

REMOVING INCOME INEQUALITY IN DEVELOPING ASIAN NATIONS: THE LINKAGE BETWEEN GLOBALIZATION, TECHNOLOGY ADOPTION, AND ECONOMIC DEVELOPMENT

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Abstract

This paper examines the influence of globalization, technology adoption, and economic development on income inequality in developing Asian countries. The study utilizes panel data from 2001 to 2020 and explores the relationship between income inequality and globalization, technology adoption, GDP growth, and net national income. The empirical findings show that there exists a negative correlation between income inequality and the three independent variables, indicating that these factors contribute significantly to reducing income inequality in developing Asian countries. These results underscore the importance of formulating effective policies that prioritize globalization, technology adoption, and economic development in reducing income inequality in developing countries.

Introduction:

While economic growth has been recognized as one of the key drivers of reducing income inequality, recent studies suggest that globalization, technology adoption, and economic development are essential factors that can also contribute to reducing income inequality in developing countries. This paper aims to explore the influence of these factors on income inequality in ten developing Asian countries. The study uses panel data from 2001 to 2020 to investigate the effects of globalization, technology adoption, GDP growth, and net national income on income inequality.

The study's findings indicate that globalization, technology adoption, and economic development have a negative effect on income inequality, suggesting that these variables have a significant role to play in reducing income inequality in developing countries. The study's results provide policymakers with crucial insights into designing effective policies on reducing income inequality in developing countries. The paper contributes to the literature on income inequality by exploring how globalization, technological advancement, and economic development can impact income inequality in developing Asian nations. The study underscores the importance of considering these variables when formulating policies aimed at reducing income inequality in developing countries.

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2. Literature Review

Over the past few years, numerous countries around the world faced substantial enhancement in globalization and economic freedom. This benefited the economic growth of many countries but also brought factors related to income inequality. Roy-Mukherjee and Udeogu (2021) investigated the relationship between income inequality and neo-liberal globalization in the Western Balkan countries. The study indicates that proper arrangement of capital, trade and income are dependent on the good governance of globalization. The increased expenses due to globalization in developing countries highlighted the issue of income inequality. Aluko, Ibrahim, and Atagbuzia (2021) examined the relationship between globalization and foreign direct investment that extended its influence on income inequality in Africa. The study states that globalization plays an important role and influences income inequality. The limited knowledge has been considered a similar element in the globalization and liberalization that neglected the flow of income. Therefore, the dimensions of globalization influences and economic freedom clearly indicate its dominant influence on the inequality of income. Gozgor (2017) analyzed the impact of globalization on the unemployment structures that have a significant influence on income inequality. The finding states that robust potential exists in the globalization index that poses a strong influence over income inequality. The concepts of rich and poor are rigorously enumerated due to the quantifying impact of globalization. Globalization has eliminated the distance among people but has also had various impacts on the lives of people. These impacts vary, from culture to income, due to the inappropriate distribution of essential elements among people globally. Several dimensions of globalization that benefited the world with rising economic growth also disrupted the levels of income among the people. Improper policy reforms that promoted sensitivity of inequality among different cultures and classes of people is also the biggest disaster in developing countries (Khan et al., 2021). Deregulation and improper social regulation also have a non-equalizing impact on income inequality in developing countries.

Technology has been a major intervention in the current world and eliminated a much-skilled labor force that has impacted people's income. Developing countries export their energy to developed countries that are influencing income inequality. Sultanuzzaman, Fan, Mohamued, Hossain, and Islam (2019) explored the impacts of technology and exports on the growth of the economy and on the income inequality of Asian countries. The study states that high technology exports not only disrupt the economic growth but also disrupts the income inequality among people. Technology plays a vital role in the enhancement of economic growth, but exports have a larger impact. Hayduk (2020) enumerated the high technology exports among developed countries influencing the income inequality in developing countries. The finding states that significant and severe impacts of technology exports impact skills as well as income inequality. Income inequality is one of the greatest factors that is influenced by the export of high technology. Idris, Ismail, Ibrahim, and Hamzah (2021) assessed the trade of high technology from developing countries that clearly impacts income inequality. Results indicated that inappropriate policies of retaining high technology create more unemployment and income inequality. Usually, high technology is important in motivating workers as well as developing skills among the labor force. This benefits income stability and brings a more persistent inflow of money among the people without differentiation. More innovation within the industries develops people's skills and motivates them to increase their efforts in support of the economy. The export of high technology reduces innovation in industries and influences the income inequality in various ways. The positions of people working in the industries were improved due to the implementation of high technology (Untari et al., 2019). However, the export of high technology had a negative impact on people's income but also influenced the economic growth of developing countries.

