

Ashesi University

Exploring the Effect of Economic Growth on Income Inequality in West African

Countries

By

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DECLARATION

I hereby declare that this thesis is my original work and that no part of it has
been presented for another degree in this university or elsewhere.
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ABSTRACT

This thesis addresses two major issues: first, the effect of economic growth on income inequality in West African countries; and second, the impact of some macroeconomic factors on income inequality in West African countries. For the period 1990 to 2019, panel data for fourteen members of the Economic Community of West African States (ECOWAS) is examined. In order to answer the questions, the analysis employs a fixed-effects model. The findings of diagnostic experiments, such as cross-sectional dependency, heteroskedasticity, serial correlation, and Hausman, are used to choose the fixed effects model. The fixed-effects model confirms the independent variables' effect on income inequality. Consequently, a conclusion that economic growth in West African countries has a negative and negligible effect on income inequality is drawn. In West African nations, the rate of inflation has a positive and significant effect on income inequality. On the other hand, unemployment and literacy rates have a negative and significant effect on income inequality. The thesis proposes that policymakers focus on raising literacy rates by investing in public schools and adult education services and reducing the impact of inflation by enacting economic policies that minimise inflation and income inequality.

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CHAPTER 1: INTRODUCTION

The thesis is introduced in this part. It explains the thesis's context, the problem found, and why it was worth studying. This chapter also provides a summary of the methodology used in this thesis. This chapter includes the core research question and objectives addressed in this thesis. This chapter further discusses the thesis's significance.

Background of the Study

For many developing countries around the world, achieving fast economic growth has become a big priority. Many of these developing countries' policymakers aim to focus on strategies that promote economic growth. Six of Africa's fastestgrowing economies is in West Africa, according to Hallum and Obeng (2019), and three were among the world's top ten fastest-growing economies.

With the introduction of the Sustainable Development Goals (SDGs), many countries put measures to eradicate poverty. Economic growth is a powerful force for reducing poverty and promoting the SDGs. The focus over the years has been on reducing poverty, which is ensuring that households do not fall below the poverty line. Many developing countries have put in initiatives to ensure that poverty is eradicated in line with attaining the SDG goals. There is evidence that in West Africa, with high economic growth, poverty has been reducing (Wodon, 2007).

Nevertheless, the wealth share in the country is usually ignored. Compared to the early 1980s, poverty rates in developing countries have fallen sharply, but the same cannot be said for income inequality (Organisation for Economic Co-operation and Development, 2015). In West Africa, income inequality has reached extreme levels, and as of 2019, "1% of West Africans owned more wealth than everyone else in the region" (Oxfam International, 2020). The extreme levels of income inequality are despite the positive economic growth rate the region has experienced over the years. According to Tabassum and Majeed (2008), this high degree of income inequality demonstrates that attempts to stimulate economic growth and reduce overall poverty are insufficient; measures to reduce income inequality must also be implemented.

Over the years, the association between economic growth and income inequality has piqued economists' interest. The relationship between economic growth and income inequality has been studied extensively. This relationship is significant because policymakers must consider how the pursuit of higher economic growth influences income distribution in the economy. As García-Peñalosa put it in her 2018 paper, Inequality in Macroeconomic Levels, "the relationship shows how an increase in output will be shared among different individuals and firms within an economy, and the constraints this sharing may put on future growth" (García-Peñalosa, 2018). There are significant differences when comparing the results of different studies on the relationship between income inequality and economic growth. Economists such as Nicholas Kaldor and Simon Kuznets have argued that reducing income inequality and promoting growth are mutually exclusive goals in a country (Kuznets, 1955, as cited in Forbes, 2000). Other researchers, such as Robert Barro, discovered that while the relationship is positive in advanced economies, it is harmful in developing economies (Barro, 2000). The fact that reconciling the various hypotheses has proven difficult could explain the disparity in the findings obtained in analysing the relationship between income inequality and economic growth.

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Problem Statement

Many West African countries are concentrating their efforts on reducing extreme poverty while still boosting economic growth. However, income inequality in the region has reached unprecedented heights (Oxfam International, 2020). The wealthy have accumulated more wealth over time, while the poor have been significantly poorer. Furthermore, many of these West African countries have a northsouth division, which is a cause of rising inequalities. The southern parts of the country are usually established, while the northern parts are less so. As a result, people in the southern divide have more income sources and opportunities, which affects the economy's overall level of inequality. In Ghana, for example, the northern region is less developed than the southern part (Oxfam International, 2020). In Nigeria, the socioeconomic level of the conflict-affected north-eastern states pales compared to the prosperity of the south's urban megacities, which are home to many of the continent's billionaires. According to Arku, some progress has been made in reducing the inequality between rural and urban areas, such as Ghana's attempt to establish a factory in each district (Arku, 2019).

When it comes to reducing income inequality, West African countries have a weak track record. Governments in West Africa are among the least committed to reducing inequalities in Africa, according to Oxfam's Commitment to Reducing Inequality (CRI) Index (Hallum & Obeng, 2019). "The governments of West Africa are compounding inequality by underfunding public institutions, such as medical care and schooling, whereas under-taxing businesses and the wealthy," according to the paper (Oxfam International, 2020). Governments must step up their efforts to reduce income inequalities in their respective economies.

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Methodology

A quantitative analysis approach will be used in this thesis. The thesis will concentrate on 14 countries of West Africa. Secondary data from the World Bank database is used in this analysis. GDP per capita growth, the GINI coefficient, financial development as broad money (percentage of GDP), inflation rate, unemployment rate, government consumption, literacy rate, population growth, and trade openness are among the data used in this study. The data gathered from 1990 to 2019 for these variables will be the priority.

Research Question

This study attempts to address the question, "Does economic growth promote the reduction of income inequalities in West African countries?".

Research Objectives

The goal of this thesis is to determine how economic growth affects income inequality in West African countries.

