Re-investigation of Financial Development on Income Inequality: An Empirical Analysis for G-20 Emerging Economies

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Abstract*:* This research examines effects of financial development, economic growth, government expenditures, urbanization, and trade openness on income inequality in the leading emerging economies of the G-20 (Argentina, Brazil, China, India, Indonesia, Mexico, Russia, and Turkiye) for the period from 1989 to 2021. The findings confirm the existence of a cointegration nexus among the variables over the long-term. According to the common correlated effects mean group estimator, financial development has negative effects on income inequality in the panel. Factors such as government expenditures and trade openness demonstrate positive effects on income inequality. In the country-specific effects, we find that the impact of financial development on income inequality is negative and statistically significant in Argentina, India, and Russia. The influence of economic growth on income inequality is positive and significant in Indonesia, Mexico, and Turkiye. Government expenditures on income inequality appear to be positive in Argentina, Indonesia, and Mexico. Finally, trade openness demonstrates a positive and significant effect in India, Indonesia, Mexico, and Turkiye. Among the reasons for the differences in test results across countries are variations in their political structures, particularly the high inflation and macroeconomic instability in Turkey, the presence of the informal economy and corruption in Brazil, Indonesia, Turkey, and China, as well as regional inequalities. In this context, based on the overall panel test results, it is recommended that policymakers increase financial inclusion, reduce regional disparities, reduce corruption, increase social assistance, and balanced trade policy to enhance the impact of financial development on income distribution.

Keywords: : financial development; income inequality; economic growth; emerging countries.

JEL classification: F41; G20; O15; O16.

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1. INTRODUCTION

Income inequality (IE) remains a pressing concern for policymakers and researchers worldwide, particularly in emerging economies where rapid economic growth (GDP) often coincides with widening income disparities. Understanding the multifaceted relationship between financial development (FD) and IE is crucial for formulating effective policies to promote inclusive growth. FD, encompassing the expansion and deepening of financial markets and institutions, is traditionally considered a catalyst for GDP. However, its impact on IE is more complex and nuanced, varying significantly across different contexts and stages of GDP.

In recent years, FD has emerged as a critical determinant of economic outcomes for the G-20 group of leading emerging economies, including Argentina, Brazil, China, India, Indonesia, Mexico, Russia, and Turkiye. These nations have witnessed substantial transformations in their financial sectors, characterized by increased access to financial services, greater market depth, and enhanced financial infrastructure. Despite these advancements, the benefits of FD have not been uniformly distributed, raising concerns about its potential to exacerbate IE.

The widely accepted view in the relevant literature is that FD positively influences GDP through various channels. This perspective was first explored in studies conducted by Bagehot (1873) and Schumpeter (1934) and has since been the subject of increased research. Schumpeter (1934) posited that financial intermediaries performing their functions effectively provide funds for technological development, thereby contributing to GDP through efficient investments. Levine (2005), on the other hand, argued that FD promotes GDP through multiple channels. The first of these channels is the facilitation of the exchange of goods and services through the distribution of payment systems in a developed financial system. The second is to ensure efficient utilization of savings via the financial system. The third is to supervise investments and implement corporate governance. Additionally, FD minimizes intertemporal risk and enhances liquidity. Through these channels, a well-developed financial system facilitates the productive allocation of resources, which in turn supports economic progress. Developing countries, which typically have low savings rates and require financial resources for investment, particularly benefit from an effective financial system.

On the contrary, economic globalization and the progression of information and communication technologies since the 1990s have significantly contributed to the growth of financial markets in developing countries. The financial system's development allows investors in these countries with limited savings to access resources to finance their productive projects. Consequently, these countries can experience sustained growth through increased investments, and it is believed that a fair distribution of income can be achieved with an increase in per capita income. Hence, this study aims to investigate the influence of FD on IE for the emerging G-20 countries using panel data analysis during the period 1989 to 2021. Certainly, one of the most significant features of the emerging G-20 countries is their high growth rates. However, these countries often lack sufficient domestic savings to complete their economic development processes, which necessitates the need for a well-developed financial system that can efficiently allocate resources to investors. Additionally, it is important to note that despite their high growth rates, these countries do not always have a fair distribution of income. Therefore, it is essential to examine the impact of FD on IE in emerging G-20 countries. The study's analysis includes the emerging G-20 countries

identified by the International Monetary Fund's (IMF) country classification, which includes Argentina, Brazil, China, India, Indonesia, Mexico, Russia, and Turkiye. However, data for the examination period concerning Saudi Arabia and South Africa, which are among the emerging G-20 countries, could not be obtained from the relevant statistical institutions. For this reason, Saudi Arabia and South Africa could not be included in the analysis of the study, and this situation highlights the limitations of the study.

A comprehensive review of existing literature indicates that despite numerous studies exploring the influence of FD on income distribution in developed and developing countries using diverse analytical techniques and time frames, a consensus has yet to be reached on this topic. Thus, it is essential to continue investigating the nexus between FD and income distribution, particularly in developing countries where income distribution is markedly unequal. Furthermore, it is noteworthy that no studies have been identified in the literature specifically examining the effect of FD on income distribution in emerging G-20 countries. To address this gap in the literature, this study examines the nexus between FD and IE in emerging G-20 countries. In line with this objective, variables that affect income distribution, such as economic growth, government expenditures, trade openness, and urbanization rate, have been included in the analysis as control variables. Within this framework, the main questions of the study are as follows:

- Does financial development in emerging G-20 countries increase, decrease, or first increase and then decrease income inequality?
- Does economic growth in emerging G-20 countries reduce income inequality?
- Do government expenditures in emerging G-20 countries improve income inequality?
- Does trade openness in emerging G-20 countries have an increasing or decreasing effect on income inequality?
- Does urbanization in emerging G-20 countries reduce income inequality?

Furthermore, the current study employs advanced econometric techniques such as the Westerlund (2008) cointegration test and the common correlated effects mean group (CCEMG) estimator to provide robust empirical evidence of the long-run nexus among the variables. The results of this research reveal heterogeneity in the effects of FD across various countries, emphasizing the importance of tailored policy interventions. This study not only advances academic understanding but also offers practical insights for policymakers aiming to promote inclusive GDP and reduce IE in emerging economies. These aspects of the research demonstrate its originality and contribute to the relevant literature.

