

FINANCIAL DEVELOPMENT AND INCOME INEQUALITY NEXUS IN WEST AFRICAN COUNTRIES: THE MEDIATING ROLE OF TRADE OPENNESS AND INSTITUTIONAL QUALITY

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Abstract

Financial sector development enables more access to financial services and allow a growing number of low-income households and small businesses to participate productively in the formal economy. The study aims to examine the nexus between modern indicators of financial development and income inequality by mediating the role of trade openness and institutional quality in 16 West African countries over the period of 1990 - 2022 using CS-ARDL model. The tests for slope heterogeneity and cross-sectional dependence evidence that the slopes of the regression coefficients are not homogeneous across the cross-sectional units and there is strong cross-sectional dependency among West African countries due to globalization movement, economic cooperation, and labor mobility. The test for panel cointegration evidences the existence of cointegration among the variables, which means there is a stable, long-term relationship among financial development indicators, and income inequality. The result of CS-ARDL reveals that financial access and financial stability significantly improve income distribution while financial efficiency, government expenditure, regulatory quality and corruption control increase income inequality. It also reveals that financial deepening, financial efficiency, and government expenditure increases income inequality. The result also shows that there is bidirectional causality between financial development and inequality. The study concludes that financial access and stability reduce income inequality. It is recommended that there should be increased in access to financial services and products for vulnerable groups of the population, as well as to stabilize the financial institutions and market by reducing high volatility in the price of financial services, product and the stock price index.

Keywords: CS-ARDL Model, Financial Development, Income Inequality, Institutional Quality, Trade Openness, West Africa

Introduction

Global income inequality has decreased over the last two decades, owing to significant efforts in emerging markets and developing economies that boosts economic performance and reduce inequality. Financial sector policies and technological advancements are enabling more access to financial services, particularly in large economies like China and India, allowing a growing number of low-income households and small businesses to participate productively in the formal economy. Since early 1990s, income inequality has been rising significantly across many developing economies (Cihak, & Sahay, 2020). Similarly, Africa is ranked the second in terms of income inequality in the world, and home to seven of the most unequal countries. Africa's three

richest billionaires have more wealth than the bottom 50% of the population of Africa, approximately 650 million people (Seery, Okanda, & Lawson, 2019). In addition, the wealthiest (one percent) in West Africa owns more than the entire population (Hallum & Obeng, 2019). Also, the richest man, in Nigeria (Africa's largest economy), earns about 150,000 times more than the poorest 10% of Nigerians earn, in a year, and it would take him 46 years to spend all of his wealth, at a rate of \$1m per day (Hallum & Obeng, 2019).

The development of every economy is contingent upon the performance of numerous sectors of the economy. Financial sector is among the sectors that contribute towards achieving economic growth and development. Financial sector development enhances efficient access to financial services and products and facilitates the flow of funds among individuals, which is a driver of consumption and investment. This creates more employment opportunities, remove people out of poverty, reduces income inequality and improves economic performance (Iheonu, Asongu, Odo, & Ojiem, 2020). Therefore, an effective intermediation process and enhanced financial sector promote domestic savings and improve the effectiveness of monetary policy by ensuring that limited financial resources are channeled to profitable investments (Fagbemi, Ajibike, & Ige, 2018). Strong institutions are essential for realizing the benefits of trade openness while mitigating its adverse effects on income inequality. Transparent and predictable regulatory environments, efficient customs procedures, and the enforcement of property rights are critical for facilitating trade, attracting foreign investment, and fostering competitive markets. Countries with higher institutional quality are better positioned to harness the potential gains from trade, such as increased productivity, job creation, and consumer welfare, while minimizing the risks of exploitation, rent-seeking behavior, and market distortions that could exacerbate income disparities. Institutional quality also underpins the effectiveness and inclusiveness of financial development initiatives. Sound regulatory frameworks, strong property rights protection, and effective contract enforcement mechanisms are essential for building trust in financial institutions, promoting financial stability, and expanding access to finance, especially for underserved populations. Countries with higher institutional quality are more likely to have well-functioning financial systems that allocate capital efficiently, support entrepreneurship, and facilitate economic diversification, thereby reducing income inequality by promoting broad-based economic growth and wealth accumulation.

This study is clearly different from previous studies. Most of the existing studies use traditional measures of financial development– M2 to GDP, private credit to GDP, the GDP ratio of liquid liabilities and the GDP ratio of deposits (Alshubiri, 2021; Asongu *et al.*, 2020a), while overlooking comprehensive measure that capture all dimensions of financial development. They cover one dimension of financial development (financial access) and ignore other dimensions (financial stability and financial efficiency). Therefore, this study contributes to the extant literature by using four modern indicators of financial development (financial deepening, access, efficiency, and stability). This study also employs cross-sectionally augmented autoregressive distributed lag (CS-ARDL) model that produces efficient, unbiased and consistent both short-run and long-run estimates in the presence of slope heterogeneity and cross-section dependence to examine the impact of financial development on income inequality in West Africa. The study is organized into five sections. Following this introduction is section two: literature Review. Section three presents the methodology. Section four contains empirical results and discussion while section five concludes and recommends.

