDP by using finance, entrepreneurial process, financial market, and innovation (Arcand et al. 2015; Büyükkarabacak & Valev, 2010).

The link between financial development and human capital, technology, and labor productivity has been the subject of ongoing theoretical discussion. Thus, in their study, (Bosworth & Collins 2003) explained total factor productivity and education attainment and they applied the extended structure which included the incorporation of human capital. In other words, the role played by education in the Cobb Douglas model is shown in the equation below:

$$Y_t = A_t K_t^{\alpha} \{h_t L_t\}^{1-\alpha} \quad (16)$$

Note: $0 < \alpha < 1$

Where Y_t is output, A_t is Total Factor Productivity (TFP), $K[H_t = h_t, L_t]$, α is the share of K, h_t is educational attainment (human capital), and L_t is labor. Therefore, the following model is considered:

$$PL_{it} = \beta + \theta Y_{it} + \delta K_{it} + \varepsilon_{it} \quad (17)$$

According to the human capital approach, education has a direct impact on labor productivity by fostering the development of skills. By fostering the development of skills that increase labor productivity, education is seen to have a direct impact on social welfare and economic activity. A productive input that increases workers' contributions to production is education. By using educated people, the production process can be carried out properly and efficiently. All nations that have seen significant economic expansion have seen a major rise in educational attainment. One of the most crucial factors in economic success is a trained labor force. According to Susanto & Purwiyanta, (2014), human capital plays a significant role in the process of growth of sophisticated industrial nations.

Despite the literature's explanation that education is crucial for increasing labor productivity, many studies on the topic also use other variables as controls instead of education. For this reason, we chose to focus more on the accumulation of capital and financial development in our study as a factor that can increase labor productivity. which also aligns with the research of (Ararso, 2021; Duarte, & Doornik, 2019).

Finally, for better economic development and performance, capital accumulation and labor productivity are considered to be prerequisites. The other basics include growth in financial institution development, financial market development, which will transform into an improved labor force, and technical progress along with the monetary impact (Hong et al. 2021). However, capital accumulation, particularly financial capital, occurs when the financial structure, in addition to the financial institution and financial market expansion discussed earlier, plans and invests a portion of current income in order to improve future output and incomes. The expansion and integration of economic activities in the aspect of labor productivity and accumulation of capital have been a propelling factor in the development of financial systems. Therefore, on this basis, as a collaborative relationship, capital is categorized into three groups: foreign private capital, state capital accumulation, and domestic capital accumulation, all of which aid in promoting the productivity of labor.

3.4 Research Gap

Despite the large number of research on the topic, very few have particularly looked at the African continent and the sub-Saharan region in terms of the relationship between financial development, capital accumulation, and labor productivity. In 29 SSA countries between 1980 and 2014, Muazu (2018) looks at the part that human capital played in the link between finance and economic growth. The analyses were

conducted using the endogenous development paradigm while accounting for time and national influences. The key finding is that while growth is universally promoted in both the short and long runs by both financial and human capital development, interactive terms are what actually cause growth. argue that the expansion of the financial sector primarily spurs growth on the strength of high-caliber human capital, regardless of the financial measure. However, because the study relied on a measure of financial development, it was unable to pinpoint the specific financial factor that affects labor productivity. Additionally, certain aspects of financial development were taken into account rather than the overall financial index and human capital. With this strategy, it is difficult, if not impossible, to offer concrete policy recommendations for the kind of institutions that should be taken into consideration to support the continent's efforts to increase capital accumulation and labor productivity.

Additionally, Africa's situation is not examined in the existing literature on human capital. Once more, the literature completely ignores the various aspects of financial progress. Few studies, which recognized the importance of financial development as a factor influencing labor productivity, focused on data from banking organizations. As a result, their research has a limited scope and cannot be used to draw conclusions about African policy. Additionally, the disparities in productivity and financial growth were not taken into account in the studies. This is crucial in order to understand the precise effects of different facets of financial development and capital accumulation on labor productivity and to design a specialized policy framework. This thesis meets a research gap by looking at how financial development, capital accumulation, and labor productivity affect Sub-Saharan Africa.

Chapter 4

METHODOLOGY (EMPIRICAL STUDY)

4.1 Data Modelling and Empirical Specification

The data used for the empirical analysis are gathered from several sources and different set of variables were adopted for this thesis.

4.1.1 Description of Data

Data from 39 sub-Saharan nations, which comprised countries from different regions as indicated in Table 1, were extracted and analyzed for the period from 1990 to 2018.

Table 1: Description of Sub-Saharan Region

Central African Region	East African Region	South African Region	West African Region
Angola	Mozambique	Angola	Benin
Cameroon	Madagascar	Botswana	Burkina Faso
Central African Republic	Malawi	Lesotho	Cabo Verde
Chad	Zambia	Malawi	Côte D'ivoire
Congo Democratic Republic of the	Zimbabwe	Mozambique	The Gambia
Equatorial Guinea	Comoros	Namibia	Ghana
Gabon	Mauritius	South Africa	Guinea
Republic of the Congo	Seychelles	Swaziland	Guinea Bissau
São Tomé and Príncipe		Zambia	Liberia
		Zimbabwe	Mali
			Niger
			Nigeria
			Senegal
			Sierra Leone
			Togo

Source: Africana collections.

The first strategy of collecting observations and examining all of sub-Saharan Africa's countries was abandoned due to some countries' lack of data for the necessary variables.

Countries from the various regions with the most available data for the required period under study were chosen. The panel method and model of analysis were applied in order to resolve or adjust for heterogeneity changes and the differences in various countries. Data were collected from different sources, which consisted of data on labor productivity (LNPROD) which was proxied by output per worker sourced from the International Labor Organization (ILO), capital accumulation (LNCAPTA) proxied by gross capital formation (GCF) obtained from the recent 2019 form of the World Development Indicators and a comprehensive financial index (FDI).

Table 2: Summary of Variables

Variables	Proxy	Symbols
Labour Productivity	The value of productivity, Output Per Worker (opw)	LNPROD
Financial Development	Overall Financial development index	FD
Financial Institution	Financial institution development index	FI
Financial Market	Financial markets development Index	FM
Capital Accumulation	Gross Capital Formation	LNCAPTA

4.2 Descriptive Statistics

A preliminary analysis was carried out in order to examine the variables' characteristics and the existing connection between the growth of financial institutions, capital accumulation, and labor productivity. The findings are presented as follows:

Table 3: Descriptive Statistics

Stat	LNPROD	FD	FI	FM	LNCAPTA
Mean	10.502	0.134	0.226	0.0398	21.19
Standard deviation	13.687	0.0923	0.127	0.0779	1.510
Minimum	411.8	0.000	0.000	0.000	17.31
Maximum	107.751	0.618	0.743	0.489	25.22

Source: Author's computation.

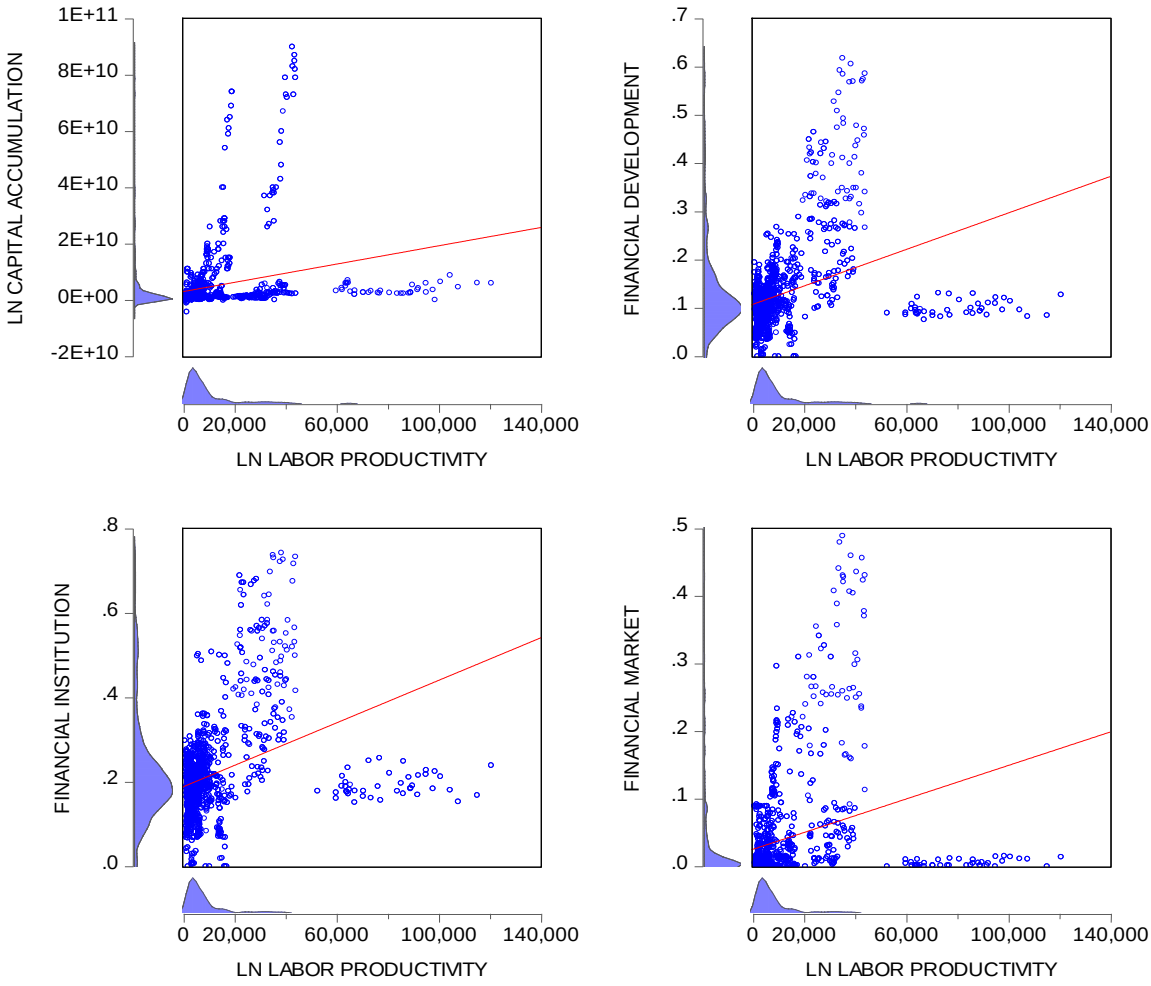


Figure 2: Scatter Dot Diagram

The dependent and explanatory factors employed in this investigation are summarized in Table 2. This makes it possible to quickly look over the variables' statistical characteristics. According to descriptive statistics shown in Table 2, the average level of PROD is 10,502 and the average total financial development of the sub-Saharan nations is approximately 0.134 percent for the sample of 39 countries for the time period under consideration. Minimum financial development is zero, and greatest financial development is 0.618. This demonstrates that, on average, throughout the chosen time period, the sub-Saharan countries experienced good overall financial development. The PRODs for the minimum and maximum are, however, 411.8 and 107.51, respectively. The greatest and minimum values of the financial institution index are 0.743 and 0, respectively, with an average value of roughly 2%. The financial markets development index has a range from 0 to 0.489, with an average value of 0.3%. This result connects to the work of since the standard deviation, as well as the min and max values, reveal that there are considerable differences in the variables across the period, which is worthy of further analysis (Baiardi et al., 2019).

The scatter graph presents a visualization of the relationship between the productivity of labor and the other variables under study, which denotes a positive connection between capital accumulation, financial development, and financial market and the productivity of labor. the variables are correlated, which is in accordance with the findings of Nakamura et al., (2019); this indicates that an improvement in the capital, finance, and technology will encourage productivity. The correlation outcomes are presented in Table 3.

Table 4: Correlation Matrix Test

VARIABLES	LNPROD	LNCAPTA	FI	FM	FD
PROD	1.000				
CAPTA	0.226	1.000			
FI	0.473	0.357	1.000		
FM	0.298	0.630	0.569	1.000	
FD	0.455	0.509	0.937	0.820	1.000

Source: Author's computation.

Correlation coefficients are employed to test for multicollinearity and all the variables are positively correlated. The findings, however, show a high association between Financial Development (FD) and its sub-components, Financial Institution (FI) and Financial Market (FM). Therefore, Financial Development (FD), Financial Institution (FI), and Financial Market (FM) are each independently included in the regression to compensate for the issue of multicollinearity.

4.3 Model Specification

The following sentence summarizes the model that was developed for our study based on Hirono's (2021) modification and extension:

$$LnX_{it} = \beta_{0i} + \beta_{1i} LnY_{it} + \mu_{it} \quad (18)$$

The independent variables Y_{it} are the capital accumulation (LNCAPTA), financial development (FD), financial institution (FI), and financial market (FM) of the Sub-Saharan African country i at time t. X_{it} *is the* Output per worker is proxied by labor productivity of labor (LNPROD) in the country i at time t. Logarithmic form is used to express two of the variables.

4.4 Cross Sectional ARDL

Although the panel ARDL model is widely used, this approach ignores the possibility of false cross-sectional dependence. In this work, the ARDL model is combined with the cross-sectionally augmented autoregressive distributed lag (CS-ARDL) model

(Chudik and Pesaran 2015; De et al. 2015). The CS-ARDL model just adds a linear combination of the cross-sectional averages of all the regressors and the dependent variables to the ARDL model in order to capture the cross-sectional correlation in the error term.

The estimation of the CS-ARDL model frequently employs both mean group (MG) and pooled mean group (PMG) estimators, as shown by Chudik and Pesaran (2015). In order to estimate the model for each cross-country unit, the temporal dimension must, of course, be large enough. A large number of lagged cross-section averages should be utilized to ensure the precision of these estimators. The mean group (MG) estimator must first estimate the time series equations for each country separately. The obtained coefficients' unweighted means can then be used to calculate the coefficients across countries. According to Pesaran (2015), the MG estimator produces reliable estimations of the parameters' average when the time-series dimension is large enough.

It is crucial to remember that the MG estimator does not impose any restrictions on the cross-sectional parameters and disregards the potential that some parameters might be the same across nations. Since all intercepts and coefficients can vary freely, the approach provides for the most diversity. It is evident that this tactic has a number of shortcomings, though. The MG estimator is probably useless for a modest cross-country dimension despite its dependability. In addition, as indicated by Arnold et al. (2011) and Samargandi et al. (2015), this estimate is sensitive to any nation outliers that can significantly affect the averages of the country coefficients.

Alternatively, Pesaran et al. (1999) propose the pooled mean group (PMG) estimator. The PMG methodology has been heavily utilized in recent empirical growth studies by Loayza and Ranciere (2006), Arnold et al. (2011), Samargandi et al. (2015), and Cavalcanti et al. (2015) because it represents a middle-ground process between the averaging and pooling methods of estimation. In particular, a two-step procedure is employed. The long-term slope coefficients are first calculated collectively across all countries using a concentrated maximum likelihood technique. Additionally, using maximum likelihood estimation on a county-by-country basis, the intercepts, short-term coefficients, speed of adjustment, and error variances are calculated given the estimates of the long-term slope coefficients.

