

# The Dynamics of Income Inequality in Emerging Nations: A Panel GMM Approach

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**Abstract:** This paper examines the determinants of income inequality across twelve emerging economies over the period of 1991 to 2023. Generalized Method of Moments approach has been used to account for endogeneity issues and cross-sectional dependence. The study analyses the impact of economic growth, expenditure of government and human development on the Gini index. The study finds a strong persistence income inequality over time. Economic growth exhibits a positive relationship with the Gini index, indicating it widens income disparity in these nations. In contrast, control variables such as the Human Development Index and Government Expenditure shows an adverse effect on income disparity.

**Keywords:** Income Disparity, Emerging Countries, Panel GMM, Economic Growth

## 1. Introduction

In past few years, the topic income disparity has drawn global attention. This term denotes the imbalanced allocation of resources and earnings among various nations or within a community. When a small segment of the population gets disproportionate share of total income while majority receives less than its share, this is referred to as inequality. This inequality has negative consequences for economic development and the overall well-being of the country. Social cohesion weakens and the potential for social unrest increases when a significant part of the population feels excluded from the benefits of economic growth (Milanov, 2016). Moreover, unchecked disparities generate

an intergenerational persistence of disadvantage, as economically disadvantaged groups lack the resources necessary for social mobility (Bernheim and Rangel, 2009). This results in low dynamism and productivity at work, which, in the end, hampers sustainable economic growth (OECD, 2018).

Reducing income disparity is a complex task that requires a holistic perspective. One common example of attempts to reduce inequality is when SDGs were unveiled by UN in 2015. Goal 10 of the SDGs specifically focuses on reducing disparities between countries and within countries. This goal is particularly relevant to the context for emerging economies. Where rapid economic growth is often accompanied by increasing income inequality. The research conducted by the International Monetary Fund was conclusively demonstrated that large levels of income inequality can reduce the rate and sustainability of economic growth in emerging economies (Ostry, Berg, & Tsangarides, 2014). The inequality of wealth and opportunity can give rise to bitterness, social unrest, and feelings of injustice, which can result in the destruction of the legitimacy of the government (Acemoglu and Robinson, 2012).

In the past, the relationship between income disparity and economic growth in developing countries has been explained by Kuznets' hypothesis. The hypothesis posits that income inequality increases during the early stages of economic growth and then decreases (Kuznets, 1955). However, the validity of this theory has been questioned, suggesting that the relationship between income inequality and economic growth is more complex (Piketty, 2014). To encourage inclusive growth that provides equal opportunities for all citizens, the leaders of these nations must implement a comprehensive plan that includes human capital investments, redistributive policies (Stiglitz, 2012). So, purpose of this article is to examine current income inequality trends in many emerging economies and systematically identify the macroeconomic factors that contribute to these inequalities.

## **2. Review of Literature**

### **2.1. Theoretical Review**

When looking into the theoretical framework of income inequality one fundamental theory that emerges is the Kuznets curve hypothesis, proposed by Simon Kuznets. He proposes there is a nonlinear correlation between expansion of an economy and disparity in wealth. As per the theory, disparity initially rises in the starting phases of development, as an economy matures the benefits of growth become fairly spread which results in a decline in disparity (Kuznets, 1955). On the other hand, the "human capital theory" was proposed by Schultz and Becker. They provide an important theoretical

perspective on income inequality. Investments in education lead to higher productivity and earning capacity, which decreases income disparities (Becker, 1964 & Schultz, 1961). Institutional economists have a different view. They argue that income distribution is not a natural outcome of growth but is actively constructed by the manner in which society is organized, including the rules for the labour market and taxation (North, 1990; Atkinson & Brandolini, 2001). The capability approach highlights how income inequality hinders human development. It recommends specific policy interventions for promoting social justice, moving beyond material wealth to human freedom and capabilities (Sen, 1992; Nussbaum, 2000).

## ***2.2. Review of Empirical Studies***

There has been numerous research conducted on the determinants of disparity in income. Empirical studies on the determinants of disparities in wealth in emerging economies show the diversity of these factors.

Economic growth and its impact on income disparities have been researched by a large number of economists, and the results are varied. In research conducted in Korea, Lee et al. (2013) concluded that there was no U-shaped curve in the income disparities in the country. In another research, Bouincha & Karim (2018) used panel data from 190 countries worldwide and concluded that economic growth does not affect income disparities in the world as a whole. They also concluded that economic growth can help in reducing income disparities in developed countries with a good system of wealth redistribution. In another research conducted in Indonesia, Amri (2018) concluded that in Indonesia, there was no long-term relationship between income disparities in the distribution of wealth and economic growth in the country. In research conducted in Nigeria, Idowu & Adeneye (2017) concluded that income disparities actually act as a hindrance in the development of poorer countries, even though it might be a help in European countries.