Literature Review

Financial development has been found to be a major driver of growth (Ibrahim, Ozdeser & Cavusoglu, 2019). Empirical studies dealing with the relationship between financial development and income inequality within and across countries abound. For instance, some of these empirical studies have found significant positive relationship between financial development and income inequality (Perugini & Tekin, 2022; Tabash *et al.*, 2022; Chletsos & Sintos, 2022; Alshubiri, 2021), while other studies have found significant negative relationship between financial development and income inequality (Fu & Liu, 2023; Shi, 2022; Klachkova & Solonina, 2022; Gehrung, 2020). These results notwithstanding, others have established a nonlinear relationship between financial development and income inequality (Huynh & Tran, 2023; Khatatbeh & Moosa, 2023; Zungu and Grelying, 2021; Altiner, Bozkurt, & Turedi, 2022). Yet, a number of other studies have found no significant evidence for nonlinear relationship between financial development and income inequality (Seven, 2022; Mathonnat & Williams, 2020; Batuo, Guidi, & Mlambo, 2010; Seven & Coskun, 2016). This therefore suggest that the study of the relationship between financial development and income inequality is inconclusive. Thus, this study intends to contribute to this growing empirical literature by examining the impact of financial development on income inequality in West African countries.

For instance, providing a regional analysis on the relationship between financial deepening and income inequality across 32 OECD and ASIAN countries covering the period of 2002–2018 and using pooled OLS and GMM estimators, Alshubiri (2021) find that financial depth is positively related to income inequality across the countries. Tabash *et al.* (2022) and Ofori *et al.* (2022) review the effect of financial development indicators on income inequality and poverty reduction across 28 selected Sub Saharan African countries for the 2000 – 2017 period. They find that financial development indicators significantly increase income inequality across different income groups. Similarly, Asongu *et al.* (2020b) apply GMM and FEM to analyze the impact of financial access on income inequality vis-a-viz gender economic inclusion in 42 SSA countries over the period of 2004–2014 and find that financial access has positive effect on income inequality. Similarly, Sotiropoulou *et al.* (2022) examine the causal relationship between financial development indicators, economic growth, and income inequality in a sample of 23 European Union (EU) countries covering 1987-2017 period, and indicate a unidirectional causality from financial development and income inequality to economic growth, and also from income inequality to financial development.

In addition, Fu and Liu (2023), find that income inequality has negative impact on accessibility of financial services. They fail to consider the impact and disruptions brought about by weak institutional quality on the economic activities that affect the intermediation impact of financial development on income distribution. Alwafai (2019) uses Johansen cointegration test and FMOLS regression to study the impact of financial development on income inequality in South Africa for the period of 1975 – 2018, and find that financial development has negative impact on income inequality and also there is evidence of inverted U-shape relationship between financial development and income inequality. Using Pooled Ordinary Least Square (OLS), Feasible Generalized Least Squares (FGLS) and two-step System Generalized Method of Moments (SGMM), Huynh and Tran (2023) examine the impact of financial development indicators and institutional quality on income inequality across 30 Asian countries over the period 2000 and 2019. The methods of analysis used in this study are robust but they do not account for the issues of cross-sectional dependence (CD) in the residuals as well as slope heterogeneity in the coefficients, which jeopardize the reliability of their findings. To address these issues, this study

uses Cross-Sectionally Augmented ARDL (CS-ARDL), which produces efficient, unbiased and consistent estimates in the presences of CD and slope heterogeneity. In addition, the Financial Kuznet Hypothesis (FKC) is hereby adopted as theoretical framework for the study to examine the impact of financial development on income inequality in West African countries.

Methodology

This subsection presents study area, data sources and variables measurement, model specification, Cross-Sectionally Augmented Autoregressive Distributed Lag (CS-ARDL) Model and Dumitrescu and Hurlin (2012) Granger Causality Test.

Study Area and Data Sources

The study is set out to examine the nexus between financial development and income inequality in 16 West African countries: Benin, Burkina Faso, Cote d'Ivoire (Ivory Coast), Cabo Verde, Ghana, Liberia, The Gambia, Guinea, Guinea-Bissau, Mali, Mauritania, Niger, Nigeria, Senegal, Sierra Leone, and Togo. The period of the study was selected based on the availability of data on GINI index, indicators of financial development and indicators of institutional quality. Thus, paucity of data before 1990 limits the period of the study to 1990-2022. The study employs annual data from 1990 to 2022. It is adequate to analyze the properties of the time series as well as of the cross-sections. Furthermore, the dataset was obtained from various sources: economic growth, government expenditure and trade openness are from World Bank's WDI database; while indicators of financial development, institutional quality indicators, and GINI index were obtained from Global Financial Development Database, World Governance Indicator, and World Income Inequality Database, respectively.

