

# FINANCIAL STABILITY AND INCOME INEQUALITY IN DEVELOPING COUNTRIES

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## Abstract

This paper examines the relationship between financial stability and income inequality in 35 developing countries from 2004 to 2020 using system generalized method of moments (GMM) estimation. Four dimensions of the financial sector, namely financial stability, depth, access and efficiency were included as regressors. The results for the relationship of each of the financial dimensions with income inequality are mixed. In this study, inequality increases with an increase in the stability of the financial sector; on the contrary, the depth of the financial sector reduces inequality. Furthermore, not only does the dimension of the financial sector matter in addressing income inequality issues, but the quality of institutions is important. It is important for policy makers to understand linkages between financial dimensions and inequality so as to come up with appropriate prudential regulatory mechanisms.

**Keywords:** Financial stability, inequality, financial dimensions, developing countries

**JEL Classification:** D31, G20, E02, E44, O15, O16

## 1. Introduction

Sustainable Development Goal 10 aims at reducing inequality within and among countries with a requirement to “improve the regulation and monitoring of global financial markets and institutions and strengthen the implementation of such regulations”, among other targets (SDG target 10.5), (UN, 2015). Developing countries have most of the unequal societies globally with the highest Gini coefficients. Bazillier and Hericourt (2017) opined that inequality is an aspect behind credit bubbles, increasing the probabilities of financial crises. Income inequality in developing countries is now a persistent problem as policies to support income distribution have been instituted to combat inequality, but it remains high (UN, 2020). The financial sector has a deep, long-lasting positive or negative influence on income inequality (IMF, 2020). Changes in the financial system can influence

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both credit allocation and aggregate production, each of which may change the demand for low and high-skilled workers, with associated ramifications on income distribution (Townsend and Ueda, 2006; Calice and Zhou, 2018).

In most developing countries, inequality creates a number of socio-economic problems. Previous studies have deliberated on the probable factors which affect the relationship between finance and inequality (Dabla-Norris *et al.*, 2015; Bittencourt *et al.*, 2019). Most of these previous studies mainly focused of the aspect of financial depth as the main dimension under study without considering the other dimensions of finance in influencing finance and inequality relationship (see Demirgüç-Kunt and Levine, 2009; Dabla Norris *et al.*, 2015; Rewilak, 2017; Bittencourt *et al.*, 2019). The stability of the financial sector is significant for macroeconomic stability and it is an aspect of financial development (Čihák *et al.*, 2012). Reckless credit extension on the surface can seem like financial deepening and increased access to finance. Lack of due diligence in the loan approval process might appear as the financial sector is efficient but under these conditions the stability of the sector will be under threat.

Hence, this study change focuses to focused on all the four financial dimensions (access, depth, efficiency and stability) to determine the relationship between financial stability and inequality. Access to financial and credit markets is not easy for low-income earners due to geographical, collateral and cost barrier factors, among others (Magwedere *et al.*, 2021). Imperfect financial and credit markets can influence the occupational outcomes of low-income individuals (Galor and Zeira, 1993; Bittencourt *et al.*, 2019).

There are inconsistent theoretical predictions on the relationship between finance and inequality. Extensive and intensive margin arguments have been put forward to explain this relationship, most of which focused on financial depth (Demirgüç-Kunt and Levine, 2009; Bittencourt *et al.*, 2019). The extensive margin affects the number of individuals using financial services, adding more individuals from the lower end of the income to access and use financial services (Čihák and Sahay, 2020). Thus, inequality is reduced by the extensive margin through human capital accumulation, reduced liquidity constraints, expansion of investment, entrepreneurial opportunities and risk management by more low-income households (Greenwood and Jovanovic, 1990; Makhlof *et al.*, 2020). Accordingly, the development of the financial sector under the extensive margin reduces inequality based on the ability of the sector to cover a large number of individuals (Gurley and Shaw, 1967; Makhlof *et al.*, 2020). By covering a large number of individuals, the financial development alleviates inequality as entry barriers are removed and economic opportunities are extended to poor households (see Becker and Tomes, 1986; Galor and Moav, 2004; Bittencourt *et al.*, 2019).

On the other hand, the intensive margin widens the inequality gap as the developments in the range and quality of financial services benefits those already using financial services

(Greenwood and Jovanovic, 1990; Demirgüç-Kunt and Levine, 2009). The financial resources are channelled to individuals with a higher propensity to save at the expense of others (Galor and Moav, 2004). Hence, the benefit of the provision of financial services and products under the intensive margin will likely widen the distribution of income as it benefits the rich more than the poor (Makhlouf *et al.*, 2020). However, these arguments in literature have mainly focused only on financial depth as a measure of financial development (Jauch and Watzka, 2016; Haan and Sturm, 2017; Zhang and Naceur, 2019).

It is not only the financial sector dimensions that are important for the relationship between finance and income inequalities. Loosening of financial regulations may ease credit supply and contribute to higher leverage and financial vulnerability; capital market imperfections limiting access to credit markets may exaggerate income and wealth inequalities (Čihák and Sahay, 2020). Thus, the benefits of increasing financial access are reduced when the financial sector leverage is too high (Bazillier and Hericourt, 2017). Hence, policies that increase access to finance without paying a close attention to the stability of the sector can be detrimental to the whole financial sector. Loosening of financial regulations may ease credit supply and contribute to higher leverage and financial vulnerability; hence, the institutional quality with respect to regulation and supervision mitigates financial risks associated with high income inequality (Park and Mercado, 2015). Few studies have included the quality of institutions as a probable factor in determining the relationship between finance and inequality (Rewilak, 2017; de Haan and Sturm, 2017).

Empirical research so far has mainly focused on the depth of the financial system with limited scrutiny given to its stability, access and efficiency in the context of African countries. There are mixed findings on the relationship of finance and income inequality and this study contributes to the literature on the relationship, which has remained an open empirical research objective. It is argued that finance has an inequality-reducing effect only to a certain point, after which deeper financial markets or more access are not beneficial to the underserved parts of the population (see Bittencourt *et al.*, 2019; Čihák and Sahay, 2020). Furthermore, deep financial markets do not necessarily mean improved access, efficiency and stability. Hence, this study includes these other financial dimensions in a finance-inequality nexus.

It is the objective of this paper to examine the relationship between income inequality and financial stability in developing countries. The question arising from the study is whether there is a relationship between income inequality and financial stability. The stability of the financial sector is crucial as it has social and economic ramifications. If active growth in the credit extended to the private sector results in the economy

“overheating”, this can have a negative effect on income inequality (Afanasyeva *et al.*, 2018). Instability in the banking sector can lead to banking crises and economic recession accompanied by job losses, increasing the level of inequality. Poor households have little headroom to absorb financial shocks. Thus, the instability of the financial system can increase inequality (Neaime and Gaysset, 2018).

This paper proposes to examine all these financial dimensions in one study for the purpose of providing an extensive analysis of the finance-inequality nexus using a sample of African countries. It examines whether these financial dimensions can reduce inequality within the selected countries in the sample. The results of the study suggest a positive relationship between financial stability and inequality. The stability of the sector contributes to more inequality. On the contrary, the depth of the financial sector is negatively related with inequality, suggesting that deep financial markets are associated with a reduction in income inequality.

The rest of the paper is organised as follows: Section 2 reviews the literature of the study. The methodology and data are presented in Section 3, whilst Section 4 presents the results and a discussion of the results. The study is concluded in Section 5.