Another important area of research in the previous studies is the impact of government expenditure on the reduction of inequality. Hailemariam et al. (2021) discovered that government expenditure is effective in decreasing income inequality in OECD countries. In South Asian countries, Munir et al. (2017) discovered that government consumption expenditure is effective in decreasing inequality in India and Pakistan. Noor (2021) also discovered that government expenditure is effective in decreasing inequality, especially in developed countries where threshold effects exist. However, not all studies agreed on this point. Tom & Harrison (2023) discovered that no significant relationship exists between government social expenditure and wealth

disparity in the United States. What is surprising is the discovery of Walujadi et al. (2022) that government expenditure increases income disparity in Indonesia. This tells us that how public money is targeted and spent matters just as much as the amount spent.

Finally, empirical studies show a strong connection between human development and an equitable distribution of income. Researchers often discover that improvement in education, health, and living standards reduce disparities of wealth. Yuliani et al. (2021) showed that the Human Development significantly lowered income disparity in Yogyakarta province. Yuliani et al. (2021) showed that the HDI significantly lowered disparity of wealth in Yogyakarta province. Katherine et.al (2015) employing OLS and Fixed effects approach the result finds that an S-curve pattern where initial HDI growth leads to falling income inequality. It also concludes that rising inequality may not be necessary for development. In more recent studies, Sudarsana & Arka (2023) use panel data and regression analysis of province of the Riau Islands. The outcome demonstrates that HDI has a negative and somewhat significant effect on income disparity. These findings highlight a very clear consensus in the literature. Investing directly in human capabilities is one of the most reliable ways to make income distribution fairer across an economy.

### 3. Data, Variables and Estimation Technique

#### 3.1. Data and Variables

Panel data for 12 emerging countries were collected on an annual basis from 1991 to 2023. Argentina, Brazil, Chile, Colombia, the Czech Republic, Hungary, India, Indonesia, Mexico, Poland, Russia, and Thailand are the twelve developing and emerging nations. In order to determine disparities in income, one can use Gini index (GINI). GINI is the dependent variable in this investigation. These data are taken from WDI of world bank. But the Gini Index includes some missing values. To address this problem, the moving average method has been used. Additionally, data on government expenditure and the gross domestic product (GDP) is gathered from WDI. HDI is taken from the UNDP.

#### Variable Definition and Sources

<i>Sl.</i>	<i>Variable</i>	<i>Definition</i>	<i>Sources</i>
1	GINI	Gini Index	WDI
2	LGDP	Log of Gross Domestic Product (constant 2015 US\$)	WDI
3	HDI	Human Development Index (Value)	UNDP
4	GEXP	Government Expenditure as a percentage of GDP	WDI

Before testing our main models, it is helpful to look at the basic features of the data. The summary statistics for every variable used in this investigation are shown in Table number 1. It outlines minimum, maximum, standard deviation, and mean values for each variable

**Table: 1 Descriptive Statistics**

<i>Variable</i>	<i>Observation</i>	<i>Mean</i>	<i>S.D.</i>	<i>Min</i>	<i>Max</i>
<b>GINI</b>	396	40.99	9.49	20.7	60.1
<b>LGDP</b>	396	26.75	0.95	20.81	28.71
<b>HDI</b>	396	74.17	9.67	43.7	91.5
<b>GEXP</b>	396	15.21	4.41	2.97	27.72

Source: Author's estimation

The correlation matrix for the variables examined in this research is shown in the 2<sup>nd</sup> table. The primary purpose of this matrix is to check for multicollinearity. It ensures that our independent variables are not too closely related to one another.

**Table: 2 Correlation Matrix**

	<i>GINI</i>	<i>LGDP</i>	<i>HDI</i>	<i>GEXP</i>
GINI	1.00			
LGDP	0.23	1.00		
HDI	- 0.18	- 0.22	1.00	
GEXP	- 0.26	- 0.24	0.53	1.00

Source: Author's estimation

## Model Estimation

Panel data were used in this study because they produce more accurate results than “cross-sectional data” and “time-series data”. Its outcomes are greater effectiveness because they reduce misspecifications and control individual country heterogeneity. The research uses this simple model to identify the elements that lead to income disparity:

$$GINI = f(LGDP, HDI, GEXP)$$

Where, GINI is dependent variable used for measurement of income disparity. The LGDP, HDI, GEXP are the independent variables.

