

Effect of Income Inequality on Economic Growth: Evidence from Bangladesh.

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ABSTRACT

The primary goal of this research paper is to use panel data covering the years 1977 to 2016 to examine the effects of income inequality on economic growth in Bangladesh. The article makes new contributions to the literature on economic development, indicators of economic progress, and income inequality. Although Bangladesh has made significant strides in the areas of nutrition, literacy, and reproductive health care, all three still have a fundamental element of inequality. Over the time period under consideration, the rising growth was accompanied by growing inequality. The main issue facing Bangladesh right now is lowering income disparity. Income inequality is both a virtue and a vice. It is necessary to strike a balance between the benefits of rewarding hard work and fostering economic progress and the drawbacks of inequality's blatant injustice. The goal of this study is to examine the long-term relationship between inequality and growth in Bangladesh using the Johansen test for co-integration and the Vector error correction model (VECM). According to our findings, income inequality slows the rate of change in economic development. As a result, the policy proposals should be taken with caution.

Keywords: Income inequality, Economic growth, ADF, Co-integration test, VECM.

Mathematics Subject Classification: 62P20, 62M10, 91B84.

1. INTRODUCTION

High economic growth is a barometer of a country's progress. Economic growth is required for development to succeed in enhancing a country's level of living. As a result, it is expected that economic development operations will be focused on enhancing economic growth. Furthermore, economic growth is an important indicator of well-being. However, rapid economic growth does not guarantee that the community's income distribution will improve. As a result, the relationship between income distribution and economic growth is a prominent topic of study in current economics.

Bangladesh's economic activity grew at a slower rate after its independence as a new country, but it has recently surged. Economic growth is recognized as a major anti-poverty drive.

High and sustained economic growth increases labor demand and earnings, hence lowering poverty. Increased productivity and growth resulted from higher earnings as a result of poverty reduction. The extent to which poverty is decreased as a result of economic growth, on the other hand, is decided by how income distribution changes as a result of economic growth, as well as starting income inequalities.

The most often used measurements of inequality are the Lorenz curve, the Gini coefficient, and the dynamic test of inequality. Kuznets (1955, 1963) was a forerunner in the early arguments over the relationship between inequality and economic growth, which became known as the Kuznets hypothesis. According to the idea, economic growth and income disparity are linked by an inverted-U curve. In other words, until countries attain a particular level of revenue in the early phases of economic development, income distribution tends to suffer. Then, as per capita income rises later in the development process, inequality begins to decline.

The relationship between economic growth and income distribution is the subject of numerous studies, each of which yields a different set of results. As a result, the relationship between the two variables remains enigmatic and empirically disputable. Some empirical research on the Kuznets hypothesis has found a causal association between economic growth and income inequality, while others have questioned the conclusions.

Previous research has predicted a negative association between income disparity and economic growth.

2. OBJECTIVES OF THE STUDY

The goals of this article are to discover the relationship between income disparity and economic growth. To learn how emerging countries such as Bangladesh can overcome this issue and achieve long-term economic progress. However, the study's specific research objectives are as follows:

- a) Determine Bangladesh's current levels of income disparity and economic development.
- b) Determine the link between income disparity and economic development.
- c) Identify some policies/measures to address the issue of inequality.

3. LITERATURE REVIEW

Inequality's impact on economic growth is a contested issue. Literature on the subject identifies both good and negative links.

When Simon Kuznets proposed to the American Economic Association in the 1950s an inverted U link between per capita GDP and income inequality, the topic of income inequality and economic growth gained traction. Based on the statistics available at the time, Kuznets theorized that when per capita income climbed in less developed countries, income disparity increased alongside it, peaked, and then began to drop as income levels increased even more. Kuznets examined data estimating income distribution in a few prosperous and a few developing countries in order to create this theory. Additionally, he looked at historical distributional trends in a few European countries. He came up with an "inverted-U hypothesis" as a result of his investigation.

The Kuznets curve has an inverted "U" form as a result of the numerous studies that have been conducted since Kuznets' seminal study in 1955. Although the relationship between growth and income

inequality may be favorable, as inequality rises, economic growth declines. Persson and Tabellini (1991) find a negative association between 1830 and 1985 using the income share of the top quintile of developed nations. In the context of the cross-country, decreasing inequality from one standard deviation above the mean to one standard deviation below the mean boosts the long-term growth rate by roughly 1.3% per year, according to Clarke (1992), who found that beginning inequality is inversely connected with growth.