## 2. Literature Review

There is no conclusive theoretical evidence on the relationship between inequality and finance. Financial development can expand the economic opportunities of disadvantaged groups and reduce the intergenerational persistence of relative incomes (Greenwood and Jovanovic, 1990). On the contrary, development in the financial sector can enhance the financial services for individuals with access to the financial services, who are frequently high-income individuals and well-established firms, amplifying inequality (Greenwood and Jovanovic, 1990; IMF, 2020). Greenwood and Jovanovic (1990) argued that the direct effect from improving the quality of financial services could fall disproportionately on the rich, broadening inequality and proliferating cross-dynasty variances in economic opportunity. Improving the quality of financial services for the rich might increase growth and benefit the poor through a positive income effect (IMF, 2020). Furthermore, improvements in the financial sector that boost demand for low-skilled workers tend to tighten the distribution of income, expanding and balancing economic opportunities (Beck *et al.*, 2007; Demirgüç-Kunt and Levine, 2009; Čihák and Sahay, 2020). There are differences in the theoretical channels and shape of the relationships between finance and inequality (see Greenwood and Jovanovic, 1990; Banerjee and Newman, 1993; Galor and Zeira, 1993). However, the theories have a common explanation that better credit availability allows more household choices and decisions to be based on better

allocation of spending over time, free from inherited wealth, thereby reducing income inequality (Demirgüç-Kunt and Levine, 2009; Beck, 2012). These theoretical foundations guide this study. Since there is no conclusive theoretical evidence in the relationship between finance and inequality, an empirical study can be an answer to this relationship. As inequality increases, it is associated with higher financial risks.

Changes in the financial system can influence both aggregate production and the allocation of credit. Each of these may alter the demand for low- and high-skilled workers with concomitant ramifications on the distribution of income (Townsend and Ueda, 2006). Higher inequality implies slower growth and greater financial instability in the financial sector (Ostry *et al.*, 2019). Piketty (2013) has cautioned that increasing inequality could lead to broad-based dissatisfaction and destabilise democratic principles. This is in support of the Sustainable Development Goal of reducing inequalities within and among countries. Čihák and Sahay (2020) argued that the depth of the financial sector reduces inequality only to a certain point, after which inequality begins to rise.

Deeper financial systems are associated with a surge in top incomes and financial sector rents (Čihák and Sahay, 2020). The depth of financial systems coupled with financial innovations necessitates the introduction of complex financial products and services, which are high-risk and usually available only to the well-off (Zhang and Naceur, 2019). Easy access to finance and use of payment services have greater benefits for those at the low end of the income distribution, reducing inequality (Magwedere *et al.*, 2021). De Haan and Sturm (2017) argued that all financial variables increase inequality; based on previous studies, however, the relationship remains inconclusive as in some cases it depends on the estimation method used and the financial variable of interest.

Financial sector development, innovations and policies are essential for reducing inequality (IMF, 2020). The effectiveness of financial access depends on the financial and economic viability of services provided by the financial sector, as well as productive and responsible use of those financial products and services by consumers (Čihák and Sahay, 2020). It is further argued that the pace of deepening of the financial sector matters for the effectiveness of the financial stability in reducing inequality (Sahay *et al.*, 2015). Most studies in empirical literature have focused on the size of the financial sector (depth) in determining the relationship between finance and inequality (Demirgüç-Kunt and Levine, 2009; Bittencourt *et al.*, 2019; Makhoul *et al.*, 2020).

Few have studied the relationship between inequality and finance and included the other financial aspects such as stability, efficiency and access (see Rewilak, 2017; Zhang and Naceur, 2019). The depth of the financial sector and access thereto are fundamentally different as countries with the same level of financial depth can have very different levels of financial stability, access and efficiency. Furthermore, the financial

dimensions *per se* might not be adequate in reducing inequality if low-income earners have access to financial products and services that are not supported by strong institutional quality (Singh and Huang, 2015; Magwedere *et al.*, 2021). The contribution of this study is the inclusion of other financial aspects such as access, efficiency and stability in determining the relationship between finance and inequality. Furthermore, the study contributes to the literature on the ongoing debate of the finance-inequality nexus. Furthermore, most of the studies on finance and inequality have not included the aspect of policies in examining the relationship between finance and inequality.

### 3. Data and Methodology

Panel data for 35 developing countries from 2004–2020 were used for the regression analysis. The study could not extend the time series of the data prior to the year 2004 as the data on the measurements of financial access were not yet available. Table 1 provides a summary of data sources and a description of the variables including the expected sign from the analysis. The study used only data from the banking sector to cover a large sample of developing countries. The Z-score was used as a measure of stability in the banking sector (see Čihák *et al.*, 2012).

The limitations of the Z-score are based on the methodology for calculating the formula. The methodology encompasses financial ratios which totally depend on individual banks' financial statements. Manipulations of financial statements are an ongoing accounting challenge; thus, the measure is only as good as the underlying accounting and auditing framework (World Bank, 2015). The Z-score considers individual financial institutions, potentially overlooking the impact of default risk of one financial institution on the whole financial system. Nevertheless, even if it is an individual measure of an individual institution, under contagion risk a failure in one institution can result in a failure of the whole financial system (see Schoenmaker, 1996; Huynh *et al.*, 2020). However, the Z-score has the advantage that it is usable for institutions where sophisticated market-based data are not easily available. Furthermore, the Z-score is a comparable measure for default risk for different institutions with different ownership and objectives facing insolvency (World Bank, 2015; Čihák *et al.*, 2012)

The data on stock market for most of the countries in the study were not readily available, so only data from the banking sector were used for the financial dimension measures. A synthetic institutional quality index was developed from law and order, democratic accountability and bureaucracy in governments using the principal component analysis (PCA)<sup>1</sup>. Table 1 provides a summary of the variables used in the study.

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1 Due to space consideration, the results of PCA are not presented but they are available upon request.

**Table 1: Measurement and summary of variables**

<b>Variables</b>	<b>Definition / measure</b>	<b>Source</b>	<b>Expected sign</b>
<b>Inequality (Gini index) (<i>ineq</i>)</b>	Measures income inequality or income distribution in a country, where 0 resembles perfectly equal society, while 100 percent mirrors a very unequal condition.	Standardized World Income Inequality Database (SWIID), 2019.	
<b>Financial depth (<i>Fin depth</i>)</b>	The size of the financial sector relative to the economy. The private sector credit to GDP was used as a measure of financial depth.	Global Financial Development. World Bank	Negative (–)
<b>Financial efficiency (<i>Int-spread</i>)</b>	The interest rate spread (higher value means higher inefficiency)	World Bank, Global Financial Development Database (henceforth GFDD)	Negative (–/+)
<b>Financial access (<i>Fin-access</i>)</b>	The degree to which individuals can and do use formal financial services (ATMs per 1000 and commercial banks per 1000)	International Monetary Fund (Financial Access Survey)	Negative (–)
<b>Financial stability (<i>Finst</i>)</b>	The banking system's distance to distress measured by the Z-score <sup>1</sup>	Bankscope, World Bank	Positive / Negative (+/–)
<b>Inflation (<i>inf</i>)</b>	General increase in the price level measured by the consumer prices index (annual percent) ( <i>inf</i> )	World Development Indicators (WDI)	Negative (–)
<b>Remittances received (<i>rem</i>)</b>	Remittance inflows to GDP (%) ( <i>rem</i> )	World Development Indicators	Negative (–)
<b>Institutional quality (<i>instQ_index</i>)</b>	Index developed using PCA from law and order, democratic accountability and bureaucracy in governments ( <i>instQ_index</i> )	International Country Risk Guide (ICRG)	Negative (–)

Source: XXX<sup>2</sup>

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2  $z \equiv (k + \mu)/\sigma$ , where  $k$  is equity capital as percent of assets,  $\mu$  is return as percent of assets, and  $\sigma$  is standard deviation of return on assets as a proxy for return volatility (see Čihák *et al.*, 2012).

### 3.1 Methodology

The System GMM is used to determine the relationship between inequality and finance. Time series data have the problem of a unit root process; to determine the stationarity properties of the data, the unit root diagnostic test was performed and the results are presented in Table 2.<sup>3</sup> Our analysis employed a System Generalized Method of Moments (GMM) model using panel data for the research purpose. The GMM is the preferred method of estimation as estimating the model using the ordinary least square (OLS) carries substantial complications of endogeneity bias. Additionally, in both the fixed and random settings, the lagged dependent variable is correlated with the error term, even if the disturbances are not autocorrelated.