Significance of the Study

For many economists, the association between income inequality and economic growth has been a significant source of concern and political interest (e.g., Deininger & Squire 1996; Fields 1989; Forbes 2000; Li & Zou 1998; Perotti 1996; Barro 2000). Since many researchers hold opposing viewpoints on the topic, it is important to do additional analysis using current data. To determine the level to which income inequality is affected by economic growth, it is also essential to examine West African countries' economic growth and income inequality profiles. Most studies examine the impact of income inequality on economic growth, but this thesis examines the impact of economic growth on income inequality. This study could serve as a guide to what West African countries can expect based on projected GDP growth rates, as economic growth is more accessible to regulate than income inequality. It may affect reforms aimed at achieving the best GDP growth zone for decreasing income inequality.

The Organisation of the Thesis

This thesis will be divided into five chapters. The thesis is introduced in the first chapter, giving a concise overview of the thesis and its address. The literature review section of Chapter 2 examines the other literature on the subject of this thesis. The approach that will be included in this study is discussed in Chapter 3. The study's findings and analysis would be presented in Chapter 4, and the conclusion and recommendations would be presented in Chapter 5.

CHAPTER 2: LITERATURE REVIEW

Introduction

The available peer-reviewed articles that support this thesis are presented in this chapter. The theoretical analysis and the analytical review are the two main parts of the chapter.

Theoretical Review

The relationship between income inequality and economic growth and the factors that influence the relationship is the subject of much theoretical literature. Different findings have been reached on the course and effect of the relationship between income inequality and economic development. Some researchers discover a significant positive relationship, while others discover a significant negative relationship, while others assume that the relationship is not significant.

One of the first literature on the relationship between income inequality and economic growth was written by Simon Kuznets. Kuznets (1955) wanted to know how the long-term trajectory of a country's economic growth affects income inequality. He suggested that an inverted U-shape represented the relationship between income inequality and economic growth. In economics, this principle is known as the Kuznets hypothesis. According to the theory, an economy's early stages will see a rise in income inequality, while later stages will reduce income inequality (Kuznets, 1955).

Alesina and Perotti (1993) take a particular approach to the economic growthincome inequality relationship. They tried to figure out how income inequality influenced economic growth. In their paper, they emphasised and tested a different link from income inequality to capital accumulation. Political unrest was the new connector. They say that income inequality fuels civil unrest, which contributes to increased sociopolitical uncertainty. This insecurity confuses the political and economic climate, deterring economic activity. They argued that there is an inverse association between income inequality and growth since investments are the main drivers of economic development (Alesina & Perotti, 1993).

The role of financial market imperfections in the negative relationship between the initial distribution of wealth and the economy's long-term growth rate was highlighted by Banerjee and Newman (1993). They said that due to capital market imperfections, people could only borrow a certain amount of money (Banerjee & Newman, 1993). Poor people cannot afford to work in occupations that cost much money. As a result, the poor are forced to work as wage workers for the rich. They claimed that the initial distribution of wealth determines the pattern of occupational choice. Since the original income distribution is uneven, the negative effect of inequalities on the growth rate would be more significant.

The relationship between politics and economic growth was investigated by Alesina and Rodrik (1994). The greater the inequality of income and wages, the higher the taxation rate, and the lower the economic growth, their model claimed (Alesina & Rodrik, 1994). The reason for this is that higher taxes discourage private investment, which slows economic growth.

Alesina and Perotti (1994) examined the role of political uncertainty in the income inequality-growth relationship from two perspectives. The first is a link between income inequality and political instability, and the second is a link between political instability and economic growth. They claimed that income inequality is a

crucial determinant of political instability and that greater income inequality leads to more political instability, leading to slower economic growth. This is because civil unrest limits the potential to conserve and spend (Alesina & Perotti, 1994).

In their paper, Li and Zou (1998) re-examined the relationship between income inequality and economic growth. They looked at a theoretical structure that split government expenditure into production and consumption programs. They found out that equal income distribution can lead to higher income taxation and lower economic growth within a politico-economy system. This demonstrated that if public demand was included in the utility function, income inequality could lead to higher economic growth (Li & Zou, 1998).

Empirical Review

Deininger and Squire (1996) argued that previous evidence used to research the association between income inequality and economic growth was questionable. They introduced a new income inequality data package. They addressed the parameters they used to pick the data in their article. Deininger and Squire (1998) discovered a significant negative association between initial inequality in land distribution and long-term growth using a new cross-country dataset on income and land distribution. They discovered that income inequality limits economic growth for developing economies but not for wealthy economies, using the GINI coefficient to measure income inequality (Deininger & Squire, 1998).

According to Barro (2000), income inequality positively affects economic growth in industrialised economies but harms economic growth in developed economies. He looked at the effects that economic factors had on national GDP. He used panel and cross-sectional data from two different data sets and World Bank time-series data to examine income inequalities from the 1960s to the 1990s. He first focused on the various hypotheses that attempt to explain economic growth or scarcity in that field. He used a compilation of data from more than 100 countries from 1965 to 1995. To determine how strategies and social forces affect economic growth, he chose regressors such as school achievement, inflation, birth rate, investment, and an abstract democracy index. He also used an alternative panel data collection that comprised 84 countries with at least one GINI coefficient observation to see how it applied to economic growth and investment rates. Barro arrived at some interesting conclusions using random-effects estimation, inferring that economic growth slows as income inequality rises in countries with relatively low GDPs. However, in wealthy countries, economic growth rises in tandem with income inequality. When GDP per capita is less than \$2000 (1985 US dollars), economic growth will slow, and income inequality will increase. When GDP per capita is more than \$2000 (1985 US dollars), economic growth will accelerate (Barro, 2000).