Alesina and Rodrik (1994) look at a negative relationship between income disparity and economic growth rate using 70 OCSE countries. Bias. For the time period 1960–1990, Li and Zou (1998) obtain a positive estimated value for the Gini coefficient, the inequality measure used. According to study done by Barro in 2000, inequality has a negative effect on growth in developing nations but a favorable effect on growth in developed nations. When a measure of property rights is included as a control variable, the evidence of a negative link between income inequality and growth examined by Keefer and Knack (2000) loses significance.

Forbes (2000) shows a positive correlation between inequality and growth via a series of sensitivity tests for a variety of model settings. Panizza (2002) suggests collecting data from individual states to look at the connection between inequality and growth within the US. The author, however, is unable to produce statistically significant estimates for the coefficients linked to the selected inequality measures.

Banerjee and Duflo (2003) show that the pace of economic growth is a quadratic function of net changes in the inequality measure using constrained system-GMM estimators. A study by Pagano (2004) utilizing a sizable panel dataset of 138 nations reveals a positive association in wealthy nations and a negative relationship in developing nations.

Using constrained system-GMM estimators, Grijalva (2011) examines the short-run inverse-u link between inequality and growth. On an updated dataset of 141 countries from 1998 to 2008, Assa (2012) finds a significant negative impact of income inequality on future growth using both OLS and 2SLS regressions. In contrast to a positive inequality-growth link in HIDC, where a total of 111 nations were sampled, Fawaz, Rahnama, and Valcarcel (2014) found substantial evidence of a negative correlation between the distribution of income and growth of the economy for LID countries.

There is not enough literature available in Bangladesh. For the impending end of the world, the discussion on income inequality and GDP growth has been cleverly expanded. In this study, we examine the relationship between inequality and Bangladeshi economic growth between 1977 and 2016. Furthermore, in an effort to improve upon earlier models and incorporate crucial variables that affect both income inequality and economic growth, we employ different variables than some of the literature.

4. METHODOLOGY

4.1. Data Source & Data Type

The study is based on Bangladesh time series data spanning the years 1977 to 2016. With the exception of income inequality, all the data came from the World Development Indicator (WDI) of the World Bank.

The "The Standardized World Income disparity" (SWIID) Version 9.3" database is used to compile information on income disparity. For all four variables, there are a total of 40 observations. I utilized GDP growth rate (%) as the dependent variable for my study on income disparity. Here, capital formation (%), government spending (billion taka), and income inequality (Gini coefficient) are the main independent variables. Software called Eviews-12 has been used for econometric analysis and statistical tests.

4.2. Econometric Characteristics of Data

The first and primary requirement for the variables to have a long run relationship in econometric research employing time series data is that they should all be stationary. If not, non-stationary variables may suggest erroneous relationships between the variables. Therefore, we must first establish whether or not the variables are stationary. If the variables are not stationary, we must use the differencing process to make them stationary. Now, using unit root tests, we look at the stationarity of the four variables. The Augmented Dickey-Fuller Test was used in this research to determine whether the variables have a unit root or not. The following log model is how we define our model using the logarithmic forms of the two variables.

$$Y_t = \beta_0 + \beta_1 GI_t + \beta_2 CF_t + \beta_3 GE_t + \epsilon_t \dots\dots\dots (1)$$

Here, Y = the GDP growth rate, GI = Income Inequality (Gini-coefficient), CF = capital formation, GE=government expenditure, β_0 = the constant term, t denotes time and ϵ_t = denotes residual.

4.3. Unit Root Test

Augmented Dickey-Fuller Test (ADF)

When using the augmented dickey Fuller test, autocorrelation issues could arise. Dickey Fuller created the Augmented Dickey-Fuller test (ADF) to address the autocorrelation issue. A procedure to test unit root using the null hypothesis that the variables have a unit root, which implies that the variables are not stationary, is the Augmented Dickey- Fuller test. Stationarity is also implied by the alternative theory. The most inclusive test for stationarity is this one. The regression equation for Augmented Dickey-Fuller test (ADF is given below:

$$\Delta Y_t = \alpha_1 + \alpha_2 t + \gamma Y_{t-1} + \sum_{i=1}^p \beta_i Y_{t-i} + \epsilon_t \dots\dots\dots (2)$$

Here the first difference operator is denoted by Δ and the no of lags is denoted by p. Where, null hypothesis is $\gamma = 0$.