Variables Measurement

Income inequality is measured by GINI coefficient. The ratio of exports to imports of goods and services divided by the share of GDP is used to measure trade openness (TOPEN). To surmount the shortcomings of single indicator as a proxy for financial development, all the indicators of financial development are used covering various financial institutions to measure financial development – financial access (FAI), depth (FD), efficiency (FEI) and stability (FSI). Similarly, indicators of institutional quality are used to measure quality of institution – control of corruption (COC), government effectiveness (GEF), rule of law (ROL), voice and accountability (VOIC), regulatory quality (REGQ) and political stability and absence of violence/terrorism (POLS).

Model Specification

The model specification for this study is clearly guided by the theoretical framework on the basis of Financial Kuznets Curve (FKC) to anchor the relationship between the variables under investigation. The models adapted for the study is specified on the basis of the following studies: Huynh and Tran (2023); Faisal (2022); Logar and Nizami (2022); and Castells-Quintana, Gradín, & Royuela (2022). For econometric estimation, this study adopted the following mathematical equations, given as:

$$GINI_{it} = \alpha_0 + \beta_1 FAI_{it} + \beta_2 FSI_{it} + \beta_3 FD_{it} + \beta_4 FEI_{it} + \beta_5 COC_{it} + \beta_6 GEF_{it} + \beta_7 ROL_{it} + \beta_8 POLS_{it} + \beta_9 REGQ_{it} + \beta_{10} VOIC_{it} + \beta_{11} LGEXP_{it} + \beta_{12} TOPEN_{it} + \beta_{13} GROWTH_{it} + \mu_{it} \dots\dots(1)$$

Where α_0 is the constant; GINI represents income inequality FAI stands for financial access; FD represents financial depth or deepening; FEI stands for financial efficiency; FSI stands for financial stability; COC stands for control of corruption; GEF stands for government effectiveness; ROL

represents rule of law; VOIC represents voice and accountability; REGQ represents regulatory quality; POLS represents political stability and absence of violence/terrorism; GEXP stands for government expenditure; TOPEN stands for trade openness; GROWTH stands for economic growth; $\beta_1 - \beta_{12}$ are coefficients to be determined with $\beta_1 > 0$ for financial development to spur GINI; μ_t is the stochastic error term; and lastly, t and i the time dimension and cross-sectional indicators, respectively. The nexus between financial development and income inequality would be estimated with Dynamic Common Correlator Estimator – Cross-Sectionally Augmented Autoregressive Distributed Lag (CS-ARDL) approach.

Cross-Sectionally Augmented Autoregressive Distributed Lag (CS-ARDL) Model

It is equally important to address the issue of cross-sectional dependencies, endogeneity and heterogeneity, which are main characteristics of a dynamic panel data analysis. The main shortcomings of using the conventional panel ARDL methodology is the strong assumption of cross-sectional independence in the error terms. As it fails to take into account any residual cross-country dependencies caused by a variety of factors, including financial crises, institutions, oil price shocks, and epidemics, (Kamah & Riti, 2021), and other time-invariant determinants of financial development, and income inequality. The estimates of least squares of ARDL models are biased and no longer consistent when such unobserved common factors are correlated with the explanatory variables. In this scenario, applying ARDL to estimate the long run influence without taking these issues into account may lead to biased and misleading estimates (Kamah & Riti, 2021). To address these issues, we use mean group estimators based on the cross-sectionally augmented ARDL (CS-ARDL) approaches as advanced in Chudik, Kamilar, Pesaran, and Mehdi (2017) and Chudik and Pesaran (2015). This estimator allows for endogeneity, slope heterogeneity in coefficients as well as cross-sectional dependence in residuals by augmenting the ARDL regressions with cross-sectional averages of the explanatory variables and the regressand with enough number of lags in a dynamic multifactor framework, which serves as proxies for unobservables and spillovers (Kamah & Riti, 2021). The CS-ARDL models are specified as follows:

$$Y_{it} = \alpha_i + \sum_{j=1}^p \varphi_{it} Y_{i,t-1} + \sum_{j=1}^p \beta' x_{it-1} + \sum_{j=0}^3 \varphi'_{il} \bar{Z}_{t-1} + \varepsilon_{it} \dots \dots \dots (2)$$

Where $Z_t = (\bar{y}_t, \bar{x}_t)$ denotes the simple cross-sectional averages of y_{it} and x_{it} in year t , and all the other vector of explanatory variables are as explained in equation 1. Interestingly, equation (2) can be reparametrized as error-correction form given as:

$$Y_{it} = \alpha_i + \lambda_i(Y_{it-1} - \phi_i X_{it-1}) + \sum_{j=1}^{p-1} \varphi_{ij} \Delta Y_{i,t-1} + \sum_{l=0}^3 \psi'_{il} \Delta Z_{t-1} + \varepsilon_{it} \dots \dots \dots (3)$$

Where $\Delta Z_t = (\Delta \bar{y}_t, \Delta \bar{x}_t)$ denotes the cross-sectional averages of $\Delta \bar{y}_t$ and $\Delta \bar{x}_t$ in year t .