The problems of possible endogeneity bias due to interaction between the financial dimension variables, autocorrelation, individual specific heteroscedasticity and omitted variable bias are overcome by applying the System GMM estimator developed by Blundell and Bond (1998), which relies on using instrumental variables. The aim of the GMM estimator is to address potential endogeneity bias. The endogeneity bias may also result from reverse causality and measurement errors as a result of introducing the lagged dependent variable among the regressors (Blundell and Bond, 1998). Inequality in developing countries is persistent and can pose problems of autocorrelation and unobserved heterogeneity (see Wintoki *et al.*, 2012). Furthermore, the System GMM technique yields an asymptotically unbiased estimation of the *t*-statistics without requiring the heteroscedastic structure of the regression equation (Blundell and Bond, 1998; Hansen, 1982). The GMM estimation method addresses these problems and it is argued to be more efficient on short panels (see Arellano and Bond, 1991); thus, it is the preferred technique to determine the relationship between finance and inequality. The generic dynamic panel model that is estimated in this study is therefore parameterised as in Equation 1.

$$Y_{it} = \alpha Y_{i,t-1} + X'_{i,t-1} \beta + \mu_i + \varepsilon_{it}, \quad (1)$$

where  $Y_{it}$  represents inequality,  $X'_{i,t-1}$  represents a vector of inequality determinants including financial depth, financial access, financial efficiency, financial stability, inflation and remittances, and  $\mu_i$  are country fixed effects,  $\varepsilon$  is the error term,  $i$  and  $t$  indicate the country and time dimensions respectively. The baseline model estimated is therefore a Two-step System GMM:

$$\Delta \text{ineq}_{it} = (\alpha - 1) \Delta \text{ineq}_{i,t-1} + \beta_2 \Delta FS_{it} + \beta_j \Delta X_{j,it} + \Delta \varepsilon_{it}, \quad (2)$$

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3 The descriptive statistics and the correlation matrix are not reported due to space consideration but are available upon request.



where *ineq* is inequality,  $\alpha$ ,  $\beta$ , are parameters to be estimated and the vector  $X$  includes financial depth, financial access, financial efficiency, inflation, the institutional quality index and remittances. Inequality is persistence and therefore requires estimation using a dynamic model. The developed System GMM estimator, which solves the problems associated with the ordinary least squares, fixed and a random effect in Equation 2, is therefore used for examining the relationships.

The consistency of GMM estimators depends on whether lagged values of the explanatory variables are valid instruments in the inequality regression. Arellano and Bond (1991) and Arellano and Bover (1995) suggested two specification tests to address estimation of dynamic models. Firstly, the Sargan test of over-identifying restrictions, which tests the overall validity of the instruments by analysing the sample analogy of the moment conditions used in the estimation process (Sargan, 1958, Batuo *et al.*, 2018). Failure to reject the null hypothesis gives support to the model. A null hypothesis that the error term  $\varepsilon_{it}$  is not serially correlated is the second diagnostic test and the model specification is supported by not rejecting the null hypothesis.

In the System GMM specification, a test is made to determine whether the differenced error term (that is, the residual of the regression in differences) is second-order serially correlated. The differenced error term is expected to have first-order serial correlation AR(1) even if the original error term (in levels) is uncorrelated, unless the latter follows a random walk (Arellano and Bond, 1991; Batuo *et al.*, 2018). Second-order serial correlation AR(2) of the differenced residual dictates that the original error term is serially correlated and follows a moving average process at least of order one. This would reject the appropriateness of the proposed instruments (and would call for higher-order lags to be used as instruments). The System GMM model has been employed in recent financial development literature (see Bittencourt, 2019; Čihák and Sahay, 2020).

## 4. Results and Discussion

The study ascertained the stationary properties of the variables. The Levin, Lin and Chu (LLC) and Im, Pesaran and Shin (IPS) unit root tests were performed to test the stationarity of the time series. Table 2 presents the results of the unit root analysis. The Akaike Information Criterion (AIC) is used to select the optimal lag length.

**Table 2: Unit root tests**

Variable	No trend	Intercept and trend	Trend	Decision
<b>Panel Unit root test using the LLC</b>				
<i>ineq</i>	<b>−10.6663***</b>	<b>−9.70437***</b>	<b>−8.02836***</b>	<b>I(1)</b>
<i>Fin depth</i>	−13.8969***	−15.4596***	−14.6910***	I(1)
<i>Fin-access</i>	−5.19586***	−13.6585***	−14.3276***	I(1)
<i>Fin-eff</i>	−4.50351***	−255.717***	−248.125***	I(0)
<i>instQ_index</i>	−40236.8***	−19.3891***	−21.5881***	I(1)
<i>Finst</i>	−22.4538	−13.8315***	−17.0877***	I(1)
<i>inf</i>	−2.99425***	−11.1959***	−11.1559***	I(0)
<i>rem</i>	−21.3551***	−8.79870***	−9.02607***	I(1)
<b>Panel unit root tests using IPS</b>				
<i>ineq</i>	–	<b>−5.67646***</b>	<b>−5.21106***</b>	<b>I(1)</b>
<i>Fin depth</i>	–	−7.65393***	−9.89963***	I(1)
<i>Fin-access</i>	–	−2.33941***	−6.42348***	I(1)
<i>Fin-eff</i>	–	−43.0174***	−54.8416***	I(0)
<i>instQ_index</i>	–	−8.16012***	−10.3526***	I(1)
<i>Finst</i>	–	−6.19248***	−12.0075***	I(1)
<i>inf</i>	–	−5.57631***	−8.20833***	I(0)
<i>rem</i>	–	−10.3124***	−13.4532***	I(1)

Note: \*\*\*, \*\*, \* indicates that the null hypothesis of unit root tests is rejected at 1%, 5% and 10%, respectively. Inequality (*ineq*) is measured by the Gini index, *Fin depth* is the ratio of private credit to the gross domestic product measuring financial depth (*Fin depth*), *Fin-access* is the number of automated teller machines per 1,000 km<sup>2</sup>, *cb* is the number of commercial banks per 1,000 km<sup>2</sup> as financial access measures. *Fin-eff* is the interest rate spread measuring efficiency of the financial sector, *instQ\_index* is the index for the quality of institutions, *Finst* is the bank Z-score measuring financial instability, *inf* is the consumer price index, *rem* is remittance inflows.

Source: Authors' own calculations using Stata 15.1

The results displayed in Table 2 indicate that the variables under study are mostly of first-order integration except poverty gap, interest rate spread and inflation, which are stationary at levels.

Table 3 is a summary of the results of the determinants of inequality using the System Generalised Method of Moments.

**Table 3: Summary of results of determinants of inequality: dependent variable inequality**

Regressors	System GMM	Standard error
<b>L.INE</b>	1.026*** (97.91)	0.01286
<b><i>First</i></b>	0.00591* (1.93)	0.00306
<b><i>Fin depth</i></b>	−0.00256* (−1.81)	0.001414
<b><i>Fin-access</i></b>	0.000634 (0.31)	0.002045
<b><i>Fin-eff</i></b>	−0.00303 (−1.07)	0.002832
<b><i>instQ_index</i></b>	−0.0453* (−1.87)	0.024225
<b><i>inf</i></b>	0.00206 (0.93)	0.002215
<b><i>rem</i></b>	0.0111* (1.86)	0.005968
<b><i>_cons</i></b>	−1.207** (−2.59)	0.466023
<b>N</b>	353	
<b><i>F-test p-value</i></b>	0.0000	
<b>Hansen J test p-value</b>	0.632	

Note: *t*-statistics in parentheses;  $p < 0.10$ ,  $**p < 0.05$ ,  $***p < 0.01$ . Each column represents a different regression technique. Country fixed effect, AR(1) and AR(2) results are available but not reported. The *F*-test tests the null hypothesis that all the coefficients, except the constant, are jointly equal to zero. The Hansen J test of overidentifying restrictions tests the null hypothesis that the instruments are valid.