Forbes (2000) contradicts the proposed thought that income inequality has a negative association with economic growth. She used an improved data set on income inequality for 45 countries between 1966 and 1995 in her paper, which reduced measurement error and allowed estimation using a panel technique. She argued that panel estimation made it easier to monitor time-invariant country-specific results, removing a potential source of variable bias. Her indicator of income inequality was the GINI coefficient. The author used the Arellano-Bover GMM estimator. Her findings show that income inequality has a strong positive association with economic growth in high and middle-income nations. However, she noted that the positive

relationship is remarkably consistent through samples, variable definitions, and model parameters, except that it does not apply to impoverished countries (Forbes, 2000).

Shin (2008) establishes the impact of income inequality on economic growth in his article. He used a stochastic optimal growth model to investigate the relationship technically. His findings showed that, depending on the state of the economy, income inequality has both a positive and negative impact on economic growth. In the early stages of economic development, he discovered that income inequality hurt economic growth. In the long run, though, income inequality positively impacts economic growth (Shin, 2008).

CHAPTER 3: METHODOLOGY

Overview of the Method Section

This thesis examines the relationship between income inequality and economic growth in West African countries and other factors. This chapter is divided into subsections covering the following topics: relevant empirical model definition and rationale, variables explanation, data and data sources, data analysis methods, and reliability and validity.

Data

Data has been derived from a significant recognised data source, the World Bank, in answering the research question. The data is presented in a panel data format - the panel data structure aids in analysing the relationship of interest over time and across countries. Panel data is a set of observations made over time regarding various cross-sections. Some data is missing for some countries. Hence the panel is unbalanced. Guinea-Bissau, which had only two observations for the variable literacy rate, was dropped from the data to cater to this. The remaining gaps in the data have been imputed using the median values. Hence, the dataset is now balanced (Greene, 2011). The analysis of the panel data would be done using the statistical software, R.

The dataset used in this thesis contains data of 14 countries over 30 years, from 1990 to 2019. The countries were selected based on the population under study and the data available. This thesis focuses on Benin, Burkina Faso, Cabo Verde, Cote d'Ivoire, The Gambia, Ghana, Guinea, Liberia, Mali, Niger, Nigeria, Senegal, Sierra Leone, and Togo. The focus is on these 14 West African countries because they are members of the West African States Economic Community (ECOWAS). After all, the states in ECOWAS is "governed following the principles of democracy, the rule of law and good governance".

Independent Variables

The independent variable of interest is economic growth, measured as an annual percentage increase in GDP per capita. The dependent variable, income inequality, is calculated using the Gini coefficient. Other independent variables are investigated to see how they influence income inequality. Financial development as broad money (percentage of GDP), inflation, unemployment, government consumption (percentage of GDP), literacy rate, population growth, and trade openness (calculated by dividing total exports and imports by GDP) are some of the other independent variables examined in this thesis.

Economic Growth

Economic growth is the primary independent variable examined in this thesis. As previously discussed, several studies have looked into the relationship between economic growth and income inequality. The study of the relationship between income inequality and economic growth has yielded a variety of findings. Since economic growth generates more employment opportunities, it is projected that income inequality will decrease. Also, economic growth increases the government budget, which can be used to fund more social spending, including education benefits and welfare benefits. This funding of more social spending can decrease income inequality.

Financial Development

The growth of a country's financial markets affects income inequality. According to theory, financial development and income inequality have a positive linear relationship (Banerjee & Newman, 1993). This positive linear relationship exists because financial market imperfections such as financial asymmetry and transaction costs may favour the wealthy over the poor as financial markets grow. As a result, the wealthy would benefit more from the development of financial markets than the poor, and therefore financial development could exacerbate income inequality.

Inflation

Inflation is described as a decrease in a currency's purchasing power over time. Through its impact on wages, inflation plays a part in the extent of income inequality. Inflation limits one's buying power. Since the poor have fewer resources, they prefer to consume more and invest less with high inflation. On the other hand, the wealthy have excess income and will use capital markets to protect against the risk of inflation, resulting in a rise in income inequality.

Unemployment

Unemployment is thought to be one of the most important variables influencing income inequality. The importance of unemployment is because work is the primary source of income. When unemployment increases, those with lower to medium incomes suffer more than those with higher incomes. This is attributed to the lower to middle class's lack of alternative income options relative to society's wealthy. As a result, as unemployment rises, income inequality is predicted to decrease.

Government Consumption

Government consumption is one of the causes that contribute to income inequality. Income inequality can increase or decline as a result of government consumption. When government consumption is directed toward providing social welfare to the poor, such as free healthcare and schooling, the poor's money is freed up to spend in the financial markets. The freed-up money opens a new opportunity for the poor to earn income, thereby reducing income inequality. On the other hand, if government consumption is not geared toward the poor, it favours the wealthy over the poor rather than the country's overall growth. As a result, government consumption raises income inequalities in that situation.

Literacy rate

One of the fundamental reasons behind income inequality is the amount of schooling provided to society. Unequal education access leads to greater income inequality by expanding the skill and productivity divide in the working class. On the other hand, unequal wealth inequality discourages the poor from engaging in schooling and skill growth.

Population Growth

Another factor that leads to income inequality is population growth. Rapid population growth is believed to be associated with increased economic inequality in general. One theory may be that the poor community has a greater dependency load.

Openness to Trade

Several reports have attempted to relate trade policy variables to economic growth (Dollar, 1992). Trade openness has been linked to better economic growth in these studies. Dollar and Kraay (2004) found data to support the claim that globalisation leads to higher economic growth and reduced income inequality.

Estimated Model

This thesis would be using Rehman, Sajawal, and Ahmed's (2008) regression model to assess the association between income inequality and economic growth. This model was selected because it used variables that have been shown in the literature to influence income inequality and economic growth.