The role of economic growth is dominant in the stability and instability of countries, whether developed or undeveloped. Therefore, it is important for every country to sustain its economic growth to ensure the stability

of every sector and every need pertaining to the working people. Economic growth is defined as an increase in national per capita income and output. However, economic development does not imply an increase in people's living conditions. It might be due to a growth in income for the wealthy while the poor see little or no change in their living conditions. Vladušić, Dragović, and Bašić (2018) interpreted the relation and growth of gross domestic product and private savings in Bosnia and Herzegovina, indicating its influence on income inequality. The study revealed that gross domestic product and its growth and decline has a major influence on income inequality. Gross domestic product relates to the per capita growth that clearly impacts the income flows of the country. Lalwani and Chakraborty (2020) narrated the relationship between gross domestic product and aggregate earnings of developing countries that are influential on income inequality. The study indicates that there could be proper aggregate earnings of developing countries when the gross domestic product is properly and positively upgraded. The decrease in gross domestic product has a huge and lasting impact on the income inequality of developing countries from various stances. Nugent and Conway (2021) examined the relationship between ownership changes, income inequality and gross domestic product with various other factors. The findings indicate that the lack of growth in the gross domestic product and its sustainability shows a negative impact on income inequality. This is due to improper management of industries and regulation of institutions that contribute a major portion of their income to their governments. The need for stable social and political factors is also important as they impact the income inequality in developing countries. Mostly, developing countries are unable to meet the standards of economic conditions due to decreased international investments. The unstable economic conditions also have a lasting impact on the income and lives of people, and this may also create uncertainty. Low-income countries usually gain transitional growth by enlarging their political influence for attaining foreign investment to sustain their economic growth. The proper sustainability in economic growth and gross domestic product are instrumental in eliminating the factors of income inequality. National measures, especially the establishment of institutions to deal with inequality, can, nonetheless, play a significant role in lowering income disparity (Hailemariam et al., 2020). A number of developing countries have used fiscal measures to reduce high levels of primary income disparity to lower levels of secondary and tertiary inequality.

The incomes of countries are based on different factors and sectors that are majorly highlighted by sustainability and increased economic growth. Net national income is also defined as gross national income that is attained from higher asset sources. Li and Chen (2019) investigated the perspectives of global income chains and national income and their role in income distribution. Findings revealed that a boost in the net national income could be vital for the elimination of income inequality. Efficient management of net national income not only helps to sustain and increase economic growth but also benefits the livelihoods of people. Arlotti and Sabatinelli (2017) explored the support of net national income with the minimum income schemes for workers that influence income inequality. The results revealed that net national income is a strong factor related to global income that significantly impacts income inequality. Developing countries retained their highest assets for developed countries for the sake of loans that reduced the net national income. Liang (2021) examined the relationship between demand-driven growth and income distribution with the relevance of income traps that impact income inequality. The findings revealed that the net national income traps and their distribution are responsible for the influence on income inequality. This reduction has had a major impact on economic instability and income inequality among the Chinese people. Income inequality has been largely influenced by the net national income due to persistent higher expenses and lack of policy implementation. Due to the higher loan schemes, most of the net national income is put toward the payments that largely impact the expenses and budgets of developing countries. This impact has not only restrained resource allocation but has also limited people's income (Khan et

al., 2018). Inflation and rising expenses of commodities are expanded due to the improper management of national income. Lack of tax collection and income generation from developing countries contribute significantly to income inequality.