Dumitrescu and Hurlin Causality Test

It is important to know the direction of a causality and the pathways of interactions between the variables, in this regard, the study employs the causality test proposed by Dumitrescu and Hurlin (2012) as in 4. The test uses a regression approach for each cross-section in the panel to determine the causal relationships between the variables under study and a vector autoregressive structure to uncover the unobserved heterogeneity in the stationary data (Kamah & Riti, 2021; Lopez & Weber, 2017). The idea behind the causality test is not only to find the relationship between the

variables but also to determine the direction of causality between them, that is, whether the causality between the variables is a one-way (unidirectional) relationship or two-way (bidirectional or feedback) relationship or no relationship exists i.e. neutral relationship.

$$Y_{i,t}^* = \alpha_i^b + \sum_{k=1}^K \gamma_{ik}^b y_{i,t-k}^* + \sum_{k=1}^K \beta_{ik}^b x_{i,t-k} + \varepsilon_{i,t} \dots \dots \dots (4)$$

Where y and x are the stationary variables; α_i is the individual effect; t is the time dimension; γ_i^k is the autoregressive parameters; β_i^k is the regression coefficients slopes that differs across groups; k is the identical lag order for all cross-sectional units of the panels; and ε is the error term.

Empirical Results and Discussion

The empirical results and discussion begin with descriptive statistics and pre-estimation test. The descriptive statistics provide insight into the relationship between these variables in terms of not only central tendencies but also the variability and diversity in the data. This is reported in Table 1.

Data Description

Table 1: Summary Statistics of the Variables

Variable	Observation	Mean	Std. Dev.	Min.	Max.
Income Inequality	528	1.622	0.073	1.465	1.895
Financial access	528	1.587	0.789	0.049	3.340
Financial deepening	528	1.117	0.425	-0.301	2.379
Financial stability	528	1.765	0.266	0.894	2.301
Financial efficiency	528	7.751	5.694	0	33
Government Expenditure	528	1.210	0.201	-0.301	2.192
Economic growth	528	3.980	4.791	30.145	26.524
Control of Corruption	528	32.412	19.338	0	84.043
Voice and Accountability	528	1.482	0.259	0.398	1.898
Government Effectiveness	528	1.285	0.355	0.210	1.820
Rule of Law	528	1.340	0.409	0.303	1.913
Regulatory Quality	528	1.396	0.266	0.299	1.784
Political Stability	528	1.400	0.403	0.128	1.957
Trade Openness	528	6.178	0.557	5.303	7.687

Source: Authors' estimations using Stata 17.

From Table 1, West African countries have recorded five hundred and twenty eight observations for variable. Income Inequality has mean value of 1.622 implying a moderate degree of change in income inequality in West Africa. The low standard deviation (0.073) suggests that, on average, these changes are relatively consistent across observations, indicating a stable pattern in the region. The range between the minimum (1.465) and maximum (1.895) values highlights the diversity of income inequality changes within West Africa. Financial access and financial stability have mean of 1.587 and 1.765, which imply a moderate level of financial access across observations and a relatively high level of financial stability in West Africa, respectively. Financial access and financial stability have relatively high standard deviation (0.789) and low standard deviation (0.266) that some countries experience meaningfully higher or lower levels of financial

access, and consistently stable financial environment across observations, respectively. The wide range from 0.049 to 3.340 emphasizes the diverse financial access scenarios in West Africa. While, the range from 0.894 to 2.301 further emphasizes the overall stability in the financial sector across West African countries. Moreover, financial deepening and financial efficiency have recorded means of 1.117 and 7.751 that suggest a moderate level of financial deepening and relatively high average level of financial efficiency in the region; but the standard deviations (0.425 and 5.694) reveal considerable variation in financial deepening and substantial disparities in financial efficiency levels among the countries under study, respectively. The presence of negative values (minimum of -0.301) suggests instances of contraction, while positive values (maximum of 2.379) indicate periods of expansion in financial deepening. On the other hand, the wide range from 0 to 33 emphasizes the diverse nature of financial efficiency within West Africa.

Tests for Slope Heterogeneity

This section presents the tests for slope heterogeneity in order to select either homogeneous or heterogeneous panel data estimation approach using Pesaran and Yamagata (2008) and Blomquist and Westerlund (2013, 2016) slope heterogeneity tests (SHT). The results are reported in Table 2.

Table 2: Results of Slope Heterogeneity Test

Pesaran and Yamagata (2008) Test for Slope Heterogeneity		Blomquist and Westerlund (2013) HAC Test for Slope Heterogeneity		Blomquist and Westerlund (2016) Robust HAC Test for Slope Heterogeneity	
Delta	5.879 ^a	Delta	6.815 ^a	Delta	5.879 ^a
Adj. Delta	7.961 ^a	Adj. Delta	9.228 ^a	Adj. Delta	7.961 ^a

^a shows statistical significance at 1%..