The use of fixed effects in this thesis tends to eliminate the bias caused by missing variables. The elimination of bias is accomplished by tracking shifts in groups over time, typically through the use of dummy variables to account for unobserved time and country results. Omitted variables cannot be controlled for in the regression model due to data unavailability (Wooldridge, 2010). The fixed-effects model examines the relationship between different countries' dependent and independent variables over time. There are differences between the countries that cannot be explained by the independent variables used in the analysis. Hence, the

fixed-effects model incorporates a time-invariant constant term to account for these differences. The different terms reflecting the country's "fixed" discrepancies and the country's error terms should not be related.

The basic fixed-effects regression model to be used in this thesis takes the following form:

$$gini_{it} = \beta_1 growth_{it} + \beta_2 fin_{it} + \beta_3 inf_{it} + \beta_4 unemp_{it} + \beta_5 cg_{it} + \beta_6 lit_{it} + \beta_7 popg_{it} + \beta_8 opp_{it} + (\alpha_i + u_{it})$$

where i is the country, t is time, gini is the coefficient of income inequality, growth is per capita income growth, fin is financial development, inf is the rate of inflation, unemp is the unemployment rate, cg is government consumption, lit is literacy rate, popg is population growth, opp is openness to trade, α_i is the unobserved country-specific effects and ($\alpha_i + u_{it}$) is the composite error term. The coefficient β_n is the coefficient of the independent variable that shows the effects the independent variable has on the dependent variable, *gini*. This effect shows the relationship between the independent and the dependent variable.

Validity and Reliability

Given the current analysis model, data would be collected from the World Bank's official website, confirming the data's integrity. The data is focused on 14 West African nations, whose data for various periods will be analysed using panel data estimation. The data analysis method provides convincing proof of the data's legitimacy and reliability, as it provides a general unbiased representation of the relationship between economic growth and income inequality.

Unit Root Test

The term "stationarity" refers to a method and an inference used to analyse data with time-series characteristics. The term "stationary variable" refers to a variable whose mean, variance, and autocorrelation composition do not change over time. The Dickey-Fuller test is the most common unit root test for stationarity in time series data. Since the data in this study is in panel form, a panel unit root test rather than a time-series unit root test is more appropriate. The use of panel unit root tests is more appropriate than time-series unit root tests because panel unit root tests increase the test's power by increasing the likelihood of finding macroeconomic variables stationary (Hadri, 2000). The Levin-Lin-Chu unit-root test, a panel unit root test built on the Augmented Dickey-Fuller test, is used in this thesis. Each attribute is measured using the level and 1st difference to validate the data's stationarity. As a result, this procedure avoids erroneous regression.

Cross-Sectional Dependence

For cross-sectional dependence, Pesaran's (2004) error cross-sectional dependency test was used (CD). The null hypothesis of the test is cross-sectional independence (errors are not correlated). According to Pesaran, the test is suitable for panel models (2004). The test produces accurate results when working with raw series and approximate residuals.

Heteroskedasticity and Serial Correlation

The systematic change in the distribution of the residuals across the spectrum of calculated values is known as heteroskedasticity. Heteroskedasticity is when the assumption of homoskedasticity is violated (equal variance). The relationship between a given variable and a lagged version of itself over different time intervals is known as serial correlation. A serially correlated variable means that it is unlikely to be random. According to Greene (2011), panel data sets may exhibit heteroskedasticity and serial correlation characteristics due to the time-series aspect. Hence, assuming homoskedasticity (equal variance) and ignoring serial correlation in the estimation may provide estimates of the regression coefficients that are consistent but not efficient.

The studentised Breusch-Pagan test was used to test for heteroskedasticity in this thesis. The test's null hypothesis is homoskedasticity. The Breusch-Godfrey/Wooldridge serial correlation test is often used to ensure that no serial correlation exists. The null hypothesis of the test is that the idiosyncratic errors have no serial correlation.

CHAPTER 4: RESULTS

Introduction

The findings of the statistical study of the data are presented in this chapter. A thorough discussion of the study's conclusions is also included to aid comprehension of the findings in the light of the empirical literature.

Descriptive Statistics

The panel data consists of annual observations for 14 ECOWAS countries over the period 1990-2019. The total number of observations used in this thesis is 420. The descriptive statistics for the data are shown in Table 1. The mean, median, standard deviation, minimum, and maximum are the metrics used.

Table 1

Summary of Variable Statistics

Variables	Min	Median	Mean	Max	Standard	Skewness	Observations
					Deviation		
Income Inequality	31.50	42.40	41.45	54.10	3.74	-0.19	
(gini)							
Economic Growth	-31.33	1.65	1.47	21.03	4.43	-1.19	
(growth)							
Financial	5.143	22.06	25.78	104.63	16.69	2.47	
Development (fin)							
Inflation Rate (inf)	-7.77	5.02	7.17	72.84	9.38	2.92	N=420
Unemployment Rate	0.32	4.43	5.02	12.25	2.96	0.64	Id=14
(unemp)							
Government	0.91	13.34	12.91	26.06	4.50	-0.26	T=30
Consumption (cg)							
Literacy Rate (lit)	12.85	41.95	44.33	89.79	16.48	0.76	

Population Growth	-1.91	2.69	2.68	7.90	0.91	-0.27	
(popg)							
Openness to Trade	0.19	0.62	0.66	1.55	0.24	0.35	
(opp)							

The income inequality for the 14 West African countries chosen averaged 41.45 ± 3.74 gini index. This indicates that there is about a 41.5% income inequality level in the chosen countries on average, with a standard deviation of approximately 3.7%. The highest level of income inequality is about 54.1%, whereas the lowest income inequality level is 31.5%.

The mean rate of economic growth (GDP per capita growth) is $1.47\% \pm 4.43\%$. The mean shows that the countries attain on average a growth of 1.47%. Some countries experience as high as 21% in economic growth, while some experience a decline in growth as low as -31.33%, a drastic decrease in the country's economic growth.

