



The Relationship Between Income Inequality and Financial Development: Panel Data Analysis

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Abstract: *If all classes of society cannot benefit equally from the blessings of growth, although economic growth rates reach the desired level, an income inequality problem arises. At a time when income inequality is growing at the global level, governments are looking for various remedies to establish a more equitable distribution of income. Regulation and improvement of financial markets and ensuring financial development are among the solution offers. In this study, the relationship between income inequality and financial development in the period of 2000-2015 was examined for 30 countries. The countries covered are divided into three groups as the countries with the best, medium, and poor performance in terms of financial development. Panel data-based analyses were used. In this context, the Durbin-Hausman panel cointegration test and Common Correlated Error (CCE) coefficient estimator were applied. The findings proved the existence of a long-term relationship between the variables in all country groups. As a result of coefficient estimates, it was determined that the inverted U-hypothesis was valid for the countries with the best performance, the mixed results for the countries with a medium performance, and the partially inequality-narrowing hypothesis was valid for the countries with poor performance.*

Keywords: Financial Development, Income Inequality, Financial Kuznets Curve Hypothesis, Sustainable Development, Panel Data Analysis

JEL: E44, D31, O47, Q01, C23

Received : 26 January 2022

Revised : 01 April 2022

Accepted : 20 May 2022

Type : Research

1. Introduction

One of the main goals that every country should achieve for sustainable development is the equitable distribution of income. Because income distribution disorders can negatively affect social welfare and development in various ways. When a small part of the population in a country has the majority of the total income, important problems arise in various issues such as education and health, along with poverty. This causes severe social, political, and economic instability. In this regard, income inequality is one of the issues that not only policymakers but also researchers from many areas of the social sciences focus on.

With the emergence of development economics after World War II, it was expected that rapid economic growth would reduce income inequality and poverty, and therefore development would take place afterward. In this context, the studies conducted by Lewis (1954), Kuznets (1955), and Robinson (1976) emphasize that sustainable growth will occur when the weight of the agricultural sector in the economy decreases and the weight of the modern sectors increases, and accordingly income differences decrease over

Cite this article as: Altiner, A., Bozkurt, E., & Turedi, S. (2022). The relationship between income inequality and financial development: Panel data analysis. *Business and Economics Research Journal*, 13(3), 349-366. <http://dx.doi.org/10.20409/berj.2022.377>

The current issue and archive of this Journal is available at: www.berjournal.com

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time. However, by the end of the 1970s, with the decrease in capital profits in developed countries, the tendency of financial liberalization increased and the financial sector began to gain importance. In the 1990s, due to the increase in the level of financialization in the world, there were serious economic crises, especially in developing countries, and consequently, unemployment, income inequality, and poverty increased. This trend has led to questioning the impact of financial development on economic growth and income inequality. In addition, the deepening of income inequality in the world as a result of the 2008 global financial crisis has escalated the debate on this issue.

In this study, it is aimed to examine the effect of financial development on income inequality in 30 selected countries. Researches on the impact of financial development on income inequality began in the 1990s within the framework of theoretical discussions and increased in the 2000s with empirical studies. The lack of a consensus on the relationship between the two variables in the theoretical and empirical literature is the main motivation of this study. Our study differs from the relevant literature in three ways. First, the countries usually considered in the literature are analyzed by classifying them according to their level of economic development. But the countries included in this study are grouped according to their level of financial development, and we try to present a different perspective. In this way, it has been determined that the vast majority of countries that are in the upper/lower ranks at the level of financial development are also at the forward/backward level in terms of economic development. Accordingly, both the Kuznets' (1955) inverted-U curve hypothesis and the Greenwood and Jovanovic's (1990) financial Kuznets curve hypothesis have been tested. As a result, it is possible to investigate how the impact of financial development on income inequality will change according to both the economic development and financial development of the country. Second, in the vast majority of studies, the impact of financial development on income inequality is measured with the variable from the banking sector or financial markets within the scope of financial depth, accessibility, or effectiveness. In this study, financial development is measured by a more comprehensive variable covering both structures, where financial depth, accessibility, and effectiveness dimensions are combined. In this way, more accurate information is expected to be obtained. Third, most studies usually give a single result that represents the entire set of countries included. In the present study, coefficient estimates are made for each country using relatively new econometric techniques. This allows us to make stronger comments with more information. It is expected that the outcomes obtained from the analysis of our research with these differences will contribute to the literature.

The study is organized as follows: In the second part, the theoretical fundamentals are explained, and in the third part, the empirical literature is presented. In the fourth part, the data set and econometric method used in analysis are introduced. In the fifth part, the results of empirical analysis are reported, and in the sixth part, the study is completed by summarizing the results and making policy recommendations.

2. Theoretical Perspectives on Financial Development and Income Inequality

In the process of financial liberalization due to neoliberal policies since the 1980s, financial development began to be seen as a component of economic growth. Schumpeter (1912), the first economist who emphasized the importance of the financial sector on economic growth, stated that it was important that entrepreneurs had sufficient credit facilities to create innovation by developing new products and production techniques. McKinnon (1973) suggested that increases in the money supply, combined with increased savings through the well-functioning financial sector and increased competitiveness of the banking system, would accelerate economic growth. Similarly, a study by World Bank (1997) stated that a deepening financial system through the creation of new financial instruments would have positive effects on economic growth by increasing investment and productivity. In some studies, it is argued that financial development may have negative effects on growth due to the increase in non-repayable debts (Rajan, 2006; Beck et al. 2012; Jauch & Watzka, 2016; Moosa, 2016). But positive views have been supported in more studies. Studies conducted by Goldsmith (1969), Shaw (1973), King and Levine (1993), Gimet and Lagoarde-Segot (2011), Kpodar and Singh (2011), and Agnello et al. (2012) are among the studies that support this view. The most important issue focused on in studies investigating the impact of financial development on economic growth is the level of access of society to financial resources. It is argued that financial development has important

effects on income distribution as well as growth, depending on which of the poor or rich households have easy access to financial instruments.