Naturally, using the MG or PMG technique depends on whether uniform slopes can be applied to the expected long-term parameters. Therefore, efficiency and consistency are effectively traded off. If the long-term coefficients are not truly equal across nations, the MG estimates of the mean of long-term coefficients are consistent, whereas the PMG estimates are inconsistent. However, if the homogeneity limits are true, cross-country estimators beat heterogeneous ones in terms of efficiency. As a result, when the long-run coefficients for different countries are the same, both the MG and PMG estimations are consistent, but only the latter is effective (Arnold et al. 2011; Loayza and Ranciere 2006; Samargandi et al. 2015).

The CS-ARDL model specifications therefore, served as the foundation for the empirical models employed in this thesis.

4.5 Second Generation Test

The second-generation unit root tests relax the cross-sectional independence assumption. It can be difficult to define these cross-sectional correlations. This specification is unclear until we take into account a metric for economic distance since, as was previously stated, individual observations in a cross-section do not naturally order. As a result of the need for panel unit root tests allowing cross-sectional correlation, researchers have created a range of methodologies. The first of two groupings present the cross-sectional dependencies as a common factor mode.

Modeling cross-sectional dependencies can be done in a different, more comprehensive way than those based on error component models or dynamic factors models. It limits the residual covariance matrix either barely or not at all. This approach was specifically employed by Maddala and Wu (1999), Taylor and Sarno (1998), and Chang (2004). Such a technique raises some important technological problems. When there are cross-sectional dependencies, the traditional Wald-type unit root tests based on standard estimators must limit distributions that depend on a large number of nuisance parameters, making it challenging to demonstrate correlations across individual units. There is no easy method to get rid of these bothersome factors.

O'Connell, (1998) made the initial effort to address this issue. He thinks of a covariance matrix that might appear in a model with error components with random temporal effects and random individual effects that are mutually independent. But this description of cross-sectional correlations is still too narrow for widespread application. Maddala and Wu (1999) presented a different approach. They advise obtaining the empirical distributions of the LL, IPS, or Fisher's type test statistics using

a bootstrap method before drawing any conclusions. Their strategy is technically challenging to implement because it calls on panel data bootstrap techniques.

The size distortions caused by cross-sectional correlations are also lessened by the bootstrap techniques, though Maddala and Wu highlighted that they are not entirely eradicated. As a result, the bootstrap versions of the first-generation tests perform noticeably better, but they do not show the dependability of the bootstrap procedure. More recently, Chang (2004) proposed a second-generation bootstrap unit root test. He considers an extensive framework in which each panel is controlled by a finite-order autoregressive process that resembles a heterogeneous linear process. To take into account the dependency between the innovations, Chang recommends a unit root test based on the estimation of the entire system of N equations. The critical values are then established using a Bootstrap methodology.

Alternative option is to use the instrumental variable (IV, from here on) to address the cross-sectional dependency-related nuisance parameter problem. Chang has chosen this course of action (2002). The testing process described by Chang (2002) is as follows. He uses the tools created by an integrable transformation of the endogenous variable's lagged values in the first phase to estimate the autoregressive coefficient from a conventional ADF regression for each cross-section unit. He then generates N various t-statistics to test the unit root based on these N nonlinear IV estimators. The limiting standard normal distribution for each unit of this t-statistic is zero under the null hypothesis. A cross-sectional average of these individual unit test statistics is taken into account in the second phase, much like IPS.

4.5.1 Pesaran Test

Pesaran (2007) suggests an alternative strategy to address the issue of cross-sectional interdependence. As in Phillips and Sul, he considers a one-factor model with heterogeneous residual loading components (2003). Instead of basing the unit root tests on departures from the predicted common components, he augments the standard Dickey-Fuller or Augmented Dickey-Fuller regressions with the cross section average of lagged levels and first-differences of the individual series. If the residuals are not serially correlated, the regression utilized for the ith nation is as follows :

$$\Delta x_{j,t} = \partial_j + q_j x_{j,t-1} + d_j \hat{x}_{t-1} + c_j \Delta \hat{x}_t + \varepsilon_{j,t} \quad (19)$$

Where

$$\hat{x}_{t-1} = \left(\frac{1}{M}\right) \sum_j^M x_{j,t-1} \; and \; \Delta \hat{x}_t = \left(\frac{1}{M}\right) \sum_{j-1}^M \Delta x_{j,t}$$

The t-statistic for the OLS estimate of I will be denoted by the symbol t I. (M;L). Pesaran's test is based on this CADF, or cross-sectionally improved ADF statistics. A condensed form, known as CADF, is also taken into account to avoid the unwarranted influence of extreme outcomes that may arise for small T samples. The objective in both situations is to create a modified IPS t-bar test based on the average of unique CADF or CADF statistics (respectively denoted CIPS and CIPS, for cross-sectionally augmented IPS).

$$CIPS = {}^{1}/_{M} \sum_{j-1}^{M} t_j(M,L) \qquad CIPS^* = {}^{1}/_{M} \sum_{j-1}^{M} t_j^*(M,L) \quad (20)$$

When the truncated CADF statistic has the following definition:

$$t_j^*(M,L) = \begin{cases} H_1 & gjt_j(M,L) \le H_1 \\ t_j\,(M,L) & gj\; K_1 < \; t_j\,(M,L) < H_2 \\ H_2 & gjt_j(M,L) \ge H_2 \end{cases} \quad (21)$$

The variables H_1 and H_2 are set so that there is a nearly one in one chance that ti (M;L) belongs to (H_1;H_2). The corresponding simulated values are, in a model with intercept alone, correspondingly (Pesaran, 2007).

All of the individual CADF (or CADF) statistics have comparable asymptotic null distributions that are unaffected by the factor loadings. However, they are linked as a result of their reliance on a single shared component. Traditional central limit theorems do not apply to these CIPS or CIPS statistics since any CADF statistic can be aggregated. Pesaran proves that although though the null asymptotic distribution of the reduced CIPS statistic is not normal, it still exists and is free of a troublesome parameter. For a variety of sample sizes, he provides simulated critical CIPS and CIPS values. Depending on the significance levels of the particular CADF data, Pesaran also applies tests of the kind described by Maddala and Wu (1999) or Choi (2001). Such statistics lack standard distributions as a result of the aforementioned reasons. Last but not least, this method is simple to incorporate serially correlated residuals. A pth order cross-section/time series augmented regression is used to determine the relevant individual CADF statistics for an AR(p) error specification:

$$\Delta x_{j,t} = \partial_j + q_j x_{j,t-1} + \sum_{i=0}^{q} C_{j,i}\,\Delta x_{j,t-i} + \sum_{i=0}^{q} \alpha_{j,i}\,\Delta x_{j,t-i} + \ell_{j,t} \qquad (22)$$

4.6 Methodology and Results

It is crucial to confirm the presence of a long-run link among all the variables before moving forward with our estimates. In order to determine if the cross-sectional units are independent of one another or not, we first look for cross-sectional dependence within the panel data. The absence of unobserved shared shocks across nations is one of the causes of cross-sectional dependence.

4.6.1 Panel CD [Cross Dependence]

To determine whether there is cross-sectional dependence between the variables, we use the test suggested by Pesaran (2015). This test is used to evaluate the correlation coefficients for each association between the series of the variable's nation I and country j. The stronger the CD among the residuals, the higher the coefficient of correlation. Rejecting the null hypothesis indicates cross-sectional dependence or correlation for the panel.

This study takes into account a straightforward panel model:

$$x_{it} = \beta_i + \alpha' y_{it} + \mu_{it} \qquad (23)$$

Where β_i stands for each time-invariant nuisance parameters and α_i represents the parameters that need to be estimated. The CD statistical tests recommended by Pesaran (2015) are as follows for determining whether cross-sectional dependence exists :

$$CD = \sqrt{\frac{2L}{M(M-1)}\left(\sum_{t=1}^{M-1}\sum_{i=t+1}^{M}\hat{p}ti\right)}$$

Where p*ti* represents the sample evaluation of the correlation. Table four presents the outcomes of the Pesaran (2015) test. All of the tests in Table 4 reject the null hypothesis that there is no CD. As a result, we draw the conclusion that the sample exhibits CD (cross-sectional dependence).

Table 5: Panel Cross-sectional Dependence Tests.

Variables	P-CD test	P-Value
LNPROD	146.642[a]	0.000
LNCAPTA	98.964[a]	0.000

FI	130.299[a]	0.000
FD	130.311[a]	0.000
FM	130.388[a]	0.000

Note: Cross-sectional dependence is denoted by the notation P-CD, where a denotes the rejection of the null hypothesis of cross-sectional independence at 1% .

4.6.2 Second-generation Unit Root Tests

We are unable to use the first-generation unit root test, which is the standard unit root test, due to the cross-sectional dependence in our variables. This is because the first generation unit root tests disprove non-stationarity as the null hypothesis when cross-sectional dependence is present. Therefore, we used the unit root tests of the second generation to tackle this issue. In this work, the Pesaran (2015) proposed CADF test was used, which looks for a unit root when there is only one common component. This test has the advantage of not requiring the estimation of the components. The first difference of the variable as well as the cross section means of the lagged levels can be used as proxies for the common component:

$$\Delta x_{it} = \beta_i + \alpha_i x_{i,t-1} + g_i \overline{x_{t-1}} + b_i \Delta \overline{x_t} + \varepsilon_{it} \quad (24)$$

Where $\Delta \overline{x_t}$ represents the cross section mean of the first differences of x_{it} ,and the cross section mean of the lagged values of x_{it} is represented by $\overline{x_{t-1}}$

Table 6: Pesaran CADF Panel Unit Root Test (2nd Generation Unit Root Test)

	LEVELS		FIRST DIFFERENCES		
Variables	t-bar	Z(t-bar)	t-bar	Z(t-bar)	Conclusion
LNPROD	-3.086	-5.531	-4.666	-16.807[c]	I(1)
LNCAPTA	-3.357	-7.466	-4.828	-17.962[c]	I(1)

FI	-3.613	-9.297	-4.874	-18.291[c]	I(1)
FD	-3.644	-9.517	-4.900	-18.473[c]	I(1)
FM	-2.544	-1.730	-3.671	-9.706[c]	I(1)

c, b, and a denotes statistically significant at 0.01%, 0.05%, and 0.10%.

In relations to Pesaran's (2015) findings, the results of the 2ndgeneration panel unit root test are shown in Table 6. Labor productivity (LNPROD), capital accumulation (LNCAPTA), financial institutions (FI), financial development (FD), and financial market (FM) were the five variables investigated to determine whether non-stationarity (unit root) existed. For each of the aforementioned variables, the test was run at both levels and first difference. At the level, neither the versions with the trend nor the versions without the trend have stationary variables. Nevertheless, the variables become stationary at the distinction between the versions both with and without a trend. Consequently, we deduce that the variables constitute a 1(1) series. Additionally, the conclusions are solid since they take particular deterministic parameters into account.

4.6.3 Testing for Cointegration

After confirming that all of the variables are 1(1) series, we move on to determine whether there is a cointegrating link among the variables. In this study, the overlooked factors were tested using the second generation panel cointegration test and the error correction-based panel cointegration test devised by Westerlund (2007). Each test accepts cross-sectional dependency and heterogeneity.

4.6.4 Westerlund (2007) ECM Panel Cointegration Test

The four panel cointegration test statistics used by the Westerlund (2007) Error Correction Model determine whether cointegration is present or not (Ga, Gt, Pa and Pt). There is a normal distribution among the four test statistics. While the other

statistics (Ga, Pa) are based on Newey and West (1994) standard errors, adjusted for heteroscedasticity and autocorrelations, the two tests (Gt, Pt) are derived using standard estimates of the $\lambda_i^{\log K}$ standard errors. For the following reasons, we used the Westerlund (2007) cointegration test: it was designed to handle cross-sectionally dependent data and it allows for significant variation in both the short-run dynamics and the long-run cointegration relation.

The equation below represents the existence of cointegration in our study:

$$\Delta LnPROD_{it} = \beta_i^{PROD} + \lambda_i^{PROD} \sum_{j=i}^{n} \phi^{PROD} \Delta LnCAPTA_{it-j} + \sum_{j=1}^{n} \vartheta_{ij}^{PROD} \Delta FD_{it-j} + \sum_{j=1}^{n} \delta_{ij}^{PROD} \Delta FI_{it-j} + \sum_{j=1}^{n} \pi_{ij}^{PROD} \Delta FM_{it-j} + \varepsilon_{i,j} \quad (25)$$

Whereas i stands for estimates of the speed of error correction, λ_i^k K ∈(PROD) stands for the parameters of the error correction term, and $\varepsilon_{i,t}$ stands for the white noise random disturbance term.