Financial development is averaged at a rate of 25.78% for the countries, with a standard deviation of 16.69%. The calculated rate means that, on average, the amount circulating in the economy of the countries relative to GDP is about 16.7%. With a high standard deviation and a mean value greater than the median, the financial development level of the countries is skewed right. The right-skewness of the financial development data is confirmed by the positive value of 2.47. The skewness shows that there were more records of low financial development over the years and across the countries, and there were a few records of high financial development. The highest level of financial development is 104.63%, and the minimum is 5.14%.

The inflation rate for the countries chosen averaged $7.17\% \pm 9.38\%$. This rate indicates about 7.17% inflation across these countries on average, with a standard deviation of approximately 9.38%. The highest level of the inflation rate is about 72.84%, whereas the lowest inflation level is -7.77%. The data seems to be skewed to the right, with a mean value greater than the median. The right-skewness is confirmed by the positive value of 2.92. The skewness implies that most countries experience a low inflation rate relative to countries with high inflation rates.

The mean rate of the unemployment rate is $5.02\% \pm 2.96\%$. The mean rate shows that the countries have, on average, an unemployment rate of 5.02%. Some countries experience as high as an unemployment rate of 12.25%, whiles some experience as low as 0.32%.

Government consumption is averaged at a rate of 13.34% of GDP for the countries, with a standard deviation of 4.5%. The calculated rate means that, on average, the amount spent by the governments of the countries relative to GDP is about 13.34%. The highest level of government consumption is 26.06%, and the lowest is 0.91%.

The literacy rate is averaged at a rate of 44.33% for the countries, with a standard deviation of 16.48%. The calculated rate means that, on average, close to half of the total adults in the country are literates. With a high standard deviation and a mean value more significant than the median, the literacy rate of the countries is skewed right, with a majority of the countries having close to 44.33% and a few countries having literacy rates as high as 89.79%.

The population growth rate for the countries chosen averaged $2.68\% \pm 0.91\%$. The mean indicates a 2.68% increase in the population across the countries on average, with a standard deviation of 0.91%. The highest level of population growth is 7.9%, whereas the lowest population growth is -1.91%.

The mean rate of openness to trade is $0.66\% \pm 0.24\%$. This shows that countries, on average, the countries have a low impact of international trade on domestic activities. The highest level of openness to trade is 1.55%, whereas the lowest population growth is 0.19%.

Plots on the Variables

Figure 1 below is a scatter plot that shows the relationship between the dependent variable and the primary independent variable for the individual countries.



Figure 1: Scatterplot of GDP per capita growth and Income Inequality (Gini index) per country

While the scatterplot does not show a strong positive or negative linear relationship between economic growth and income inequality, it does not rule out the probability of any connection between the two variables. Figure 2 in Appendix A depicts an essential feature of the economic growth pattern: there seems to be a convergence in economic growth per nation over time.

Figures 2 to 9 in Appendix A show the trend of the independent variables over the years for each country. Some indicators show similar trends between the countries. Similar patterns in these variables between countries may be due to societal, cultural, and political correlations among ECOWAS members, which are often complementary for countries with similar levels of economic growth.

Unit Root Test

The unit root test is done using the Levin-Lin-Chu variable as mentioned above. The null hypothesis in Levin-Lin-Chu is

 H_0 = all the panels in the data set have a unit root

 H_1 = all panels are stationary.

Table 6 in Appendix B shows the output of R-Studio for the Levin-Lin-Chu unit root test on all related variables. The results show that the variables, except fin, unemp, and opp, are stationary at the level. By taking the first difference of the variables containing a unit root, the non-stationarity problem can be solved. Table 6 shows proof for the first difference I(1) having stationarity for all variables.

Multicollinearity

Multicollinearity arises when the independent variables have a strong relationship, which contradicts the regression assumption of no association between or among them. Although some degree of correlation between the regressors is appropriate, a perfect correlation between any explanatory variables should be avoided because it inflates the variance of the explanatory variable coefficients, resulting in skewed estimators (Stock and Watson, 2003). A Variance Inflation Factor (VIF) was used to ensure there was no problem with multicollinearity. The VIF findings are shown in Table 2 below:

Table 2Variance Inflation Factor of the Independent Variables

VIF							
Growth	Fin	Inf	unemp	cg	Lit	popg	Opp
1.072	2.995	1.317	1.568	1.487	2.290	1.181	1.476

A rule of thumb is that if VIF that exceeds 10 indicates a severe multicollinearity problem. Many of the explanatory variables in Table 2 have a VIF ranking that is way below the critical value of 10. The calculated VIFs illustrate that the explanatory variables are not multicollinear, and thus all of the variables can be used in the model.

Results

This research employs random effects, fixed effects, and fixed effects with time dummies to estimate the regressions. Furthermore, this thesis accounts for certain diagnostic tests such as cross-sectional dependence, heteroskedasticity, and serial correlation to achieve a stable and accurate estimator. These tests are used to ensure that the regression assumptions are not violated, which will lead to a bias in the standard errors and a decrease in the efficiency of the results. Pesaran's CD test is used to check for cross-sectional dependency in this thesis. This test's hypothesis is

 H_0 =errors are cross-sectional independent.

 H_1 =errors are not cross-sectional independent

The diagnostic test results are described in Table 3 below. Under fixed- and randomeffects estimations, Pesaran's CD test does not reject the null hypothesis of no crosssectional dependency. There is no cross-sectional dependency as a result. However, for the fixed effects with time dummies estimations, the test rejects the null hypothesis (with a p-value of 0.004); hence, there is evidence of cross-sectional dependence in the fixed effects with time dummies model.