Theoretical fundamentals on the relationship between financial development and income inequality began in the early 1990s, and three important approaches emerged: Financial Kuznets Curve (FKC) hypothesis, the inequality-narrowing hypothesis, and the inequality-widening hypothesis. The first of these hypotheses was put forward by Greenwood and Jovanovic (1990). The authors stated that the inverted-U curve hypothesis put forward by Kuznets (1955) on economic growth and income inequality is also valid for financial development and income inequality. In their model, they argued that economic growth and financial structure are closely related to each other and that income differences between households will change depending on this relationship. According to them, financial infrastructure is insufficient at the first stage of economic development. The financial sector is growing very slowly, and services offered by financial institutions have high costs. There is a situation in which the poor are deprived of financial services, but the rich are easily able to benefit. Because of this, at this stage, the income gap between the poor and the rich in society widens. But as the level of economic development increases, households' demand for financial instruments increases, and financial sector productivity increases, reducing transaction costs. In addition to increasing the income of households in the advanced stage of economic development, a larger part of society uses financial instruments thanks to a more efficient and cost-effective financial system. Thus, income inequality in the country decreases. As a result, since income inequality rises in the first stage of financial development and falls in the advanced stage, a nonlinear relationship appears in the form of an inverted-U curve. Because of this fact, this relationship is also called the "FKC hypothesis".

The second important view is the linear inequality-narrowing hypothesis, which argues that financial development will reduce income inequality. In the model put forward by Galor and Zeira (1993), the effect of human capital investments on income inequality was investigated by taking into account borrowing costs in financial markets. According to the model, the life of individuals is divided into two periods. In the first period, individuals can increase their qualifications by investing in human capital or doing any job without spending on their own development. In the second period, individuals can have a job that requires qualifications, depending on the human capital investments they have made in the first period, or they can have a job that does not require qualifications, as in the first period. In the model, it is assumed that individuals are similar in terms of potential abilities other than the wealth they have depending on inheritance. It is also recognized that human capital investments are indivisible and that transaction costs are high due to financial market disruptions. At this point, inherited wealth is of great importance. Because individuals with sufficient wealth can easily invest in human capital in the first period of their lives, individuals who do not have sufficient resources will be deprived of this opportunity, since borrowing becomes difficult and costly. Because of this, individuals with initial inheritance will have a higher-skilled job in the second period and earn more money, depending on the improvement of their qualifications, while individuals who cannot invest in human capital will continue to work in unskilled jobs in the second period of their lives and earn a low income. As a result, in an economy with disruptions to the financial market, the initial level of wealth is the main determinant of income inequality. But when financial markets develop, households with low incomes will have easier access to credit due to the decrease in the cost of borrowing, and they will be able to invest in human capital. In this way, individuals with lower incomes at the beginning will have the opportunity to earn higher incomes by having a skilled job in the second stage of their lives. As a result, income inequality between low- and high-income individuals will decrease.

Banerjee and Newman (1993) similarly argued that the initial level of wealth is of great importance in terms of income distribution. According to the authors, people who do not have enough collateral due to capital market imperfection find it difficult to borrow. Because of this, poor people can't do jobs that require a lot of investment, and they have to work in a paid job. Rich individuals, on the other hand, can become entrepreneurs by creating their own jobs, since they do not have problems with this issue. Therefore, the income gap between poor and rich individuals grows, that is, income inequality increases. But if capital markets are sufficiently developed, poor individuals will have no problem with regard to collateral and will borrow more easily. In this case, the difference between incomes closes and income inequality decreases.

The third important view is the linear inequality-widening hypothesis, which argues that financial development will increase income inequality. This view is supported by a relatively few researchers. Based on the views laid out by Rajan and Zingales (2003), Clarke et al. (2006) noted that financial development can only benefit the rich when institutions in the country are not strong. This is because the financial system channels money into the wealthy and well-connected parts, which can offer adequate collateral and have the power to repay the loan. In such a system, the poor will be excluded. In this case, while the financial sector is developing, the poor will not be able to migrate to cities, invest in education, or start a new business. In addition, the rich can prevent new firms from entering the market or accessing finance, causing the poor to have a smaller share in the economic structure. According to those who advocate this view, income inequality between households will increase at some stages, if not at all stages of financial development. In their study, Horii et al. (2005) argued that a better financial infrastructure contributes to the development of financial markets and thus supports economic development by allowing firms to use more productive and capital-intensive technologies. But in the presence of credit rationing, they have stated that this technological change increases income inequality.

In theoretical literature examining the relationship between financial development and income inequality, it is often emphasized that financial market disruptions lead to the increasing of the income gap between rich and poor parts of the society. In the vast majority of studies, the opinion prevails that the economic development that accompanies the financial development that will occur with the establishment of a good financial infrastructure will reduce income inequality. Therefore, developing an effective and robust financial structure is critical to implementing sustainable development strategies by improving income distribution.

3. An Overview of the Literature

Empirical analyzes of the relationship between financial development and income inequality began in the 2000s. In this context, the literature testing linear and non-linear theories on this subject is growing rapidly. In most empirical research conducted in the early 2000s, it was found that financial development had a significant impact on reducing income inequality. But recently there has been a significant increase in the number of studies that have reached conclusions that the inequality-widening hypothesis is valid. Similarly, while the FKC hypothesis was not supported in studies in the early 2000s, recent studies have supported this hypothesis with a greater proportion. It can be said that this phenomenon is caused by the 2008 financial crisis and the following period, in which income inequality has deepened on a global scale, in recent studies.