Table 7: Westerlund Cointegration Test

Models	G_t		G_a		P_t		P_a	
	Z-Value	P-Value	Z-Value	P-Value	Z-Value	P-Value	Z-Value	P-Value
Model (1)	-16.932[a]	0.000	-5.177[a]	0.000	-7.540[a]	0.000	-8.839[a]	0.000

Model (2)	-17.528[a]	0.000	-6.966[a]	0.000	-7.858[a]	0.000	-9.109[a]	0.000
Model (3)	-11.946[a]	0.000	-0.747	0.228	-1.799[b]	0.036	-0.670	-0.252

[a], and [b] represents the null hypothesis at 1% & 5% correspondingly

The panel co-integration test should be used to investigate the long-term equilibrium. (Note 7 in Table.) Since majority of the group and panel statistics have robust p-values, the cointegration assessment from the Westerlund results shows strong evidence to reject the null hypothesis of no co-integration. The presence of a long-run equilibrium relationship between the variables is nevertheless confirmed for the panels based on statistics with their corresponding p-values, even though Model 3 is totally significant, demonstrating that some errors can be corrected over time. In light of this, we may say that the variables under analysis are characterized by long-term linkages, which call for simulation. This is in agreement with research by Coffie et al., (2020), and Matsuoka et al (2019)

4.7 (Dynamic) Common Correlated Effects Estimator - Mean Group (CS-ARDL)

In order to compare sub-Saharan African nations, the (Dynamic) CCEE - MG (CS-ARDL) was also done to evaluate the relationship between labor productivity (LNPROD), financial development (FD), capital accumulation (LNCAPTA), financial institution (FI), and financial market (FM). Because it uses the cointegration form of the standard (ordinary) ARDL model created by Pesaran, Shin, and Smith, the CS-ARDL is thought to be an effective substitute for the GMM (Generalized Methods of Moments) (1999). The main characteristic of the (Dynamic) Common Correlated Effects Estimator - Mean Group (CS-ARDL) is that it allows the short-run coefficients to vary across countries, along with their error variances, rates of adjustment to long-

run equilibrium values, and intercepts, whereas the long-run slope coefficients are only allowed to do so. This is especially helpful when there are grounds for anticipating the emergence of the equilibrium relationship between variables within areas, according to Blackburne and Frank (2007). As shown in equation (7), which shows how divergence from the equilibrium affects the short-run dynamics of the system's variables, the error correction model (ECM) is the outcome of these qualities.

$$\Delta X_{it} = \emptyset_i(x_{i,t-1} - \theta_i' Y_{it}) + \sum_{j=1}^{F-1} \psi_{ij}^* \Delta X_{i,t-1} + \sum_{j=0}^{q-1} \vartheta_{ij}^* \Delta Y_{i,t-j} + \mu_i + \ell_{it} \quad (26)$$

Where

$$\emptyset_i = -1 - \sum_{j-1}^{F} \Psi_{ü}), \theta_i = \sum_{j-0}^{q} \vartheta_{ü} / (1 - \sum_{k} \Psi_{ü}), \Psi_{ü}^* = - \sum_{n-j+1}^{p} \Psi_m$$

$$j\ equals\ 1,2,\ldots,(f-1), \quad \& \quad \vartheta_{ij}^* = - \sum_{n=j+1}^{q} \vartheta_{in} \quad j\ equals\ 1,2,\ldots\ldots,\ (q-1)$$

X_{it} is productivity of labor and Y_{it} is the independent variables. The error correction speed of the adjustment term is represented by the parameter $ø_i$. There wouldn't be any proof of a long-term relationship if $ø_i = 0$. This parameter ought to have statistical significance, as expected. The vector θi displays the variables' long-term relationship with one another. The following Table 8 lists the results of the CS-ARDL:

Table 8: Results of (Dynamic)CCEE-MG (CS-ARDL)

Dependent variable Labor Productivity			
VARIABLES	(1) overall financial development	(2) Financial institutions development	(3) Financial markets development
Longrun coefficients			
L.lnprod	0.0285	0.0338	0.00205
	(0.0275)	(0.0283)	(0.0335)
Lncapta	0.140***	0.138***	0.128***
	(0.0414)	(0.0441)	(0.0466)

Fd	0.320		
	(0.345)		
Fi		-0.176	
		(0.239)	
Fm			4.269
			(2.827)
Constant	5.605***	5.626***	6.098***
	(0.945)	(1.006)	(1.167)
Adjustment term	-0.971***	-0.966***	-0.998***
	(0.0275)	(0.0283)	(0.0335)
Long-run coefficients			
lr_fd	0.290		
	(0.331)		
lr_lncapta	0.164***	0.162***	0.156***
	(0.0516)	(0.0544)	(0.0511)
lr_fi		-0.167	
		(0.244)	
lr_fm			4.783
			(2.931)
lr__cons	5.384***	5.452***	5.528***
	(1.084)	(1.155)	(1.080)
Observations	695	695	695
Number of groups	36	36	36

Standard errors in parentheses
*** p<0.05, & ** p<0.1,

Due to the existence of cross-sectional dependence, the CCE-MG estimator through the CS-ARDL model is implemented, the findings of which are presented in Table 8. According to the CS-ARDL coefficients, sub-Saharan African countries' labor productivity is positively impacted over the long term by financial development, financial institutions, and the financial market. has a favorable major effect on capital accumulation as well. This suggests that a 1% rise in financial institution growth, capital accumulation, financial market development, and financial development will result in concomitant losses in labor productivity of 2%, 2%, 05%, and 3%. Additionally, it is important to emphasize that capital accumulation significantly

contributes to the long-term decline in labor productivity in sub-Saharan Africa. As a result, over time, the sub-Saharan African region's worker productivity is increased through capital accumulation, financial development, financial institutions, and the financial market.

4.8 Panel Dynamic Ordinary Least Square {PDOLS} and Fully Modified Ordinary Least Square {FMOLS} Results

After determining that there was a long-run link between the sampled variables, Pedroni (2001)'s PDOLS approach was used to estimate equation (8). Additionally, this approach was employed due to the possibility of endogenous output per worker as measured by labor productivity. The PDOLS does not mandate the assumption of exogeneity, either. It then estimates the mean group estimator while accounting for group heterogeneity. The conventional time series (DOLS) estimator's average is used to create the PDOLS estimator. Below is a representation of the regression in our case:

$$\ln X_{it} = \beta_i + \vartheta_i t + \alpha_{it}\ln(Y_{it}) + \sum_{j=-Fi}^{Fi} \delta_{ij} \Delta L_{it-j} + \varepsilon_{it} \quad (27)$$

Where X_{it} is productivity, Y_{it} is the independent variables and δ_{ij} represents the lags/leads coefficients. The formula for calculating the estimator is as follows:

$$\hat{\alpha} = M^{-1} \sum_{i=1}^{M} \hat{\alpha}_i$$

The FMOLS was also estimated using equation (9) below; this test is the upgraded form of the Phillip & Hansen (FMOLS) estimator proposed by Pedroni (2001). This method of estimation was selected because it is appropriate for endogenous variables estimation and the equation is recommended when series are stationary of the same order. FMOLS can also be powerful for any variable that does not appear to be stationary. Hence, the equation below shows the panel of FMOLS:"

$$\hat{\alpha}_{fmol} = \left[\sum_{i-1}^{R}\sum_{t-1}^{G}\left(P_{it} - \hat{P}_i\right)^1\right]^{-1}\left[\sum_{i-1}^{R}\sum_{t-1}^{G}\left(h_{it} - \hat{h}_i\right)\bar{P}^t{}_{it} + G\hat{\Delta}^t + \ell\right] \quad (28)$$

Where serial correlation is denoted by $\Delta\varepsilon e$, and y_{it}^{+} stands for the correction term, while the transformed variable is denoted by Yit, which will be used to resolve endogeneity problems.

Table 9: Panel Analysis of FMOLS and PDOLS

FMOLS	
Variables	**Model**
FD	0.0150**
FI	0.0001***
FM	0.0012***
LNCAPTA	2.6100***
PDOLS	
Variables	**Model**
FD	0.0094
FI	-0.0002***
FM	0.0001***
LNCAPTA	8.0600***

****& ** means the rejection of null at 5% &10% significance level respectively*

Following testing and validating that the variables are related over the long term, Table 9 displays the estimation of Pedroni's Fully Modified Ordinary Least Square and Dynamic Ordinary Least Square off stock and Watson arguments. The estimation of the models produces the same outcomes in FMOLS and DOLS. With the exception of the financial institution, whose coefficients have a negative value, all of the variables utilized in our study are positive and statistically significant, according to the results of the FMOLS and PDOLS. Additionally, the financial institution result shows that it has a negative correlation (coefficient of 0.0002) with worker productivity in the sub-

Saharan African region. According to this, sub-Saharan Africa's labor productivity falls by 0.0002 units for every unit increase in financial institution development. According to Dumitrache et al. (2021) and Bakas et al., (2020) this is a result of the region's financial institutions' development.

With values of 0.015 and 0.009, the results of the financial development study show that labor productivity makes a favorable contribution in the sub-Saharan African region. Therefore, this suggests that financial development boosts the productivity of labor by less than a unit in the region. The results of another study that placed a strong emphasis on financial development were comparable to that of (Mohammed et al., 2019). The financial market, however, is also significant and has a positive coefficient. Therefore, an increase of one unit in the financial market will lead to increases of 0.0012 and 0.0001 units in labor productivity, respectively. Therefore, the hypothetical impact is assumed to be both a long-run and short-run event for sub-Saharan nations since the growth of financial markets increases labor productivity over time.

Capital accumulation is positive and statistically significant, meaning that labor productivity would be forstered by a rise in the accumulation of capital in sub-Saharan countries, considering the findings of (Bustos et al. 2020; Ibrahim, & Alagidede, 2018). Because the majority of the variables have a significant value, it is clear that there is no problem of collinearity among them. Also, because the main estimator, FMOLS, compensates for serial correlation, no serial correlation testing was done for the models.

4.9 Relationship Between Financial Development. Financial Market and Labor Productivity

A mixed diagram showing the findings shows the relationship between worker productivity and overall financial development. The correlation between financial development and labor productivity is depicted in Figure 3. Average total financial development and average labor productivity are positively correlated. For instance, countries like Guinea-Bissau, Cameroon, Gabon, Senegal, Mozambique, the Democratic Republic of the Congo, Burundi, etc. with lower financial sector index values also have lower productivity levels. In contrast, nations like Mauritius, Botswana, Namibia, and South Africa have higher average financial development and increased labor productivity due to higher values of financial sector indicators. However, compared to the average without financial development, there is a greater link between overall financial development and labor productivity (square root R2=32.6%). This demonstrates unequivocally that there is a higher correlation between overall financial growth and worker productivity in Sub-Saharan Africa.

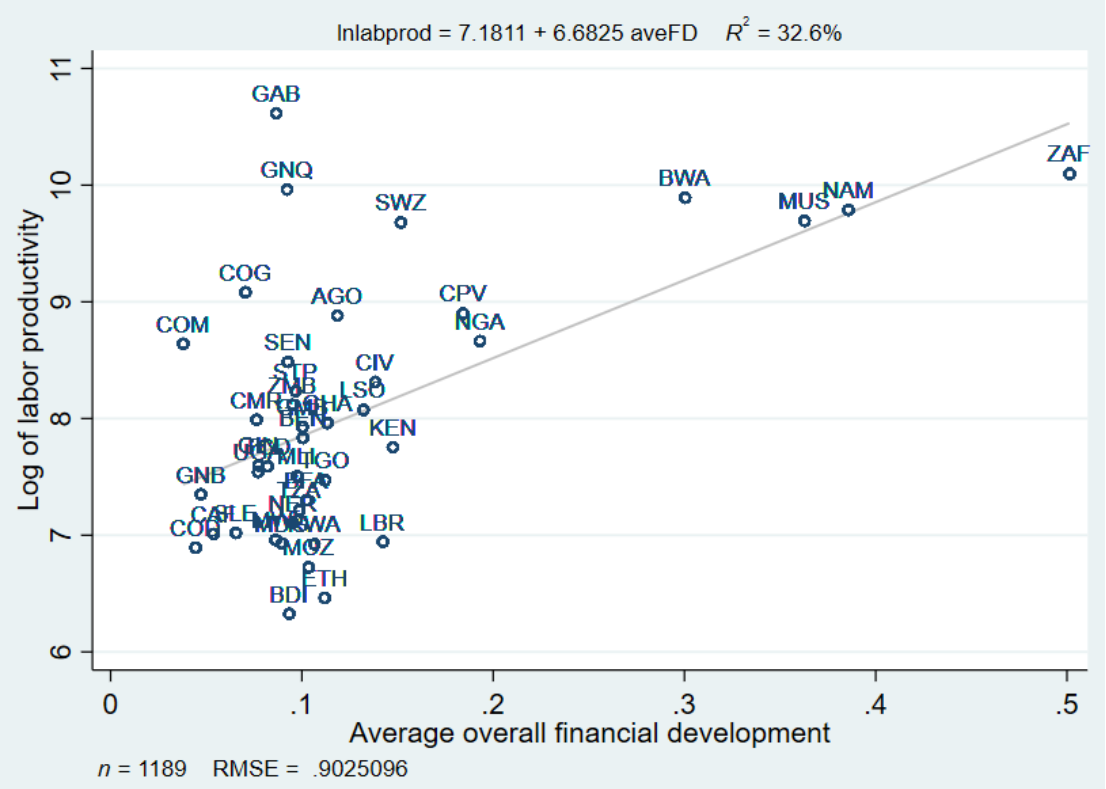


Figure 3: Relationship between labor productivity and total financial development

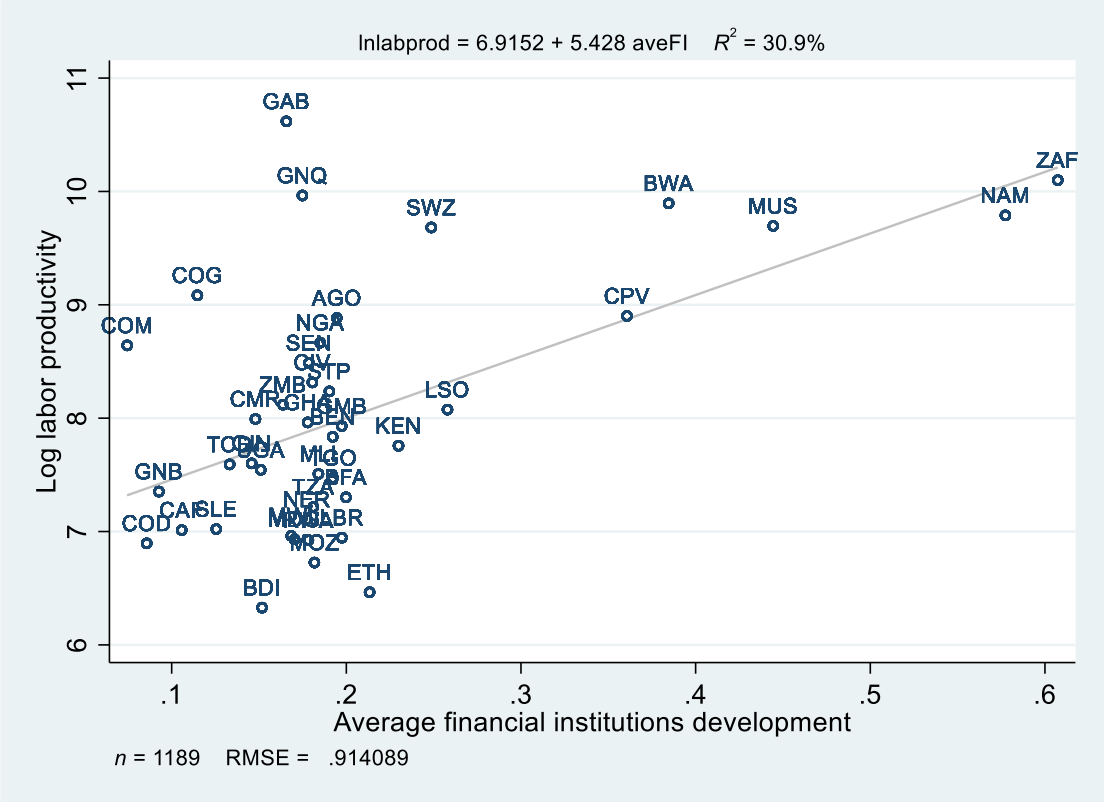


Figure 4: Relationship between Financial institutions development and labor productivity

Figure 4 illustrates how the expansion of financial institutions and labor productivity are related. It is abundantly obvious that nations with stronger financial systems—like Botswana, Cape Verde, Mauritius, Rwanda, and South Africa—have high labor productivity values. Comoros, Burundi, and Eritrea, on the other hand, saw lower levels of labor productivity. This suggests that increased labor productivity is related to an improvement in financial institution development.

