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Gender Inequality and Economic Growth: An Empirical Investigation in Bangladesh

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Abstract: Bangladesh is a highly populated South Asian country that has seen rapid economic expansion in recent years. It is equally vital to find both growth-promoting and growth-constricting elements in order to maintain this pace of growth. One of the most powerful issues that might hinder economic growth is gender inequality, which can limit growth by causing inefficient resource allocation and human capital accumulation. As a result, addressing gender inequality can help to boost current economic growth. In light of this, the current research investigates the dynamic relationship between gender inequality and economic growth. Gender inequality data was sourced from the United Nations Development Programs (UNDP), while data on real per capita GDP (which measures economic growth) was sourced from the World Development Indicators (WDI). The study also includes some pertinent control variables like labor, capital accumulation, electricity access, and trade openness, all of which are based on WDI data. The research uses quarterly data from 2005Q1 through 2019Q4 for all variables. The Phillips-Peron unit root test reveals that all variables have the same order of integration, and the Johansen cointegration test confirms that these variables are cointegrated. This study discovered that gender inequality has a large and negative impact on economic growth, which is in line with our assumptions. A 1% reduction in gender inequality leads to a 0.497 percent increase in economic growth, according to the findings, and vice versa. As a result, governments must develop an appropriate strategy to eliminate gender inequality in order to achieve the necessary economic growth.

Keywords: *Gender inequality, economic growth, cointegration, Bangladesh.*

1. Introduction

Many countries around the world are concerned about achieving their targeted economic growth. Economic growth raises the standard of living through an increase in a country's production of products and services in a given year. A higher per capita income allows people to get a better education, access to better healthcare, eat a wider variety of nutritious foods, and have enough energy and technology, among other things. Poverty and malnutrition are reduced as a result of economic progress. However, achieving the necessary level of economic growth is not straightforward. This necessitates better policies and governance. In order to design better policies, policymakers must first understand the variables that accelerate growth. Alfaro et al. (2004), Narayan et al. (2010), Ullah et al. (2013), Kumari (2014), Belloumi (2014), Ying et al. (2014), Karanfil & Li (2015), Connolly & Li (2016), Mireku et al. (2017), and Samu et al. (2017) are just a few examples of empirical studies that have investigated the determinants of economic

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growth and found evidence in favor of (2019). Again, some studies were unable to reach an agreement due to a lack of sufficient evidence. However, equal contributions from men and women are required to achieve the desired economic growth. Increased gender disparity can stifle growth, whereas decreasing gender inequality can help a country's economy grow.

Gender inequality is described as giving people different opportunities based entirely on gender concerns. Gender discrimination occurs when someone or a group is treated unfairly because of their gender. Gender inequality and discrimination are often associated with women, but anybody can be subjected to discrimination or inequality depending on their gender (Parziale, 2008). By impacting the fertility rate, child mortality rate, and children's health and education, gender disparity leads to inefficient resource allocation and human capital buildup. These factors can stymie a country's economic growth. In addition, gender inequality has certain long-term indirect economic repercussions. As a result, a slew of studies examining the influence of gender inequality on economic growth are necessary. In light of this, the current study aims to investigate the relationship between the two, and as such, Bangladesh has been chosen as the case study country.

Bangladesh is a highly populated South Asian country that has seen rapid economic growth during the previous decade. Bangladesh's per capita income has risen to $1287.82 in 2019, up from $359.46 in 1980 (in constant 2010 dollars). Gender disparity in Bangladesh has decreased to 0.537 from 0.708 in 1995, according to the UNDP (United Nations Development Program) Gender Inequality Index (UNDP, 2021). As a result, Bangladesh has made significant progress in decreasing gender disparity, and the economy is rising at a rapid pace as a result. This visual association paves the way for researchers in Bangladesh to investigate the dynamic causal relationship between gender disparity and economic growth. To avoid specification mistakes, the current study contains a number of relevant control variables.

The study's key contribution is that it examines the influence of gender inequality on Bangladesh's economic growth while controlling for a number of important variables. Section 1 of the research begins with an introduction. Following the introduction, in part 2, the relevant literature is addressed, in section 3, the specifics of techniques and materials are included, in section 4, the results are embellished with suitable discussion, and finally, in section 5, the study is concluded.

2. Literature Review

A variety of research has looked into the impact of gender inequality (GI) on economic growth (EG), with varying results. Some research has indicated a beneficial link between GI and EG, while others have discovered a negative link.