To represent income inequality in empirical studies, it is observed that variables such as the Theil index from the University of Texas Inequality Project (UTIP), the Gini index obtained from the Standardized World Income Inequality Database (SWIID), and the UN Human Development Reports (HDR) were used. In representing financial development, it was determined that very different variables were used within the scope of financial depth, accessibility, and effectiveness of financial institutions and financial markets. For this reason, it can be said that there is no common variable used in studies. However, it has been determined that the private sector credits to GDP and the M2/GDP, which is an indicator of money supply, are used more frequently in the studies. Other factors affecting income inequality were often taken into account when analyzing the issue. In this framework it has been observed that economic growth, inflation, trade openness, government expenditures, population growth, and human capital variables, which are accepted as the main determinants of income inequality in most of the studies, are included in the analysis. In addition, different control variables such as the sectoral employment rate, the share of sectoral added values in GDP, productivity, globalization, financial liberalization, democracy, and institutional quality were used.

When an evaluation was made in terms of analysis techniques, it was found that panel data techniques were used more. In this respect, it was found that more often GMM and fixed-effect model methods were applied, and therefore a general result was obtained for the entire set of countries included. In light of these explanations, some examples from the literature studied are presented in Table 1 below.

Table 1. Overview of Empirical Studies

Author(s)	Period/Country	Methodology	Findings
Li et al. (1998)	1951-1992, 49 Rich and Poor Countries	LSDV and RE	Inequality-narrowing hypothesis
Clarke et al. (2003)	1960-1995, 91 Countries	POLS, GMM	Inequality-narrowing hypothesis. FKC hypothesis is rejected.
Beck et al. (2004)	1960-1999 52 Developed and 47 Developing Countries	POLS and IV Regression	Inequality-narrowing hypothesis
Bittencourt (2006)	1985-1999, Brazil	OLS, POLS, FE, FDIV	Inequality-narrowing hypothesis
Clarke et al. (2006)	1960-1995, 83 Countries	POLS, IV, 2SLS, RE	Inequality-narrowing hypothesis. FKC hypothesis is rejected.
Liang (2006)	1986-2000, China	GMM	Inequality-narrowing hypothesis. FKC hypothesis is rejected.
Jaumotte et al. (2008)	1981-2003, 51 Developing and Developed Countries	GMM	Inequality-widening hypothesis
Rehman et al. (2008)	1975-2002, 51 Developing and Developed Countries	POLS	FKC hypothesis is valid.
Law and Tan (2009)	1980-2000, Malaysia	ARDL	Linear-insignificant effect
Ang (2010)	1951-2004, Hindistan	ARDL, ECM	Inequality-narrowing hypothesis. FKC hypothesis is rejected.
Batuo et al. (2010)	1990-2004, 22 African Countries	GMM	Inequality-narrowing hypothesis. FKC hypothesis is rejected.
Kappel (2010)	1960-2006, 78 Developing and Developed Countries	POLS, RE, 2SLS	Inequality-narrowing hypothesis
Mookerjee and Kalipioni (2010)	2000-2005, 115 Developing and Developed Countries	POLS, IV	Inequality-narrowing hypothesis
Elmi and Ariani (2011)	2004-2008, 10 Countries in MENA Region	GMM	inequality-narrowing hypothesis. FKC hypothesis is rejected.
Jalil and Feridun (2011)	1978-2006, China	ARDL	Inequality-narrowing hypothesis
Jauch and Watzka (2011)	1960-2008, 138 Developing and Developed Countries	POLS, FE	Inequality-widening hypothesis. FKC hypothesis is rejected.
Shahbaz and Islam (2011)	1971-2005, Pakistan	ARDL	Inequality-narrowing hypothesis. FKC hypothesis is rejected.
Hamori and Hashiguchi (2012)	1963-2002, 126 Countries	FE, GMM	Inequality-narrowing hypothesis
Fowowe and Abidoye (2013)	1981-2005, 27 African Countries	POLS, GMM	Inequality-narrowing hypothesis
Nikoloski (2013)	1962-2006, 162 Countries	GMM	FKC hypothesis is valid.

Table 1. Overview of Empirical Studies (Continued)