Source: Authors' estimations using Stata 17.

From Table 2, the Delta statistic of Pesaran and Yamagata (2008) and Blomquist and Westerlund (2013, 2016) slope heterogeneity tests are 5.879, 6.815 and 5.879, which are consistent and statistically significant at 1% level, respectively. It suggests that the null hypothesis of slope homogeneity is rejected in all the tests going by their respective probability values. Since the slopes of the regression coefficients are not homogeneous across the cross-sectional units, the study should employ heterogeneous panel data estimation techniques because West African countries contains varying rates of financial development as well as income inequality. As the relationship between income inequality, financial development, trade openness, institutional quality and other variables varies across different cross-sectional units in the panel.

Cross-Sectional Dependence (CD) and Panel Unit Root Tests

Before we proceed with estimation of our econometric model, we need to test for Cross-Sectional Dependence (CD) of the residuals and find out the unit-root properties of the variables. The study, however, conducted two different tests of CD. The semi-parametric tests of cross-sectional dependency as proposed by Frees (1995, 2004), as well as the parametric testing procedure developed by Pesaran (2015, 2021), Fan et al. (2015), and Pesaran & Xie (2021) in order to detect presence or absence of cross-sectional dependency among West African countries were deployed. The results are reported in Table 3.

Table 3: Results of Cross-Sectional Dependence (CD) Tests

Test	Statistics
Frees CD Test	0.386 ^a
Pesaran (2015, 2021) CD	-1.64 ^c
Fan et al. (2015) CD	127.67 ^a
Pesaran & Xie (2021) CD	1.81 ^c

^a and ^c show statistical significance at 1 and 10%, respectively.

Source: Authors' estimations using Stata 17.

From Table 3, the tests statistic for CD reports that Frees (1995, 2004) CD tests statistic is -0.368, which are statistically significant at 1 percent, indicating presence of cross-sectional dependency among West African countries. Similarly, the test statistic of Pesaran (2015, 2021) CD test, Fan et al. (2015) CD test with power enhancement and Pesaran and Xie (2021) CD test are -1.64, 127.67 and 1.81, which are also statistically significant at 1 percent and 10 percent. This indicates that there is strong cross-sectional dependency among West African countries. It suggests that West African countries are dependent on each other vis-à-vis financial development, economic cooperation, globalization, labour mobility and environmental factors within the time period. Since, there is strong evidence in support of strong cross-sectional dependence across the cross-sectional units, the study employs a second generation panel unit root tests in order to determine the stationarity of the variables under study using Pesaran (2007) Cross-Section Augmented Dickey-Fuller (CADF) Test and Pesaran (2007) Cross-sectionally augmented Im, Pesaran and Shin (CIPS) test. The results are reported in Table 4.

Table 4: Results of Second Generation Panel Unit Root Tests

Variables	CADF Test				CIPS Test			
	Level Value		First Difference		Level Value		First Difference	
	t-bar	Z(t-bar)	t-bar	Z(t-bar)	Statistic	CV	Statistic	CV
Income Inequality	-2.199 ^b	-1.853 ^b			-2.225 ^b	-2.2		
Financial access	-2.451 ^a	-2.889 ^a			-3.143 ^a	-2.38		
Financial stability			-3.258 ^a	-6.217 ^a			-4.708 ^a	-2.38
Financial efficiency	-2.335 ^a	-2.413 ^a			-2.546 ^a	-2.38		
Financial deepening			-2.879 ^a	-2.110 ^a			-4.117 ^a	-2.38
Government Expenditure			-3.106 ^a	-5.592 ^a			-4.691 ^a	-2.38
Economic growth	-2.583 ^a	-3.436 ^a					-3.815 ^a	-2.38
Control of Corruption			-3.737 ^a	-8.193 ^a			-4.431 ^a	-2.38
Voice and Accountability			-3.148 ^a	-5.764 ^a			-4.094 ^a	-2.38
Government Effectiveness			-3.544 ^a	-7.398 ^a			-4.650 ^a	-2.38
Rule of Law			-2.811 ^a	-4.377 ^a			-4.240 ^a	-2.38
Regulatory Quality			-3.884 ^a	-8.799 ^a			-4.962 ^a	-2.38
Political Stability	-2.333 ^a	-2.406 ^a			-2.450 ^a	-2.38		
Trade Openness			-3.044 ^a	-5.338 ^a			-4.173 ^a	-2.38

^a and ^b show statistical significance at 1 and 5%, respectively.

Source: Authors' estimations using Stata 17.