The organization of this study's sections is as follows: Section 2 provides a literature review, Section 3 outlines the data set and methodology, Section 4 presents the empirical findings, and Section 5 gives conclusions and policy recommendations.

2. THEORETICAL STUDIES IN THE LITERATURE AND EMPIRICAL STUDIES IN THE LITERATURE

The relevant literature has mainly examined the impact of financial market development on economic growth. The first studies to examine the relationship between these variables were carried out by Bagehot (1873) and Schumpeter (1934). Bagehot (1873) argued that the financial sector played a crucial role in British economic growth by financing the capital necessary for economic development. Schumpeter (1934), on the other

hand, argued that if financial intermediaries performed their functions effectively, they would support investors by providing funds for technological development, thereby contributing positively to economic growth through efficiently utilised investment.

Since the 1990s, the idea that FD has significant effects on both gross domestic product GDP and income inequality IE has gained prominence in the academic literature. Three main hypotheses have been proposed to explain the relationship between FD and IE. The first hypothesis is the Financial Kuznets Curve (FKC) introduced by Greenwood and Jovanovic (1990). The theoretical basis of the Financial Kuznets Curve is derived from Kuznets (1955) inverted-U hypothesis, which examines the relationship between economic development and income inequality. According to this hypothesis, income inequality increases in the early stages of rising per capita income, but once per capita income reaches a certain threshold, further economic growth leads to a reduction in income inequality. In line with the Financial Kuznets Curve approach, FD initially exacerbates IE but later helps to reduce it. In other words, during the early phases of economic development, financial markets are nonexistent. As GDP progresses, financial markets emerge gradually. At this juncture, high-income individuals gain access to financial instruments, thereby widening the income disparity between high- and low-income individuals. However, as economic development proceeds and financial markets continue to evolve, low-income individuals also gain access to financial instruments, ultimately reducing IE. Ultimately, in the final stage of economic development, IE diminishes, and income distribution becomes more equitable among individuals (Greenwood & Jovanovic, 1990, p. 4).

The second hypothesis that addresses the nexus between FD and IE is the inequality-narrowing hypothesis, which was proposed by Galor and Zeira (1993) and Banerjee and Newman (1993). This hypothesis posits that FD has a diminishing effect on IE. The premise of this hypothesis is founded on a theoretical growth model that emphasizes the role of human capital investment, as outlined by Galor and Zeira (1993). The following growth model suggests that economies experiencing high-IE and underdeveloped financial markets exhibit lower growth rates compared to those with more equitable income distribution and well-developed financial markets. In these economies, the low growth rates exacerbate the problem of IE. Consequently, the increase in FD has a positive impact on GDP by stimulating capitalization. As a result, in a growing economy, IE tends to decrease. Moreover, with increased financial development, low-income individuals can more easily access the financial resources necessary to meet their basic needs and invest in their education. These efforts aimed at improving human capital can help to reduce IE (Canavire-Bacarreza & Rioja, 2008, p. 8).

The third hypothesis, proposed by Rajan and Zingales (2003), posits the inequality-widening hypothesis. This hypothesis postulates a positive and linear nexus between FD and IE. The hypothesis suggests that in economies where financial institutions are underdeveloped, high-income individuals enjoy a significant advantage in accessing credit relative to low-income individuals. This is because high-income individuals can utilize their assets as collateral to mitigate the risk of default when borrowing from financial intermediaries. With the expansion of financial markets, the likelihood of the low-income segment obtaining resources from the financial system remains exceedingly low. Consequently, as high-income individuals have an easier time accessing financial resources than low-income individuals, IE is expected to persist and widen (Clarke *et al.*, 2006, p. 580).

In addition to studies examining the impact of financial development on income inequality in the theoretical literature, the empirical analysis of the relationship between

these variables has attracted the attention of researchers. In this context, since the 2000s there has been an increase in the number of studies that empirically examine the relationship between these variables in the context of the GJ hypothesis, the inequality-reducing hypothesis and the inequality-increasing hypothesis.

The empirical studies that reach results supporting the GJ hypothesis are summarized as follows. Shahbaz et al. (2015) used the autoregressive distributed lag (ARDL) method with data for Iran for the period 1965-2011. The authors also concluded that economic growth worsens income inequality, while inflation and globalisation improve it. Zhang and Chen (2015) applied structural vector autoregression (SVAR) analysis for Iran with data for the period 1978-2013. Park and Shin (2017) used panel data method for OECD countries with data for the period 1960-2011. Meniago and Asongu (2018) used generalised method of moments (GMM) as the analytical method for 48 African countries with data for the period 1996-2014. Younsi and Bechtini (2018) applied Pedroni panel cointegration, Kao residual panel cointegration test, pooled ordinary least square (POLS) and GMM methods for BRICS countries (Brazil, Russia, India, China and South Africa) with data for the period 1995-2015. Cong Nguyen et al. (2019) used dynamic ordinary least squares (DOLS) and fully modified ordinary least squares (FMOLS) methods for 21 emerging economies with data for the period 1961-2017. Bittencourt et al. (2019) applied the fixed effects estimation method for the 50 states of the United States of America (US) with data from 1976-2011. They categorised states into two groups based on whether they had below-average or above-average IE. Their results indicated that the GJ hypothesis is only valid for states with below-average IE. Chakroun (2020) used the instrumental variable threshold regression method with cross-sectional data for 60 developed and developing countries between 1980 and 2019. Destek et al. (2020) developed four financial development indices for Turkiye using principal component analysis (PCA) with data for the period 1995-2015 and used the ARDL method. The authors also find that real income and government expenditures reduce income inequality. However, they also find that inflation increases income inequality in the short run and decreases it in the long run. In their study, Khanday and Tarique (2023) applied the nonlinear autoregressive distributed lag (NARDL) method and the Hatemi-j-asymmetric causality test analysis method with data for India for the years 1980-2019.