Author(s)	Period/Country	Methodology	Findings
Prete (2013)	1980-2005, 30 Countries	POLS	Inequality-narrowing hypothesis
Tiwari et al. (2013)	1965-2008, India	ARDL	FKC hypothesis is rejected.
Sehrawat and Giri (2015)	1982-2012, India	ARDL	FKC hypothesis is rejected.
Zhang and Chen (2015)	1978-2013, China	SVAR	FKC hypothesis is valid.
Adams and Klobodu (2016)	1985-2011, 21 Sub-Saharan African Countries	PMG	Inequality-widening hypothesis
Baiardi and Morana (2016)	1985-2013, 19 EA member Countries	GMM	FKC hypothesis is valid.
Basirat et al. (2016)	2000-2012, 20 Developing Countries	FE	FKC hypothesis is valid.
Chen and Kinkyo (2016)	1961-2012, 88 Countries	PMG	Inequality-widening hypothesis in the short run. Inequality-narrowing hypothesis in the long run.
Çetin and Şeker (2016)	1963-2006, Turkey	ARDL	Inequality-narrowing hypothesis
Sehrawat and Giri (2016)	1990-2013, 11 South Asian Economies	PDOLS	Inequality-widening hypothesis
Adeleye et al. (2017)	1996-2015, 42 Sub-Saharan African Countries	GMM	Linear-insignificant effect
Ahmed and Masih (2017)	1970-2007, Malaysia	ARDL	Linear-insignificant effect
De Haan and Sturm (2017)	1975-2005, 121 Countries	RE	Inequality-widening hypothesis
Hepsağ (2017)	1961-2015, G7 Countries	DOLS	FKC hypothesis is valid for USA, Italy and, Canada.
Koçak and Uzay (2019)	1980-2013, Turkey	DOLS, FMOLS	Inequality-narrowing hypothesis. FKC hypothesis is valid.
Nguyen et al. (2019)	1961-2017, 21 Emerging Country	DOLS, FMOLS	FKC hypothesis is valid.
Cuesta-González et al. (2020)	2000-2015, 9 OECD Countries	GMM	FKC hypothesis is valid.
Weychert (2020)	2003-2014, 52 Countries	FE	Inequality-narrowing hypothesis
Hassan and Meyer (2021)	1970-2018, South Africa	ARDL	FKC hypothesis is valid.
Selim and Güngör (2021)	1990-2015, 11 MENA Region countries	PMG	Inequality-narrowing hypothesis.
Wajid and Awan (2021)	1980-2016, Pakistan	ARDL	Inequality-narrowing hypothesis in the short run. Inequality-widening hypothesis in the long run. FKC hypothesis is rejected.

Not: LSDV: Least-squares dummy variables; RE: Random-effects model; POLS: Panel OLS; GMM: The generalized method of moments; IV Regression: Instrumental Variable regression; FDIV: First-difference instrumental variables; FE: Fixed Effects Model; 2SLS: Two-stage least-squares; ARDL: Autoregressive distributed lag models; ECM: Error correction model; SVAR: Structural vector autoregression; PMG: Pooled mean group.

4. Data and Model

In the empirical analysis section examining the relationship between income inequality and financial development, the following three hypotheses were tested:

- Hypothesis 1: The relationship between income distribution and financial development is explained through the inverted U-shaped hypothesis.
- Hypothesis 2: The relationship between income distribution and financial development is explained through the inequality-narrowing hypothesis.
- Hypothesis 3: The relationship between income distribution and financial development is explained through the inequality-widening hypothesis.

For the testing of the hypotheses, the balanced panel data analysis method was used for 30 countries with different development levels, using the data from the period of 2000-2015. In light of this information, the study involved a multi-stage analysis process.

These stages can be sorted as follows:

Step 1: First, the financial development indicator to be used in the empirical analysis was determined and the countries were classified from the highest level to the lowest level in terms of financial development. Various indicators are used in the literature to measure financial development. Some indicators show quantity measurements, structural measurements, financial prices, product variety, and transaction costs (Lynch, 1996: 7). Some indicators consist of data on the depth, accessibility, efficiency, or security of financial institutions and markets. (Čihák et al., 2013: 3). In this context, variables such as M1, M2, M2/Y, M3, total credit volume and credits to the private sector, real interest rates, bank credits, number of people with bank accounts, the total stock of financial assets, and the ratio of some of them to income are used in the studies. In addition to these indicators, there is the financial development index (FDI) published by the IMF. FDI consists of the combination of the financial institution index and the financial markets index, which are formed with comprehensive indicators such as financial depth, access, and efficiency, the details of which are shown in Appendix Table 1. With these features, it can be stated that FDI is the most comprehensive indicator of financial development. Therefore, the IMF's financial development index was used as a financial development indicator in the study. By taking the average of the FDI series for the years 2000-2015, countries are ranked from the highest value to the lowest value. Thus, three country groups were created as countries having the best financial development performance (Switzerland, Australia, United Kingdom, United States, Spain, Canada, Korea, Rep. Japan, France, Sweden), countries having the middle performance (Thailand, Cyprus, Greece, Israel, New Zealand, Iceland, Malta, South Africa, Brazil, China), and countries having the poor financial development performance (Georgia, Dominican Republic, Ghana, Paraguay, Tanzania, Zambia, Kyrgyz Republic, Gambia, Uganda, Malawi). Since estimations would be made separately for each country, the top ten countries in each group were selected for analysis. In the second stage of the selection process, the availability of data for the variables detailed was taken into account.

Step 2: At this stage, the selection of independent variables, dependent variables, and control variables was made and the model was created. Variable selection was made with studies in the literature in mind. The variables used in the study are summarized in Table 2.

Table 2. Variables and Definitions

Dependent Variable	Definition	Source
GINI	Gini Coefficient	Harward Dataverse
Independent Variable	Definition	Source
GDP	The logarithm of GDP per capita	World Bank
GDP ²	The logarithmic square of GDP per capita	World Bank
FDI	Financial development index	IMF
FDI ²	The square of the financial development index	IMF
Control Variable	Definition	Source
INF	Inflation, consumer prices (annual %)	World Bank
FRE	Average of political rights and civil liberties	Freedom House

The relationship between the variables presented in the details above is estimated by the model in equation (1) used by authors such as Batuo et al. (2010), Jauch and Watzka (2011), Tita and Aziakpono (2016), and Nguyen et al. (2019).

$$GINI_{it} = \alpha_1 + \beta_2GDP_{it} + \beta_3GDP^2_{it} + \beta_4FDI_{it} + \beta_5FDI^2_{it} + \beta_6INF_{it} + \beta_7FRE_{it} \tag{1}$$

Model (1) is of both linear and nonlinear form. The effect of financial development on GINI is investigated with the FDI. With the FDI², the effect of financial development on income distribution as a result of the change in the development levels of the countries is revealed. Thus, by using the FDI and FDI² variables, an idea about all three hypotheses is obtained. The GDP and GDP² variables are used to test the Kuznets' (1955) inverted-U hypothesis.