4.4. Testing for Co-integration and Vector Error Correction

A long-run equilibrium relationship between two or more non-stationary variables is shown by their co-integration. All of the variables should have the same co-integrating order, which is the main requirement. All of our variables are symbolically integrated to order 1 as I (1). With regard to each of the I (1) variables in our model, we examine co-integration. We used the Johansen approach to test co-integration.

The Johansen Procedure

There can be multiple integrating relationships when using the Johansen test. It depends on the connection between a matrix's rank and the root of its properties. The method can be demonstrated,

$$\Delta X_t = A_0 + \pi X_{t-1} + \varepsilon_t \dots \dots \dots (3)$$

Characteristic roots and eigenvalues can be estimated as follows:

$$\lambda_{trace}(r) = -T \sum_{i=r+1}^n \ln(1 - \hat{\lambda}_i) \dots \dots \dots (4)$$

$$\lambda_{max}(r, r + 1) = -T \ln(1 - \hat{\lambda}_{r+1}) \dots \dots \dots (5)$$

Here, $\hat{\lambda}$ is the estimated values of the characteristic's roots or eigen values obtained from the estimated π matrix.

First test

H_0 : The number of distinct co-integrating vectors is less than or equal to r .

Second test

H_0 : The number of co-integrating vectors is r against the alternative of $r+1$ co-integrating vectors.

In the Johansen test, our analysis revealed evidence of co-integrating vectors, indicating a lengthy relationship between the variables.

The dynamic of how the short run converges to the long run while decreasing fluctuations is illustrated by the vector error correcting model. Consider the following test regression:

$$\Delta Y_t = \delta_0 + \sum_{j=1}^p \theta \Delta GI_{t-j} + \sum_{j=1}^p \omega \Delta CF_{t-j} + \sum_{j=1}^p \varphi \Delta GE_{t-j} + \lambda [\ln Y_{t-1} - \hat{\beta}_1 GI_{t-1} - \hat{\beta}_2 CF_{t-1} - \hat{\beta}_3 GE_{t-1}] + \epsilon_t \dots \dots \dots (6)$$

Long-term equilibrium is shown on the left-hand side of the equation, where the coefficients' signs are reversed to account for side-changing. We discover the co-integrating vector in this method.

5. EMPIRICAL RESULTS & DISCUSSION

5.1. Descriptive Statistics

To confirm the variables' properties and understand the variability of the elements employed in the model, the empirical analysis begins with descriptive statistics of the variables. In Bangladesh, growth has been relatively stable during the last 15 years. Bangladesh displays a surprising degree of steadiness in its economic path despite the global food and fuel crisis, as well as the worldwide recession. The fact that all sectors—including agriculture, industry, and services—are growing and contributing to total growth is a key aspect of Bangladesh's economic progress. Maximum GDP growth rate from 1977 to 2016 was 7.23%, with an average of roughly 5%.

To measure income inequality, the GINI coefficient or GINI index has been utilized, and it has increased dramatically over the past few decades all over the world. The GINI coefficient ranges from 0 to 1, with 0 denoting perfect equality (no inequality) and 1 denoting perfect inequality (extremely skewed income

distribution, where one person owns all the money), respectively. Bangladesh's GINI coefficient is, on average, 32.6%.

This study substitutes investment for gross capital formation as a proportion of GDP. It is one of the most significant factors influencing a nation's economic development. Averaging 21% of GDP, gross capital formation is a percentage of capital formation.

With a standard deviation of 49800 crore BDT, gross national spending is, on average, 94100 crore BDT.

Table 1: Descriptive Statistics

Variables	GDP growth rate	Gini Co-efficient	Capital Formation	Gross national Expenditure
Mean	4.922516	0.326000	20.99289	9.41E+12
Median	5.061206	0.329000	21.27308	7.63E+12
Maximum	7.233944	0.342000	30.23976	2.14E+13
Minimum	0.819142	0.308000	11.20387	3.81E+12
Std. Dev.	1.505852	0.012832	5.464264	4.98E+12

The graph below displays the rising trends for the variables under study.