Among the empirical studies that support the inequality-narrowing hypothesis, Shahbaz and Islam (2011) used the ARDL method for Pakistan for the period 1971-2005. Moreover, contrary to the theoretical expectation, the authors find that economic growth further increases income inequality and income distribution worsens due to trade openness. Baiardi and Morana (2016) used the GMM method for 19-euro area (EA) countries with data for the period 1985-2013. Moreover, the test results show that financial development promotes economic growth. Bumann and Lensink (2016) applied the GMM method for 106 countries with data for the period 1978-2008. They found that financial liberalization improves income inequality in countries with high financial depth. Ahmed and Masih (2017) used ARDL, Granger causality test and variance decomposition (VDC) method with data covering the period 1970-2007 for Malaysia. In addition, the authors find that trade openness also reduces income inequality. Baiardi and Morana (2018) applied panel regressions for both linear and log-log specifications for 19 EA countries between 1985 and 2013. The results of the analysis show that financial development both positively affects economic growth and reduces income inequality. Jung and Vijverberg (2019) used spatial dependence modeling technique with provincial data of China for the years 1998-2014.

Thornton and Di Tommaso (2020) conducted their study with heterogeneous panel cointegration techniques for 119 countries between 1980-2015. Alshubiri (2021), who conducted his studies with data for 32 Organization Economic Cooperation and Development (OECD) and ASIAN countries for the years 2002-2018, used pooled ordinary least squares (OLS), the pooled OLS group and GMM estimator methods.

The empirical studies that reach results supporting the inequality-widening hypothesis are summarized as follows. Sehrawat and Giri (2015) used the ARDL method for the period 1982-2012 with data from India. In addition, the authors find that economic growth and inflation increase income inequality in both the short and long run, while trade openness decreases it. Jauch and Watzka (2016) applied the fixed effects static and dynamic GMM estimations method with a data set covering 138 developed and developing countries between 1960-2008. Nandelenga and Oduor (2020) used the Nonlinear Autoregressive Distributed Lag (NARDL) method with the data of 20 sub-Sahara African countries between 1980-2018. The authors find that a negative financial inclusion shock and a positive financial inclusion shock increase income inequality in sub-Sahara African countries. However, the results show that trade openness, GDP per capita and human capital reduce income inequality.

Some of the important studies in the empirical literature are shown in Table no. 1.

Table no. 1 − Summary on Literature Review on Emprical Analysis

Author(s)	Data period	Country (ies)	Type of data sources	Methodology	Results
Law and Tan (2009)	1980-2000	Malaysia	Country level	ARDL	The impact of FD on reducing IE is weak and statistically insignificant.
Shahbaz *et al.* (2015)	1965-2011	Iran	Country level	ARDL	The GJ hypothesis is valid.
Zhang and Chen (2015)	1978-2013	Iran	Country level	SVAR	The GJ hypothesis is valid.
Baiardi and Morana (2016)	1985-2013	19 EA countries	Country level	GMM method	Inequality-narrowing hypothesis is valid
Seven and Coskun (2016)	1987-2011	45 developing countries	Country level	Dynamic panel data	FD does not improve IE.
Park and Shin (2017) used panel data method for	1960-2011.	OECD countries	Country level	Panel data method	The GJ hypothesis is valid.
Baiardi and Morana (2018)	1985-2013	19 EA countries	Country level	Panel regressions for both linear and log-log specification	The inequality-narrowing hypothesis is valid
Bittencourt *et al.* (2019)	1976-2011	U.S.	States level	Fixed effects estimation method	GJ hypothesis is only valid for states with below-average IE
Nandelenga and Oduor (2020)	1980-2018	20 sub-Sahara African countries	Country level	NARDL	The inequality-widening hypothesis is valid
Thornton and Di Tommaso (2020)	1980-2015	119 countries	Country level	Heterogeneous panel cointegration techniques	The inequality-narrowing hypothesis is valid.

Author(s)	Data period	Country (ies)	Type of data sources	Methodology	Results
Alshubiri (2021)	2002-2018	32 OECD and ASIAN countries	Country level	The pooled OLS group and GMM estimator	The inequality-narrowing hypothesis is valid.

Note: The abbreviations are as follows: ARDL; autoregressive distributed lag, EA; euro area, FD; financial development, GMM; Generalized Method of Moments, IE; income inequality, NARDL; Nonlinear Autoregressive Distributed Lag, OLS; ordinary least squares, SVAR; structural vector autoregression

Some of the studies in the literature have concluded that both the inequality-narrowing hypothesis and the inequality-widening hypothesis are valid for different countries. Among these studies, Chiu and Lee (2019) analyzed the impact of both financial development and country risks on income inequality when country risks change for 59 countries for the period 1985-2015 using the panel smooth transition regression model. The results of the analysis show that the inequality-widening hypothesis holds under unstable economic, stable financial and policy conditions for the entire sample. When the authors divided the sample into high-income countries and low-income countries, they found that the inequality-narrowing hypothesis is valid in high-income countries, while the inequality-widening hypothesis is valid in low-income countries. Koçak and Uzay (2019) investigated the linear and nonlinear effects of financial development on income inequality for Turkiye by using DOLS and FMOLS methods with data for the years 1980-2013. They found that the inequality-widening hypothesis is valid in the estimation results of the linear relationship and the GJ hypothesis is valid in the estimation results of the non-linear relationship for Turkiye.

Bolarinwa *et al.* (2021) examined financial development and income inequality with the financial development indicator developed by using four financial development measures consisting of financial deepening/efficiency, stability/access with PCA analysis method for 40 African countries with data between 1995-2015. The results of the System Generalized Method of Moments (SGMM) tests indicated that the inequality-narrowing hypothesis is valid for high and middle-low-income African countries. However, the authors found that financial development does not affect income distribution inequality for low-income African countries. Bolarinwa and Akinlo (2021) used the dynamic panel threshold model method with data for the period 1999-2015 for 40 African countries. The authors concluded that the inequality-widening hypothesis is valid for high-income African countries, while the inequality-narrowing hypothesis holds true for low- and middle-income African countries.