Table 3 also shows the results of heteroskedasticity and serial correlation when using the models. In checking for any serial correlation, the Breusch-Godfrey/Wooldridge test was used. The null hypothesis of this test is

 H_0 = the idiosyncratic errors have no serial correlation

 H_1 = the idiosyncratic errors have serial correlation

For the fixed effects estimate, the p-value of the Breusch-Godfrey/Wooldridge test is 0.134, based on the findings in Table 3. As a result, the null hypothesis of no serial correlation is not rejected, implying that there is no serial correlation. For the random effects estimate, the p-value of the test is 0.211. As a result, the null hypothesis of no serial correlation is not rejected, implying that there is no serial correlation. For the fixed effects with time dummies estimate, the p-value of the test is 0.023. As a result, the null hypothesis of no serial correlation is no serial correlation is rejected, implying that there is no serial correlation. For the fixed effects with time dummies estimate, the p-value of the test is 0.023. As a result, the null hypothesis of no serial correlation is rejected, implying that there is serial correlation.

Heteroskedasticity was evaluated using the studentised Breusch-Pagan test.

The test's null hypothesis is

 H_0 =homoskedasticity

 H_1 =heteroskedasticity

The p-value obtained from the test for the fixed effects estimate is 0.516, indicating

that the null hypothesis of homoskedasticity is not rejected. As a result,

heteroskedasticity does not exist.

Table 3

Cross-Sectional, Heteroskedasticity and Serial Correlation Tests

	Random Effects	Fixed Effects	Fixed Effects with
			Time Dummies
Cross-sectional			
Dependence			
Pesaran CD	0.12	0.065	0.004
Serial Correlation			
Breusch-	0.211	0.134	0.023
Godfrey/Wooldridge			
Heteroskedasticity			
Studentized		0.516	
Breusch-Pagan			

Note: Values represent the p-value of each test

Hausman Test

The Hausman test is used to determine whether fixed or random effects exist. The test's null hypothesis is that random effects is the preferred model, while the alternative hypothesis is that fixed effects is the preferred model. The Hausman test results are shown in Table 4 below. The Hausman test is important at a 5% alpha level, indicating that fixed effects is more acceptable in estimating the association between the variables. In other words, relative to random effects, fixed effects would be a more reliable estimator.

Table 4

Hausman Inspection Results

<i>chi</i> ² (5)	376.24
Prob > chi ²	<2.2e-16

Regression Output

Based on the presence of unit roots, as discussed above, three regressions were run to see the significance of unit roots in this thesis. The first regression used the fixed effects estimation without differencing the problem variables. The second regression used the fixed effects estimation differencing the problem variables. The third regression was an estimation based on a first difference panel regression. Table 7 in Appendix B shows that the key variables do not significantly differ across the three regressions because the transformed variables' regressions provide similar results as the untransformed ones. Hence, the fixed effect without the difference of the problem variables can be considered for analysis. The regression results are provided in this section. Based on the regression results, we would be able to answer the research question: 'Does economic growth reduce income inequality?'.

Two variations of the fixed effect regression is performed in this thesis, one without time dummies and the other with time dummies. The random effect regression is added for comparison. The results of this procedure are summarised in Table 5 below.

Table 5

Regression Output of Fixed Effects, Time-Fixed Effects and Random Effects

Dependent Variable: Gini							
Independent Variables	Fixed Effects	Time-Fixed Effects	Random Effects				
(Intercept)			41.789***				
			(1.400)				
growth	-0.006	-0.011	-0.002				
	(0.020)	(0.021)	(0.020)				
fin	-0.003	0.014	0.0003				
	(0.011)	(0.014)	(0.011)				
inf	0.029***	0.013	0.031***				
	(0.011)	(0.013)	(0.011)				
unemp	-0.221***	-0.206**	-0.143**				
	(0.069)	(0.071)	(0.069)				
cg	0.027	0.014	0.028				
	(0.032)	(0.034)	(0.032)				
lit	-0.073**	-0.058*	-0.003				
	(0.032)	(0.035)	(0.026)				
popg	0.037	0.062	0.021				
	(0.104)	(0.108)	(0.108)				
opp	0.027	0.416	-0.180				
	(0.658)	(0.713)	(1.671)				
nobs	420	420	420				
r.squared	0.065	0.122	0.033				
adj.r.squared	0.016	-0.003	0.014				
F-statistic	3.454**	1.338*	13.819**				
df.residual	398.00	369.00					
*** $p < 0.01; ** p < 0.05; * p < 0.1.$							

Looking at the regression results, we find that the growth coefficient is negative for all three models. As discussed in this thesis, there is no defined relationship between income inequality and economic growth based on numerous findings. The negative sign of the coefficient of the growth variable indicates a negative relationship between income inequality and economic growth. An increase in economic growth leads to a reduction in income inequality, all other things being equal. Since most of the countries used in this thesis are developing countries, an increase in economic growth could mean better infrastructures, increased jobs and more amenities aimed towards the poor. Hence, with the growth, inequality would decrease. However, the coefficient of the growth variable found in this thesis is insignificant at a 10% significant level. Possible explanations could be the missing values of the income inequality variable that were imputed. However, since the coefficient is insignificant, it implies that there is not enough evidence to support the negative relationship between income inequality and economic growth.

The coefficient of inflation is positively significant for the fixed effects and the random-effects model. The sign of the coefficient implies that there is a positive relationship between income inequality and inflation. An increase in the inflation rate leads to an increase in the income inequality of the countries, all other things being equal. The coefficient of inflation is significant at the 1% significant level. A positive relationship was expected. Based on the fixed effects estimate, there is 99% confidence that a 1% increase in the inflation rate of the West African countries would lead to an increase of 0.029 gini index points. The direction of the relationship between income inequality and economic growth is because of the influence inflation has on the purchasing power of one's income, as discussed earlier. Inflation reduces the purchasing power of one's income. Since the poor have little income, to begin

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with, they tend to spend more and save less, reducing the income opportunity they could have gotten from investments. On the other hand, the rich have excess income and hedge against the risk of inflation through the financial markets, hence leading to an increase in income inequality. Hence, all things being equal, an increase in the inflation rate leads to an increase in income inequality.