In general, the INF is one of the most commonly used control variables in the literature. Inflation is effective in income distribution. Because in an inflationary environment, individuals may not be able to maintain their income and may lose income. For individuals with a fixed income, inflation disrupts the income distribution, while it can be an advantage for those with a capital income. In short, the effect of inflation on income distribution varies according to different income groups. The theoretical expectation is that inflation has a positive effect in developed countries and a negative effect in developing countries. Finally, the FRE, which represents institutional quality, does not have a single, clear effect on income distribution, just as with inflation.

Step 3: After determining the countries and variables, panel data analysis was started. Homogeneity and cross-section dependence tests were performed to determine which of the unit root and cointegration tests in the panel data literature would be applied. Cross-section dependence gives information about whether cross-section units are dependent on each other. In the study, since the time dimension (T) was greater than the cross-section dimension (N), appropriate analyses were made for this situation. CD_{LM1} and CD_{LMadj} (Bias-adjusted CD_{LM}) tests were used to investigate cross-section dependence. The hypotheses for both tests are that H₀ = there is no cross-section dependence, and H₁ = there is a cross-section dependence. The test statistics were calculated as follows (Pesaran, 2004: 5; Baltagi, 2005: 59; Pesaran et al., 2008: 108):

$$CDLM_1 = T \sum_{i=1}^{N-1} \sum_{j=i+1}^N \hat{\rho}_{ij}^2 \tag{2}$$

and

$$CDLM_{adj} = \sqrt{\frac{2}{N(N-1)}} \sum_{i=1}^{N-1} \sum_{j=i+1}^N \frac{(T-k)\hat{\rho}_{ij}^2 - \mu_{Tij}}{v_{Tij}} \tag{3}$$

The homogeneity test examines whether the slope coefficients (β) in panel data models are different between cross-section units. The Delta ($\hat{\Delta}$) and the adjusted Delta ($\tilde{\Delta}$) tests developed by Pesaran and Yamagata (2008) are used in the homogeneity test. ($\hat{\Delta}$) test statistic is calculated by the equation $\hat{\Delta} = \sqrt{N} \left(\frac{N^{-1}\hat{S}-k}{\sqrt{2k}} \right)$. ($\tilde{\Delta}$) test statistic is determined by the equation $\tilde{\Delta} = \sqrt{N} \left(\frac{N^{-1}\tilde{S}-E(\tilde{Z}_{it})}{\sqrt{\text{Var}\tilde{Z}_{it}}} \right)$. If the probability value is statistically significant, the H_0 hypothesis is rejected and it is decided that the slope coefficients are heterogeneous (Pesaran and Yamagata, 2008: 57).

Step 4: In the next step, unit root tests were applied for the series. Pesaran's (2007) Cross-Sectionally Augmented Dickey-Fuller (CADF) test is an extended version of the standard ADF unit root test according to the cross-section averages of the first differences and lag levels of individual series. In the CADF test, the first difference in ADF regression eliminates the correlation between units. The null hypothesis ($H_0: \beta_i = 0$, there is a unit root) is tested against the alternative hypothesis ($H_1: \beta_i < 0$, there is no unit root). It is difficult to determine the stationary of value of each cross-section with CADF. After CADF regression is estimated, the validity of the H_0 hypothesis can be tested with CIPS (Cross-Sectional Augmented IPS) statistics for the entire panel. In CIPS statistics, expressed as $CIPS = N^{-1} \sum_{i=1}^N CADF_i$ the averages of t-statistics of lagged variables ($CADF_i$) are taken (Pesaran, 2007: 267-268).

Step 5: In the last stage, the cointegration relationship between the variables and the long-term coefficients was estimated. In the Durbin-Hausmann panel cointegration test, which considers the heterogeneity of variables and the cross-section dependence and also does not impose any restrictions on the stationary of variables, the existence of cointegration is considered in two ways: panel and group size. In the Durbin-Hausman test, the autoregressive parameter is assumed to be the same for all cross-sections under the hypotheses of H_0 : there is no cointegration and H_1 : there is cointegration. The rejection of the null hypothesis under this assumption indicates the existence of cointegration for all cross-sections. In the group test, the autoregressive parameter is allowed to differ between cross-sections. The rejection of the null hypothesis indicates the existence of a cointegration relationship, at least for some cross-sections (Westerlund, 2008: 209). After determining the existence of a cointegration relationship, long-term coefficients were estimated with the help of the following equation (4) with the CCE estimator.

$$y_{it} = \alpha'_i d_t + \beta'_i x_{it} + e_{it} \quad i = 1, \dots, N, \quad t = 1, \dots, T \quad (4)$$

Although the CCE estimator takes into account cross-section dependence, it can give researchers individual results for each cross-section unit. If, as a result of the analysis, it is decided that the series is homogeneous and that cross-section dependence exists, then the Common Correlated Mean Group Effects (CCMGE) estimator is used. Common Correlated Effects Pooled (CCEP) estimator is used if there is very little information about common effects, fixed or unobserved common effects (Pesaran, 2006: 982).

5. Empirical Results

In Table 3, the results of cross-section dependence can be seen. CD_{LM1} and CD_{LMadj} test results showed that there is cross-sectional dependence between the series and in the models at different levels of significance in the three country groups. This indicates that a shock in one of the countries will affect other countries as well.