Kavya and Shijin (2020) analyzed the validity of the GJ hypothesis using the dynamic panel GMM estimation model with data from 85 high-, middle-, and low-income countries for the period 1984-2014. The authors did not find sufficient evidence in their test results to suggest that financial and economic development significantly reduces income inequality.

In the empirical literature, there are many studies investigating the impact of financial development on income distribution for different countries/countries in different periods and with different analysis methods. However, the results of these studies have shown that different hypotheses are valid for the country/country groups they examined. This shows that there is no consensus in the empirical literature in line with the theoretical literature. In other words, this situation indicates that there is a gap in the empirical literature in line with the theoretical literature. Therefore, it is important to reinvestigate the effect of financial development on income inequality, especially in developing countries, in line with the

theoretical literature. Moreover, it has been observed that there is no study in the empirical literature that analyzes the theoretical theories for developing G-20 countries. Therefore, in this study, the effect of financial development on income inequality is analyzed by panel data method for developing G-20 countries in line with the theoretical literature. Therefore, this study attempts to fill the gap between the theoretical literature and the empirical literature.

3. DATA AND METHODOLOGY

3.1 Data and Empirical Model

The study uses annual panel data for the emerging leading countries in G-20 (Argentina, Brazil, China, India, Indonesia, Mexico, Russia, Turkiye) during the period 1989 to 2021. Since data for Russia is available starting from 1989, the study period has been initiated from that year. Data for the examination period concerning Saudi Arabia and South Africa, which are among the emerging G-20 countries, could not be obtained from the relevant statistical institutions. Therefore, Saudi Arabia and South Africa could not be included in the analysis.

The multivariate models used in the studies conducted by Shahbaz and Islam (2011), Shahbaz *et al.* (2015), Jauch and Watzka (2016), Cong Nguyen *et al.* (2019), Koçak and Uzay (2019), Destek *et al.* (2020), Kavya and Shijin (2020), Alshubiri (2021), Bolarinwa and Akinlo (2021), and Khanday and Tarique (2023) have served as a reference for analyzing the nexus among the variables. Thus, our model can be shown as:

$$lIE_{it} = \beta_0 + \beta_1 FD_{it} + \beta_2 lGDP_{it} + \beta_3 lGOV_{it} + \beta_4 URB_{it} + \beta_5 lTO_{it} + \varepsilon_{it} \qquad (1)$$

where i, t, and l symbolize cross-sections, and the time and natural logarithm; ε indicates the normally distributed error term.

Upon examining the empirical literature, it is clear that the Gini coefficient is commonly utilized to approximate IE (Bolarinwa & Akinlo, 2021). As a result, the Gini coefficient is adopted as the variable for IE in this research.

On the other hand, GOV has an impact on IE. Specifically, transfer expenditures and social assistance provided by the public sector to meet the basic needs of low-income groups, such as education, healthcare, and housing, help reduce IE. Furthermore, by increasing total demand in the economy through the procurement of goods and services, public expenditures can positively impact employment and growth, thereby contributing to the reduction of IE. Similarly, TO also plays a significant role in IE. According to the income distribution theory developed by Stolper and Samuelson (1941), TO increases the demand for low-skilled labour in developing countries, resulting in higher wages for this group and thereby reducing IE. However, in developed countries, the increase in international trade raises the demand for skilled labour while decreasing the demand for unskilled labour. This situation leads to an increase in IE (Stockhammer, 2017). Additionally, URB also has effects on IE, which can either increase or decrease it. URB can increase employment opportunities, enabling low-income groups to earn additional income. Thus, URB can effectively reduce IE.

Taking into account the impact of GDP, GOV, TO, and URB on IE, as well as the models utilized in literature, these factors have been integrated as control variables into the model to improve its explanatory power. The use of variables in natural logarithmic form is a commonly applied method in econometrics, and there are several reasons for this. Linearizing relationships and interpreting the coefficients as elasticities in models where both the dependent and independent variables are logged are two of the main reasons for this. Therefore, all variables are transformed into their natural logarithmic forms.

The data used in the model and their sources are detailed in Table no. 2.

Table no. 2 – Variables and Data Sources

Variables	Symbol	Definition	Source
Gini Coefficient	IE	Gini coefficient	Standardized World Income Inequality Database (SWIID, 9.6) (Solt, 2019)
Financial Development Index	FD	Financial Development Index	International Monetary Fund (IMF)
Economic growth	GDP	GDP per capita is GDP divided by midyear population	World Bank, Indicators
Government expenditures	GOV	General government final consumption expenditure to GDP	World Bank, Indicators
Urbanization	URB	Urban population to total population	World Bank, Indicators
Trade openness	TO	The total of exports and imports of goods and services to GDP	World Bank, Indicators

3.2 Empirical Methodology

In the study, the CD test developed by Pesaran (2004) was first conducted to test for possible cross-sectional dependence (CSD) among the series. Subsequently, to determine whether the dataset is homogeneous, the Swamy approach by Pesaran and Yamagata (2008) was used. If panel time-series data is not homogeneous and cross-sectionally independent, conventional panel unit root tests yield inconsistent and unreliable results. After identifying CSD and slope heterogeneity, we opted to use the cross-sectionally augmented panel unit root test (CIPS) to explore the stationary levels of the variables. The presence of a cointegrating relationship among the variables was assessed using the Westerlund (2008) cointegration test. Long-term cointegration coefficients were obtained using the common correlated effects mean group (CCEMG) estimator, which provides consistent results even in the presence of CSD.

3.2.1 Testing Cross-Sectional Dependence

Managing CSD is essential when dealing with panel data. Ignoring this dependency can result in serious consequences, such as significant inaccuracies in unit root tests. Cross-correlated errors can emerge from a variety of sources, including spatial effects, overlooked common influences, or interactions within socioeconomic networks (Sencer Atasoy, 2017). We assess CSD using the CD test developed by Pesaran (2004). The CD test assesses the presence of cross-sectional dependence among units. It remains robust in cases of weak cross-sectional dependence and can effectively manage data with non-normally distributed random errors (Pesaran, 2004).