From Table 4, the CADF and CIPS unit root test statistic reveal that most variables appear to be integrated of order one $I(1)$ across all the cross-sectional units. It shows that the results of CADF and CIPS tests uniformly display that the null hypothesis of a panel unit-root for the financial stability, financial deepening, government expenditure, control of corruption, voice and accountability, government effectiveness, rule of law, regulatory quality and trade openness can be rejected at 1% level of significance. It means the aforementioned variables are stationary at first differenced i.e. integrated at order one. On a similar note, the tests uniformly revealed that income inequality, financial access, political stability and financial efficiency are stationary at level values $I(0)$, leading to rejection of null hypothesis of panel unit-root at 1% level of significance except income inequality. On the other hand, only economic growth appear to be $I(0)$ in CADF and $I(1)$ in CIPS. These tests show that the variables exhibit stationarity in both levels and first differences, which is crucial assumption in panel data analysis, and selecting appropriate estimation techniques, which is fundamental for reliable statistical inference.

Panel Cointegration Tests

Having examined the order of integration of the variables, it is important to examine whether the variables share a long-run relationship or otherwise for further investigation. To achieve this purpose, the residual-based tests for panel cointegration, proposed by Kao (1999), Pedroni (1999, 2004), and Westerlund (2007), are employed to investigate the null hypothesis of no cointegration in heterogeneous panels. The results are reported in Table 5.

Table5: Panel Cointegration Tests

Kao Test for Cointegration	Statistic
Modified Dickey-Fuller t	-2.462 ^a
Dickey-Fuller t	-2.921 ^a
Augmented Dickey-Fuller t	-2.008 ^b
Unadjusted Modified Dickey-Fuller t	-4.792 ^a
Unadjusted Dickey-Fuller t	-3.926 ^a
Pedroni Test for Cointegration	
Modified Phillips-Perron t	4.001 ^a
Phillips-Perron t	-1.643 ^c
Augmented Dickey-Fuller t	-1.711 ^b
Westerlund Test for Cointegration	
Variance ratio	-1.652 ^b

^{a, b, and c} show statistical significance at 1, 5, and 10%, respectively.

Source: Authors' estimations using Stata 17.

From Table 5, the results for panel cointegration of Kao test, Pedroni test, and Westerlund test (heteroscedasticity-robust framework) are presented, where the null hypothesis of no panel cointegration among the variables is rejected. Since all the three tests' statistics are statistically significant, implying that there is strong evidence supporting the presence of cointegration among the variables. It denoted existence of a stable, long-term relationship among the variables, that is, the variables move together and never diverge in the long-run. This is consistent with the

findings from the three tests including the heteroscedasticity-robust cointegration framework of Westerlund (2007). The presence of cointegration among the variables implies a kind of connection that exists between the variables that persists over time, suggesting that adjustments happen when short-term deviations from the long-term equilibrium occur. Consequently, the presence of a cointegrating equilibrium relationship between the variables under investigation paves the way for examining both the short-run and the long-run dynamics. Consequently, CS-ARDL model are used to estimate the short-run and the long-run dynamics, which contains error correction model (ECM) that explores the dynamics of the short-run adjustments towards the long-term equilibrium.

Cross-Sectionally Augmented Autoregressive Distributed Lag (CS-ARDL) Model Results

The study addresses the problem of cross-sectional dependency and slope heterogeneity in the panel time-series dataset by applying a Dynamic Common Correlated Effects Estimator – Cross-Sectionally Augmented Autoregressive Distributed Lags (CS-ARDL, henceforth), which is efficiently capable of estimating both the short-run and long-run dynamics of the variables that explores the short-run adjustments towards the long-term equilibrium.

Table 6: Mean Group Estimates Results Based on CS-ARDL Approach

Dependent Variable: Income Inequality	Short Run Estimates		Long Run Estimates	
Independent Variable	Coefficient	Standard Error	Coefficient	Standard Error
Income Inequality	-0.532	0.129 ^a	-	-
Financial access	-0.496	0.169 ^a	-0.389	0.128 ^a
Financial stability	-0.496	0.224 ^b	-0.465	0.221 ^b
Financial efficiency	0.021	0.009 ^b	0.022	0.012 ^c
Financial deepening	0.353	0.194 ^c	0.394	0.213
Government Expenditure	0.342	0.153 ^b	0.242	0.131 ^c
Economic growth	0.0008	0.002	-4.62	0.002
Control of Corruption	0.006	0.004	0.007	0.004 ^c
Voice and Accountability	0.226	0.348	0.387	0.495
Government Effectiveness	-0.203	0.212	-0.169	0.135
Rule of Law	-0.184	0.237	-0.211	0.160
Regulatory Quality	-0.0131	0.182	0.011	0.152 ^c
Political Stability	-0.198	0.156	-0.140	0.127
Trade Openness	0.127	0.129	-0.101	0.087
ECM	-1.532	0.129 ^a	-	-
F Statistic (464, 32)				
R-squared	0.1			
R-squared (MG)	0.04			
CD Statistic	0.61			

^a, ^b, and ^c show statistical significance at 1, 5, and 10%, respectively.

Source: Authors' estimations using Stata 17.