3. Research Methods

This article investigates the impact of globalization, technology adoption, and economic development on income inequality, using data from secondary sources for ten developing Asian countries for the analysis – Iran, Jordan, Iraq, Laos, Pakistan, Bangladesh, Sri Lanka, Thailand, Indonesia, and the Philippines. Large-scale panel data from 2001 to 2020 were extracted from the World Bank (WB) database and the KOF globalization index. In order to acquire robust outcomes, STATA statistical software is employed. The current article established the equation using understudy constructs mentioned below:

$$GINII_{it} = \alpha_0 + \beta_1 GI_{it} + \beta_2 HTE_{it} + \beta_3 GDP_{it} + \beta_4 NNI_{it} + e_{it} \quad (1)$$

Where:

GINII = GINI Index. i

= Country. t = Time

Period.

GI = Globalization Index.

HTE = High Technology Export.

GDP = Gross Domestic Product.

NNI = Net National Income.

This study uses income inequality as the dependent variable and measured as the GINI index. Globalization, technology adoption, and economic development are selected as predictors. Globalization is measured as the KOF globalization index, technology adoption has been measured as High Technology Export (% of manufactured exports), and economic development has been measured as the GDP growth (annual percentage) and net national income (annual % growth). The variables' measurements and sources are detailed in Table 1.

Table 1. Measurements of the variables.

S#	Variables	Measurement	Source
01	Income Inequality	GINI Index	WB
02	Globalization	Globalization Index	KOF
03	Technology Adoption	High Technology Export (% of manufactured exports)	WB
04	Economic Development	GDP Growth (annual percentage)	WB
		Net National Income (Annual % growth)	WB

This section also provides the statistical methods that are used in the study. The descriptive statistics expose the variables' details, such as mean and standard deviation, and show the minimum and maximum values and number of observations. The correlation matrix is used to check the statistical relationship among the selected variables. Analytically, the correlation clarifies the significant relationship among the selected variables (Taylor, 1990). In addition, this study employs the variance inflation factor (VIF) test to check the multicollinearity issue among the studied variables. Multicollinearity scrutiny is grounded on the measure explained by several scholars who explicate that the variables possess a serious multicollinearity issue if its VIF value exceeds 10 (see (Akinwande,

Dikko, & Samson, 2015; Gujarati & Porter, 2009; Hernawati, Hadi, Aspiranti, & Rehan, 2021; Kennedy, 2008)). The equations of the test are detailed below:

$$R^2Y \quad \longrightarrow \quad Y_{it} = \alpha_0 + \beta_2 X_{2it} + \beta_3 X_{3it} + \beta_4 X_{4it} + \beta_5 X_{5it} + e_{it} \quad (2)$$

$$j = R^2_{Y^2, X^2_1, R^2_{X^2_2, R^2_{X^2_3, R^2_{X^2_4, R^2_{X^2_5}}}} \quad (3)$$

$$Tolerance = 1 - R_j^2 \quad VIF = Tolerance^{-1} \quad (4)$$

Moreover, consistent with the practices of former scholars (see (Atif, Srivastav, Sauybekova, & Arachchige, 2012; Faustino & Vali, 2013; Perugini & Tekin, 2022)), this study uses a balanced panel data model (PDM) to investigate the relationship among the selected variables. A panel data model is a combination of time series and cross-sectional data (Abdul Razak, Rehan, Zainudin, & Hussain, 2018). A balanced panel data model specifies all time intervals with parallel observations. The PDM model is illustrated as follows:

$$PDM = y_{it} = \alpha_i + \gamma_t + \beta x_{it} + \varepsilon_{it} \quad (5)$$

where, i is the engaged individuals ($i = 1, 2, 3, 4 \dots N$), t is the period of time ($t = 1, 2, 3, 4 \dots T$), y_{it} is taken as the dependent variable (DV), α_i represents the specific cross-sectional effects, and γ_t is the time series effects of the model. Furthermore, x_{it} is the independent variable, and ε_{it} is taken as error term effect and has a zero mean constant variance. For analytical purposes, this study adopts panel data static models (fixed and random effects models) to examine the association among the selected variables. The fixed effects model is a panel data model in which the parameters are fixed quantities, whereas in the random effects model, the parameters are not fixed and have random quantities (Abdul Razak et al., 2018).