The slope homogeneity test developed by Pesaran and Yamagata (2008) assesses whether the influence of the explanatory variable varies across different cross-sections. This test retains its validity even in the presence of CSD. As outlined by Sencer Atasoy (2017), the Pesaran and Yamagata slope homogeneity test, remains robust under such conditions.

3.2.2 Panel Unit Root Test

Banerjee *et al.* (2004) highlighted the inadequacy of first-generation unit root tests for evaluating cross-sectional properties. Consequently, second-generation unit root tests have been developed to overcome this shortcoming. After identifying cross-sectional dependency and slope heterogeneity, we opted to use the CIPS, which accommodates parameter heterogeneity and serial correlation among cross-sections when analyzing the stationarity of variables. Pesaran (2007) introduced the CIPS test as a novel method for assessing stationarity. These second-generation panel unit root tests have become increasingly popular in empirical research, playing a vital role in examining stationary properties across various contexts.

3.2.3 Panel Cointegration and Causality Test

In addressing cross-sectional dependency (CSD), researchers frequently turn to the Durbin-Hausman panel cointegration test, which provides a valuable method without requiring prior knowledge of the variables' order of integration (Westerlund, 2008). The fact that this test specifically addresses the issue of CSD makes it an important choice in our study. The Durbin-Hausman test comprises two separate assessments: the Durbin-Hausman Panel (DH_p) test and the Durbin-Hausman Group (DH_g) test. The DH_p statistic operates based on the assumption of slope homogeneity, while the DH_g statistic operates under the assumption of slope heterogeneity. When the calculated test statistics surpass the critical value, it indicates rejecting the null hypothesis of "no cointegration." This way, it provides an appropriate methodology for testing cointegration among variables while addressing cross-sectional dependence. Once cointegration is established among the variables, we turn to the CCEMG estimator to investigate the long-term effects of the independent variables. Pesaran (2006) presents two distinct estimators for panel data analysis. The first one is the CCEMG estimator, which considers parameter heterogeneity across individual entities. The second estimator is the common correlated effects pooled (CCEP), assuming parameter homogeneity across all entities in the panel.

Considering cross-sectional dependence and heterogeneous slopes is crucial for the econometric model to make accurate predictions. Given the presence of both CSD and heterogeneity in slopes, we utilize the CCEMG panel data estimator. This method, developed by Pesaran (2006), is resilient to variations in slopes across different groups and considers the interdependence among cross-sectional units. Kapetanios *et al.* (2011) extended Pesaran (2006) methods to cover the case where unobserved common factors are nonstationary. They have showed that, despite the presence of unit roots in the unobserved common factors, the CCE estimators remain consistent and are also robust to structural breaks in the means of these factors. This ensures more reliable and robust results. This estimator works efficiently when the data involves panel heterogeneity and multifactor error components. Therefore, it utilizes the group averages of common effects and variables in a

linear combination (Dong *et al.*, 2017). The insights derived from the outcomes of the CCEMG estimators provide a valuable understanding of how independent variables influence IE. However, these results do not establish causal relationships between our variables of interest.

Dumitrescu and Hurlin (2012) state that the causality relationship existing for any given country within the context of panel data is also valid for different countries, and provides effective results with an increase in the number of observations. To deepen our insights, we integrate the causality test formulated by Dumitrescu and Hurlin (2012), lauded for its robustness against cross-sectional dependency (CSD) and parameter diversity. Their Granger causality test is adept for unbalanced and heterogeneous panels, as well as when (T > N) or (T < N). This test overcomes the uniformity assumption of a standard Granger causality test and effectively tackles CSD issues in panel data.

4. FINDINGS AND DISCUSSION

In panel data studies, the standard assumption is that the series are cross-sectionally independent, neglecting the presence of CSD within the panel. Overlooking this aspect can result in substantial bias and distortion in the results. Table no. 3 demonstrates the implications of CSD and homogeneity in the panel data. The findings indicate the existence of CSD and heterogeneous slope coefficients, suggesting that a shock experienced by one of the leading emerging countries can have a propagating effect on other nations.

Table no. 3 – CSD and Slope Homogeneity Tests

	Statistics	Prob.
CD Test	17.100	0.001
$\tilde{\Delta}$	10.880	0.001
$\tilde{\Delta}_{adj}$	11.990	0.001

Note: Δ and Δ_{adj} symbolize delta (Δ) and the adjusted delta on Swamy approach
Source: Author's estimations.

In the empirical analysis, the determination of the unit root properties of the variables constitutes the second step. Given that the variables exhibit unit roots, employing traditional estimators such as ordinary least squares, fixed effects, and random effects may lead to spurious regression. Thus, it is crucial to ascertain the unit root properties of the variables and utilize estimators that appropriately account for these properties.

First-generation tests inadequately address the CSD or heterogeneity present within panel data. Table no. 4 presents the results of the CIPS test. The findings indicate that the variables contain unit roots at their levels. However, when considering the first differences of the variables, the null hypothesis is rejected. In other words, all variables become stationary in their first differences at the 0.01 significance level.

Table no. 4 – CIPS Panel Unit Root Test

	Level	First Difference	Result
lIE	-1.766	-2.674**	I(1)
IFD	-1.886	-3.820***	I(1)
lGDP	-1.824	-4.102***	I(1)
lGOV	-1.414	-4.218***	I(1)
lURB	-1.553	-2.720***	I(1)
ITO	-2.194	-4.129***	I(1)

Note: ***, **, denote significance at 0.01, 0.05.
*Source***:** Author's estimations.

Upon establishing that the variables display stationary behavior at I(1), the subsequent inquiry is focused on determining if there exists a cointegrating relationship among them. This determination is made through the application of the Westerlund (2008) cointegration test, a widely utilized method in the literature for this purpose. The cointegration analysis aims to uncover if a long-term relationship exists between the variables. Identifying a cointegration relationship is essential, as it enables the formulation of policies based on the pertinent variables. Table no. 5 showcases the panel cointegration results. The null hypothesis, positing the absence of cointegration, is rejected at the 1% significance level. Consequently, the findings validate the presence of a cointegration nexus among the variables in the long-term.