Source: Authors' own calculations using Stata 15.1

The preferred method for the regression analysis was the System GMM. Since the validity of the instruments is crucial for the reliability of the econometric model,

the diagnostics on the validity of the instruments were confirmed by the Sargan and Hansen statistics (Sargan, 1958; Hansen, 1982)<sup>4</sup>. The validity of the instruments could not be rejected using the Hansen statistics. This is vital as the Hansen result confirms that no type II error emanates from pooling valid and invalid instruments. The estimates of the model are consistent as confirmed by the results of first-order AR(1) and second-order AR(2) serial correlation tests, which were performed using the Arellano and Bond (1991)<sup>5</sup>.

The AR(2) assumes that the explanatory variables are not “post-determined”, implying that the independent variables are not correlated with future errors following Roodman (2012). The results show a positive relationship between financial stability and income inequality. The coefficient of financial stability (*Finst*) is positive (0.00591) and statistically significant with a robust Hansen test of the overidentifying restrictions (0.632). An increase in stability of the financial sector increases inequality by 0.00591 percentage points. The finding is consistent with de Haan and Sturm (2017), who found a significant positive relationship between financial stability and income inequality. Periods of high financial instability are associated with hyperinflation; there is low confidence in the financial system and banks are reluctant to finance profitable projects (World Bank, 2015). Thus, a high Z-score (*Finst*) is associated with increased risks for banking increasing inequality as banks are reluctant to extend credit that can be beneficial in reducing the inequality.

When considering the financial dimension of depth, there is a negative and significant relationship between financial depth and inequality. Financial depth increases with a decrease in inequality. A unit increase in financial depth reduces inequality by 0.00256 percentage points *ceteris paribus*. The results fail to reject the theoretical consideration of a negative relationship between financial depth and inequality. Banerjee and Newman (1993) argued that the optimality of household choices depends on the availability of credit, whilst Galor and Zeira (1993) opined that investment in human capital is contingent to the availability of credit. As the credit is made available to low-income earners, they are able to smooth their consumption and invest in human capital. A finding of an inequality effect of financial depth is in line with the findings of Beck *et al.* (2007). This is in contrast with Dabla-Norris *et al.* (2015), who found a positive relationship between finance and inequality in developing economies.

The prior expectations were for a negative and significant relationship between financial access and inequality. However, the results reported an insignificant positive relationship. This finding may be due to the nature of the sample of developing countries,

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4 Only the results for the *p*-value of the Hansen J test are reported in Table 3.

5 Results are not included due to space consideration but are available upon request.

where there is lack of access and most of the poor and the small businesses mainly use the informal sector. Other factors such as institutional quality, which is not very strong in developing countries, can be a constraint on the outreach of banks to the poor (Yoshino and Morgan, 2018). In microfinance experience, the World Bank (2014 : 3) found mixed results for the role of financial access in inequality. The general consensus was that overextension of credit at a higher interest rate increases inequality irrespective of the poor having access to these services (World Bank, 2014). If there is an increase in access to finance and the access is tilted more to larger enterprises and the rich, the increase in access cannot be beneficial to the poor (World Bank, 2014).

Even if there is improved financial access in developing countries, most of the financial products and services follow a top-down approach where services are available but the poor cannot access them because they do not meet their needs (Magwedere *et al.*, 2020). Individuals' behavioural responses can become an aspect of the relationship between increased access and inequality (Stiglitz, 2017). Furthermore, when the concentration or market power of banks is brought in the mix, the role of financial access and inequality can be complex. Stiglitz (2017) argued that where there is monopoly power, the marginal return on investment is lower than the average return, market power is associated with inefficiency and distortion in the allocation of resources (Atkinson, 2015). In most developing countries, the structure of the formal banking sector is oligopolistic, where banks can still have higher profit margins with limited breadth of their services. Furthermore, policy frameworks affect the relationship between finance and inequality. As measured by institutional quality, improvements in the quality of institutions reduce inequality by 0.0453. Market power cannot be the only driver of higher inequalities; irrespective of increased access to finance, if the financial products are too expensive or there exist other barriers to financial access, the increased financial access will be of little value to the unbanked.

The nature of market power affects the distribution of the financial resources such that, in the absence of strong prudential regulations, market power can worsen inequalities (Claessens and Perotti, 2007; Stiglitz, 2019). Thus, the relationship between financial access and income inequality in economies where banks have higher concentration can be positive (Stiglitz, 2017). With access measured by bank branch expansion, inequality has a significant positive relationship with access to finance. The significant difference between the two measures of access was that as access is measured by commercial banks, inequality became positively significant at 10 percent for the access measure. In the developing countries' context, banks exert significant monopoly power, access to financial services is not very competitive and lack of infrastructure centralises the availability of banking services (Tchamyu *et al.*, 2019). Furthermore, an account in a commercial bank which has

fixed costs leads to an increase in inequality. Findings confirm theoretical underpinnings of Greenwood and Jovanovic (1990) that access to finance can initially increase inequality. This is because the financial services will only be affordable to certain population groups, widening inequality gaps (Beck *et al.*, 2007a; Zhang and Naceur, 2019). For the sample of this study, commercial bank branches are mostly available in urban settings, not in rural areas; thus, the positive relationship between inequality and financial access as measured by the number of bank branches is justifiable.

It is imperative that the financial sector is able to deliver financial services efficiently and it is normally expected that efficiency of the financial sector is negatively related to inequality. The results of this study show an insignificant negative relationship between financial efficiency and inequality. An increase in financial sector efficiency reduces income inequality as financial products and services are available cost effectively (Calice and Zhou, 2018). The study found a negative and statistically insignificant relationship between bank efficiency and inequality, which is consistent with the findings of Rewilak (2017).

Beside the financial dimension, the study included quality of institutions in the analysis. The relationship between institutional quality and inequality is negative and significant, as expected. A percentage point increase in the quality of institutions tends to reduce inequality as measured by the Gini index, and quality institutions tend to reduce the income gap by 0.0453 percentage points. Institutional quality reduces inequality in that if the economy has a favourable legal and policy environment with the capacity to cost-efficiently address market failures through sustainable and well-designed interventions, inequality is reduced (Čihák and Sahay, 2020).

Literature does not show a clear-cut effect of inflation on inequality as it can either be positive or negative (Blank and Blinder, 1985; Yoshino and Morgan, 2018). Inflation creates inequality traps for low-income earners as higher-income earners can offset inflation by higher incomes, widening the disparities in wealth through the inflation disparity phenomenon (see Neaime and Gaysset, 2018; Yoshino and Morgan, 2018). Methodological differences and different study samples can possibly explain the difference in findings on the relationship between inflation and inequality between this study and previous studies (see Rewilak, 2017; Zhang and Naceur, 2019). However, not having a clear-cut relationship between the financial sector and inflation is consistent with a study by Čihák and Sahay (2020).

Remittances are thought to reduce inequality since they are directly received by the poor households (Adams and Page, 2005; Ratha, 2019). The results show a positive and significant relationship between remittances and inequality. A ten percent increase in remittances increases the inequality by 0.0111 percentage point. The finding contradicts those of Inoue (2018) and Kóczán and Loyola (2021), who found that remittances have

a significant inequality-reducing effect. According to Ratha (2019), remittances in Africa are a major source of external finance providing more stable finance than official development assistance and foreign direct investments. The international remittances are thought to reduce inequality only when the migration is safe and orderly (UN, 2020). Only these households can have their saving, consumption and investments improved using remittances received, widening the inequality gap with households that do not receive remittances.