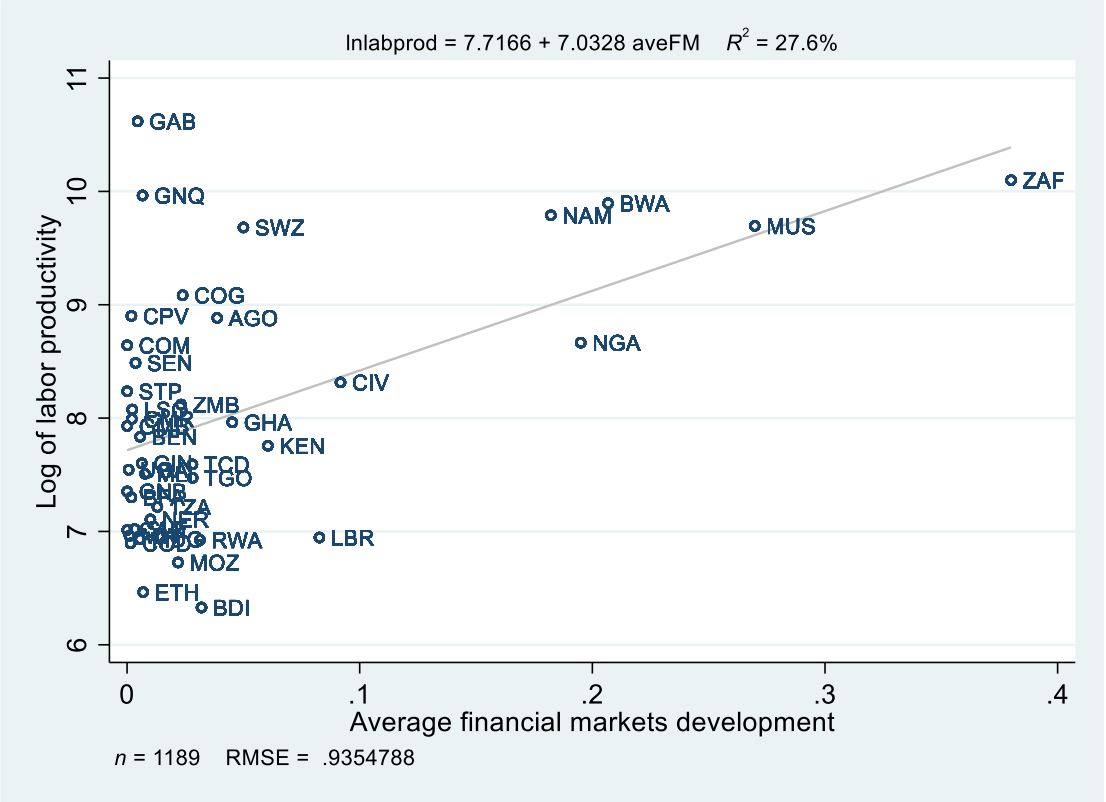


Figure 5: Relationship between Financial markets development and labor productivity

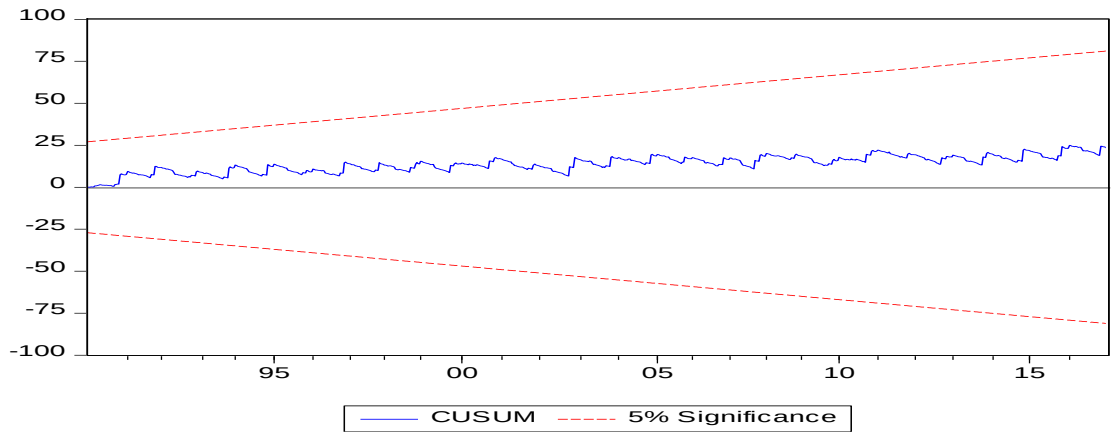
Similar to this, figure 5 shows a mixed graph showing the relationship between labor productivity and average financial market development. The graph shows a generally positive association between labor productivity and the state of the financial markets. The scenario demonstrates a substantial connection between the variables with R^S = 27.6%. This suggests a connection between the growth of the financial markets and labor productivity. Some intermediate variables are anticipated to be favorably impacted by an improvement in financial market development.

4.10 Structural Stability Check

To check the stability of model variables, Cumulative Sum of Recursive Residuals (CUSUM) and Cumulative Sum of Recursive Residuals Squares (CUSUMSQ) calculations are made. The CUSUM results indicate that the parameters remain

constant throughout the research duration because the CUSUM numbers fall inside the threshold region of 5% (Fig. 3).

(a)



(b)

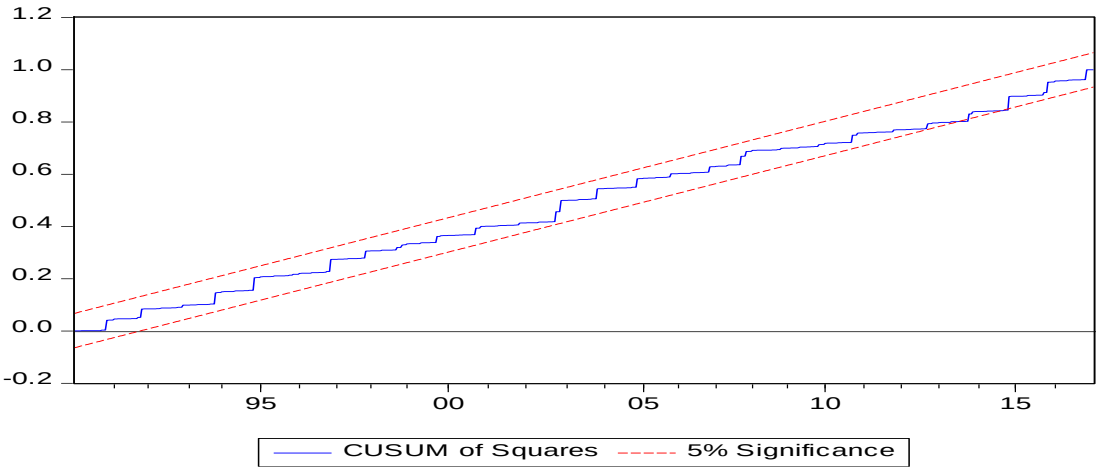
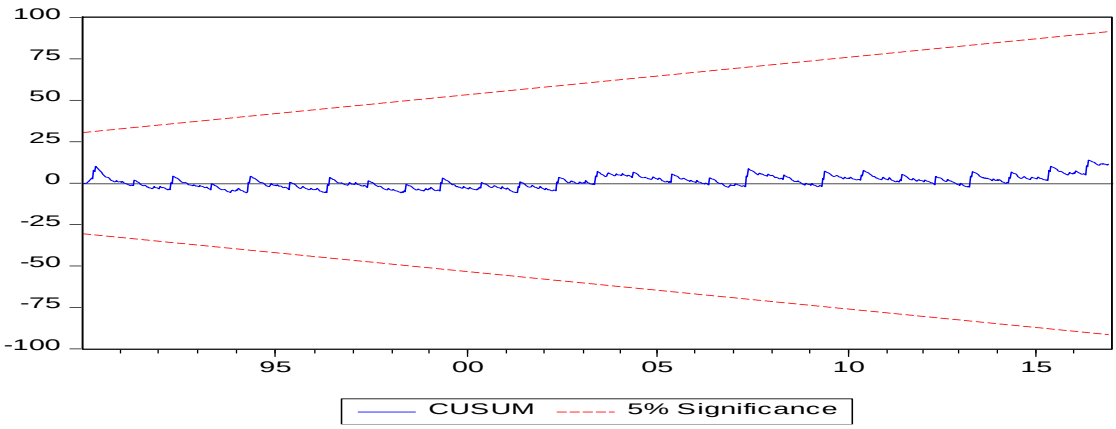


Figure 6: The CUSUM STABILITY test with capital accumulation (LNCAPTA) and the CUSUM-of-squares test with capital accumulation (LNCAPTA).

(a)



(b)

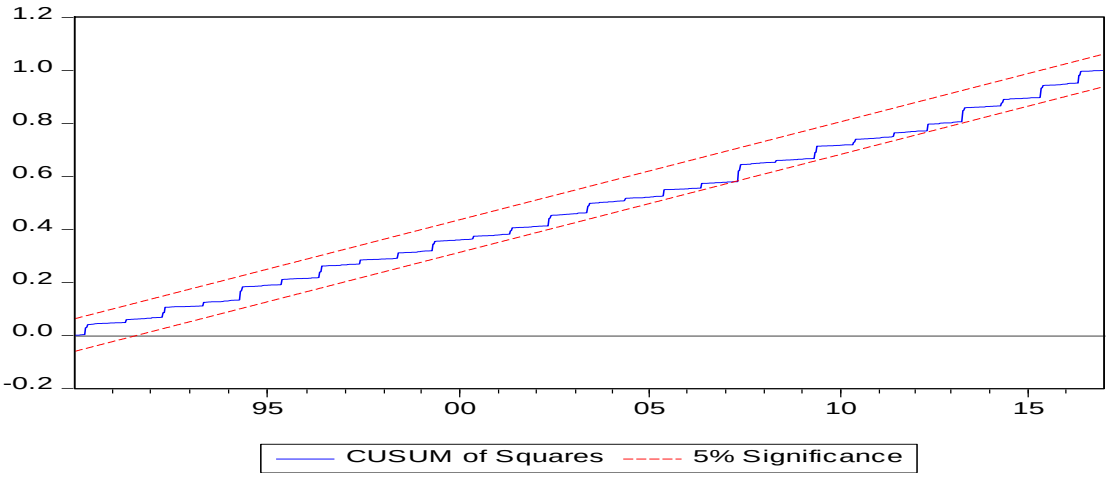
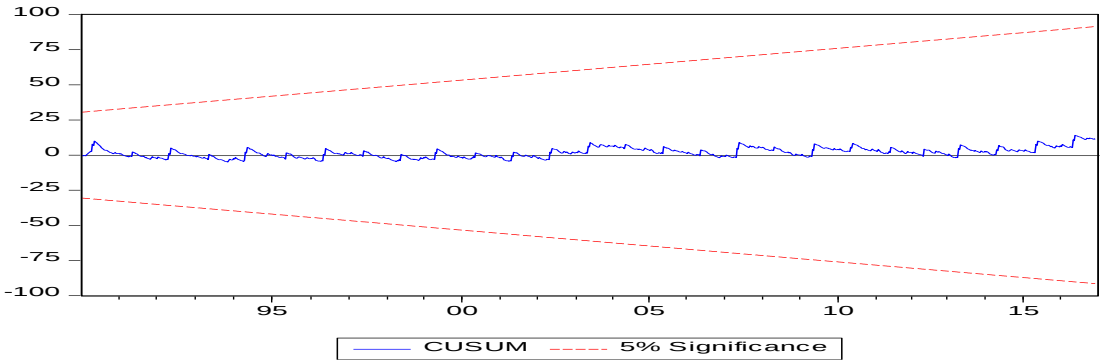


Figure 7: The CUSUM STABILITY test with Financial Development (FD) and the CUSUM-of-squares test with Financial Development (FD)

(a)



(b)

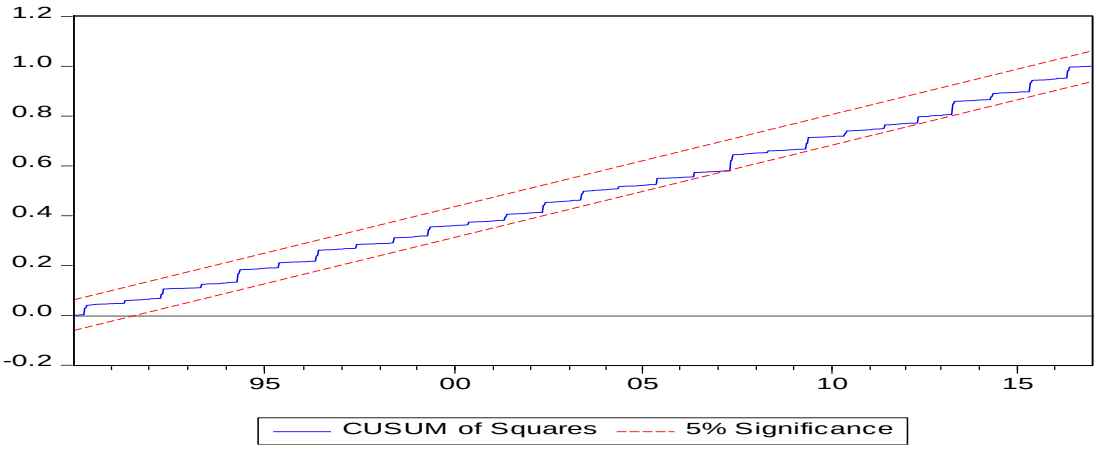
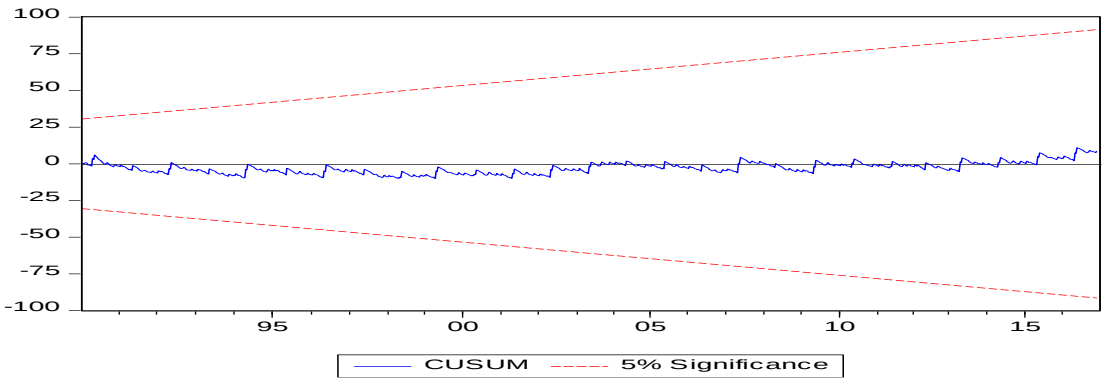