Table no. 5 –Westerlund (2008) Cointegration Test

	Test Statistics
DH_g	319.81***
DH_p	73.096***

Note: *** indicates significance at 0.01.
*Source***:** Author's estimations

After revealing the cointegration linkages among variables, long-term coefficients are estimated by the CCEMG estimator. The results are presented in Table no. 6.

Table no. 6 – CCEMG Long-Term Coefficients

Country	lFD	lGDP	lGOV	lURB	ITO
Argentina	-0.054***	0.027	0.003*	-0.4	0.012
Brazil	-0.055	-0.433***	0.003	0.01	-0.013
China	-0.058	-0.320*	0.082	0.655***	0.004
India	-0.115*	-0.018	0.075	0.209	0.221***
Indonesia	-0.177	0.163***	0.111***	0.215	0.073***
Mexico	0.001*	0.098*	0.080**	-0.692	0.063**
Russia	-0.037***	-0.116**	-0.084	0.142***	-0.021
Turkiye	0.019	0.167***	0.028	0.752	0.026**
Panel	-0.039***	-0.005	0.004**	0.111	0.045*

Note: ***, **, and * indicate significance for 0.01, 0.05 and 0.10.
*Source***:** Author's estimations.

According to the CCEMG estimator, FD negatively affects IE in the panel. This finding is consistent with Shahbaz and Islam (2011), Shahbaz et al. (2015), Baiardi and Morana (2016), Bumann and Lensink (2016), Ahmed and Masih (2017), Baiardi and Morana (2018), Jung and Vijverberg (2019), Thornton and Di Tommaso (2020). The negative trade-off between FD and IE can be explained in several different ways. First improved FD often leads to greater access to financial services for individuals across different income levels. This access allows lower-income individuals to invest in education, health, and entrepreneurship, thereby enhancing their income-generating opportunities. Second FD fosters entrepreneurship and innovation by providing funding and support to small and medium-sized enterprises (SMEs) and startups. This can lead to the creation of new job opportunities and income sources, particularly benefiting those at the lower end of the income distribution. Third a well-functioning financial system can facilitate wealth redistribution through mechanisms such as progressive taxation, social welfare programs funded by financial intermediaries, and targeted lending programs for disadvantaged groups. These initiatives can help reduce IE by ensuring that wealth is more equitably distributed across society.

Other factors that positively affect IE are GOV and TO. If GOV is disproportionately allocated towards sectors or programs that primarily benefit higher-income groups (such as subsidies for industries dominated by wealthy individuals or lavish infrastructure projects in affluent areas), it can widen income disparities. Also, government subsidies and transfers aimed at providing social assistance or support to low-income households may not always effectively reach their intended beneficiaries. Inefficient targeting mechanisms or corruption can lead to leakage of funds, benefiting wealthier individuals or groups instead of the intended recipients. Excessive GOV financed through money creation or deficit spending can lead to inflation, which tends to disproportionately affect the purchasing power of low-income households. This can widen IE by eroding the real incomes of the poor while having less impact on the wealthier segments of society.

TO can lead to structural changes in the economy, with resources shifting from sectors that employ low-skilled workers (such as agriculture or traditional manufacturing) to sectors that employ high-skilled workers (such as technology or services). This can exacerbate IE by reducing employment opportunities and wages for low-skilled workers while benefiting high-skilled workers. TO may favor larger, more productive firms better equipped to compete in international markets, while smaller firms may struggle to survive or be forced out of business. This can result in an increased concentration of wealth and income among a small number of large firms and their owners, leading to higher IE. In some cases, governments may respond to increased import competition by implementing policies that disproportionately benefit certain groups or sectors, leading to further income disparities. For example, subsidies or protectionist measures may be introduced to support declining industries, benefiting specific groups while imposing costs on others.

On the other hand, we find that there are no statistically significant effects of GDP and URB on IE. It is commonly assumed GDP leads to higher incomes for all segments of society, thereby reducing IE through a trickle-down effect. However, the finding suggests that any such effect may be non-existent in the studied context. This could imply that the benefits of GDP are not evenly distributed across different income groups. URB can have both positive and negative effects on IE. While URB may provide opportunities for economic growth, job creation, and access to services, it can also lead to increased

competition for resources and employment, as well as spatial segregation between affluent and impoverished urban areas. In this case, the net effect of URB on IE may be negligible.

Moreover, Table no.6 also reports the long-term coefficients for each country. The effect of FD on IE is negative and statistically significant in Argentina, India, and Russia. This finding supports the studies conducted by Baiardi and Morana (2016), Ahmed and Masih (2017), Baiardi and Morana (2018), Thornton and Di Tommaso (2020), Alshubiri (2021) in the literature. Policies aimed at promoting financial inclusion and expanding access to financial services for marginalized and underserved populations can play a crucial role in reducing IE. By empowering individuals to participate more fully in economic activities and access resources for investment and consumption, FD can contribute to a more inclusive and equitable society in these countries. We also explore that FD has a positive effect on IE in Mexico. This finding is consistent with the studies conducted by Sehrawat and Giri (2015), Seven and Coskun (2016), Jauch and Watzka (2016), and Koçak and Uzay (2019). While FD may lead to overall GDP and development, it may also exacerbate IE if the benefits of financial services are unequally distributed among different income groups. In Mexico, the expansion of financial services may primarily benefit wealthier individuals or certain sectors of the economy, leading to widening income disparities. FD has no statistically significant effect on IE in Brazil, China, Indonesia, and Turkiye. In these countries, the existence of an informal economy limits the impact of financial development on income distribution. Namely, individuals who work informally cannot benefit from the services provided by the financial sector (-credit etc. provided by the banking sector). Therefore, the limited financial inclusion due to the informal economy in these countries leads to a decrease in the impact of financial sector development on income distribution. The existence of corruption in these countries is also one of the important factors that reduce the efficiency of the financial sector. Corruption prevents the efficient allocation of financial resources and makes it difficult for economic agents to benefit from financial opportunities. In addition, the inadequacy of regulatory and supervisory institutions in the financial system and the lack of financial literacy in these countries limit the impact of the financial sector on income distribution. In addition, especially in Turkey, macroeconomic instability and high inflation significantly reduce the purchasing power of low- and middle-income individuals. This situation leads high-income individuals to benefit more from the services provided by the financial sector in Turkey, thus reducing the impact of the financial sector on income distribution.