To analyse this, we employ “Fixed Effect”, “Random Effect” and “Generalized Method of Moments” models. GMM is especially useful when dealing with models that include endogeneity, autocorrelation, or heteroskedasticity. The optimal model between FEM and REM is found using the Hausman specification test. The Sargan test evaluates the reliability of instrumental variables in the GMM model.

## 4. Empirical Result and Discussion

### 4.1. Unit Root and Cross-Sectional Dependence Tests

Testing whether the data is stationarity or not is first stage of data analysis. The stationarity of a variable over time across several cross-sectional units is tested using the panel UR test. Following table presented provides the outcomes of two panel tests such as LLC and IPS.

**Table 3: Panel Unit Root Test**

Variables	Levin-Lin-Chu(LLC)				Im-Pesaran-Shin(IPS)			
	Level		1 <sup>st</sup> Dif.		Level		1 <sup>st</sup> Dif.	
	INT	INT & TR	INT	INT & TR	INT	INT & TR	INT	INT & TR
GINI	-3.40 (0.30)	10.79*** (0.00)	-16.30*** (0.00)	-16.59*** (0.00)	-1.58 (0.49)	-2.96*** (0.00)	-8.01*** (0.00)	-8.17*** (0.00)
LGDP	-3.47** (0.002)	-7.54 (0.11)	-12.44*** (0.00)	-12.79*** (0.00)	-1.03 (0.97)	-1.99** (0.04)	-4.62*** (0.00)	-4.69*** (0.00)
HDI	-9.56*** (0.00)	-3.18 (0.98)	-11.67*** (0.00)	-14.74*** (0.00)	-2.17** (0.01)	-0.57 (1.00)	-4.06*** (0.00)	-4.90*** (0.00)
GEXP	-7.33*** (0.00)	-11.58*** (0.00)	-16.52*** (0.00)	-16.62*** (0.00)	-2.38*** (0.00)	-2.63*** (0.00)	-5.24 (0.00)	-5.26*** (0.00)

Source: Author's estimation

Notes: p-values are reported in parenthesis. \*\*\* and \*\* represent 1% and 5% level of significance, respectively.

In the above table both LLC & IPS tests confirm that every variable is stationary at level I(0). Following this, the test known as Cross-Sectional Dependence is a statistical tool for determining the Cross-sectional dependency is present in the panel data set.

**Table 4: Cross Sectional Dependence Test of the Variables**

VARIABLES	CD TEST	CORRELATION	P-VALUE
GINI	8.61	0.187	0.000
LGDP	43.60	0.949	0.000
HDI	45.14	0.982	0.000
GEXP	3.13	0.068	0.002

Source: Author's estimation

Based on the outcome, there is significant proof of the cross-sectional dependence among variables GINI, LGD, HDI & GEXP. This means that the error terms from these variables are correlated. To account for this, the Pesaran CIPS second-generation unit root test was utilized. In the table 5 the result confirmed that all series remain stationary when accounting for cross-sectional dependency.

**Table 5: Pesaran CIPS Test of the Variables**

Variables	CIPS Value	Level of Significance
GINI	-2.726	1%
LGDP	-2.350	5%
HDI	-2.621	1%
GEXP	-2.229	5%

Source: Author's estimation

#### 4.2. Fixed Effect, Random Effect and Hausman Tests

The tables show the results of the Fixed Effect and Random models used for analyse of the determinants of income disparity. Where Gini coefficient as the dependent variable and LGDP, HDI & GEXP are independent variable. The model 1 includes Constant and LGDP. The Model 2 adds HDI to model 1. The Model 3 includes Constant term, LGDP, HDI and GEXP. The coefficients indicate the effects of each variable on inequality of income. FE & RE model shows LGDP has positive effect on inequality. Variables such as HDI and GEXP have a negative effect on income disparity. RE and FE model shows positive effect of LGDP on disparity of income. The variables HDI and GEXP have an adverse impact on disparity.

Hausman test is particularly useful in “selecting between random-effects (RE) and fixed-effects (FE) models for panel data analysis”. As the P-value across all models is greater than 0.05, so the null hypothesis cannot be rejected. It means the RE model is preferred over the FE model.