Figure 8: The CUSUM STABILITY test with Financial Institution (FI) and the CUSUM-of-Squares test with Financial Institution (FI)

(a)



(b)

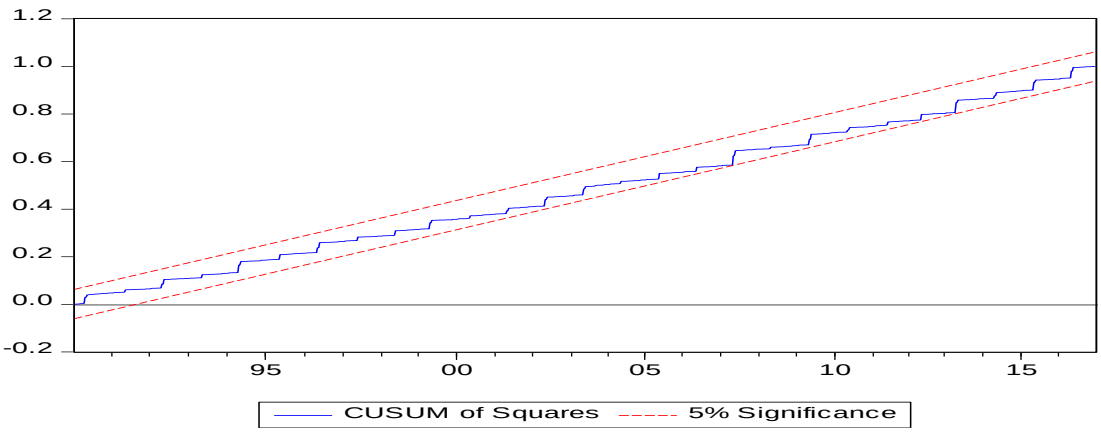


Figure 9: The CUSUM STABILITY test with Financial Market (FM) and the CUSUM-of-Squares test with Financial Market (FM)

4.11 Discussion of Findings

The Pesaran CD residual cross-sectional dependence test rejected the null hypothesis of cross-sectional independence across all variables early on in the research. This suggests that there is cross-country connectivity across the sub-Saharan African countries among the different research panels. It is not surprising to see the inter-sectoral dependency of these nations in their respective panels given the economic, regional, and social experiences of the sampled sub-Saharan countries. This data contrasts with the conclusions of Coffie et al (2020).'s study on income levels in

African nations, Mendez & Kataoka's (2021) study on South Asian countries, and Dumitrache et al(2021) .'s study on industrialized countries.

Since all the examined variables had a homogenous integration order at first difference, the implementation of the CADF stationarity tests revealed this. As a result, it may be concluded that the variables employed can provide a variety of results because they have been demonstrated to be stationary. In terms of production, financial development, and income in south Asian nations, the stationarity test results support those of Hong et al. (2021). From an economic standpoint, the Westerlund ECM panel cointegration result indicates that the presence of a long-run equilibrium relationship among the variables is still confirmed for the panels, which implies that the employed financial indicators and capital accumulation have an elastic long-term impact on labor productivity. This evidence, therefore, supports the revelation of Nakamura et al., (2019) concerning states in North America, Bernier & Plouffe (2019) also for 23 states but was having a contrary view from their findings which states the non-existence of long-run relationship amid FD.

With cross-sectional dependence and proliferation issues present, the CCEEMG-CSARDL approach's long-term simulation results taken into account empirically, the CCE-MG estimator is used, and the results are shown in Table 8. The impact of FD, FI, and FM on LNPROD and LNCAPTA is significant over time for the majority of panels. According to the CS-ARDL coefficients, sub-Saharan African countries' labor productivity will increase over time due to their financial development, financial institutions, and financial market, and this trend will continue as they continue to accumulate capital.

It is possible to conclude that the expansion of the financial sector in many sub-Saharan African economies raises labor productivity, which raises the level of economic activity. As a result, a gain in productivity in this region is likely to have a negative impact on the economy. Mendez & Kataoka (2021) and Baiardi et al. (2019) for the economies of Europe and Asia, respectively, also showed a strong long-term association between the financial sector and other variables, supporting our findings. However, Erosa & Gonzalez (2019) found a negative correlation between the mentioned factors in the case of the BRICS countries.

Additionally, the results of the FMOLS and PDOLS in the Sub-Saharan region support the conclusions of Fonseca and Doornik (2022) for Brazil that LNCAPTA has a positive substantial impact on LNPROD. Increased productivity will improve capital accumulation, which will expand capacity for all endeavors, whether they are governmental or not. Aside from the financial institution, whose coefficients have a negative value, every variable included in our analysis is positive and statistically significant. Results also show that financial institutions in the sub-Saharan African region have a detrimental impact on labor productivity. This implies that the productivity of labor in sub-Saharan Africa decreases with each step up in the growth of financial institutions. This is consistent with both Khraief et al., (2020) and Bakas et al., and is due to the region's financial institutions' developing nature (2020).

Finally, the results of financial development show that it has a positive impact on labor productivity in the sub-Saharan African region. This highlights the fact that policymakers in the sub-Saharan African nations represented on this panel are charged with encouraging the growth of finance in order to increase worker productivity. This outcome is in line with those of African states in Baiardi et al., (2019). On the other

hand, the research by Mohammed et al. (2019) for Turkey notably departs from the relationship between financial development and the productivity of labor in general. The financial market, however, is also significant and has a positive coefficient. Therefore, an increase of one unit in the financial market will lead to an increase in labor productivity. The potential impact is therefore assumed to be both a long-run and short-run event for sub-Saharan nations because the expansion of financial markets raises worker productivity over the long term. This conclusion is consistent with those made by Ibrahim and Alagidede (2017) for SSA countries and Barucca et al. (2021) for the United Kingdom region.

Chapter 5

CONCLUSION AND POLICY RECOMMENDATION

5.1 Summary

This thesis looks at the impact of capital accumulation and financial growth on labor productivity in sub-Saharan Africa. The fundamental finding is that, as a result of the interaction between terms, the development of financial and human capital unequivocally supports growth in both the short and long periods. imply that the expansion of the financial sector essentially spurs growth on the strength of high-quality human capital, regardless of quantitative measures. However, because the study relied on a measure of financial development, it could not pinpoint the specific financial factor affecting labor productivity.

A variety of estimation techniques were used in the study, including the (dynamic) common correlated effects estimator - mean group, panel dynamic ordinary least square (PDOLS), and completely modified ordinary least square (FMOLS) (CCEE-MG). This method can be used to overcome the issues of heteroscedasticity and endogeneity, which are frequently encountered when using micro panel data. In contrast to the consecutive year data utilized in other studies, panel data were used in this analysis to accurately capture the slowly altering dynamics of labor productivity and financial growth in the continent.

As a result, the thesis delivers policy findings that are beneficial for policymaking in Africa and makes a substantial contribution to the literature. This is vital because the economies and labor productivity of African countries urgently need to grow. Without a solid understanding of the primary processes underlying financial development and capital accumulation, designing an ideal labor productivity policy for the continent will be difficult, if not impossible. The thesis's policy suggestions can benefit other emerging economies that share characteristics with the countries of Africa.

The second part of this thesis evaluates quite number of theories regarding labor productivity, financial development and capital accumulation. The results of an analysis of theoretical data by Fonseca and Doornik (2022) comparing changes in outcomes on a firm's financial constraints, the labor market, and productivity showed a positive relationship between the various variables and an increase in employment, particularly among skilled workers. Thomas Piketty, a modern economist, claims that societal inequality may increase if the process of capital accumulation is unregulated. Instead of merely the company, capital can be invested in other assets including houses, stocks, and bonds, according to Piketty et al. (2019).

The process through which revenue is reinvested in the economy, increasing the overall amount of capital, is known as capital accumulation, in accordance with Karl Marx's economic theory. Marx defined capital as "growing value" or, to put it another way, amount of capital, usually expressed in dollars, which is turned into a higher value and extracted as profits through labor by humans. The value of an economic or commercial item that capitalists use to create additional value is known as capital (Alves, 2022). According to Picketty, economic output typically increases more slowly than wealth. He uses the equation $r > g$, where r stands for the rate of wealth return and

g for the rate of economic expansion. The ability to reinvest asset return income and the process of capital accumulation are mostly to blame for this.

Theories that have grown over time with a primary focus on economic development patterns, financial development, and labor productivity are recognized as an engine of progress. Two prominent economists, Joseph A. Schumpeter and John Maynard Keynes, each support growth theories in their own unique ways. Financial institutions are the primary sources of economic expansion and growth, according to studies conducted today. This offered the literature on financial growth new angles. Early theories identified factors that directly affected production.

The null hypothesis of cross-sectional independence across all variables was disproved early on in the investigation by the Pesaran CD residual cross-sectional dependence test. This suggests that there is cross-country connectivity across the sub-Saharan African countries among the different research panels. It is not surprising to see the inter-sectoral dependency of these nations in their respective panels given the economic, regional, and social experiences of the sampled sub-Saharan countries. This evidence contrasts the findings of Coffie et al (2020) study on income levels in African nations, and Mendez & Kataoka's (2021) study on South Asian countries.

According to the CS-ARDL coefficient, sub-Saharan African countries' labor productivity will increase over time as a result of their financial development, financial institutions, and financial market. However, the primary factors that have a large impact on productivity across all nation groups are FD, FI, and FM. Rapid capital accumulation also fosters economic growth in the sub-Saharan African region. productivity.

5.2 Conclusion

The current study made use of efficient and reliable panel econometric approaches in order to model the effect of capital accumulation and financial development on the reliability of labor productivity within the sub-Saharan African region in the presence of potential issues of heterogeneity and residual cross-sectional connectivity and prevent false conclusions. Therefore, using recently developed econometric tools, the key results that were drawn are as follows:

To begin with, all panel time-series data from the second-generation panel unit root evaluation of the CADF demonstrated that the variables are stationary with no unit root at first difference. Cross-sectional dependence was examined using the CD statistic proposed by Pesaran (2015), and all tests found evidence of CD, rejecting the null hypothesis that CD didn't exist.

Given the results, this thesis draws the conclusion that capital accumulation and financial development are both important factors influencing labor productivity in Sub-Saharan Africa. However, there are numerous and asymmetrical effects of financial institutions and the financial market on labor productivity. The anticipated impact of each indicator of financial development component on labor productivity varies. For the continent's labor productivity, progress in some areas of financial development is desirable while improvement in others is not. Labor productivity is increased by public trust in public authorities, openness in policymaking, prudent capital accumulation, and financial independence. Controlling corruption and injustice reduces labor productivity while unstable policymaking stunts economic growth and destabilizes the financial system in Sub-Saharan Africa.

The thesis also comes to the conclusion that important factors influencing worker productivity in Sub-Saharan Africa include both capital expansion and financial development. Strong financial institutions boost stagnant productivity and promote industry growth in the area. Additionally, this study found a link between the continent's productivity and the index of financial market development, which is fueled by the expansion of financial institutions on the one hand and labor productivity on the other. This can be a result of Africa's underdeveloped financial market. We come to the conclusion that the financial market, capital accumulation, and financial growth all have a favorable impact on labor productivity in Africa and its sub-regions.

Additionally, long-run estimates on LNPROD and LNCAPTA concerning FD, FI, and FM using the (dynamic) common correlated effects estimator - mean group (CCEE-MG) using cross-section Autoregressive Distributed Lag (CS-ARDL) revealed a substantial effect among the panels. According to the CS-ARDL coefficient, sub-Saharan African countries' labor productivity will increase over time as a result of their financial development, financial institutions, and financial market. However, FD, FI, and FM are the main variables that have a significant impact on productivity across all nation groups. In the sub-Saharan African region, the quick accumulation of capital also boosts productivity.

Also, PDOLS and FMOLS approaches were used, with the results demonstrating that the sub-Saharan African region's financial development, capital accumulation, and financial market all significantly improve productivity. Africa's productivity is increased through easy access to effective financial services and a thriving financial market. This is consistence with the work of Mohammed et al. (2019) and Mendez & Kataoka (2021), the major findings of PDOLS and FMOLS showed that financial

development exhibits a positive impact on labor productivity. On the other hand, weak financial institutions and fragile financial market development will have a negative impact on labor productivity, as indicated in the findings.

Additionally, the results and findings showed that the growth of the continent's financial industry will increase labor productivity. This study also discovered a positive association between the continent's productivity and the financial market development index, which supports the idea that the growth of financial institutions will increase labor productivity on the one hand. This can be a result of Africa's underdeveloped financial market. We come to the conclusion that the financial market, capital accumulation, and financial growth all have a favorable impact on labor productivity in Africa and its sub-regions.

5.3 Policy Recommendations

According to this study, issues including a fragile financial system, a dysfunctional financial market, and a high prevalence of corruption and mismanagement prevented the increase of labor productivity. In Sub-Saharan Africa, structural variables, policy considerations, and institutional structure indicators all play a significant role in determining labor productivity. However, African nations share characteristics with many other emerging nations around the world, participate in a wide range of financial activities, and certain sub-Saharan African nations have access to natural resources. In a similar spirit, African nations provide fewer limited opportunities for development. For instance, according to Bustos et al. 2020, the majority of developing nations, including Africa, have an adequate supply of low-skilled labor and draw a respectable amount of efficiency- and resource-seeking FDI to address capital shortages.

This study found a link between the continent's productivity and the index of financial market development, which is caused by the expansion of financial institutions on the one hand and labor productivity on the other. This can be a result of the undeveloped financial market in Africa. We come to the conclusion that financial development, capital formation, and the financial market all have a favorable impact on labor productivity in Africa and its sub-regions. This is demonstrated by the huge sums of money that foreign companies investing in Africa's extractive industries.

Additionally, several economic activities are being pursued by African nations, which could lower the unemployment rate. Additionally, global advancements in important institutions and technology promote connectedness and lessen the impact of low worker productivity. However, the continent's record in terms of economic growth and worker productivity is underwhelming. Given the lack of strong institutions on the region, Sub-Saharan Africa's productivity is heavily influenced by the quality of financial development and capital accumulation. Weak worker productivity can be linked to the financial market's insignificance and the continent's minimal role in fostering a positive economic environment.

Therefore, the focus of this study's recommendations is on increasing labor productivity and financial development. Generally speaking, Sub-Saharan African nations must prioritize capital accumulation and finance sector development. It is difficult to increase productivity universally, though. Therefore, this study offers particular financial development promotion measures that can boost worker productivity. This is essential as a sound strategy for the continent's economic development.

First, for the advantage of each nation, favorable agreements on financial growth should be reached amongst the Sub-Saharan African nations. These are in addition to the policy measures that are part of the accords, which also encompass investment policies, competitive tactics, judicial framework, and country rights protection. Aside from eliminating administrative bottlenecks in customs operations by requiring the use of electronic systems and harmonizing customs practices, the agreements may also focus on particular aspects of economic development including contract enforcement, the rule of law, and labor regulations. These can strengthen interregional ties and promote balanced financial sector development.