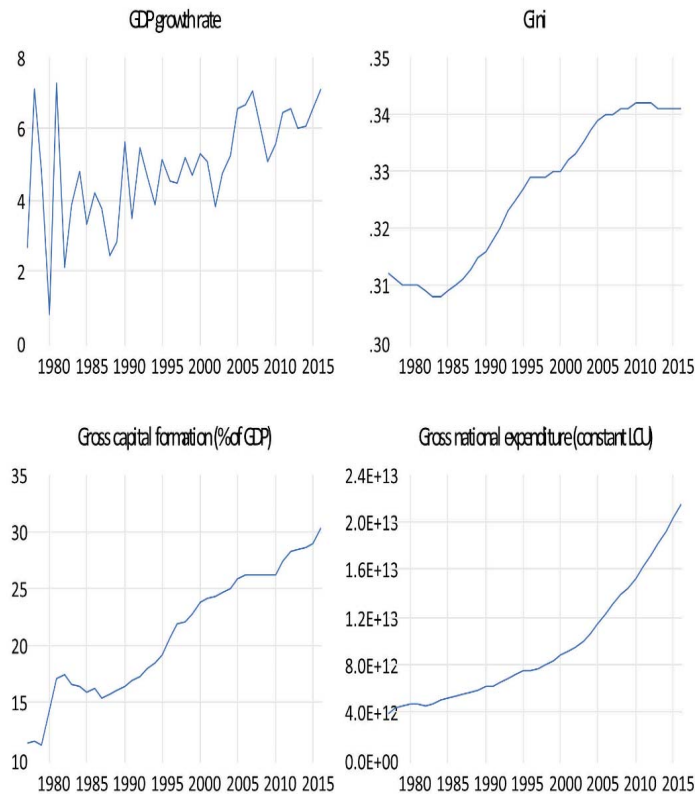


Figure 1: Historical trends of the studied variables

5.2. Results of Augmented dickey fuller test

The other three variables are not stationary at level, except for growth rate, according to the Augmented Dickey Fuller Test (ADF). All non-stationary variables (Table 2) become stationary after first order differentiation. Therefore, all variables of order 1 or I (1) are integrated.

Table 2: Results of Stationarity Tests (Augmented Dickey-Fuller)

Variables	Without trend			With trend		
	Level	1 st Difference	Lag	Level	1 st Difference	Lag
Growth rate	-8.210***	-10.874***	1	-11.011***	-4.718***	4
Gini index	-0.907	-3.302**	1	-2.793	-3.306*	1
Capital formation	-0.771	-4.866***	1	-3.613	-4.183***	1
Gross national Expenditure	12.115	-5.772***	1	3.966	-4.323***	1

Notes: (i) The figures in parentheses show the lag lengths determined by the Akaike Information Criterion (AIC); (ii) The symbols *, **, and *** signify rejection of the unit root null hypothesis at the 10%, 5%, and 1% significance levels, respectively.

5.3. Result of Co-integration Test and Vector Error Correction Test Johansen tests for co-integration

Our findings imply that factors are co-integrating. The alternative hypothesis $r = 1$ implies that there is at least one integrating equation, while our first null hypothesis $r = 0$ states that there is no co-integration. As a general rule, we can reject the null hypothesis ($r = 0$) when either the trace or maximum statistics are higher than the critical value. We reject the null hypothesis (There are no co-integrating relations, $r = 0$) and accept the alternative hypothesis (There is one co-integrating connection) when our trace statistics are greater than the critical value. The values trace statistics are not more than the critical value when our null hypothesis is $r = 1$, $r = 2$, $r = 3$, and alternative hypothesis is $r = 2$, $r = 3$, $r = 4$, hence we accept the null hypothesis.

Table 3: Results of co-integration test (Johansen tests for co-integration)

	Trace statistics			
	$r = 0$	$r \leq 1$	$r \leq 2$	$r \leq 3$
Null				
Alternative	$r = 1$	$r = 2$	$r = 3$	$r = 4$
Statistics	71.81473***	27.68281	12.75650	0.101840
Critical value (5% significant level)	47.85613	29.79707	15.49471	3.841465
Conclusion	One co-integrating vector			

Note: **, denote rejection of the null hypothesis of at Johansen tests for co-integration the 5% significance level.

The result for trace test shows, there is one co-integrating relations. The same result shows max statistics. When null hypothesis $r=0$, our max statistics is greater than critical value then we reject the null hypothesis (There is no co-integrating relations, $r=0$) and accept the alternative hypothesis (there is one co-integrating relations). When our null hypothesis $r \leq 1$, $r \leq 2$, $r \leq 3$ and alternative hypothesis are $r = 2$, $r = 3$, $r = 4$ the values trace statistics are not greater than the critical value, so we accept the null hypothesis.