The impact of GDP on IE is positive and significant in Indonesia, Mexico, and Turkiye. GDP may disproportionately benefit certain segments of the population, such as wealthy individuals or specific industries, leading to widening income disparities. In Indonesia, Mexico, and Turkiye, the benefits of GDP may not be evenly distributed across different income groups, resulting in an increase in IE. Results also indicate that impact of GDP on IE is negative and significant in Brazil and Russia. Both Brazil and Russia are rich in natural resources, such as oil, gas, and minerals, which can drive GDP and contribute to reductions in IE. Revenue generated from the extraction and export of natural resources may be used to fund social programs, infrastructure development, and poverty alleviation initiatives, benefiting a wide range of individuals and communities.

The effect of GOV on IE appears to be positive in Argentina, Indonesia, and Mexico. Inefficient allocation and management of government resources may contribute to IE by failing to address the needs of the poorest segments of society. In Argentina, Indonesia, and Mexico, corruption, bureaucracy, and lack of transparency in public spending may limit the effectiveness

of government interventions aimed at reducing income disparities. Broader macroeconomic factors, such as inflation, fiscal deficits, and debt levels may also influence the relationship between GOV and IE. In Argentina, Indonesia, and Mexico, unsustainable fiscal policies or macroeconomic instability may exacerbate IE by undermining GDP and increasing poverty levels.

Another factor that positively affects IE is the URB in China and Russia. URB in China and Russia may exacerbate IE by widening the gap between urban and rural areas. Rapid URB may lead to unequal access to economic opportunities, social services, and infrastructure between urban centers and rural regions, resulting in higher IE. URB may lead to large-scale migration from rural to urban areas in China and Russia, creating challenges in integrating migrants into the urban labor market. Migrant workers may face discrimination, low wages, and limited access to social welfare benefits, contributing to income disparities within urban areas and overall IE.

Finally, TO has a positive and significant effect on IE in India, Indonesia, and Mexico, and Turkiye. TO may lead to structural changes in the economy, with certain industries benefiting more from increased trade than others. In India, Indonesia, Mexico, and Turkiye, trade liberalization may disproportionately benefit industries that are capital-intensive or export-oriented, leading to income disparities between sectors and contributing to overall IE. TO may lead to changes in labor market dynamics, including shifts in employment patterns, wage differentials, and job insecurity. In India, Indonesia, Mexico, and Turkiye, increased competition from foreign goods and changes in comparative advantage may lead to displacement of workers in less competitive sectors, exacerbating IE and widening the wage gap between skilled and unskilled workers. Similar results have also been obtained in different studies. Aghion et al. (2004), in their study, found similar results for India, stating that India's 1991 trade liberalization promoted growth only in the most productive Indian industries located in already advantaged states. They also emphasized that this increased regional inequalities. In addition, Daumal (2013) found that in India, the increase in industrial exports compared to agricultural exports has reinforced this inequality. Kuncoro and Murbarani (2016) found that the increase in TO has a positive effect on IE between provinces in Indonesia. The main reason for this is that approximately 60% of exports are concentrated in three provinces. Another reason is that Indonesia's exports are concentrated in the main export products of only a few provinces. González Rivas (2007) stated that in Mexico, trade openness benefits regions with higher income and infrastructure, thereby increasing IE. Topuz and Dağdemir (2020) stated that TO increases IE in Turkiye. They also found that as the income gap between the agricultural and industrial sectors widens, there is an increasing trend in overall income inequality.

The Dumitrescu and Hurlin (2012) causality test is used to causality nexus among IE, FD, GDP, GOV, URB, and TO the results are presented in Table no. 7.

Table no. 7 – Dumitrescu and Hurlin Panel Causality Test

Null Hypothesis:	W-Stat.	Zbar-Stat.	Prob.
ΔlIE does not homogeneously cause ΔlFD	2.317	2.171	0.030
ΔlFD does not homogeneously cause ΔlIE	8.010	6.163	0.001
ΔlIE does not homogeneously cause ΔlGDP	2.405	2.326	0.020
ΔlGDP does not homogeneously cause ΔlIE	1.808	1.280	0.200

Null Hypothesis:	W-Stat.	Zbar-Stat.	Prob.
ΔlIE does not homogeneously cause ΔlGOV	0.588	-0.856	0.392
ΔlGOV does not homogeneously cause ΔlIE	2.369	2.262	0.024
ΔlIE does not homogeneously cause ΔlURB	2.502	2.496	0.013
ΔlURB does not homogeneously cause ΔlIE	0.600	-0.835	0.404
ΔlIE does not homogeneously cause ΔlTO	1.447	0.648	0.517
ΔlTO does not homogeneously cause ΔlIE	2.565	2.606	0.009

Note: Δ symbolizes first differences.

Source: Author's estimations

Findings indicate a bidirectional causality relationship between FD and IE. This result indicates that any change in FD will affect IE and vice versa in the short-term. An increase in FD, such as improvements in access to financial services, development of capital markets, or expansion of banking services, may lead to changes in income distribution. For example, increased access to credit and investment opportunities may stimulate GDP and job creation, potentially reducing IE. Conversely, if FD primarily benefits wealthier individuals or exacerbates financial exclusion, it may lead to widening income disparities.

We also found causality from IE to GDP in the panel. The channels through which IE affects GDP can vary and may include both demand-side and supply-side factors. On the demand side, IE may lead to lower levels of aggregate demand as lower-income households have limited purchasing power, which can dampen consumer spending and investment. On the supply side, IE may affect factors such as human capital accumulation, labor market efficiency, and technological innovation, all of which are critical determinants for GDP.

The identification of causality from GOV to IE in the short-term suggests that changes in government expenditures can lead to immediate adjustments in IE levels. For example, increases in GOV on social assistance programs or progressive taxation policies may result in a reduction in IE in the short-term as resources are redistributed to lower-income groups. Conversely, cuts in government spending on social programs or austerity measures may exacerbate IE by reducing support for vulnerable populations.