Second, the study also shows that increased capital accumulation and the financial sector have a major impact on labor productivity. Therefore, Sub-Saharan African nations must implement appropriate policies to enhance the financial industry and promote capital accumulation. Institutions that are necessary should be created to support the measures in the continents. Regionalizing policies and involving the global community are essential since they will foster the expansion of the financial sector, which will also impact worker productivity (Manasseh et al., 2022). The countries of Sub-Saharan Africa can benefit from the abounding natural resources and raw materials by increasing their investments, which would eventually lead to an improvement in financial growth due to labor productivity.

Third, considering the findings on financial institutions and labor productivity. The economies of Sub-Saharan Africa should implement measures to restrain the actions of financial institutions and offer rewards that will boost labor productivity. However, in order to increase the sector's activities and benefit African nations more, the relevant government should vehemently prevent malfunction and corruption in the industry.

Fourth, Sub Saharan African nations should foster a stable business environment by offering large incentives and signing investment agreements with global corporations. Investment incentives, such as soft loans for both new and current businesses, would encourage investment in the area, which would then accelerate the expansion of the financial sector.

Five, Sub-Saharan African nations should give financial markets and institutions a certain amount of autonomy. Only those supervision services and monetary policies that are beneficial for the efficient running of the financial institution should be offered by central banks or other monetary authorities. This will facilitate financial growth and promote financial and monetary flexibility, all of which are necessary for simple access to credit, the provision of effective financial services to both domestic and foreign businesses, and an increase in labor productivity. In addition, while formulating policies aiming at maximizing the advantages of labor productivity, policymakers should take into account the heterogeneity and asymmetry of the influence of financial development and capital accumulation.

Finally, this study recommends that policymakers should consider financial development and accumulation of capital as indispensable for the enhancement of labor productivity in Africa and its sub-regions. In conclusion, it is important for the financial administrators and the apex bank supervisors in the different sub-Saharan nations to promote different programs and policies that will heighten development in the financial sector towards achieving greater productivity in the region.

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APPENDICES

Appendix A: List of Sampled Countries

Central African Region	**East African Region**	**South African Region**	**West African Region**
Angola	Mozambique	Angola	Benin
Cameroon	Madagascar	Botswana	Burkina Faso
Central African Republic	Malawi	Lesotho	Cabo Verde
Chad	Zambia	Malawi	Côte D'ivoire
Congo	Zimbabwe	Mozambique	The Gambia
Democratic Republic of the	Comoros	Namibia	Ghana
Equatorial Guinea	Mauritius	South Africa	Guinea
Gabon	Seychelles	Swaziland	Guinea Bissau
Republic of the Congo		Zambia	Liberia
São Tomé and Príncipe		Zimbabwe	Mali
			Niger
			Nigeria
			Senegal
			Sierra Leone
			Togo

Appendix B: Additional Results

Dependent variable Labor Productivity			
VARIABLES	(1) overall financial development	(2) Financial institutions development	(3) Financial markets development
Long-run coefficients			
L.lnprod	0.0285	0.0338	0.00205
	(0.0275)	(0.0283)	(0.0335)
Lncapta	0.140***	0.138***	0.128***
	(0.0414)	(0.0441)	(0.0466)
Fd	0.320		
	(0.345)		
Fi		-0.176	
		(0.239)	
Fm			4.269
			(2.827)
Constant	5.605***	5.626***	6.098***
	(0.945)	(1.006)	(1.167)
Adjustment term	-0.971***	-0.966***	-0.998***
	(0.0275)	(0.0283)	(0.0335)
Long-run coefficients			
lr_fd	0.290		
	(0.331)		
lr_lncapta	0.164***	0.162***	0.156***
	(0.0516)	(0.0544)	(0.0511)
lr_fi		-0.167	
		(0.244)	
lr_fm			4.783
			(2.931)
lr__cons	5.384***	5.452***	5.528***
	(1.084)	(1.155)	(1.080)
Observations	695	695	695
Number of groups	36	36	36

Standard Errors in Parentheses
*** p<0.05, & ** p<0.1,

Variables	P-CD test	P-Value
LNPROD	146.642[a]	0.000
LNCAPTA	98.964[a]	0.000
FI	130.299[a]	0.000
FD	130.311[a]	0.000
FM	130.388[a]	0.000

Stat	LNPROD	FD	FI	FM	LNCAPTA
Mean	10.502	0.134	0.226	0.0398	21.19
Standard deviation	13.687	0.0923	0.127	0.0779	1.510
Minimum	411.8	0.000	0.000	0.000	17.31
Maximum	107.751	0.618	0.743	0.489	25.22

VARIABLES	LNPROD	LNCAPTA	FI	FM	FD
PROD	1.000				
CAPTA	0.226	1.000			
FI	0.473	0.357	1.000		
FM	0.298	0.630	0.569	1.000	
FD	0.455	0.509	0.937	0.820	1.000

Cross sectional dependence and Unit root tests results

Pesaran (2015) test for weak cross-sectional dependence.
H0: errors are weakly cross-sectional dependent.
CD = 55.583
p-value = 0.000

Pesaran (2015) test for weak cross-sectional dependence.
H0: errors are weakly cross-sectional dependent.
CD = 14.527

p-value = 0.000

Pesaran's CADF test for lnlabprod
Cross-sectional average in first period extracted and extreme t-values truncated
Deterministics chosen: constant & trend
t-bar test, N,T = (41,29) Obs = 1107
Augmented by 1 lags (average)

t-bar	cv10	cv5	cv1	Z[t-bar]	P-value
-2.226	-2.540	-2.610	-2.730	0.576	0.718

Pesaran's CADF test for D.lnlabprod
Cross-sectional average in first period extracted and extreme t-values truncated
Deterministics chosen: constant & trend
t-bar test, N,T = (41,28) Obs = 1066
Augmented by 1 lags (average)

t-bar	cv10	cv5	cv1	Z[t-bar]	P-value
-3.619	-2.540	-2.610	-2.730	-9.011	0.000

Pesaran (2015) test for weak cross-sectional dependence.
H0: errors are weakly cross-sectional dependent.
CD = 139.461
p-value = 0.000

Pesaran (2015) test for weak cross-sectional dependence.
H0: errors are weakly cross-sectional dependent.
CD = 22.142
p-value = 0.000

Pesaran's CADF test for lncapta
Cross-sectional average in first period extracted and extreme t-values truncated
Deterministics chosen: constant & trend
t-bar test, N,T = (41,29) Obs = 1107
Augmented by 1 lags (average)

t-bar	cv10	cv5	cv1	Z[t-bar]	P-value
-2.382	-2.540	-2.610	-2.730	-0.496	0.310

Pesaran's CADF test for D.lncapta
Cross-sectional average in first period extracted and extreme t-values truncated
Deterministics chosen: constant & trend
t-bar test, N,T = (41,28) Obs = 1066
Augmented by 1 lags (average)

t-bar	cv10	cv5	cv1	Z[t-bar]	P-value
-2.589	-2.540	-2.610	-2.730	-1.920	0.027

Pesaran (2015) test for weak cross-sectional dependence.

H0: errors are weakly cross-sectional dependent.
CD = 91.176
p-value = 0.000

Pesaran (2015) test for weak cross-sectional dependence.
H0: errors are weakly cross-sectional dependent.
CD = 5.305
p-value = 0.000

Pesaran's CADF test for hc
Cross-sectional average in first period extracted and extreme t-values truncated
Deterministics chosen: constant & trend
t-bar test, N,T = (41,29) Obs = 1107
Augmented by 1 lags (average)

t-bar	cv10	cv5	cv1	Z[t-bar]	P-value
-1.683	-2.540	-2.610	-2.730	4.319	1.000

Pesaran's CADF test for D.hc
Cross-sectional average in first period extracted and extreme t-values truncated
Deterministics chosen: constant & trend
t-bar test, N,T = (41,28) Obs = 1066
Augmented by 1 lags (average)

t-bar	cv10	cv5	cv1	Z[t-bar]	P-value
-1.618	-2.540	-2.610	-2.730	4.762	1.000

Pesaran (2015) test for weak cross-sectional dependence.
H0: errors are weakly cross-sectional dependent.
CD = 64.074
p-value = 0.000

Pesaran (2015) test for weak cross-sectional dependence.
H0: errors are weakly cross-sectional dependent.
CD = 1.134
p-value = 0.257

Pesaran's CADF test for lnfdi
Cross-sectional average in first period extracted and extreme t-values truncated
Deterministics chosen: constant & trend
t-bar test, N,T = (41,29) Obs = 1107
Augmented by 1 lags (average)

t-bar	cv10	cv5	cv1	Z[t-bar]	P-value
-3.428	-2.540	-2.610	-2.730	-7.697	0.000

Pesaran's CADF test for D.lnfdi
Cross-sectional average in first period extracted and extreme t-values truncated

Deterministics chosen: constant & trend
t-bar test, N,T = (41,28) Obs = 1066
Augmented by 1 lags (average)

t-bar	cv10	cv5	cv1	Z[t-bar]	P-value
-4.717	-2.540	-2.610	-2.730	-16.571	0.000

Pesaran (2015) test for weak cross-sectional dependence.
H0: errors are weakly cross-sectional dependent.
CD = 54.606
p-value = 0.000

Pesaran (2015) test for weak cross-sectional dependence.
H0: errors are weakly cross-sectional dependent.
CD = 14.568
p-value = 0.000

Pesaran's CADF test for lngdppc
Cross-sectional average in first period extracted and extreme t-values truncated
Deterministics chosen: constant & trend
t-bar test, N,T = (41,29) Obs = 1107
Augmented by 1 lags (average)

t-bar	cv10	cv5	cv1	Z[t-bar]	P-value
-2.091	-2.540	-2.610	-2.730	1.507	0.934

Pesaran's CADF test for D.lngdppc
Cross-sectional average in first period extracted and extreme t-values truncated
Deterministics chosen: constant & trend
t-bar test, N,T = (41,28) Obs = 1066
Augmented by 1 lags (average)

t-bar	cv10	cv5	cv1	Z[t-bar]	P-value
-3.785	-2.540	-2.610	-2.730	-10.153	0.000

Pesaran (2015) test for weak cross-sectional dependence.
H0: errors are weakly cross-sectional dependent.
CD = 12.290
p-value = 0.000

Pesaran (2015) test for weak cross-sectional dependence.
H0: errors are weakly cross-sectional dependent.
CD = 7.257
p-value = 0.000

Pesaran's CADF test for trade
Cross-sectional average in first period extracted and extreme t-values truncated
Deterministics chosen: constant & trend

t-bar test, N,T = (41,29) Obs = 1107
Augmented by 1 lags (average)

t-bar	cv10	cv5	cv1	Z[t-bar]	P-value
-2.152	-2.540	-2.610	-2.730	1.085	0.861

Pesaran's CADF test for D.trade
Cross-sectional average in first period extracted and extreme t-values truncated
Deterministics chosen: constant & trend
t-bar test, N,T = (41,28) Obs = 1066
Augmented by 1 lags (average)

t-bar	cv10	cv5	cv1	Z[t-bar]	P-value
-3.433	-2.540	-2.610	-2.730	-7.733	0.000

Pesaran (2015) test for weak cross-sectional dependence.
H0: errors are weakly cross-sectional dependent.
CD = 151.007
p-value = 0.000

Pesaran (2015) test for weak cross-sectional dependence.
H0: errors are weakly cross-sectional dependent.
CD = 0.179
p-value = 0.858

Pesaran's CADF test for lnlab
Cross-sectional average in first period extracted and extreme t-values truncated
Deterministics chosen: constant & trend
t-bar test, N,T = (41,29) Obs = 1107
Augmented by 1 lags (average)

t-bar	cv10	cv5	cv1	Z[t-bar]	P-value
-3.156	-2.540	-2.610	-2.730	-5.824	0.000

Pesaran's CADF test for D.lnlab
Cross-sectional average in first period extracted and extreme t-values truncated
Deterministics chosen: constant & trend
t-bar test, N,T = (41,28) Obs = 1066
Augmented by 1 lags (average)

t-bar	cv10	cv5	cv1	Z[t-bar]	P-value
-2.444	-2.540	-2.610	-2.730	-0.920	0.179

Pesaran (2015) test for weak cross-sectional dependence.
H0: errors are weakly cross-sectional dependent.
CD = 37.500
p-value = 0.000

Pesaran (2015) test for weak cross-sectional dependence.

H0: errors are weakly cross-sectional dependent.
CD = 0.750
p-value = 0.453

Pesaran's CADF test for FD
Cross-sectional average in first period extracted and extreme t-values truncated
Deterministics chosen: constant & trend
t-bar test, N,T = (41,29) Obs = 1107
Augmented by 1 lags (average)

t-bar	cv10	cv5	cv1	Z[t-bar]	P-value
-2.681	-2.540	-2.610	-2.730	-2.553	0.005

Pesaran's CADF test for D.FD
Cross-sectional average in first period extracted and extreme t-values truncated
Deterministics chosen: constant & trend
t-bar test, N,T = (41,28) Obs = 1066
Augmented by 1 lags (average)

t-bar	cv10	cv5	cv1	Z[t-bar]	P-value
-4.186	-2.540	-2.610	-2.730	-12.920	0.000

Pesaran (2015) test for weak cross-sectional dependence.
H0: errors are weakly cross-sectional dependent.
CD = 40.077
p-value = 0.000

Pesaran (2015) test for weak cross-sectional dependence.
H0: errors are weakly cross-sectional dependent.
CD = 0.417
p-value = 0.677

Pesaran's CADF test for FI
Cross-sectional average in first period extracted and extreme t-values truncated
Deterministics chosen: constant & trend
t-bar test, N,T = (41,29) Obs = 1107
Augmented by 1 lags (average)

t-bar	cv10	cv5	cv1	Z[t-bar]	P-value
-2.959	-2.540	-2.610	-2.730	-4.465	0.000

Pesaran's CADF test for D.FI
Cross-sectional average in first period extracted and extreme t-values truncated
Deterministics chosen: constant & trend
t-bar test, N,T = (41,28) Obs = 1066
Augmented by 1 lags (average)

t-bar	cv10	cv5	cv1	Z[t-bar]	P-value
-4.190	-2.540	-2.610	-2.730	-12.944	0.000

Pesaran (2015) test for weak cross-sectional dependence.