## 5. Conclusion

This paper examined the impact of financial stability on income inequality and included the other financial dimensions of depth, access and efficiency in the analysis. Using a panel of developing countries, the results showed that inequality increases with increase in financial sector instability. Policy makers in developing countries should carefully consider the underlying causes of inequality in their respective countries. It is detrimental to promote policies aimed at reducing inequality without altering the inequality-generating factors – in this case, the use of the financial sector to address inequality in economic opportunities. If the efficiency of the financial sector improves the quality of financial products and services already enjoyed by people who have purchased the services without broadening access to the financial services and products, it tends to increase inequality (Greenwood and Jovanovic, 1990). This is affirmed by the results of this study that there ought to be consideration of all aspects of finance as a remedy to socio-economic issues. The previous global financial crises, which originated from the advanced economies, ought to be a benchmark of the importance of all aspects of finance as not only the depth of the financial sector matters. It is recommended that further studies be undertaken on the interaction of these financial dimensions in reducing inequality. As inequality in most developing economies is persistent irrespective of improvements in the depth of the financial markets, further studies on the channels through which changes in financial sector policies can increase economic opportunities for low-income groups in developing countries are necessary.

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both credit allocation and aggregate production, each of which may change the demand for low and high-skilled workers, with associated ramifications on income distribution (Townsend and Ueda, 2006; Calice and Zhou, 2018).

In most developing countries, inequality creates a number of socio-economic problems. Previous studies have deliberated on the probable factors which affect the relationship between finance and inequality (Dabla-Norris *et al.*, 2015; Bittencourt *et al.*, 2019). Most of these previous studies mainly focused of the aspect of financial depth as the main dimension under study without considering the other dimensions of finance in influencing finance and inequality relationship (see Demirgüç-Kunt and Levine, 2009; Dabla Norris *et al.*, 2015; Rewilak, 2017; Bittencourt *et al.*, 2019). The stability of the financial sector is significant for macroeconomic stability and it is an aspect of financial development (Čihák *et al.*, 2012). Reckless credit extension on the surface can seem like financial deepening and increased access to finance. Lack of due diligence in the loan approval process might appear as the financial sector is efficient but under these conditions the stability of the sector will be under threat.

Hence, this study change focuses to focused on all the four financial dimensions (access, depth, efficiency and stability) to determine the relationship between financial stability and inequality. Access to financial and credit markets is not easy for low-income earners due to geographical, collateral and cost barrier factors, among others (Magwedere *et al.*, 2021). Imperfect financial and credit markets can influence the occupational outcomes of low-income individuals (Galor and Zeira, 1993; Bittencourt *et al.*, 2019).

There are inconsistent theoretical predictions on the relationship between finance and inequality. Extensive and intensive margin arguments have been put forward to explain this relationship, most of which focused on financial depth (Demirgüç-Kunt and Levine, 2009; Bittencourt *et al.*, 2019). The extensive margin affects the number of individuals using financial services, adding more individuals from the lower end of the income to access and use financial services (Čihák and Sahay, 2020). Thus, inequality is reduced by the extensive margin through human capital accumulation, reduced liquidity constraints, expansion of investment, entrepreneurial opportunities and risk management by more low-income households (Greenwood and Jovanovic, 1990; Makhoul *et al.*, 2020). Accordingly, the development of the financial sector under the extensive margin reduces inequality based on the ability of the sector to cover a large number of individuals (Gurley and Shaw, 1967; Makhoul *et al.*, 2020). By covering a large number of individuals, the financial development alleviates inequality as entry barriers are removed and economic opportunities are extended to poor households (see Becker and Tomes, 1986; Galor and Moav, 2004; Bittencourt *et al.*, 2019).

On the other hand, the intensive margin widens the inequality gap as the developments in the range and quality of financial services benefits those already using financial services

(Greenwood and Jovanovic, 1990; Demirgüç-Kunt and Levine, 2009). The financial resources are channelled to individuals with a higher propensity to save at the expense of others (Galor and Moav, 2004). Hence, the benefit of the provision of financial services and products under the intensive margin will likely widen the distribution of income as it benefits the rich more than the poor (Makhlouf *et al.*, 2020). However, these arguments in literature have mainly focused only on financial depth as a measure of financial development (Jauch and Watzka, 2016; Haan and Sturm, 2017; Zhang and Naceur, 2019).

It is not only the financial sector dimensions that are important for the relationship between finance and income inequalities. Loosening of financial regulations may ease credit supply and contribute to higher leverage and financial vulnerability; capital market imperfections limiting access to credit markets may exaggerate income and wealth inequalities (Čihák and Sahay, 2020). Thus, the benefits of increasing financial access are reduced when the financial sector leverage is too high (Bazillier and Hericourt, 2017). Hence, policies that increase access to finance without paying a close attention to the stability of the sector can be detrimental to the whole financial sector. Loosening of financial regulations may ease credit supply and contribute to higher leverage and financial vulnerability; hence, the institutional quality with respect to regulation and supervision mitigates financial risks associated with high income inequality (Park and Mercado, 2015). Few studies have included the quality of institutions as a probable factor in determining the relationship between finance and inequality (Rewilak, 2017; de Haan and Sturm, 2017).

Empirical research so far has mainly focused on the depth of the financial system with limited scrutiny given to its stability, access and efficiency in the context of African countries. There are mixed findings on the relationship of finance and income inequality and this study contributes to the literature on the relationship, which has remained an open empirical research objective. It is argued that finance has an inequality-reducing effect only to a certain point, after which deeper financial markets or more access are not beneficial to the underserved parts of the population (see Bittencourt *et al.*, 2019; Čihák and Sahay, 2020). Furthermore, deep financial markets do not necessarily mean improved access, efficiency and stability. Hence, this study includes these other financial dimensions in a finance-inequality nexus.

It is the objective of this paper to examine the relationship between income inequality and financial stability in developing countries. The question arising from the study is whether there is a relationship between income inequality and financial stability. The stability of the financial sector is crucial as it has social and economic ramifications. If active growth in the credit extended to the private sector results in the economy

“overheating”, this can have a negative effect on income inequality (Afanasyeva *et al.*, 2018). Instability in the banking sector can lead to banking crises and economic recession accompanied by job losses, increasing the level of inequality. Poor households have little headroom to absorb financial shocks. Thus, the instability of the financial system can increase inequality (Neaime and Gaysset, 2018).

This paper proposes to examine all these financial dimensions in one study for the purpose of providing an extensive analysis of the finance-inequality nexus using a sample of African countries. It examines whether these financial dimensions can reduce inequality within the selected countries in the sample. The results of the study suggest a positive relationship between financial stability and inequality. The stability of the sector contributes to more inequality. On the contrary, the depth of the financial sector is negatively related with inequality, suggesting that deep financial markets are associated with a reduction in income inequality.

The rest of the paper is organised as follows: Section 2 reviews the literature of the study. The methodology and data are presented in Section 3, whilst Section 4 presents the results and a discussion of the results. The study is concluded in Section 5.

## 2. Literature Review

There is no conclusive theoretical evidence on the relationship between inequality and finance. Financial development can expand the economic opportunities of disadvantaged groups and reduce the intergenerational persistence of relative incomes (Greenwood and Jovanovic, 1990). On the contrary, development in the financial sector can enhance the financial services for individuals with access to the financial services, who are frequently high-income individuals and well-established firms, amplifying inequality (Greenwood and Jovanovic, 1990; IMF, 2020). Greenwood and Jovanovic (1990) argued that the direct effect from improving the quality of financial services could fall disproportionately on the rich, broadening inequality and proliferating cross-dynasty variances in economic opportunity. Improving the quality of financial services for the rich might increase growth and benefit the poor through a positive income effect (IMF, 2020). Furthermore, improvements in the financial sector that boost demand for low-skilled workers tend to tighten the distribution of income, expanding and balancing economic opportunities (Beck *et al.*, 2007; Demirgüç-Kunt and Levine, 2009; Čihák and Sahay, 2020). There are differences in the theoretical channels and shape of the relationships between finance and inequality (see Greenwood and Jovanovic, 1990; Banerjee and Newman, 1993; Galor and Zeira, 1993). However, the theories have a common explanation that better credit availability allows more household choices and decisions to be based on better

allocation of spending over time, free from inherited wealth, thereby reducing income inequality (Demirgüç-Kunt and Levine, 2009; Beck, 2012). These theoretical foundations guide this study. Since there is no conclusive theoretical evidence in the relationship between finance and inequality, an empirical study can be an answer to this relationship. As inequality increases, it is associated with higher financial risks.