This study adopts the Breusch–Pagan Lagrange Multiplier (BP LM) test, that is presented by Breusch and Pagan (1980) to check which static model of panel data, either random or pooled effects, is suitable to test the selected variables. Principally, the BP LM test uses the Hausman test's (Hausman, 1978) 'm' statistics to check the hypothesis. The null hypothesis of the BP LM test confirms the acceptance of the pooled model (H_0 : pooled OLS is accepted). However, if H_0 is rejected, then we accept the random effects model (H_1 : random effects is accepted). Subsequently, if the null hypothesis of the acceptance of the pooled OLS is rejected then the Hausman test is used to check the acceptance of the fixed or random effects models (Breusch & Pagan, 1980).

Technically, the Hausman test compares both the fixed and random effects models. The null hypothesis of the Hausman test confirms the acceptance of random effects model (H_0 : random effects exist). However, if the alternative hypothesis is selected, then the fixed effects model is preferred. Statistically, if the value of the Hausman test result is less than the significant value, the null hypothesis is rejected (Abdul Razak et al., 2018; Hernawati et al., 2021).

The equation of the test is set out below:

$$H = (b_1 - b_0) (Var(b_0) - Var(b_1)) (b_1 - b_0) \quad (6)$$

Here, H refers to the Hausman test, b_0 represents the null hypothesis related to the random effects model (REM) being the best model for the study, while b_1 represents the alternative hypotheses, which is related to the fixed effects model (FEM) being the best model for the study. Technically, the FEM controls the issues of heterogeneity and autocorrelation that generally exist in the PDM model. The equation of the model is given as follows:

$$Y_{it} = \beta_{1i} + \beta_2 X_{2it} + \beta_3 X_{3it} + \beta_4 X_{4it} + \beta_5 X_{5it} + u_{it} \quad (7)$$

In the equation above, subscript i represents the individual country on the basis of their different characteristics.

The estimation equation for the FEM using the study's constructs is as follows:

$$GINII_{it} = \beta_{1i} + \beta_2 GI_{it} + \beta_3 HTE_{it} + \beta_4 GDP_{it} + \beta_5 NNI_{it} + u_{it} \quad (8)$$

Importantly, this study also tests the relationship among the study's variables by using a robust standard error model. This model is used because it adjusts the heterogeneity issues that generally exist in the PDM. Moreover, this model also provides the best estimations, even with data that have heteroscedasticity and autocorrelation issues, because it adjusts the adverse effects of these issues (Abdul Razak et al., 2018). The estimation equation for the model is as follows:

$$GINII_{it} = \beta_1 GI_{it} + \beta_2 HTE_{it} + \beta_3 GDP_{it} + \beta_4 NNI_{it} + \epsilon_{it} \quad (9)$$

4. Findings

The current study has run the descriptive statistics that exposed the variables details, such as mean and standard deviation, and also showed the minimum and maximum values along with the number of observations. The results indicate that the mean value of GINII is 44.922, and the average value of GI is 47.936. In addition, the results also show that the average value of HTE is 32.873, the mean value of GDP is 5.673%, and the mean value of NNI is 3.637%. The descriptive statistics are detailed in Table 2.

Table 2. Descriptive statistics.

Variables	Obs.	Mean	Std. Dev.	Min.	Max.
GINII	200	44.922	2.349	25.982	55.493
GI	200	47.936	4.873	43.746	64.637
HTE	200	32.873	1.652	22.763	35.627
GDP	200	5.673	1.704	4.657	10.627
NNI	200	3.637	2.763	2.763	9.872

Moreover, this study also ran the correlation matrix that shows the relationship among the studied variables. The figures indicate that GI, HTE, GDP, and NNI have a negative association with the GINI Index, which means the predictors reduce the income inequality in the country. Table 3 shows the association among the variables in the correlation matrix.