We find that IE is the cause of URB. IE can affect patterns of URB through various channels. Higher levels of IE may lead to rural-urban migration as individuals seek better economic opportunities and living conditions in urban areas. Income disparities can create push factors such as limited job prospects and low wages in rural areas, while pull factors such as higher wages, access to services, and social mobility in urban centers may attract migrants. As a result, increasing IE may drive higher rates of URB as more people move to cities in search of improved livelihoods.

The other finding of the Dumitrescu and Hurlin (2012) test is that TO is the cause of IE. TO refers to the degree to which an economy is integrated into the global economy through trade in goods and services. Changes in trade policies, such as tariff reductions, trade agreements, and globalization, can affect income distribution within a country. TO may lead to positive and negative effects on IE, depending on various factors such as the economy's structure, the competitiveness of domestic industries, and the distributional effects of trade liberalization.

These results indicate that FD, GOV, and TO are important determinants of IE in the short-term. Overall, the identification of FD, GOV, and TO as important determinants of the IE in the short-term underscores the multifaceted nature of IE and the diverse range of factors that can influence its dynamics. Policymakers should consider implementing targeted interventions and policies aimed at addressing these determinants to promote more equitable socio-economic outcomes and foster inclusive development.

5. CONCLUSION AND POLICY IMPLICATIONS

Analyzing the effect of FD on IE in emerging G-20 nations is a significant issue, especially for developing countries that lack equitable income distribution or a well-developed financial system. This research examines the impact of FD on IE for emerging G-20 countries from 1989 to 2021 using panel data methodology. The study includes the emerging G-20 countries identified in the IMF country classification, such as Argentina, Brazil, China, India, Indonesia, Mexico, Russia, and Turkiye. Unfortunately, due to a lack of data, Saudi Arabia and South Africa, though part of the emerging G-20 group, were not included in the analysis.

According to the study, the Westerlund (2008) cointegration test revealed a long-term relationship among the variables. The CCEMG estimator results for the panel demonstrated that FD has a negative impact on IE, which supports the inequality-narrowing hypothesis. However, the findings also showed that GOV and TO have a positive effect on IE. Furthermore, the results indicated that GDP and URB do not have a statistically significant impact on IE in the panel.

At the country-specific level, CCEMG analysis results indicate that FD reduces IE in Argentina, India, and Russia. For Mexico, the test results indicate that FD worsens IE. In this context, it can be said that the inequality-widening hypothesis is valid in Mexico during the study period. In Brazil, China, Indonesia, and Turkiye, FD was found no statistically significant impact on IE.

On the other hand, CCEMG results show that GDP increases IE in Indonesia, Mexico, and Turkiye. In Brazil and Russia, GDP was found to contribute to equitable income distribution. Additionally, the results indicate that GOV increases IE in Argentina, Indonesia, and Mexico. URB was found to worsen IE in China and Russia, while TO was found to worsen IE in India, Indonesia, Mexico, and Turkiye.

Policy recommendations to address IE in emerging G-20 countries include enhancing financial inclusion by promoting access to financial services through microfinance, mobile banking, and financial literacy programs, and by providing funding and support to SMEs and startups to foster entrepreneurship and create job opportunities for lower-income individuals. Governments should ensure efficient allocation of expenditures by targeting social programs and subsidies to low-income households, improving transparency and efficiency in public spending, and investing in public goods like education, healthcare, and infrastructure to promote inclusive growth. Balanced trade policies are also essential, with measures to support and retrain workers displaced by trade liberalization and promote inclusive trade policies that benefit a wide range of industries and workers. Addressing urban-rural disparities through investments in rural infrastructure, education, and healthcare can reduce income gaps, while inclusive URB policies can ensure equitable access to economic opportunities and services in urban areas. Additionally, macroeconomic stability

should be pursued through sustainable fiscal policies and measures to control inflation, protect the purchasing power of low-income households, and reduce income disparities. By implementing these comprehensive policy measures, emerging G-20 countries can effectively harness the benefits of FD while mitigating its potential adverse effects on IE, leading to more inclusive and sustainable GDP and a fairer income distribution.

The recommended policies for Argentina, India and Russia where the inequality-narrowing hypothesis is valid are as follows:

- The financial sector should provide microfinance to facilitate access to the financial system for low-income households and small-scale enterprises. In this way, more individuals can have opportunities to invest capital and start new businesses.

- Digital financial services need to be made more widespread. In this way, access to financial services, especially for individuals in rural areas, can be facilitated. This may reduce inequality in income distribution.

- In these countries, the concentration of financial services in specific regions increases income inequality. Therefore, it is recommended to eliminate regional disparities in these countries.

For Mexico, where the inequality-widening hypothesis is applicable, it is recommended to establish a more balanced and stable economic structure. Financial development can support economic growth; however, only high-income individuals benefit from this growth, which can increase income inequality. In this context, it is crucial to ensure access to financial services for low-income groups and to strengthen the oversight of regulatory institutions in the financial system. Stricter regulations should be implemented in Mexico's financial system to limit the impact of speculative activities and excessive risk-taking on low-income groups. Furthermore, a fairer trade policy is necessary in Mexico. A fair-trade policy can enable small and medium-sized enterprises to benefit more from trade opportunities, thereby reducing income inequality. Additionally, to prevent the concentration of financial development in certain regions, special incentives should be provided for rural areas, and infrastructure investments should be increased. This would help address regional imbalances and create a more balanced income distribution in both urban and rural areas. In addition to these policy recommendations, Mexico should also pursue a fair tax policy aimed at reducing income inequality, increase social assistance for low-income groups, and improve the education system.

Future research could concentrate on comparing various regions or income groups within countries or investigating the effects of FD on different sectors of the economy and their respective contributions to IE. By identifying which sectors gain the most from FD, policymakers can develop more targeted and effective interventions. Moreover, since data for Saudi Arabia and South Africa, which are among the emerging G-20 countries, were not available during the period under review, these countries could not be included in the analysis. This situation shows the limitations of the study. Due to this limitation of the study, it is suggested that future studies on this topic should be conducted for these countries as well, if the relevant data for these countries can be obtained.

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