Changes in the financial system can influence both aggregate production and the allocation of credit. Each of these may alter the demand for low- and high-skilled workers with concomitant ramifications on the distribution of income (Townsend and Ueda, 2006). Higher inequality implies slower growth and greater financial instability in the financial sector (Ostry *et al.*, 2019). Piketty (2013) has cautioned that increasing inequality could lead to broad-based dissatisfaction and destabilise democratic principles. This is in support of the Sustainable Development Goal of reducing inequalities within and among countries. Čihák and Sahay (2020) argued that the depth of the financial sector reduces inequality only to a certain point, after which inequality begins to rise.

Deeper financial systems are associated with a surge in top incomes and financial sector rents (Čihák and Sahay, 2020). The depth of financial systems coupled with financial innovations necessitates the introduction of complex financial products and services, which are high-risk and usually available only to the well-off (Zhang and Naceur, 2019). Easy access to finance and use of payment services have greater benefits for those at the low end of the income distribution, reducing inequality (Magwedere *et al.*, 2021). De Haan and Sturm (2017) argued that all financial variables increase inequality; based on previous studies, however, the relationship remains inconclusive as in some cases it depends on the estimation method used and the financial variable of interest.

Financial sector development, innovations and policies are essential for reducing inequality (IMF, 2020). The effectiveness of financial access depends on the financial and economic viability of services provided by the financial sector, as well as productive and responsible use of those financial products and services by consumers (Čihák and Sahay, 2020). It is further argued that the pace of deepening of the financial sector matters for the effectiveness of the financial stability in reducing inequality (Sahay *et al.*, 2015). Most studies in empirical literature have focused on the size of the financial sector (depth) in determining the relationship between finance and inequality (Demirgüç-Kunt and Levine, 2009; Bittencourt *et al.*, 2019; Makhoul *et al.*, 2020).

Few have studied the relationship between inequality and finance and included the other financial aspects such as stability, efficiency and access (see Rewilak, 2017; Zhang and Naceur, 2019). The depth of the financial sector and access thereto are fundamentally different as countries with the same level of financial depth can have very different levels of financial stability, access and efficiency. Furthermore, the financial

dimensions *per se* might not be adequate in reducing inequality if low-income earners have access to financial products and services that are not supported by strong institutional quality (Singh and Huang, 2015; Magwedere *et al.*, 2021). The contribution of this study is the inclusion of other financial aspects such as access, efficiency and stability in determining the relationship between finance and inequality. Furthermore, the study contributes to the literature on the ongoing debate of the finance-inequality nexus. Furthermore, most of the studies on finance and inequality have not included the aspect of policies in examining the relationship between finance and inequality.

### 3. Data and Methodology

Panel data for 35 developing countries from 2004–2020 were used for the regression analysis. The study could not extend the time series of the data prior to the year 2004 as the data on the measurements of financial access were not yet available. Table 1 provides a summary of data sources and a description of the variables including the expected sign from the analysis. The study used only data from the banking sector to cover a large sample of developing countries. The Z-score was used as a measure of stability in the banking sector (see Čihák *et al.*, 2012).

The limitations of the Z-score are based on the methodology for calculating the formula. The methodology encompasses financial ratios which totally depend on individual banks' financial statements. Manipulations of financial statements are an ongoing accounting challenge; thus, the measure is only as good as the underlying accounting and auditing framework (World Bank, 2015). The Z-score considers individual financial institutions, potentially overlooking the impact of default risk of one financial institution on the whole financial system. Nevertheless, even if it is an individual measure of an individual institution, under contagion risk a failure in one institution can result in a failure of the whole financial system (see Schoenmaker, 1996; Huynh *et al.*, 2020). However, the Z-score has the advantage that it is usable for institutions where sophisticated market-based data are not easily available. Furthermore, the Z-score is a comparable measure for default risk for different institutions with different ownership and objectives facing insolvency (World Bank, 2015; Čihák *et al.*, 2012).

The data on stock market for most of the countries in the study were not readily available, so only data from the banking sector were used for the financial dimension measures. A synthetic institutional quality index was developed from law and order, democratic accountability and bureaucracy in governments using the principal component analysis (PCA)<sup>1</sup>. Table 1 provides a summary of the variables used in the study.

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1 Due to space consideration, the results of PCA are not presented but they are available upon request.

**Table 1: Measurement and summary of variables**

<b>Variables</b>	<b>Definition / measure</b>	<b>Source</b>	<b>Expected sign</b>
<b>Inequality (Gini index) (<i>ineq</i>)</b>	Measures income inequality or income distribution in a country, where 0 resembles perfectly equal society, while 100 percent mirrors a very unequal condition.	Standardized World Income Inequality Database (SWIID), 2019.	
<b>Financial depth (<i>Fin depth</i>)</b>	The size of the financial sector relative to the economy. The private sector credit to GDP was used as a measure of financial depth.	Global Financial Development. World Bank	Negative (–)
<b>Financial efficiency (<i>Int-spread</i>)</b>	The interest rate spread (higher value means higher inefficiency)	World Bank, Global Financial Development Database (henceforth GFDD)	Negative (–/+)
<b>Financial access (<i>Fin-access</i>)</b>	The degree to which individuals can and do use formal financial services (ATMs per 1000 and commercial banks per 1000)	International Monetary Fund (Financial Access Survey)	Negative (–)
<b>Financial stability (<i>Finst</i>)</b>	The banking system's distance to distress measured by the Z-score <sup>1</sup>	Bankscope, World Bank	Positive / Negative (+/–)
<b>Inflation (<i>inf</i>)</b>	General increase in the price level measured by the consumer prices index (annual percent) ( <i>inf</i> )	World Development Indicators (WDI)	Negative (–)
<b>Remittances received (<i>rem</i>)</b>	Remittance inflows to GDP (%) ( <i>rem</i> )	World Development Indicators	Negative (–)
<b>Institutional quality (<i>instQ_index</i>)</b>	Index developed using PCA from law and order, democratic accountability and bureaucracy in governments ( <i>instQ_index</i> )	International Country Risk Guide (ICRG)	Negative (–)

Source: XXX<sup>2</sup>

2  $z \equiv (k + \mu)/\sigma$ , where  $k$  is equity capital as percent of assets,  $\mu$  is return as percent of assets, and  $\sigma$  is standard deviation of return on assets as a proxy for return volatility (see Čihák *et al.*, 2012).



### 3.1 Methodology

The System GMM is used to determine the relationship between inequality and finance. Time series data have the problem of a unit root process; to determine the stationarity properties of the data, the unit root diagnostic test was performed and the results are presented in Table 2.<sup>3</sup> Our analysis employed a System Generalized Method of Moments (GMM) model using panel data for the research purpose. The GMM is the preferred method of estimation as estimating the model using the ordinary least square (OLS) carries substantial complications of endogeneity bias. Additionally, in both the fixed and random settings, the lagged dependent variable is correlated with the error term, even if the disturbances are not autocorrelated.