**Table 6: Fixed Effect Model and Random Effect Model**

GINI: Dependent Variable						
Independent Variables	FE Model			Random Effect Model		
	Model 1	Model 2	Model 3	Model 1	Model 2	Model 3
Const.	40.71*** (0.00)	58.94*** (0.00)	61.13*** (0.00)	40.71*** (0.000)	58.91*** (0.000)	61.10*** (0.000)
LGDP	11.25*** (0.003)	9.25*** (0.007)	6.29* (0.080)	11.22*** (0.003)	9.21*** (0.007)	6.22* (0.083)
HDI		-0.24*** (0.00)	-0.22*** (0.00)		-0.22*** (0.000)	-0.22*** (0.000)
GEXP			-0.22*** (0.009)			-0.22*** (0.008)

Source: Author's estimation

Notes: p-values are reported within parenthesis. The significance levels of 1% and 10%, respectively, are denoted by \*\*\* and \*.

**Table 7: Hausman Test**

<i>Models</i>	<i>Cross-Section Random</i>		
	<i>Chi-Sq. Stat.</i>	<i>D.F.</i>	<i>Prob.</i>
Model 1	0.0200	1	0.6540
Model 2	0.0892	2	0.6573
Model 3	1.4046	3	0.7045

Source: Author's estimation

#### 4.4. GMM Model Estimation

The GMM stands for “Generalized Method of Moments”. To estimate the model parameters, it makes use of moment conditions obtained from the information. GMM is especially useful when dealing with models that include endogeneity, autocorrelation and heteroskedasticity. In models where past values of the explained variable are used as explanatory variable in models, GMM can handle the resulting autocorrelation in the error term. The table 8 displays the outcomes of GMM calculations employed to recognise the determinants of income inequality. Here, GINI is the dependent variable and LGDP, HDI & GEXP are independent variable. Each model includes various sets of independent variables to see how they affect the disparity in income.

**Table 8: GMM Model**

<i>Variables</i>	<i>GINI: Dependent Variable</i>		
	<i>Model 1</i>	<i>Model 2</i>	<i>Model 3</i>
GINI (-1)	0.81*** (0.000)	0.78*** (0.000)	0.68*** (0.008)
LGDP	-0.97*** (0.000)	2.13*** (0.037)	14.61** (0.034)
HDI		-0.21*** (0.002)	-1.25** (0.026)
GEXP			-0.55** (0.020)

Source: Author's estimation

Notes: p-values are reported in parenthesis. \*\*\* and \*\* represent 1% and 5% level of significance, respectively.

The full model i.e. models 3 includes GINI (-1), LGDP, HDI and GEXP. With the P-value of 0.008, the lagged Gini Index coefficient of 0.68 is statistically significant. It means the past year's Gini significantly and favourably influences the GINI of the present time. In other words, the Gini Index shows a high level of consistency throughout

time. The coefficient for LGDP is 14.61 which is significant at 5% level. It indicates that Growth in the economy, quantified by GDP, is correlated with rising inequality in income, as capture by the Gini. The coefficient for HDI is -1.258483, it means a one-unit rise in the HDI is associated with a 1.25 unit fall in Gini, keeping other variables fixed. This implies that improvements in human development which as determined by the HDI, are related to a decrease in income disparity. With a coefficient of -0.55, GEXP is statistically significant. This indicates that a 1 unit rise in govt expenditure is connected with a 0.55-unit decline in the GINI, holding all other variables constant. The negative sign on the coefficient suggests that higher government expenditure is linked to lower inequality in income. This implies that increased government spending and investment may help reduce income disparities within the economy.

#### 4.5. Sargan Test

At last, the Sargan test for overidentifying restrictions was used to evaluate the validity of instrumental variables. The table show the results of a Sargan test for three different models. For all the model the P-values are greater than 0.05. As a result, we are unable to rule out the null hypothesis that the overidentifying constraints are legitimate. It means that the instrumental variables employed in the model appear to be valid.

**Table 9: Sargan Test**

	<i>Model 1</i>	<i>Model 2</i>	<i>Model 3</i>
P- Value	0.92	0.94	1.00

Source: Author's estimation

## 5. Conclusion

Income inequality dynamics of different countries have been explored in this research by employing the GMM method. The results of the research have indicated that income inequality persists, as the lagged Gini Index has a positive coefficient, signifying that past levels of income inequality are the most important factors that determine the current levels of income inequality. The positive relationship between the Log of GDP and the Gini Index indicates that economic growth may not be sufficient to reduce income inequality, as economic growth may even increase income inequality as the benefits of economic growth are not distributed equally among the people of the countries. The negative and significant coefficients of government expenditure and HDI indicate that income inequality may be reduced by focusing on social development, as the improvement of the living standards of the people of the countries reduces income

inequality, and government expenditure may be an important tool to reduce income inequality by increasing government expenditure.

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