Table 3. Cross-sectional Dependence Test Results

Countries	Best Performing Countries		Middle Performing Countries		Poorly Performing Countries	
	CD _{LM1} (Prob.)	CD _{LMadj} (Prob.)	CD _{LM1} (Prob.)	CD _{LMadj} (Prob.)	CD _{LM1} (Prob.)	CD _{LMadj} (Prob.)
GINI	69.661^b (0.011)	2.506^a (0.006)	78.394^a (0.000)	3.881^a (0.000)	59.958^a (0.007)	3.575^a (0.000)
GDP	94.096^a (0.000)	3.701^a (0.000)	63.662^b (0.035)	15.415^a (0.000)	67.745^b (0.016)	5.710^a (0.000)
GDP ²	93.243^a (0.000)	3.609^a (0.000)	58.908^b (0.030)	6.254^a (0.000)	68.612^b (0.013)	5.998^a (0.000)
FDI	64.729^b (0.028)	4.480^a (0.000)	78.821^a (0.001)	9.958^a (0.000)	77.971^a (0.002)	1.081^a (0.000)
FDI ²	63.807^b (0.034)	4.361^a (0.000)	75.618^b (0.030)	7.914^a (0.000)	63.529^b (0.036)	12.141^a (0.000)
INF	77.241^a (0.002)	5.332^a (0.000)	75.947^a (0.002)	7.533^a (0.000)	94.314^b (0.000)	1.373^a (0.000)
FRE	88.264^a (0.001)	3.173^a (0.001)	87.092^a (0.000)	3.049^a (0.002)	92.458^b (0.000)	8.596^a (0.000)
Model	145.433^a (0.000)	9.199^a (0.000)	141.456^a (0.000)	5.704^a (0.000)	138.000^a (0.000)	13.561^a (0.000)

Note: a; %1 and b; 5% indicate significance levels.

After determining cross-section dependence, the homogeneity tests whose results are presented in Table 4 were performed. The results showed that the probability values for all models had a significance level of 1%. Accordingly, the null hypothesis that the slope coefficients are homogeneous was rejected. It is possible to say that the slope coefficients are heterogeneous. In this way, it was determined that the cointegration test to be performed for each cross-section was valid and reliable.

Table 4. Homogeneity Test Results

Countries	Best Performing Countries		Middle Performing Countries		Poorly Performing Countries	
	Statistics	Prob.	Statistics	Prob.	Statistics	Prob.
Delta_tilde (Δ^*)	10.192^a	0.000	6.765^a	0.000	7.528^a	0.000
Delta_tilde_adj (Δ^*)	11.231^a	0.000	7.445^a	0.000	8.295^a	0.000

Note: a, indicates the significance level of 1%.

Analysis was continued with the CADF unit root test to determine whether the series have a unit root. While examining the stationarity of the series with the CADF unit root test, the CIPS test, which gives results for the entire panel, is taken into account. According to Table 5, for the best performing countries, GDP, GDP², INF, and FRE are stationary at the level and GINI, FDI, and FDI² are stationary after the first difference values are taken. In medium-performing countries, only the FRE is stationary at the level, and other variables are stationary at the first difference. In countries with poor performance, which are the last group of countries, it was found that the FDI and FDI² did not contain a unit root, while other variables were stationary only after taking the first differences.

Table 5. Unit Root Test Results

Countries	Best Performing Countries		Middle Performing Countries		Poorly Performing Countries	
	Level	First Differences	Level	First Differences	Level	First Differences
GINI	-2.101	-2.310^c	-1.694	-4.207^a	-1.886	-2.434^b
GDP	-2.323^c	-	-1.490	-2.660^b	-1.492	-2.484^b
GDP ²	-2.311^c	-	-1.908	-4.139^a	-1.700	-2.288^c
FDI	-2.141	-3.213^a	-2.008	-2.964^a	-2.883^a	-
FDI ²	-2.024	-3.153^a	-1.972	-3.322^a	-2.791^a	-
INF	-2.444^b	-	-2.200	-3.349^a	-2.117	-2.956^a
FRE	-2.653^b	-	-2.674^a	-	-1.763	-2.740^a

Note: CIPS critical values of Pesaran (2007) Table 2c p.280; -2.66 (1%), -2.37 (5%), and -2.22 (1%).

The results of homogeneity, cross-section dependence and unit root test performed in the study indicate that the series contain heterogeneity, cross-sectional dependence and are stationary at different degrees. In this case, it was determined that it would be appropriate to use the Durbin-Hausmann panel cointegration test. Test results are given in Table 6. It was determined that the test statistics for both the group and the panel were significant, that is, there was a cointegration relationship.

Table 6. Durbin-Hausman Cointegration Test Results

Countries	Best Performing Countries		Middle Performing Countries		Poorly Performing Countries		
	Test	Statistics	Prob.	Statistics	Prob.	Statistics	Prob.
dh_g		9.347^a	0.000	3.582^a	0.000	3.188^a	0.000
dh_p		3.533^a	0.000	3.854^a	0.000	4.480^a	0.000

Note: a; %1, b; 5% and c; 10% indicate significance levels.