The problems of possible endogeneity bias due to interaction between the financial dimension variables, autocorrelation, individual specific heteroscedasticity and omitted variable bias are overcome by applying the System GMM estimator developed by Blundell and Bond (1998), which relies on using instrumental variables. The aim of the GMM estimator is to address potential endogeneity bias. The endogeneity bias may also result from reverse causality and measurement errors as a result of introducing the lagged dependent variable among the regressors (Blundell and Bond, 1998). Inequality in developing countries is persistent and can pose problems of autocorrelation and unobserved heterogeneity (see Wintoki *et al.*, 2012). Furthermore, the System GMM technique yields an asymptotically unbiased estimation of the *t*-statistics without requiring the heteroscedastic structure of the regression equation (Blundell and Bond, 1998; Hansen, 1982). The GMM estimation method addresses these problems and it is argued to be more efficient on short panels (see Arellano and Bond, 1991); thus, it is the preferred technique to determine the relationship between finance and inequality. The generic dynamic panel model that is estimated in this study is therefore parameterised as in Equation 1.

$$Y_{it} = \alpha Y_{i,t-1} + X'_{i,t-1}\beta + \mu_i + \varepsilon_{it}, \quad (1)$$

where  $Y_{it}$  represents inequality,  $X'_{i,t-1}$  represents a vector of inequality determinants including financial depth, financial access, financial efficiency, financial stability, inflation and remittances, and  $\mu_i$  are country fixed effects,  $\varepsilon$  is the error term,  $i$  and  $t$  indicate the country and time dimensions respectively. The baseline model estimated is therefore a Two-step System GMM:

$$\Delta ineq_{it} = (\alpha - 1)\Delta ineq_{i,t-1} + \beta_2 \Delta FS_{it} + \beta_j \Delta X_{j,it} + \Delta \varepsilon_{it}, \quad (2)$$

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3 The descriptive statistics and the correlation matrix are not reported due to space consideration but are available upon request.

where *ineq* is inequality,  $\alpha$ ,  $\beta$ , are parameters to be estimated and the vector  $X$  includes financial depth, financial access, financial efficiency, inflation, the institutional quality index and remittances. Inequality is persistence and therefore requires estimation using a dynamic model. The developed System GMM estimator, which solves the problems associated with the ordinary least squares, fixed and a random effect in Equation 2, is therefore used for examining the relationships.

The consistency of GMM estimators depends on whether lagged values of the explanatory variables are valid instruments in the inequality regression. Arellano and Bond (1991) and Arellano and Bover (1995) suggested two specification tests to address estimation of dynamic models. Firstly, the Sargan test of over-identifying restrictions, which tests the overall validity of the instruments by analysing the sample analogy of the moment conditions used in the estimation process (Sargan, 1958, Batuo *et al.*, 2018). Failure to reject the null hypothesis gives support to the model. A null hypothesis that the error term  $\varepsilon_{it}$  is not serially correlated is the second diagnostic test and the model specification is supported by not rejecting the null hypothesis.

In the System GMM specification, a test is made to determine whether the differenced error term (that is, the residual of the regression in differences) is second-order serially correlated. The differenced error term is expected to have first-order serial correlation AR(1) even if the original error term (in levels) is uncorrelated, unless the latter follows a random walk (Arellano and Bond, 1991; Batuo *et al.*, 2018). Second-order serial correlation AR(2) of the differenced residual dictates that the original error term is serially correlated and follows a moving average process at least of order one. This would reject the appropriateness of the proposed instruments (and would call for higher-order lags to be used as instruments). The System GMM model has been employed in recent financial development literature (see Bittencourt, 2019; Čihák and Sahay, 2020).

## 4. Results and Discussion

The study ascertained the stationary properties of the variables. The Levin, Lin and Chu (LLC) and Im, Pesaran and Shin (IPS) unit root tests were performed to test the stationarity of the time series. Table 2 presents the results of the unit root analysis. The Akaike Information Criterion (AIC) is used to select the optimal lag length.

**Table 2: Unit root tests**

Variable	No trend	Intercept and trend	Trend	Decision
<b>Panel Unit root test using the LLC</b>				
<i>ineq</i>	<b>−10.6663***</b>	<b>−9.70437***</b>	<b>−8.02836***</b>	<b>I(1)</b>
<i>Fin depth</i>	−13.8969***	−15.4596***	−14.6910***	I(1)
<i>Fin-access</i>	−5.19586***	−13.6585***	−14.3276***	I(1)
<i>Fin-eff</i>	−4.50351***	−255.717***	−248.125***	I(0)
<i>instQ_index</i>	−40236.8***	−19.3891***	−21.5881***	I(1)
<i>Finst</i>	−22.4538	−13.8315***	−17.0877***	I(1)
<i>inf</i>	−2.99425***	−11.1959***	−11.1559***	I(0)
<i>rem</i>	−21.3551***	−8.79870***	−9.02607***	I(1)
<b>Panel unit root tests using IPS</b>				
<i>ineq</i>	–	<b>−5.67646***</b>	<b>−5.21106***</b>	<b>I(1)</b>
<i>Fin depth</i>	–	−7.65393***	−9.89963***	I(1)
<i>Fin-access</i>	–	−2.33941***	−6.42348***	I(1)
<i>Fin-eff</i>	–	−43.0174***	−54.8416***	I(0)
<i>instQ_index</i>	–	−8.16012***	−10.3526***	I(1)
<i>Finst</i>	–	−6.19248***	−12.0075***	I(1)
<i>inf</i>	–	−5.57631***	−8.20833***	I(0)
<i>rem</i>	–	−10.3124***	−13.4532***	I(1)

Note: \*\*\*, \*\*, \* indicates that the null hypothesis of unit root tests is rejected at 1%, 5% and 10%, respectively. Inequality (*ineq*) is measured by the Gini index, *Fin depth* is the ratio of private credit to the gross domestic product measuring financial depth (*Fin depth*), *Fin-access* is the number of automated teller machines per 1,000 km<sup>2</sup>, *cb* is the number of commercial banks per 1,000 km<sup>2</sup> as financial access measures. *Fin-eff* is the interest rate spread measuring efficiency of the financial sector, *instQ\_index* is the index for the quality of institutions, *Finst* is the bank Z-score measuring financial instability, *inf* is the consumer price index, *rem* is remittance inflows.

Source: Authors' own calculations using Stata 15.1

The results displayed in Table 2 indicate that the variables under study are mostly of first-order integration except poverty gap, interest rate spread and inflation, which are stationary at levels.

Table 3 is a summary of the results of the determinants of inequality using the System Generalised Method of Moments.

**Table 3: Summary of results of determinants of inequality: dependent variable inequality**

Regressors	System GMM	Standard error
<b>L.INE</b>	1.026*** (97.91)	0.01286
<b>First</b>	0.00591* (1.93)	0.00306
<b>Fin depth</b>	−0.00256* (−1.81)	0.001414
<b>Fin-access</b>	0.000634 (0.31)	0.002045
<b>Fin-eff</b>	−0.00303 (−1.07)	0.002832
<b>instQ_index</b>	−0.0453* (−1.87)	0.024225
<b>inf</b>	0.00206 (0.93)	0.002215
<b>rem</b>	0.0111* (1.86)	0.005968
<b>_cons</b>	−1.207** (−2.59)	0.466023
<b>N</b>	353	
<b>F-test p-value</b>	0.0000	
<b>Hansen J test p-value</b>	0.632	

Note: t-statistics in parentheses;  $p < 0.10$ ,  $**p < 0.05$ ,  $***p < 0.01$ . Each column represents a different regression technique. Country fixed effect, AR(1) and AR(2) results are available but not reported. The *F*-test tests the null hypothesis that all the coefficients, except the constant, are jointly equal to zero. The Hansen J test of overidentifying restrictions tests the null hypothesis that the instruments are valid.

Source: Authors' own calculations using Stata 15.1

The preferred method for the regression analysis was the System GMM. Since the validity of the instruments is crucial for the reliability of the econometric model,

the diagnostics on the validity of the instruments were confirmed by the Sargan and Hansen statistics (Sargan, 1958; Hansen, 1982)<sup>4</sup>. The validity of the instruments could not be rejected using the Hansen statistics. This is vital as the Hansen result confirms that no type II error emanates from pooling valid and invalid instruments. The estimates of the model are consistent as confirmed by the results of first-order AR(1) and second-order AR(2) serial correlation tests, which were performed using the Arellano and Bond (1991)<sup>5</sup>.