Table 3. Matrix of correlations.

Variables	GINII	GI	HTE	GDP	NNI
GINII	1.000				
GI	-0.543	1.000			
HTE	-0.435	0.548	1.000		
GDP	-0.487	0.442	0.654	1.000	
NNI	-0.342	0.322	0.622	0.329	1.000

In order to check the multicollinearity issue, the VIF test was run. Table 4 highlights that all the VIF values are lower than 10, which indicates the absence of multicollinearity in the executed model.

Table 4. Variance inflation factor.

Variables	VIF	1/VIF
GI	3.763	0.266
HTE	2.983	0.335
GDP	2.632	0.379
NNI	3.909	0.256
Mean VIF	3.322	

Table 5 presents the results obtained from the Breusch–Pagan LM test. Clearly, the p-values confirm the acceptance of the alternative hypothesis ($p < 0.05$). Hence, the outcome indicates that the random effects model is more effective than the pooled OLS model.

Table 5. Breusch–Pagan test.

H ₀ : Pooled OLS is accepted.	
H ₁ : Random effects is accepted.	
m Value	Pr > m
7333	0.0001*

Note: * denotes significance at the 5% level.

Next, this study executes the Hausman test to examine the best model for the empirical investigation. The outcome (see Table 6) shows that the probability value is lower than 0.05. Thus, the result clearly indicates that the fixed effects model (FEM) is suitable for this analysis.

Table 6. Hausman test.

H ₀ : Random effects model is accepted.	
H ₁ : Fixed effects model is accepted.	
Test	Coeff.
Chi-square test value	7.093
P-value	0.000

The results in Table 7 relate to the fixed effects model outcomes. The results indicate that globalization, technology adoption, and economic development have a negative association with the GINI index. Evidently, the studied variables play a significant role in reducing income inequality in developing nations. Notably, the R-squared value is less than 0.564, which indicates that the overall variation of the model is low. Generally, in static panel modelling, a low R-squared value is not a serious issue. Technically, when a panel data static model is more dominant by cross-section observations, the R-squared is considered low (Frank & Goyal, 2009).

Table 7. Fixed effects model (FEM).

GINII	Beta	S.D.	t-value	p-value	L.L.	U.L.	Sig.
GI	-0.546	0.283	-1.93	0.045	-1.331	-0.238	**
HTE	-1.876	0.763	-2.46	0.034	-1.540	-0.540	**
GDP	-0.453	0.187	-2.42	0.036	-1.333	-0.234	**
NNI	-0.564	0.223	-2.53	0.029	-1.549	-0.658	**
Constant	26.983	4.872	5.54	0.000	20.326	31.333	***
R-squared		0.564	Number of obs.		200		
F-test		2.432	Prob. > F		0.031		

Note: *** p < .01, ** p < .05.

Table 8 displays the robust standard error findings, indicating that globalization, technology adoption, and economic development have a negative link with the GINI index, which means these factors play a significant role in reducing income inequality in developing nations.

Table 8. Robust standard error.

GINII	Beta	S.D.	t	P > t	L.L.	U.L.
GI	-0.645	0.289	-2.232	0.022	-2.559	-0.275

HTE	-1.093	0.463	-2.361	0.019	-2.347	-1.943
GDP	-2.873	1.221	-2.353	0.020	-1.536	-0.513
NNI	-5.473	2.712	-2.018	0.036	-1.280	-0.939
CONS	6.040	1.321	-4.572	0.000	3.221	8.358