The results of a Dynamic Common Correlated Effects (CCE) Estimator using a Cross-Sectionally Augmented Autoregressive Distributed Lag (CS-ARDL) approach is provided in Table 6. These estimates are separated into short-run and long-run effects for income inequality (GINI), financial development indicators: financial access, financial stability, financial efficiency and financial deepening; government expenditure, economic growth, trade openness and institutional quality

indicators: control of corruption, voice and accountability, government effectiveness, rule of law, regulatory quality, political stability and absence of violence/terrorism. Table 6 revealed that financial access and financial stability indicators of financial development negatively and significantly contribute to reducing income inequality in West African countries both in the short-run and in the long-run, which is statistically significant at 1% and 5% levels of significance. The coefficients of financial access and financial stability in the long-run are -0.389 and -0.465, while in the short-run are -0.496 and -0.496. The magnitude of their impact varies across short-run and long-run dynamics. In the long-run, a percent increase in financial access and financial stability would lead to 38.9 and 46.5 percent decrease in income inequality, respectively; while in the short-run, a percent increase in financial access and financial stability will reduce income inequality by 49.6 percent in West African countries. But the reduction in income inequality is larger in the short-run.

The results also show that financial efficiency and financial deepening positively and significantly increase income inequality in the long-run but only financial efficiency has statistically significant impact on income inequality in the short-run. However, the coefficients of financial efficiency and financial deepening in the short-run are 0.021 and 0.353 that are statistically significant at 5% and 10% level of significance, while in the long run are 0.022 and 0.394 which only that of financial efficiency is statistically significant at 10% level. Moreover, in the long-run, a percent increase in financial efficiency and financial deepening would lead to 2.1 and 35.3 percent increase in income inequality, respectively; while in the short-run, a percent increase in financial efficiency will increase income inequality by 2.2 percent in West African countries. Both financial efficiency and financial deepening indicators of financial development have significant impact in the short-run but the latter has more impact on income inequality. This implies that financial access and financial stability are the right policy approach in West African countries in order to improve income distribution and reduce income inequality both in the short-run and in the long-run. The impact of government expenditure on income inequality is positive and statistically significant both in the short-run and in the long-run at 5% and 10% level of significance, respectively. The coefficient of government expenditure for both the short-run and the long-run are 0.342 and 0.242, which implies that a percent increase in government expenditure will increase income inequality by 34.2 and 24.2 percents both in the short-run and in the long-run. It appears that the magnitude of the impact is more in the short-run than in the long-run.

Furthermore, the coefficients of economic growth and trade openness are not statistically significant both in the short-run and in the long-run, likewise most of the institutional quality indicators – voice and accountability, government effectiveness, rule of law, and political stability and absence of violence or terrorism. This implies that economic growth, trade openness and most of the institutional quality indicators (voice and accountability, government effectiveness, rule of law, and political stability and absence of violence or terrorism) have no impact on income inequality and hence do not promote income distribution via financial development both in the short-run and in the long-run. On the other hand, the coefficients of corruption control and regulatory quality are statistically significant in the long-run but not significant in the short-run at 1% level of significance. This implies that corruption control and regulatory quality positively increase income inequality in the long-run, hence, a 0.7 and 1.1 percent increase in income inequality is due to a one percent change in corruption control and regulatory quality.

The coefficient of the first differenced of income inequality (-0.532) indicates a negative relationship between the first difference of income inequality and its short-term effect on itself, which is statistically significant at 1% level. The negative coefficient suggests a short-run decrease

in income inequality (the GINI index) following a one percent increase in its first difference. Thus, it explains partial adjustment towards long-run equilibrium. That is, the system is not adjusting completely to a new equilibrium immediately. Instead, it makes a partial adjustment. This suggests that changes in income inequality (the GINI index) take time to fully manifest and does not happen instantaneously; hence, the short-run effect represents only part of the total adjustment towards the long-run equilibrium. Also, the coefficient of error correction model (ECM) of the CS-ARDL model is -1.532 which is statistically significant at 1% level. The negative error correction term (-1.532) suggests that the system tends to correct deviations from the equilibrium at a rate of 1.532 units per period. Implying that if there are short-term deviations in the relationship between financial development and income inequality from their long-term equilibrium, the system would automatically adjust back to equilibrium. The negative sign of the error correction term indicates a tendency for the variables to adjust towards their long-run relationship. This suggests that if there is a divergence between the expected impact of financial development on income inequality and the actual observed inequality, the system would adjust over time to align them. The magnitude of the error correction term (-1.532) represents the speed at which the adjustment occurs. In this context, any imbalance between financial development and income inequality is corrected quickly at a rate of 1.532 units per period. Besides, R-squared values indicate that the model has limitations in capturing and explaining the variability in income inequality in relation to the explanatory variables. The majority of the variance in income inequality is not accounted for by the independent variables included in the model. Therefore, while the model might be statistically significant, meaning that the included variables have an evident impact, but it is not highly effective in explaining the observed variations in income inequality. As, there are other variables influencing income inequality that are not considered in the model. These unaccounted factors could be contributing significantly to the variability in income inequality, which highlights the need for further investigation or the inclusion of additional variables to enhance the model's explanatory power.