The AR(2) assumes that the explanatory variables are not “post-determined”, implying that the independent variables are not correlated with future errors following Roodman (2012). The results show a positive relationship between financial stability and income inequality. The coefficient of financial stability (*Finst*) is positive (0.00591) and statistically significant with a robust Hansen test of the overidentifying restrictions (0.632). An increase in stability of the financial sector increases inequality by 0.00591 percentage points. The finding is consistent with de Haan and Sturm (2017), who found a significant positive relationship between financial stability and income inequality. Periods of high financial instability are associated with hyperinflation; there is low confidence in the financial system and banks are reluctant to finance profitable projects (World Bank, 2015). Thus, a high Z-score (*Finst*) is associated with increased risks for banking increasing inequality as banks are reluctant to extend credit that can be beneficial in reducing the inequality.

When considering the financial dimension of depth, there is a negative and significant relationship between financial depth and inequality. Financial depth increases with a decrease in inequality. A unit increase in financial depth reduces inequality by 0.00256 percentage points *ceteris paribus*. The results fail to reject the theoretical consideration of a negative relationship between financial depth and inequality. Banerjee and Newman (1993) argued that the optimality of household choices depends on the availability of credit, whilst Galor and Zeira (1993) opined that investment in human capital is contingent to the availability of credit. As the credit is made available to low-income earners, they are able to smooth their consumption and invest in human capital. A finding of an inequality effect of financial depth is in line with the findings of Beck *et al.* (2007). This is in contrast with Dabla-Norris *et al.* (2015), who found a positive relationship between finance and inequality in developing economies.

The prior expectations were for a negative and significant relationship between financial access and inequality. However, the results reported an insignificant positive relationship. This finding may be due to the nature of the sample of developing countries,

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4 Only the results for the *p*-value of the Hansen J test are reported in Table 3.

5 Results are not included due to space consideration but are available upon request.

where there is lack of access and most of the poor and the small businesses mainly use the informal sector. Other factors such as institutional quality, which is not very strong in developing countries, can be a constraint on the outreach of banks to the poor (Yoshino and Morgan, 2018). In microfinance experience, the World Bank (2014 : 3) found mixed results for the role of financial access in inequality. The general consensus was that overextension of credit at a higher interest rate increases inequality irrespective of the poor having access to these services (World Bank, 2014). If there is an increase in access to finance and the access is tilted more to larger enterprises and the rich, the increase in access cannot be beneficial to the poor (World Bank, 2014).

Even if there is improved financial access in developing countries, most of the financial products and services follow a top-down approach where services are available but the poor cannot access them because they do not meet their needs (Magwedere *et al.*, 2020). Individuals' behavioural responses can become an aspect of the relationship between increased access and inequality (Stiglitz, 2017). Furthermore, when the concentration or market power of banks is brought in the mix, the role of financial access and inequality can be complex. Stiglitz (2017) argued that where there is monopoly power, the marginal return on investment is lower than the average return, market power is associated with inefficiency and distortion in the allocation of resources (Atkinson, 2015). In most developing countries, the structure of the formal banking sector is oligopolistic, where banks can still have higher profit margins with limited breadth of their services. Furthermore, policy frameworks affect the relationship between finance and inequality. As measured by institutional quality, improvements in the quality of institutions reduce inequality by 0.0453. Market power cannot be the only driver of higher inequalities; irrespective of increased access to finance, if the financial products are too expensive or there exist other barriers to financial access, the increased financial access will be of little value to the unbanked.

The nature of market power affects the distribution of the financial resources such that, in the absence of strong prudential regulations, market power can worsen inequalities (Claessens and Perotti, 2007; Stiglitz, 2019). Thus, the relationship between financial access and income inequality in economies where banks have higher concentration can be positive (Stiglitz, 2017). With access measured by bank branch expansion, inequality has a significant positive relationship with access to finance. The significant difference between the two measures of access was that as access is measured by commercial banks, inequality became positively significant at 10 percent for the access measure. In the developing countries' context, banks exert significant monopoly power, access to financial services is not very competitive and lack of infrastructure centralises the availability of banking services (Tchamyau *et al.*, 2019). Furthermore, an account in a commercial bank which has

fixed costs leads to an increase in inequality. Findings confirm theoretical underpinnings of Greenwood and Jovanovic (1990) that access to finance can initially increase inequality. This is because the financial services will only be affordable to certain population groups, widening inequality gaps (Beck *et al.*, 2007a; Zhang and Naceur, 2019). For the sample of this study, commercial bank branches are mostly available in urban settings, not in rural areas; thus, the positive relationship between inequality and financial access as measured by the number of bank branches is justifiable.

It is imperative that the financial sector is able to deliver financial services efficiently and it is normally expected that efficiency of the financial sector is negatively related to inequality. The results of this study show an insignificant negative relationship between financial efficiency and inequality. An increase in financial sector efficiency reduces income inequality as financial products and services are available cost effectively (Calice and Zhou, 2018). The study found a negative and statistically insignificant relationship between bank efficiency and inequality, which is consistent with the findings of Rewilak (2017).

Beside the financial dimension, the study included quality of institutions in the analysis. The relationship between institutional quality and inequality is negative and significant, as expected. A percentage point increase in the quality of institutions tends to reduce inequality as measured by the Gini index, and quality institutions tend to reduce the income gap by 0.0453 percentage points. Institutional quality reduces inequality in that if the economy has a favourable legal and policy environment with the capacity to cost-efficiently address market failures through sustainable and well-designed interventions, inequality is reduced (Čihák and Sahay, 2020).

Literature does not show a clear-cut effect of inflation on inequality as it can either be positive or negative (Blank and Blinder, 1985; Yoshino and Morgan, 2018). Inflation creates inequality traps for low-income earners as higher-income earners can offset inflation by higher incomes, widening the disparities in wealth through the inflation disparity phenomenon (see Neaime and Gaysset, 2018; Yoshino and Morgan, 2018). Methodological differences and different study samples can possibly explain the difference in findings on the relationship between inflation and inequality between this study and previous studies (see Rewilak, 2017; Zhang and Naceur, 2019). However, not having a clear-cut relationship between the financial sector and inflation is consistent with a study by Čihák and Sahay (2020).

Remittances are thought to reduce inequality since they are directly received by the poor households (Adams and Page, 2005; Ratha, 2019). The results show a positive and significant relationship between remittances and inequality. A ten percent increase in remittances increases the inequality by 0.0111 percentage point. The finding contradicts those of Inoue (2018) and Kóczán and Loyola (2021), who found that remittances have

a significant inequality-reducing effect. According to Ratha (2019), remittances in Africa are a major source of external finance providing more stable finance than official development assistance and foreign direct investments. The international remittances are thought to reduce inequality only when the migration is safe and orderly (UN, 2020). Only these households can have their saving, consumption and investments improved using remittances received, widening the inequality gap with households that do not receive remittances.

## 5. Conclusion

This paper examined the impact of financial stability on income inequality and included the other financial dimensions of depth, access and efficiency in the analysis. Using a panel of developing countries, the results showed that inequality increases with increase in financial sector instability. Policy makers in developing countries should carefully consider the underlying causes of inequality in their respective countries. It is detrimental to promote policies aimed at reducing inequality without altering the inequality-generating factors – in this case, the use of the financial sector to address inequality in economic opportunities. If the efficiency of the financial sector improves the quality of financial products and services already enjoyed by people who have purchased the services without broadening access to the financial services and products, it tends to increase inequality (Greenwood and Jovanovic, 1990). This is affirmed by the results of this study that there ought to be consideration of all aspects of finance as a remedy to socio-economic issues. The previous global financial crises, which originated from the advanced economies, ought to be a benchmark of the importance of all aspects of finance as not only the depth of the financial sector matters. It is recommended that further studies be undertaken on the interaction of these financial dimensions in reducing inequality. As inequality in most developing economies is persistent irrespective of improvements in the depth of the financial markets, further studies on the channels through which changes in financial sector policies can increase economic opportunities for low-income groups in developing countries are necessary.

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