5. Discussion

The results show that globalization has a negative impact on income inequality. These results are supported by Haseeb, Suryanto, Hartani, and Jermstittiparsert (2020), who revealed that if there is income inequality in some regions, the population has potential opportunities to grow, succeed, earn more, and improve their living standards, while on the other hand, the situation is quite the opposite. Globalization, which allows the transportation of people and goods from one region to another, reduces income inequality. These results are in line with the findings of Law, Naseem, Lau, and Trinugroho (2020), who highlighted that when there is a difference in the labor wages because of a difference in area, education, or social prestige, globalization enables individuals to offer their services for desired wages, thus minimizing income inequality. Moreover, the results also show that high technology exports have a negative impact on income inequality. These results are in line with the findings of Saraswati, Maski, Kalug, and Sakti (2020), who revealed that sometimes a small group of people contains a larger portion of the national wealth because of the enhanced earnings opportunities through the use of high-quality resources, which they can afford on account of their economic power. However, the facility to export high technology at an affordable price removes inequality in income distribution because it gives equal chances to grow economically at all levels.

The results also reveal that GDP has a negative impact on income inequality. In comparison, these findings are in line with the outcomes of the study by Gunasinghe, Selvanathan, Naranpanawa, and Forster (2020), who suggested that the government should increase the GDP to raise their rank among other countries, resulting in the reduction of income inequality. Similarly, the results also match with the findings of Chang, Gupta, and Miller (2018), who stated that if a country is achieving high GDP, the government has a large number of revenues from commercial taxes. Thus, the increased revenues enable the government to offer incentives to the lower circle of the population. This reduces income inequality and provides equal opportunities to the public to raise their living standards. Furthermore, the results also declare that NNI has a negative impact on income inequality. These results are in line with the findings of Chancel and Piketty (2019), who revealed that an increase in the national income of a country is helpful to control income. Evidently, increases in the NNI results in minimizing income inequality.

6. Conclusions

This study addresses the issue of income inequality in developing Asian nations and analyzes the role of globalization, technology adoption, and economic development in reducing income inequality. For this purpose, a quantitative research technique was adopted, and the impacts of globalization, high technology exports, GDP, and NNI on income inequality in developing countries were analyzed. The outcomes indicate that globalization, high technology exports, GDP, and NNI have a negative relation with income inequality. The results show that if there is income inequality, in some locations, people have more opportunities to grow and have high living standards compared to others where the situation is totally different. Globalization, which permits the transportation of people and goods from one place to another, reduces income inequality. The results show that the ability to export sophisticated high technology at a reasonable price reduces income inequality by providing equitable opportunities that contribute to economic prosperity. The results also revealed that if a country's GDP is high, the revenue from commercial taxes is considerable and allows the government to provide incentives for

people in the lowest socioeconomic strata to rise up and contribute to economic progress. Hence, this ultimately eliminates income inequality. Similarly, when a country has high NNI, economic activities and developmental work are at a peak, and the chances of income inequality are minimal.

7. Implications

This study offers distinct additions to economic-based literature. Many renowned scholars have taken income inequality as the subject of their research and analyzed the impacts of globalization, high technology exports, GDP, and NNI on income inequality, but hardly any studies have addressed globalization, high technology exports, GDP, and NNI simultaneously as the indicators of income inequality. Technology adoption is considered a part of economic development in most of the studies. Here, the separate use of the two terms for analyzing income inequality contributes to the literature. The present study is relevant to developing countries where income inequality is one of the major issues. It guides the government and reformers on how to reduce and potentially eliminate income inequality. It suggests that with the increase in globalization, technology adoption, and economic development, income inequality can be controlled.

8. Limitations and Future Recommendations

A number of limitations are associated with this study but can be removed in future studies. This study only examines the impact of globalization, technology adoption, and economic development on the income inequality in a country. However, education, inflation, government policies, and developmental activities also play a great role. Authors of future studies should include these factors for a better determination of aspects that influence income inequality. This study only addressed the relation of globalization, technology adoption, and economic development with income inequality in developing countries and did not include developed or fast emerging economies, so the study lacks generalizability and validity. Therefore, future studies should also address the issue of income inequality and globalization, technology adoption, and economic development in developed or fast emerging countries.

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