Dumitrescu and Hurlin (2012) Granger Causality Result

This study employs Dumitrescu and Hurlin (2012) Granger Causality Test to investigate causality between financial development indicators and income inequality as reported in table 7.

Table 7: Dumitrescu and Hurlin (2012) Granger Causality Test Results

Null Hypothesis (Ho)	W-Stat.	Z-stat.	Causality	Conclusion
GINI → FAI	2.093 ^a	3.093 ^b	Yes	Income inequality causes financial access
FAI → GINI	4.132 ^a	8.857 ^a	Yes	Financial access causes Income inequality
GINI → FEI	1.963 ^a	2.723 ^b	Yes	Income inequality causes financial efficiency
FEI → GINI	1.460 ^a	1.302 ^a	Yes	Financial efficiency causes income inequality
FSI → GINI	2.130 ^a	3.195 ^a	Yes	Financial stability causes income inequality
GINI → FSI	1.965 ^a	2.729 ^b	Yes	Income inequality causes financial stability
GINI → FD	3.72 ^a	7.694 ^a	Yes	Income inequality causes financial deepening
FD → GINI	3.977 ^a	8.419 ^a	Yes	Financial deepening causes income inequality

^a and ^b show statistical significance at 1 and 5%, respectively.

Source: Authors' estimations using Stata 17.

The result focuses on examining pairs of variables, specifically to determine the direction of Granger causality whether there is bidirectional, unidirectional or zero-directional causality between the variables. The result indicate significant Granger causality in all variables, providing evidence that there is bidirectional causality between all financial development indicators and income inequality. In each case, the W-Stat. and Z-Stat. values are statistically significant,

providing evidence to reject the null hypothesis of no Granger causality, and hence support the existence of Granger causality across all the variables. This implies that past values of financial development contain information that helps predict future values of income inequality, indicating a temporal causal relationship as well as the directional influence and dynamics between financial development indicators and income inequality in West African countries.

Conclusion and Recommendations

This study examines the nexus between financial development and income inequality by mediating the role of trade openness and institutional quality across West African countries from 1990 to 2022 using CS-ARDL model. Financial development (in terms of financial access and financial stability) are the right policy approaches in West African countries in order to improve income distribution and reduce income inequality both in the short-run and in the long-run. The critical role played by the financial sector demonstrates that it can lift people out of poverty and improve income distribution in West African countries. The most important aspects of financial sector development, in West African countries, are increasing access to financial services and products for vulnerable groups of the population, as well as stabilizing the financial market by reducing volatility in the stock price index. This means that lower stock price fluctuations indicate a more stable financial market, which boosts investors' and other market participants' confidence, ultimately helping to improve a country's income distribution through increased investment and job creation. As a result, financial development has the potential to reduce income inequality, which has positively impacted many West African countries. This can be achieved if government implement financial reform programs that increase access to more advanced and efficient financial services and products in order to generate more employment opportunities to the populace and thus, reduce income inequality. Given the short-run effects of all financial development indicators (financial access, financial stability, financial efficiency and financial deepening), policymakers should focus on addressing factors that contribute to income distribution with immediate effect. For example, attention should be directed towards policies impacting more accessibility to financial services to vulnerable and less-privileged groups and also reducing volatility of the stock price index because a lower fluctuation in stock prices shows a more stable financial market/institutions. Institutional quality influences the design and implementation of redistribution policies aimed at addressing income inequality. Transparent and accountable governance structures, foster public trust and confidence in the state's ability to deliver social services, enforce labor standards, and administer progressive taxation systems. Countries with higher institutional quality are more likely to adopt redistributive policies that target the root causes of income inequality, such as unequal access to education, healthcare, and economic opportunities, thereby promoting social mobility and equalizing income distribution.

The impact of government expenditure on income inequality is positive and statistically significant both in the short-run and in the long-run, highlighting the role of fiscal policies in shaping income distribution. Government expenditure is captured to account for the degree of government intervention in marketplace, the provision of public goods, and the possible use of redistributive spending. Since most redistribution through the tax and transfer system are toward high-income groups the rich households use their political power to exploit the poor, thus, government spending might result in greater inequality. Policymakers need to carefully tailor interventions to address specific structural issues in each economy. This may involve targeted policies to improve financial systems, enhance education and skills development, and promote inclusive economic growth that significantly improve income distribution. Institutions perform economic functions of promoting enforcement of contract and economic cooperation as well as protecting property

right. It is important for policymakers to recognize the complexity of income inequality and implement a holistic approach that addresses both short-term fluctuations and long-term structural issues. Regular assessment and adaptation of policies will be crucial to achieving sustained improvements in income distribution in West African countries.

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