Table 7. CCE estimator results for Best Performing Countries

Variables	GDP		GDP ²		FDI		FDI ²		INF		FRE	
	Coeff.	Prob	Coeff.	Prob	Coeff.	Prob	Coeff.	Prob	Coeff.	Prob	Coeff.	Prob
SWT	-4.085	0.972	0.417	0.973	-0.254	0.703	0.176	0.639	0.014^b	0.030	-0.001	0.794
AUS	-1.186	0.647	-4.428	0.128	-1.835^b	0.033	-1.050^b	0.024	0.004	0.115	-0.004	0.154
GBR	-2.979	0.130	-20.693	0.129	-2.365	0.552	1.579	0.476	-0.008	0.244	-0.006	0.662
USA	-0.589	0.784	4.241	0.775	8.282	0.801	-4.872	0.795	-0.003	0.029	-0.008^b	0.030
SPN	4.119	0.873	-0.431	0.664	3.623	0.388	-2.139	0.381	-0.001	0.873	-0.012	0.515
CAN	1.486^c	0.081	-1.307^b	0.023	-2.296	0.151	1.213	0.174	0.002^b	0.039	-0.003	0.218
KOR	3.839^a	0.004	-2.205^a	0.004	3.975^a	0.003	-2.448^a	0.003	0.005^b	0.023	0.010^c	0.050
JPN	1.483	0.138	-2.336	0.272	1.203	0.544	-0.641	0.558	0.003	0.173	0.002	0.850
FRA	1.644^a	0.000	-9.449^a	0.000	4.278^a	0.000	-2.843^a	0.000	0.005^a	0.000	-0.016^a	0.000
SWE	1.896^a	0.000	-1.649^a	0.000	0.380^a	0.000	-0.145^a	0.000	0.002^a	0.000	-0.010^a	0.000

Note: a; %1, b; 5% and c; %10% indicate significance levels.

At the last stage, long-term cointegration coefficients were estimated. The result of heterogeneity found for the panel allowed the coefficient estimate to be made for cross-section units. Table 7 gives CCE estimation results for the best-performing countries. When the individual country results are examined, only the INF variable for Switzerland is significant at the 5% significance level and has a positive sign. In other words, inflation increases the inequality in income distribution. In Australia, the variables FDI and FDI² are significant and negative. Financial development is effective in correcting the distribution of income for Australia. There are no significant variables for the United Kingdom, Spain, and Japan. In the US, however, the only significant variable is FRE, which is significant and corrective to income distribution. For Canada, GDP is positive, and GDP² is negative and significant. So the Kuznets hypothesis is valid. In Canada, inflation is significant and has a disruptive effect on income distribution. For Korea, France and Sweden, GDP and FDI are positive and significant, while GDP² and FDI² are negative and significant. This suggests that both the Kuznets and the FK hypothesises are valid. In addition, inflation in these countries is positive and significant. In France and Sweden, FRE decreases the inequality in income distribution. But the same is not the case for Korea.

Table 8. CCE estimator results for Middle Performing Countries

Variables	GDP			GDP ²			FDI			FDI ²			INF			FRE		
	Coeff.	Prob.		Coeff.	Prob.		Coeff.	Prob.		Coeff.	Prob.		Coeff.	Prob.		Coeff.	Prob.	
THA	0.209^b	0.024		-0.005^c	0.064		0.003^b	0.050		-0.356^b	0.047		0.011^b	0.000		-0.035^a	0.001	
CYP	-0.021	0.555		-0.001	0.633		-0.001	0.113		0.164^b	0.066		-0.001^b	0.069		-0.001	0.251	
GRC	0.128^a	0.003		0.009^a	0.005		0.004^a	0.005		0.004^b	0.071		0.001^b	0.038		0.016	0.261	
ISR	-0.165^b	0.067		0.001	0.225		0.027^a	0.000		-2.507^a	0.000		0.002^b	0.087		0.025^b	0.023	
NZL	0.478^a	0.000		-0.001^a	0.000		0.005^a	0.000		-0.439^a	0.000		-0.008^a	0.000		-0.012^a	0.000	
ICL	0.183^a	0.000		-0.002^a	0.000		0.010^b	0.016		-1.102^b	0.012		-0.001^a	0.000		-0.005^a	0.000	
MLT	0.053	0.403		-0.002	0.496		0.002	0.779		0.214	0.785		0.002	0.111		0.004	0.111	
SAF	0.107	0.782		0.007	0.670		0.013^b	0.070		-1.241^b	0.058		-0.120	0.441		0.021	0.575	
BRA	0.081^b	0.055		0.030^a	0.004		0.598^a	0.002		0.572^a	0.001		-0.097^a	0.000		-3.262	0.201	
CHN	0.451^a	0.000		-0.002^a	0.000		-0.027^a	0.000		2.612^a	0.000		-0.003^a	0.000		-0.063	0.146	

Note: a, %1, b, 5% and c, 10% indicate significance levels.

The coefficient estimate results of countries with a middle performing in terms of financial development are summarized in Table 8. For Thailand, all variables are significant and it has been determined that financial development can be explained by the inverted U-shaped hypothesis. Also, the Kuznets hypothesis is confirmed in terms of income. In Cyprus, only FDI² and INF are significant. The FDI increases inequality, while INF decreases. In Greece, all variables except for FRE are significant and increase income inequality. While GDP creates income inequality in Israel, GDP² does not make sense. In terms of financial development, the inverted U-shaped hypothesis is valid. INF and FRE increase inequality. A similar structure prevails in New Zealand and Iceland. All variables are significant, and the Kuznets and FKC hypotheses are valid. INF and FRE reduce inequality. No significant variables have been identified for Malta. For South Africa, only FDI and FDI² variables make sense, and an inverted U-shaped hypothesis is observed. In Brazil, all variables except for FRE are significant and tend to increase income inequality except for INF. While the Kuznets hypothesis is valid in China, the FKC hypothesis does not. In addition, inflation reduces income equality. FRE is not significant.

Coefficient estimate results of countries with poor financial development performance are reported in Table 9. No significant results were found for Georgia, Gambia, and Paraguay. Kuznets and the FKC hypotheses are valid in the Dominican Republic and Ghana. In these two countries, the INF disrupts the income distribution, while the FRE is effective in a reducing direction. In Tanzania, Zambia, and Kyrgyz, GDP, GDP², FDI, FDI², and INF increase income inequality. In Uganda and Malawi, income and financial development indicators in linear form are effective in reducing inequality, while FRE is effective in increasing inequality.