H0: errors are weakly cross-sectional dependent.
CD = 8.265
p-value = 0.000

Pesaran (2015) test for weak cross-sectional dependence.
H0: errors are weakly cross-sectional dependent.
CD = 0.316
p-value = 0.752

Pesaran's CADF test for FM
Cross-sectional average in first period extracted and extreme t-values truncated
Deterministics chosen: constant & trend
t-bar test, N,T = (41,29) Obs = 1107
Augmented by 1 lags (average)

t-bar	cv10	cv5	cv1	Z[t-bar]	P-value
-1.835	-2.540	-2.610	-2.730	3.271	0.999

Pesaran's CADF test for D.FM
Cross-sectional average in first period extracted and extreme t-values truncated
Deterministics chosen: constant & trend
t-bar test, N,T = (41,28) Obs = 1066
Augmented by 1 lags (average)

t-bar	cv10	cv5	cv1	Z[t-bar]	P-value
-3.124	-2.540	-2.610	-2.730	-5.603	0.000

Calculating Westerlund ECM panel cointegration tests.....
Results for H0: no cointegration
With 41 series and 6 covariates

Statistic	Value	Z-value	P-value
Gt	-1.357	6.713	1.000
Ga	-1.253	9.675	1.000
Pt	-8.062	4.649	1.000
Pa	-1.053	6.548	1.000

Calculating Westerlund ECM panel cointegration tests.....
Results for H0: no cointegration
With 41 series and 6 covariates

Statistic	Value	Z-value	P-value

Gt	-1.293	7.112	1.000
Ga	-1.254	9.674	1.000
Pt	-9.571	3.385	1.000
Pa	-1.658	6.106	1.000

Calculating Westerlund ECM panel cointegration tests.....
Results for H0: no cointegration
With 41 series and 6 covariates

Statistic	Value	Z-value	P-value
Gt	-1.718	4.446	1.000
Ga	-1.497	9.488	1.000
Pt	-7.677	4.971	1.000
Pa	-1.053	6.548	1.000

Graphical analysis – Relationship between financial development and labor productivity

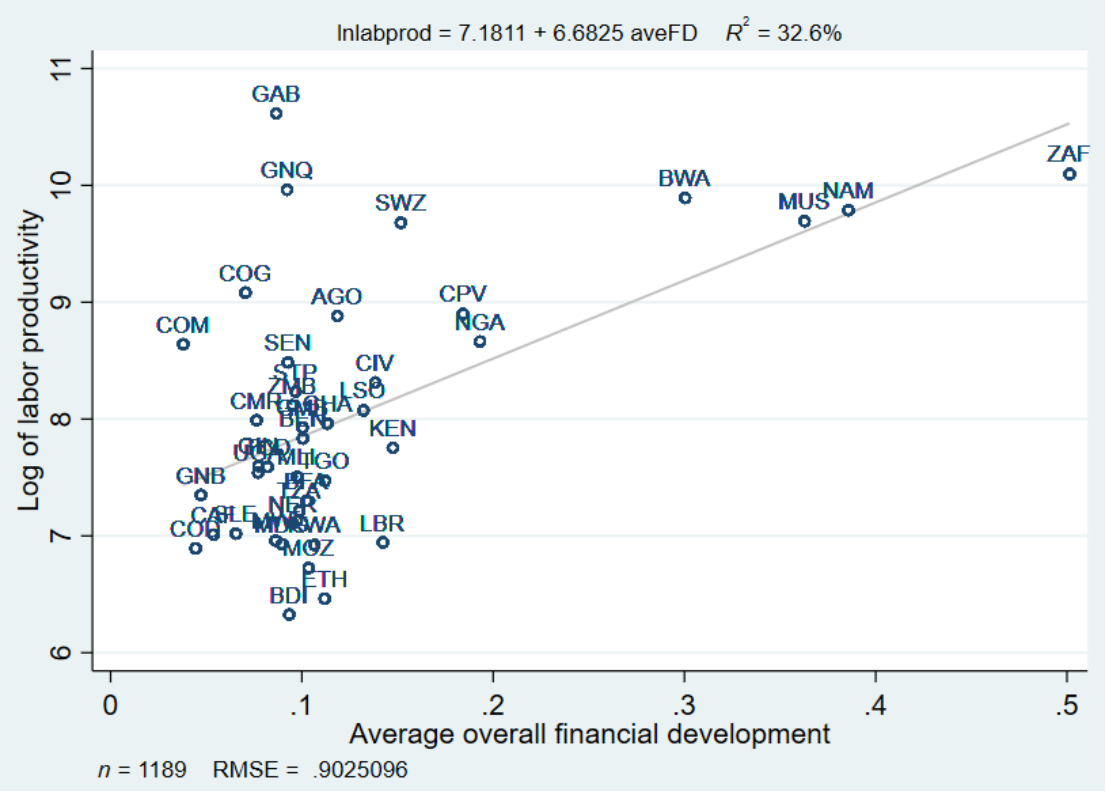

Figure 1: Relationship between overall financial development and labor productivity

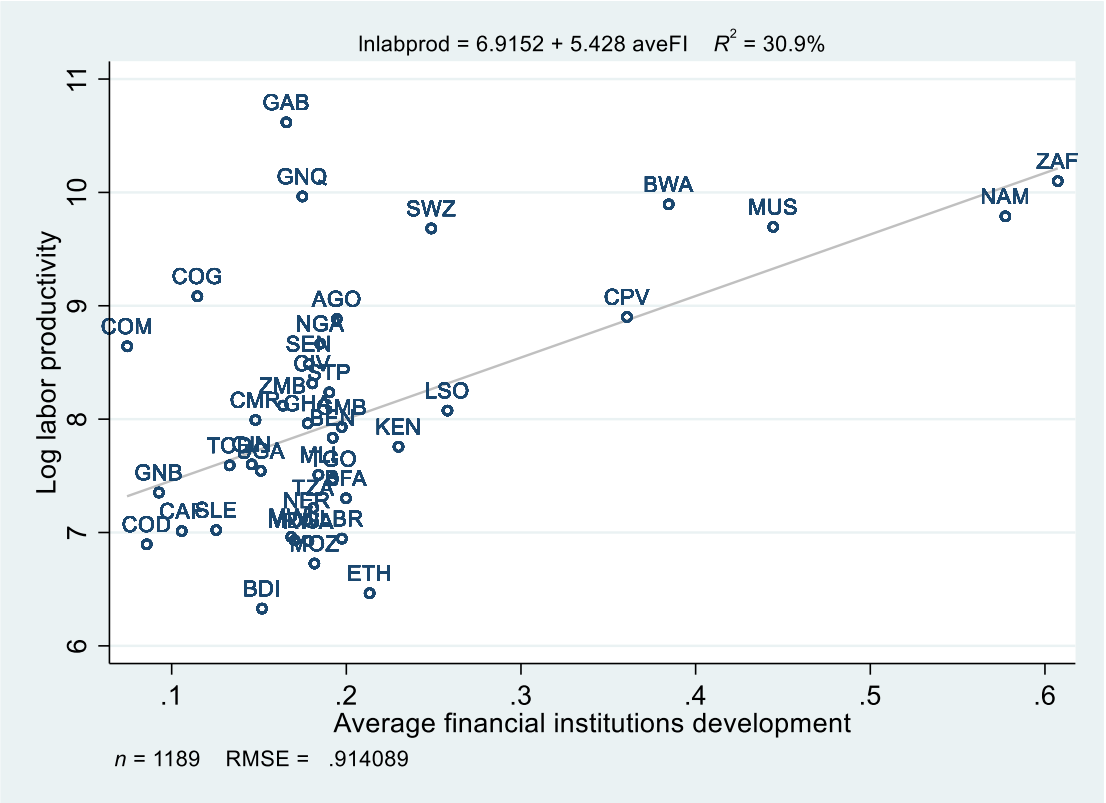

Figure 2: Relationship between Financial institutions development and labor productivity

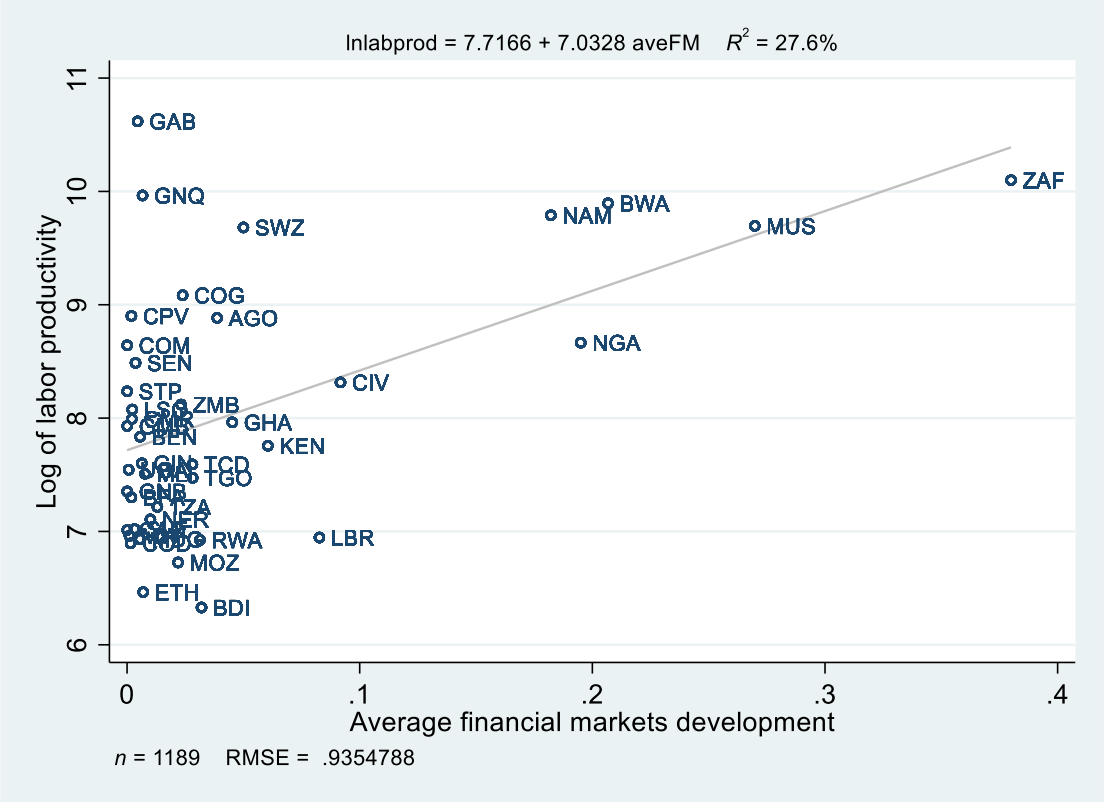

Figure 3: Relationship between Financial markets development and labor productivity

Appendix C: Data and Stata Commands

```
****Financial Development and Labor Productivity in Sub-Sahara Africa***
****Joshua Dzankar Zoaka , Hasan Güngör ***
xtset cid year
foreach i of varlist  lnlabprod lncapta hc lnfdi lngdppc trade lnlab FD FI FM  {
bysort country: egen ave`i' = mean( `i')
aaplot avelnlabprod aveFD, mlabel( iso3)
aaplot avelnlabprod aveFD, mlabel( country )
aaplot avelnlabprod aveFI , mlabel( iso3)
aaplot avelnlabprod aveFI , mlabel( country )
aaplot avelnlabprod aveFM , mlabel( iso3)
aaplot avelnlabprod aveFM , mlabel( country )

foreach i of varlist  lnlabprod lncapta hc lnfdi lngdppc trade lnlab FD FI FM  {
**********Pesaran and Chudik (2015) Cross sectional Dependency test
         *********
asdoc xtcd2 `i', noestimation
asdoc xtcd2 d.`i', noestimation
**Unitroot tests
*********Pesaran (2007)********
******at level**********
asdoc pescadf `i', lags(1) trend
******at First difference**********
asdoc pescadf d.`i', lags(1) trend
}
 *****Westerlund cointegration
asdoc xtwest labprod capta  fdi gdppc trade lab FD   , lags(1)
asdoc xtwest labprod capta  fdi gdppc trade lab  FI  , lags(1)
```

```
asdoc xtwest labprod capta  fdi gdppc trade lab FM   , lags(1)


*Dumitrescu Hurlin Panel (non) Causality Tests

asdoc xtgcause lnlabprod FD

asdoc xtgcause  FD lnlabprod

asdoc xtgcause lnlabprod FI

asdoc xtgcause  FI lnlabprod

asdoc xtgcause lnlabprod FM

asdoc xtgcause  FM lnlabprod

*****estimations of Dynamic CCE Pesaran and Chudik (2016)***

xtdcce2 d.lnlabprod  lncapta hc lnfdi lngdppc trade lnlab FD , crosssectional(
        lnlabprod   hc lnfdi  lngdppc  ) lr ( L.lnlabprod  lncapta hc lnfdi lngdppc trade
        lnlab FD) lr_options(ardl) cr_lags(1)

outreg2 using DCCE, word auto(4) ctitle(FD) replace

xtdcce2 d.lnlabprod lncapta hc lnfdi lngdppc trade lnlab FI , crosssectional( FI ) lr (
        L.lnlabprod lncapta hc lnfdi lngdppc trade lnlab FI) lr_options(ardl) cr_lags(1)

outreg2 using DCCE, word auto(4) ctitle(FI) append

xtdcce2 d.lnlabprod lncapta hc lnfdi lngdppc trade lnlab FM , crosssectional(
        lnlabprod FM) lr (L.lnlabprod lncapta hc lnfdi lngdppc trade lnlab FM)
        lr_options(ardl) cr_lags(1)

outreg2 using DCCE, word auto(4) ctitle(FM) append


___ ____ ____ ____ ____(R)

/__ / ____/ / ____/

___/ / /___/ / /___/

Statistics/Data Analysis

User: RESULTS FOR ZOAKA

1 . do "C:\Users\sabim\AppData\Local\Temp\STD00000000.tmp"

2 . *SECOND generation panel data methods

3 . **********Cross sectional Dependency test *********

4 . xtcd2 fd , noestimation

Pesaran (2015) test for weak cross sectional dependence
```

H0: errors are weakly cross sectional dependent.

CD = 130.311

p-value = 0.000

5 . xtcd2 fi , noestimation

Pesaran (2015) test for weak cross sectional dependence

H0: errors are weakly cross sectional dependent.

CD = 130.299

p-value = 0.000

6 . xtcd2 fi , noestimation

Pesaran (2015) test for weak cross sectional dependence

H0: errors are weakly cross sectional dependent.

CD = 130.299

p-value = 0.000

7 . xtcd2 lnprod , noestimation

Pesaran (2015) test for weak cross sectional dependence

H0: errors are weakly cross sectional dependent.

CD = 146.642

p-value = 0.000

8 . xtcd2 lncapta , noestimation

Pesaran (2015) test for weak cross sectional dependence

H0: errors are weakly cross sectional dependent.

CD = 98.964

p-value = 0.000

9 .