An independent variable with a significant coefficient for all three models is unemployment. The negative sign of the unemployment variable is surprising. It is surprising because it was expected that as unemployment increases, income inequality also increases due to the lack of jobs for the poor and middle income to gain income. However, the regression results suggest the opposite; that as unemployment rises, income inequality falls. The coefficient is significant at 1%. That means a 99% confidence that a 1% increase in the unemployment rate leads to a 0.221 gini index points decrease in income inequality. The possible explanation could be that unemployment in these countries affects both the rich and the poor. The income levels gained from the employment of the rich is higher than the poor, largely due to the level and quality of attained education. With increased unemployment, the rich lose out on more income than the poor, all other things being equal. In other words, when unemployment falls, that is, more employment, the rich gain more income compared to the poor since the rich are paid more. Hence, lower unemployment levels in the countries lead to an increase in income inequality. This reasoning is intuitive and lacks literature backings. However, this reasoning is a possible explanation of the unemployment variable sign from the regression output.

Another independent variable with a significant negative coefficient for all the models, except the random-effects model, is literacy rate. From the results of the regression, there is a negative relationship between income inequality and literacy

rate. A higher literacy rate reduces income inequality, and a lower literacy rate increases income inequality at a 5% significance level. There is 95% confidence that an increase in the literacy rate leads to a decrease of 0.073 in the gini index points for the West African countries. The negative relationship can be due to the impact of education on income attainment. The opportunities available to a literate citizen in a country is more than the opportunities available to an illiterate person. The literate person can further his education, develop and grow necessary skills, and need higherpaying employment opportunities. The influence on income inequality is that, with higher opportunities from being literate such as quality education, the poor can gain employment in jobs that pay a higher income than he or she would have gotten being illiterate. All things being equal, the higher paying job for the poor would reduce the income inequality in the countries. Hence, a rise in the literacy rate of the countries would lead to a reduction in income inequality, all other things being equal.

An insignificant negative coefficient is estimated for financial development, which implies that income inequality is likely to decrease as the financial markets develop. This negative relationship is different from the one discussed by Banerjee and Newman (1993). They found a positive relationship, which they argued that financial development favours the rich due to financial market imperfections. However, the negative relationship between income inequality and financial inequality from the regression results might be due to the opportunities created for the poor to gain a hand in financial markets. Opportunities that were traditionally available to only the rich are being opened to everyone with further financial development. Hence, it is not surprising to see a negative coefficient of financial development. However, the coefficient is insignificant at a 10% significance level; therefore, the relationship lacks evidence of being true. An insignificant positive coefficient is estimated for government consumption, which implies that as the government spends more, income inequality is likely to increase, all things being equal. The positive relationship can be due to the nature of the countries chosen for this thesis. Since most of the countries are developing, there is little government expenditure directed at social welfare, compared to the government expenditure directed at the general development of the countries. Since the expenditure is directed to the country's general development, the rich benefit more than the poor, and hence income inequality increases, all things being equal. However, due to the insignificance of the coefficient, there is not enough evidence supporting the positive relationship between income inequality and population growth.

An insignificant positive coefficient is estimated for population growth, which implies that as the population of a nation rises faster, income inequality is likely to increase. This positive relationship could be seen as a reflection of how an increase in population growth influences the poor more than the rich. As the population increases, all things being equal, the dependence on the income of the poor increases, so the poor spend more and save less. On the other hand, the rich spend relatively less and save more, gaining more income, which increases the countries' income inequality. However, due to the insignificance of the coefficient, there is not enough evidence supporting the positive relationship between income inequality and population growth.

The coefficient of openness to trade is positively insignificant for the fixed effects models. The sign of the coefficient implies a positive relationship between income inequality and openness to trade. An increase in the openness to trade leads to an increase in the income inequality of the countries, all other things being equal. The insignificance of the coefficient implies not enough evidence supporting the positive relationship between income inequality and openness to trade.

CHAPTER 5: CONCLUSION

Introduction

This section summarises the study's observations and draws relevant conclusions based on them. Based on the findings, recommendations would be made to address further some of the issues surrounding income inequality.

Summary of Findings

This thesis analysed the relationship between income inequality and economic growth for some selected West African countries. The thesis also analysed macroeconomic factors responsible for income inequality in West African countries.

Economic growth reduces income inequality in all the models estimated. The results, however, show little evidence for the existence of the negative relationship between income inequality and economic growth. The inflation rate of the West African countries is a major factor of income inequality. As inflation increases, income inequality increases in the West African countries. The results provide strong evidence of the existence of the positive effect inflation has on income inequality. Unemployment and literacy rate, on the other hand, reduce income inequality as they increase. Unemployment and literacy rate has a significant negative relationship with income inequality.

Limitation of the Study

The infrequent collection of data on Gini as a proxy for income inequality was a major problem in this thesis. A median imputation was done for the missing data across the various countries for the missing years to conduct the thesis. The median imputation reduced the variance of the imputed variables and also affected the relationship between variables.

Policy Recommendation

According to the results of the fixed-effects model, inflation, unemployment, and literacy rate are the key variables that can influence income inequality in West African countries. As a result, it is proposed that to reduce income inequality, the governments of these countries should place a strong focus on increasing literacy rates and developing policies to reduce inflation.

The governments of the West African countries can increase literacy rates by investing in public schools and setting up funds that target those with the greatest need for those funds. The suggested policies would reduce the burden of education on the poor whiles simultaneously increasing the education that the poor can access. The governments can also introduce new policies that ensure that every child receives a form of education, such as setting up new laws requiring parents or guardians to ensure completion of primary education for children in their care. With the aid of government funds, the public would be willing to make their children get an education. For the older generation, local literacy programmes can be introduced. Programmes such as adult education would allow adults to gain literacy at an older age. With the implementation of these policies and other relevant policies, the literacy rate would increase, reducing income inequality in the West African countries.