Table 9. CCE estimator results for Poorly Performing Countries

Variables Countries	GDP		GDP ²		FDI		FDI ²		INF		FRE	
	Coeff.	Prob.	Coeff.	Prob.	Coeff.	Prob.	Coeff.	Prob.	Coeff.	Prob.	Coeff.	Prob.
GEO	-4.956	0.401	0.730	0.419	0.196	0.644	-0.399	0.842	0.002	0.667	0.003	0.985
DOM	-16.399^a	0.000	2.372^a	0.000	5.062^a	0.000	-20.833^a	0.000	0.004^a	0.000	-0.008^a	0.000
GHA	1.661^b	0.040	-0.260^b	0.043	-0.676^a	0.000	2.371^a	0.000	0.004^b	0.029	-0.004^a	0.000
PRY	2.868	0.145	2.914	0.143	3.724	0.184	6.545	0.189	-0.003	0.719	0.016	0.451
TZA	1.284^b	0.022	0.222^b	0.028	0.466^a	0.005	1.683^a	0.009	0.001^b	0.035	0.003	0.107
ZMB	5.767^a	0.003	4.847^a	0.002	14.416^a	0.000	-1.319^a	0.000	0.002^a	0.001	0.016^b	0.067
KGZ	0.900	0.807	-0.162	0.798	-1.689^a	0.009	9.449^a	0.007	0.002^c	0.088	-0.020^b	0.018
GMB	3.414	0.478	-0.582	0.481	-0.612	0.153	3.517	0.133	0.009	0.885	-0.001	0.246
UGA	-2.357^a	0.003	0.421^a	0.002	-2.464^b	0.024	13.812^b	0.019	0.003	0.575	0.009^a	0.007
MWI	-1.059^b	0.067	0.128	0.762	-0.708^b	0.042	3.904^c	0.069	-0.003	0.642	0.010^b	0.081

Note: a; %1, b; 5% and c; 10% indicate significance levels.

6. Conclusion

Financial markets are mechanisms that combine those having surplus funds with those in need of funds. In cases where financial development is increasing in the country's economies, people who have previously been outside the financial system are also more likely to be involved in the system. In this way, individuals are expected to increase their income using financial instruments. As a result, it is envisaged that the income distribution will become more equitable. Theoretical and empirical researches reveal that financial development will not always reduce the income inequality. In this study, 30 countries ranked for performance in terms of financial development level were included for the period of 2000-2015. In countries divided into three groups as best, middle and poor performance in terms of financial development, panel data analyses showed that the income inequality and independent variables were cointegrated. What is important here is the issue of how the variables used affect the income distribution. In countries that are in the best group in terms of financial development, financial development and income per capita have been found to improve the distribution of income in general. In middle-performing countries, financial development has a reducing effect on income inequality in countries with a higher level of development, such as Thailand, New Zealand, and Iceland. But for developing countries such as China and Brazil, financial development has not yet been found to reduce income inequality. Although income inequality tends to reduce partly as income increases in countries with high growth rates, such as China, the financial structure

is not yet able to fulfill this task. In countries with poor financial development, which are the last group of countries, both income per capita and financial development have a weaker ability to reduce income inequality. These findings show that the financial system is a regulatory mechanism that arises only at a certain level of sophistication of the economy. However, it should not be forgotten that financial development is an important means of reducing income inequality. It is critical to create a well-functioning financial sector with structural regulations and incentives, especially in countries with medium and low-level financial development. As stated in the study of Altıntaş and Akpolat (2021), in these country groups, governments should provide facilities by easing the collateral needs of households who want to benefit from the financial system. In this way, individuals who have easier access to financial services will have the opportunity to make both physical and human capital investments. Thus, depending on the increase in total savings and competition in the banking system, investments in the economy increase, and sustainable economic growth can be achieved. As a result, income inequality can be reduced by establishing a bilateral mechanism in which financial development feeds economic growth and economic growth increases financial development.

Declarations and Disclosures

Ethical Responsibilities of Authors: The authors of this article confirm that their work complies with the principles of research and publication ethics.

Conflicts of Interest: No potential conflict of interest was reported by the authors.

Funding: The authors received no financial support for the preparation and/or publication of this article.

Author Contributions: The authors confirm contribution to the article as follows: Conceptualization and design, A. Altiner and S. Turedi; data collection, E. Bozkurt; analysis of data and interpretation of results, E. Bozkurt; writing the first draft of the manuscript, A. Altiner, E. Bozkurt and S. Turedi; review and editing, A. Altiner, E. Bozkurt and S. Turedi. The manuscript/article was read and approved by all the authors, and all authors accepted responsibility for their article.

Plagiarism Checking: This article was screened for potential plagiarism using a plagiarism screening program.

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Appendix

Table 1. Financial Development Index

Financial Institutions Index	
Depth	Bank credit to private sector/GDP
	Pension fund assets/GDP
	Mutual fund assets/GDP
	Insurance premiums (life and non-life)/GDP
Access	Bank branches per 100.000 adults
	ATMs per 100.000 adults
Efficiency	Banking sector net interest margin
	Non-interest income/total income
	Lending-deposits spread
	Return on assets
	Overhead costs/total assets
	Return on equity
Financial Market Index	
Depth	Stock market capitalization/GDP
	Stocks traded/GDP
	International debt securities of government/GDP
Access	Total debt securities of financial and nonfinancial corporations/GDP
	Percent of market capitalization outside of top largest companies
Efficiency	Total number of issuers of debt per 100.000 adults
	Stock market turnover ratio

Source: IMF (2020)