10 . ******Objective one**********

11 . *****Unit root*********

12 . *********Pesaran (2007)Unit root at levels********

13 . pescadf fd , lags(1) trend

Pesaran's CADF test for fd

Cross-sectional average in first period extracted and extreme t-values truncated

Deterministics chosen: constant & trend

t-bar test, N,T = (44,27) Obs = 1100

Augmented by 1 lags (average)

t-bar cv10 cv5 cv1 Z[t-bar] P-value

-3.644 -2.540 -2.610 -2.730 -9.517 0.000

14 . pescadf fi , lags(1) trend

Pesaran's CADF test for fi

Cross-sectional average in first period extracted and extreme t-values truncated

Deterministics chosen: constant & trend

t-bar test, N,T = (44,27) Obs = 1100

Augmented by 1 lags (average)

t-bar cv10 cv5 cv1 Z[t-bar] P-value

-3.613 -2.540 -2.610 -2.730 -9.297 0.000

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15 . pescadf fm , lags(1) trend

Pesaran's CADF test for fm

Cross-sectional average in first period extracted and extreme t-values truncated

Deterministics chosen: constant & trend

t-bar test, N,T = (44,27) Obs = 1100

Augmented by 1 lags (average)

t-bar cv10 cv5 cv1 Z[t-bar] P-value

-2.544 -2.540 -2.610 -2.730 -1.665 0.048

16 . pescadf lnprod , lags(1) trend

Pesaran's CADF test for lnprod

Cross-sectional average in first period extracted and extreme t-values truncated

Deterministics chosen: constant & trend

t-bar test, N,T = (44,27) Obs = 1100

Augmented by 1 lags (average)

t-bar cv10 cv5 cv1 Z[t-bar] P-value

-3.086 -2.540 -2.610 -2.730 -5.531 0.000

17 . pescadf lncapta , lags(1) trend

Pesaran's CADF test for lncapta

Cross-sectional average in first period extracted and extreme t-values truncated

Deterministics chosen: constant & trend

t-bar test, N,T = (44,27) Obs = 1100

Augmented by 1 lags (average)

t-bar cv10 cv5 cv1 Z[t-bar] P-value

-3.357 -2.540 -2.610 -2.730 -7.466 0.000

.

19 . ********Pesaran (2007)Unit root at First Difference**********

20 . pescadf d.fd , lags(1) trend

Pesaran's CADF test for D.fd

Cross-sectional average in first period extracted and extreme t-values truncated

Deterministics chosen: constant & trend

t-bar test, N,T = (44,26) Obs = 1056

Augmented by 1 lags (average)

t-bar cv10 cv5 cv1 Z[t-bar] P-value

-4.900 -2.540 -2.610 -2.730 -18.473 0.000

21 . pescadf d.fi , lags(1) trend

Pesaran's CADF test for D.fi

Cross-sectional average in first period extracted and extreme t-values truncated

Deterministics chosen: constant & trend

t-bar test, N,T = (44,26) Obs = 1056

Augmented by 1 lags (average)

t-bar cv10 cv5 cv1 Z[t-bar] P-value

-4.874 -2.540 -2.610 -2.730 -18.291 0.000

26 . **Westerlund Cointegration tests*

27 . **********

28 . *Model with overall financial development

29 . xtwest lnprod lncapta fd , lags(1)

Calculating Westerlund ECM panel cointegration tests.....

Results for H0: no cointegration

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30 . *Model with financial institutions development

31 . xtwest lnprod lncapta fi , lags(1)

Calculating Westerlund ECM panel cointegration tests.....

32 . *Model with financial markets development

33 . xtwest lnprod lncapta fm , lags(1)

Calculating Westerlund ECM panel cointegration tests.....

Results for H0: no cointegration

35 . *****Estimations of (Dynamic) Common Correlated Effects Estimator - Mean Group (C

> S-ARDL) Pesaran and Chudik (2016)

36 . *Model with overall financial development

37 . xtdcce2 d.lnprod l.lnprod lncapta fd, crosssectional(l.lnprod l.fd l.lncapta) l

> r (l.lnprod lncapta fd) lr_options(ardl) cr_lags(1) reportconstant

(Dynamic) Common Correlated Effects Estimator - Mean Group (CS-ARDL)

Panel Variable (i): cid Number of obs = 1100

Time Variable (t): year Number of groups = 44

Degrees of freedom per group: Obs per group (T) = 25

without cross-sectional averages = 17

with cross-sectional averages = 11

Number of F(440, 660) = 2.64

cross-sectional lags = 1 Prob > F = 0.00

variables in mean group regression = 176 R-squared = 0.64

variables partialled out = 264 Adj. R-squared = 0.40

Root MSE = 1.73

CD Statistic = -0.13

p-value = 0.8947

D.lnprod Coef. Std. Err. z P>|z| [95% Conf. Interval]

Short Run Est.

Mean Group:

L.lnprod -1.177668 .1381665 -8.52 0.000 -1.448469 -.9068666

lncapta .5385379 .1155522 4.66 0.000 .3120598 .7650161

fd 4.498399 4.133412 1.09 0.276 -3.602939 12.59974

_cons -1.185453 6.19908 -0.19 0.848 -13.33543 10.96452

Long Run Est.

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Mean Group:

lr__cons -1.338289 2.809448 -0.48 0.634 -6.844706 4.168128

lr_fd 2.042964 1.981974 1.03 0.303 -1.841634 5.927561

lr_lncapta .258026 .0563271 4.58 0.000 .1476269 .3684251

lr_lnprod -2.177668 .1381665 -15.76 0.000 -2.448469 -1.906867

Mean Group Variables: L.lnprod lncapta fd _cons

Cross-sectional Averaged Variables: L.lnprod L.fd L.lncapta

Long Run Variables: lr__cons lr_fd lr_lncapta lr_lnprod

Cointegration variable(s): lr_lnprod

38 . outreg2 using results, word replace ctitle(overall financial development)

results.rtf

dir : seeout

39 . *Model with financial institutions development

40 . xtdcce2 d.lnprod l.lnprod lncapta fi, crosssectional(l.lnprod l.fd l.lncapta) l

> r (l.lnprod lncapta fd) lr_options(ardl) cr_lags(1) reportconstant

(Dynamic) Common Correlated Effects Estimator - Mean Group (CS-ARDL)

Panel Variable (i): cid Number of obs = 1100

Time Variable (t): year Number of groups = 44

Degrees of freedom per group: Obs per group (T) = 25

without cross-sectional averages = 17

with cross-sectional averages = 11

Number of F(484, 616) = 2.43

cross-sectional lags = 1 Prob > F = 0.00

variables in mean group regression = 220 R-squared = 0.66

variables partialled out = 264 Adj. R-squared = 0.39

Root MSE = 1.74

CD Statistic = 0.09

p-value = 0.9249

D.lnprod Coef. Std. Err. z P>|z| [95% Conf. Interval]

Short Run Est.

Mean Group:

L.lnprod -1.198876 .1408851 -8.51 0.000 -1.475006 -.9227466

lncapta .5407524 .1160703 4.66 0.000 .3132588 .768246

fi -25051.02 31294.15 -0.80 0.423 -86386.42 36284.38

_cons .5945219 6.452572 0.09 0.927 -12.05229 13.24133

fd 49746.36 62133.74 0.80 0.423 -72033.53 171526.2

Long Run Est.

Mean Group:

lr__cons -.5430923 2.90844 -0.19 0.852 -6.243531 5.157346

lr_fd 22472.47 28994.7 0.78 0.438 -34356.09 79301.04

lr_lncapta .2596203 .0566252 4.58 0.000 .148637 .3706037

lr_lnprod -2.198876 .1408851 -15.61 0.000 -2.475006 -1.922747

Mean Group Variables: L.lnprod lncapta fi _cons

Cross-sectional Averaged Variables: L.lnprod L.fd L.lncapta

Long Run Variables: lr__cons lr_fd lr_lncapta lr_lnprod

Cointegration variable(s): lr_lnprod

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41 . outreg2 using results, word append ctitle(Financial institutions development)

results.rtf

dir : seeout

42 . *Model with financial institutions development

43 . xtdcce2 d.lnprod l.lnprod lncapta fm, crosssectional(l.lnprod l.fd l.lncapta) l
> r (l.lnprod lncapta fd) lr_options(ardl) cr_lags(1) reportconstant

(Dynamic) Common Correlated Effects Estimator - Mean Group (CS-ARDL)

Panel Variable (i): cid Number of obs = 1100

1 . do "C:\Users\sabim\AppData\Local\Temp\STD00000000.tmp"

2 . *SECOND generation panel data methods
3 . **********Cross sectional Dependency test *********
4 . xtcd2 fd , noestimation
Pesaran (2015) test for weak cross sectional dependence

H0: errors are weakly cross sectional
dependent. CD = 130.311 p-value
= 0.000

5 . xtcd2 fi , noestimation
Pesaran (2015) test for weak cross sectional dependence

H0: errors are weakly cross sectional
dependent. CD = 130.299 p-value
= 0.000

6 . xtcd2 fi , noestimation
Pesaran (2015) test for weak cross sectional dependence

H0: errors are weakly cross sectional
dependent. CD = 130.299 p-value
= 0.000

7 . xtcd2 lnprod , noestimation
Pesaran (2015) test for weak cross sectional dependence

H0: errors are weakly cross sectional
dependent. CD = 146.642 p-value
= 0.000

8 . xtcd2 lncapta , noestimation

Pesaran (2015) test for weak cross sectional dependence

H0: errors are weakly cross sectional
dependent. CD = 98.964 p-value
= 0.000

```
9  .
10 . ******Objective one**********
11 . *****Unit root*********
12 . *********Pesaran (2007)Unit root at levels********
13 . pescadf fd , lags(1) trend
```

Pesaran's CADF test for fd

Cross-sectional average in first period extracted and extreme t-values truncated
Deterministics chosen: constant & trend

t-bar test, N,T = (44,27) Obs = 1100
Augmented by 1 lags (average)

t-bar	cv10	cv5	cv1	Z[t-bar]	P-value
-3.644	-2.540	-2.610	-2.730	-9.517	0.000

```
14 . pescadf fi , lags(1) trend
```

Pesaran's CADF test for fi

Cross-sectional average in first period extracted and extreme t-values truncated
Deterministics chosen: constant & trend

t-bar test, N,T = (44,27) Obs = 1100
Augmented by 1 lags (average)

t-bar	cv10	cv5	cv1	Z[t-bar]	P-value
-3.613	-2.540	-2.610	-2.730	-9.297	0.000

```
15 . pescadf fm , lags(1) trend
```

Pesaran's CADF test for fm

Cross-sectional average in first period extracted and extreme t-values truncated
Deterministics chosen: constant & trend

t-bar test, N,T = (44,27) Obs = 1100
Augmented by 1 lags (average)

t-bar	cv10	cv5	cv1	Z[t-bar]	P-value
-2.544	-2.540	-2.610	-2.730	-1.665	0.048

```
16 . pescadf lnprod , lags(1) trend
```

Pesaran's CADF test for lnprod

Cross-sectional average in first period extracted and extreme t-values truncated
Deterministics chosen: constant & trend

t-bar test, N,T = (44,27) Obs = 1100
Augmented by 1 lags (average)

t-bar	cv10	cv5	cv1	Z[t-bar]	P-value
-3.086	-2.540	-2.610	-2.730	-5.531	0.000

17 . pescadf lncapta , lags(1) trend

Pesaran's CADF test for lncapta

Cross-sectional average in first period extracted and extreme t-values truncated
Deterministics chosen: constant & trend

t-bar test, N,T = (44,27) Obs = 1100
Augmented by 1 lags (average)

t-bar	cv10	cv5	cv1	Z[t-bar]	P-value
-3.357	-2.540	-2.610	-2.730	-7.466	0.000

18 .
19 . ********Pesaran (2007)Unit root at First Difference**********
20 . pescadf d.fd , lags(1) trend

Pesaran's CADF test for D.fd

Cross-sectional average in first period extracted and extreme t-values truncated
Deterministics chosen: constant & trend

t-bar test, N,T = (44,26) Obs = 1056
Augmented by 1 lags (average)

t-bar	cv10	cv5	cv1	Z[t-bar]	P-value
-4.900	-2.540	-2.610	-2.730	-18.473	0.000

21 . pescadf d.fi , lags(1) trend

Pesaran's CADF test for D.fi

Cross-sectional average in first period extracted and extreme t-values truncated
Deterministics chosen: constant & trend

t-bar test, N,T = (44,26) Obs = 1056
Augmented by 1 lags (average)

t-bar	cv10	cv5	cv1	Z[t-bar]	P-value
-4.874	-2.540	-2.610	-2.730	-18.291	0.000

22 . pescadf d.fm , lags(1) trend

Pesaran's CADF test for D.fm

Cross-sectional average in first period extracted and extreme t-values truncated
Deterministics chosen: constant & trend

t-bar test, N,T = (44,26) Obs = 1056
Augmented by 1 lags (average)

t-bar	cv10	cv5	cv1	Z[t-bar]	P-value
-3.671	-2.540	-2.610	-2.730	-9.706	0.000

23 . pescadf d.lnprod , lags(1) trend

Pesaran's CADF test for D.lnprod

Cross-sectional average in first period extracted and extreme t-values truncated
Deterministics chosen: constant & trend

t-bar test, N,T = (44,26) Obs = 1056
Augmented by 1 lags (average)

t-bar	cv10	cv5	cv1	Z[t-bar]	P-value
-4.666	-2.540	-2.610	-2.730	-16.807	0.000

24 . pescadf d.lncapta , lags(1) trend

Pesaran's CADF test for D.lncapta

Cross-sectional average in first period extracted and extreme t-values truncated
Deterministics chosen: constant & trend

t-bar test, N,T = (44,26) Obs = 1056
Augmented by 1 lags (average)

t-bar	cv10	cv5	cv1	Z[t-bar]	P-value
-4.828	-2.540	-2.610	-2.730	-17.962	0.000

25 .
26 . **Westerlund Cointegration tests*
27 . **
28 . *Model with overall financial development
29 . xtwest lnprod lncapta fd , lags(1)

Calculating Westerlund ECM panel cointegration tests.....

Results for H0: no cointegration

With 44 series and 2 covariates

Statistic	Value	Z-value	P-value
Gt	-4.056	-16.932	0.000
Ga	-10.092	-5.177	0.000
Pt	-16.234	-7.540	0.000

Pa	-9.030	-8.839	0.000

. *Model with financial institutions development

. xtwest lnprod lncapta fi , lags(1)

Calculating Westerlund ECM panel cointegration tests.....

Results for H0: no cointegration

With 44 series and 2 covariates

Statistic	Value	Z-value	P-value
Gt	-4.151	-17.528	0.000
Ga	-11.567	-6.966	0.000
Pt	-16.657	-7.858	0.000
Pa	-9.230	-9.109	0.000

. *Model with financial markets development

. xtwest lnprod lncapta fm , lags(1)

Calculating Westerlund ECM panel cointegration tests.....

Results for H0: no cointegration With 44 series and 2 covariates

Statistic	Value	Z-value	P-value
Gt	-3.269	-11.946	0.000
Ga	-6.440	-0.747	0.228
Pt	-8.605	-1.799	0.036
Pa	-2.994	-0.670	0.252

.

. *****Estimations of (Dynamic) Common Correlated Effects Estimator - Mean Group (C > S-ARDL) Pesaran and Chudik (2016)

. *Model with overall financial development