In reducing inflation, governments of the West African countries can implement fiscal policies such as an increased progressive tax. Progressive tax can be defined as a tax in which the tax rate increases as the taxable amount increases. With the progressive tax, the personal disposable income of the citizens reduces, with the rich's disposable income reducing more since their taxable amount is much higher than the poor. With a reduced disposable income, the money supply in the market reduces since more goes to the government, reducing demand for goods and services, which reduces inflation in the long run. Other policies to reduce inflation can include supply-side policies, wage control and appreciation in the exchange rate.

Further Studies

Our study to establish the relationship between economic growth and income inequality heavily dwelt on quantitative research methods and analysis, which had some limitations. However, to have an in-depth understanding of the relationship we are studying here, a different, more consistent proxy for income inequality can be used. Also, further studies could apply qualitative research approaches in the individual countries, which will generate an in-depth understanding of why certain variables are related in specific ways. Though this would be very expensive and would need many resources, applying qualitative research would be a significant investment. The qualitative research will guide policymakers to make decisions that would solve the various problems associated with income inequality and economic growth from their roots. Also, an analysis that measures the effect of change in economic growth on income inequality, in the long run, could produce more interesting results.

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APPENDICES

Figure 2: GDP per capita growth (annual %) by country



Figure 3: Financial Development by country



Figure 4: Inflation Rate by country



Figure 5: Unemployment Rate by country



Figure 6: Government Consumption by country



Figure 7: Literacy Rate by country



Figure 8: Population Growth by country



Figure 9: Openness to Trade by country

Appendix **B**

Table 6

Levin-Lin-Chu unit-root test

Variable	Level	First Difference	
gini	-17.60 (<2.2e-16)	-31.25 (<2.2e-16)	Stationary at level & First difference
growth	-13.81 (<2.2e-16)	-26.26 (<2.2e-16)	Stationary at level & First difference
fin	2.00 (0.98)	-14.44 (<2.2e-16)	Unit root at level & Stationary at first difference &
inf	-9.50 (<2.2e-16)	-19.87 (<2.2e-16)	Stationary at level & First difference
unemp	-0.50 (0.31)	-9.43 (<2.2e-16)	Unit root at level & Stationary at first difference
cg	-3.95 (4.03e-05)	-18.08 (<2.2e-16)	Stationary at level & First difference
lit	-19.91 (<2.2e-16)	-23.41 (<2.2e-16)	Stationary at level & First difference
popg	-3.65 (0.00)	-8.98 (<2.2e-16)	Stationary at level & First difference
opp	-0.09 (0.46)	-15.55 (<2.2e-16)	Unit root at level & Stationary at first difference

Author's calculation. The values without parentheses are the z-score. The

values in parentheses are p-values.

Table 7

Regression Output for the Fixed Effects, Fixed Effects with First Differenced

Variables and First Difference Estimation

$\begin{tabular}{ c c c c c c c c c c c c c c c c c c c$	Dependent Variable: Gini						
$\begin{array}{c c c c c c c c c c c c c c c c c c c $		Fixed Effects	Fixed Effects with Differenced Variables	First Difference Estimation			
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	(Intercept)			-0.017			
$\begin{array}{cccccccccccccccccccccccccccccccccccc$				(0.118)			
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	growth	-0.006	0.0003	-0.006			
$\begin{array}{cccccccccccccccccccccccccccccccccccc$		(0.020)	(0.020)	(0.021)			
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	fin	-0.003		0.050			
$\begin{array}{cccccccccccccccccccccccccccccccccccc$		(0.011)		(0.036)			
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	∆fin		0.032				
$\begin{array}{cccccccccccccccccccccccccccccccccccc$			(0.026)				
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	inf	0.029**	0.032**	0.047**			
$\begin{array}{cccccccccccccccccccccccccccccccccccc$		(0.011)	(0.011)	(0.015)			
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	unemp	-0.221**		-0.149			
$\begin{array}{cccccccccccccccccccccccccccccccccccc$		(0.069)		(0.241)			
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	∆unemp		-0.152				
cg 0.027 0.022 0.061 (0.032) (0.032) (0.072) lit -0.073^* -0.090^{**} -0.077 (0.032) (0.034) (0.032) popg 0.037 0.026 0.050 (0.104) (0.111) (0.379) opp 0.027 -0.755 (0.658) (1.628)			(0.174)				
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	cg	0.027	0.022	0.061			
$\begin{array}{cccccccccccccccccccccccccccccccccccc$		(0.032)	(0.032)	(0.072)			
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	lit	-0.073*	-0.090**	-0.077			
popg0.0370.0260.050(0.104)(0.111)(0.379)opp0.027-0.755(0.658)(1.628)Δopp0.111		(0.032)	(0.034)	(0.032)			
(0.104)(0.111)(0.379)opp0.027-0.755(0.658)(1.628)Δopp0.111	popg	0.037	0.026	0.050			
opp 0.027 -0.755 (0.658) (1.628) Δopp 0.111		(0.104)	(0.111)	(0.379)			
(0.658) (1.628) Δοpp 0.111	opp	0.027		-0.755			
Δopp 0.111		(0.658)		(1.628)			
	Δopp		0.111				
(1.176)			(1.176)				
nobs 420 406 406	nobs	420	406	406			
r.squared 0.065 0.046 0.050	r.squared	0.065	0.046	0.050			
adj.r.squared 0.016 -0.006 0.031	adj.r.squared	0.016	-0.006	0.031			
F-statistic 3.454** 2.338* 2.597**	F-statistic	3.454**	2.338*	2.597**			
df.residual 398.00 384.00 397.00	df.residual	398.00	384.00	397.00			

*** p < 0.001; ** p < 0.01; * p < 0.05.