Table 4: Results of Johansen Co-integration Test

Null	Max statistics			
	$r = 0$	$r \leq 1$	$r \leq 2$	$r \leq 3$
Alternative	$r = 1$	$r = 2$	$r = 3$	$r = 4$
Statistics	44.13192***	14.92632	12.65466	0.101840
Critical value (5% significant level)	27.58434	21.13162	14.26460	3.841465
Conclusion	One co-integrating vector			

Note: *** indicates that the Johansen tests for co-integration failed to detect the null hypothesis at the 5% level of significance.

The same conclusion is reached by two statistics when using trace and max statistics. The best scenario is when both provide the same answer, making it safer to choose whether to use the VECM or unrestricted VAR model. So, running a vector error correction model won't be difficult. All variables must initially be non-stationary, but they must become stationary when we transform them into the first difference. Expect capital formation (CA); non-stationary at level for the other three factors. All non-stationary variables turn stationary after first order differentiation.

5.4. Results of Vector Error Correction Model

We first check whether there are a lot of lags. The model Johansen tests for co-integration are then run. We learned that there is only one co-integrating vector through the Johansen tests for co-integration test. Our rule is that we can easily run the VECM model if at least one variable is co-integrated.

The results of VECM are listed in Table 5. There is long-term causation in the VECM because the coefficient error correction term is inadequate and significant. The first error correction vector's projected coefficient is -1.717956, which indicates that CE (1) is the rate of adjustment correcting back disequilibrium at a rate of 171 % annually.

We obtain the long-term link between income inequality and growth rate using VECM. This table demonstrated that every coefficient value is extremely significant because every variable's statistical value is higher than the threshold value. Running this model reveals a conflict between Bangladesh's growth rate and income inequality. Additionally, we observe a strong correlation between capital formation and government spending and Bangladeshi growth.

Table 5 shows that if income disparity rises by 1%, economic growth typically declines by.659% of a percentage point.

Table 5: Results of Vector Error Correction Model

Variables	Coefficient	Std. Error	t-Statistic	Prob.
Error Correction Term	-1.717956	0.27271	-6.29660	0.0000
Gini index	-0.659176	0.19683	-3.34892	0.0000
Capital formation	0.088298	0.05031	1.75494	0.0000
Gross national Expenditure	9.75E-14	5.54E-14	1.7761	0.0000
R-squared	0.75			
Adjusted R-squared	0.71			

The serial correlation (Table 6) and heteroscedasticity (Table 7) tests were used to assess the model and find any potential problems. At a 5% level of significance, serial correlation has no impact on the models under investigation. Its heteroscedasticity has no impact on the output of the model, which is also negligible. The outcomes of testing this model in various contexts point to its validity and dependability.

Table 6: Results of Serial Correlation Test

lag	Test Statistic	P-Value
1	1.289553	0.2257
2	0.732163	0.7531

Table 7: Results of Heteroskedascity Test

Test Statistic	df	P-Value
107.6019	100	0.2839

6. CONCLUSIONS & RECOMMENDATIONS

The main goal of this study is to establish a causal connection between GDP growth rate, a dependent variable, and the three explanatory variables of Gini coefficients, capital formation, and government spending for the period (1977–2016). For Bangladeshi policymakers, the study of this empirical link may yield useful policy recommendations that they may utilize to increase the contribution of income equality to Bangladesh's economic growth. For researchers in this discipline, the research findings offer background knowledge.

As was already noted, we looked at the correlation between Bangladesh's GDP growth rate, capital formation, and government spending using secondary data. The VECM model's time series analysis reveals a long-term link between these values. The VECM model is validated using diagnostic and stability tests, and it is discovered that the regression residuals have a normal distribution and no autocorrelation. Furthermore, our model is structurally sound. We assume that the Bangladeshi government can develop measures that will reduce income disparity and should also enhance capital formation and government spending because of the long-term relationship between income inequality and economic growth in the VECM model.

It is necessary to focus more on how to promote education and strengthen the endowment of human capital in order to contribute to a more equitable distribution of income. This can be accomplished through increasing the formation of human capital, which will raise the earnings of the poorer sections of the population and improve the distribution of income. Economic growth may result in a considerable drop in poverty if income disparity gradually declines together with an increase in economic growth. Bangladesh's economic growth rate will be faster and lead to greater wealth if poverty declines over time.

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