Gender inequality, according to Seguino (2000), is linked to economic growth in a beneficial way. He claimed that women's low wages in the industrial sector helped in the expansion of the manufacturing sector. Furthermore, a country's exports would benefit from women earning lower wages in the export-oriented sector. As a result, women's low wages can help to boost economic growth. Seguino (2000) discovered that GI was positively associated with economic growth in "semi-industrialized export-oriented

economies" between 1975 and 1995. Schober and Winter-Ebmer (2011), on the other hand, did not share Seguino's conclusion (2000). They contended that gender inequality, rather than promoting economic growth, stifles it in the long term. Schober and Winter-Ebmer (2011) looked at data from "a meta-study on gender wage discrimination" and found no evidence for a link between GI and EG. In contrast to Seguino (2000), Schober & Winter-Ebmer (2011) found that GI has a deleterious impact on EG.

Klasen and Lamanna (2009) used panel regression techniques to evaluate cross-country data from 1960 to 2000. According to the research, gender discrimination in education and the workplace, among other things, slowed economic growth. Furthermore, Cavalcanti & Tavares (2016) found that a 50% increase in the wage gap between men and women reduces long-term income per capita by 35%. Cuberes & Teignier (2016) concluded that long-term gender discrimination reduced output by 15.4% in OECD nations and 17.5 percent in developing countries after evaluating data from "33 OECD countries and 106 developing countries". Based on data from 37 European countries and the United States, Cuberes & Teignier (2016) found that gender discrimination reduced aggregate output by 13.2% in 37 European countries and the United States.

Kim et al. (2018) used the endogenous growth model to investigate how GI affects EG. According to the study, female labor force participation and the country's economic development would climb from 54.4 percent to 67.5 percent and 3.6 percent to 4.1 percent, respectively, in a gender-equality-free economy. Karoui & Feki (2018), for example, used the dynamic panel GMM estimate approach to assess data from 26 African nations between 1995 and 2012. The study's findings demonstrated that GI has a considerable unfavorable effect on EG. In a similar study, Lee (2020) looked at data from 66 nations and discovered that reducing gender inequality to the level of the United States would boost GDP per capita by 3% and agricultural labor productivity by 21%.

Furthermore, according to Bloom et al. (2015), the transition to sustainable economic growth may gain traction as women's health improves. Similarly, de la Croix and Vander Donckt (2010) discovered that nations with a high child mortality rate and low girl survival have a higher risk of falling into the low growth regime. Although some studies have looked into the dynamic interaction between GI and EG in different countries, there aren't enough studies available in Bangladesh to reach a conclusion. As a result, the current research aims to add to the existing literature by investigating the dynamic link between GE and EG in Bangladesh.

The study includes a total of four control variables, with labor and capital being included because they are the two most important factors for estimating long-run economic growth. In addition, depending on the literature, two additional essential variables are included. The study has added the electricity variable to the model by following the studies of Osman et al. (2016), Raza et al. (2016), Bah & Azam (2017), and M. M. Rahman (2020). There are four types of connections between electricity use and economic growth. The first is the growth hypothesis, which states that using electricity stimulates economic growth, and Raza et al. (2016) discovered that this theory is authentic for four South Asian countries. The second one is the conservation hypothesis, which predicts that economic growth will increase electricity consumption, and M. M. Rahman's study (2020) found the authenticity of this hypothesis.

The third strategy, known as the neutrality hypothesis, predicts that there is no relationship between these two, and Bah & Azam (2017) discovered that this hypothesis is valid for South Africa. Finally, the fourth approach predicts a feedback relationship between these two, known as the feedback hypothesis, which was validated in a study by Osman et al. (2016) for a panel of GCC countries. This research focuses on the growth hypothesis, which anticipates electricity as a growth contributor.

In addition, the study has added the trade openness variable in the model, following the work of Awokuse (2008), Brueckner & Lederman (2015), Hye & Lau (2015), Ulaşan (2015), and M. M. Rahman et al. (2019). Because no previous study has looked at the influence of gender disparity on economic growth in Bangladesh while controlling for the effects of labor, capital, energy consumption, and trade openness, the current study has attempted to add to the existing literature.

3. Methods and Materials

3.1 Gender Inequality Index

The UNDP has developed an index to measure the extent of gender inequality. Health, empowerment, and the labor market are the three dimensions of this indicator. By combining the three dimensions, a female and male gender index is initially calculated. The female reproductive health index is calculated using the "maternal mortality rate and adolescent birth rate"; the female empowerment index is calculated using the "female and male population with at least secondary education and the female and male shares of parliamentary seats"; and the female labor market index is calculated using the "female and male labor force participation rates" (UNDP, 2020). The female gender index is created by adding together the female reproductive index, female empowerment index, and female labor market index (UNDP, 2020). A male gender index is likewise computed in the same manner. The gender inequality index (GII) was created by combining the female gender index with the male gender index (UNDP, 2020). Figure 1 depicts the detailed chart flow of GII.

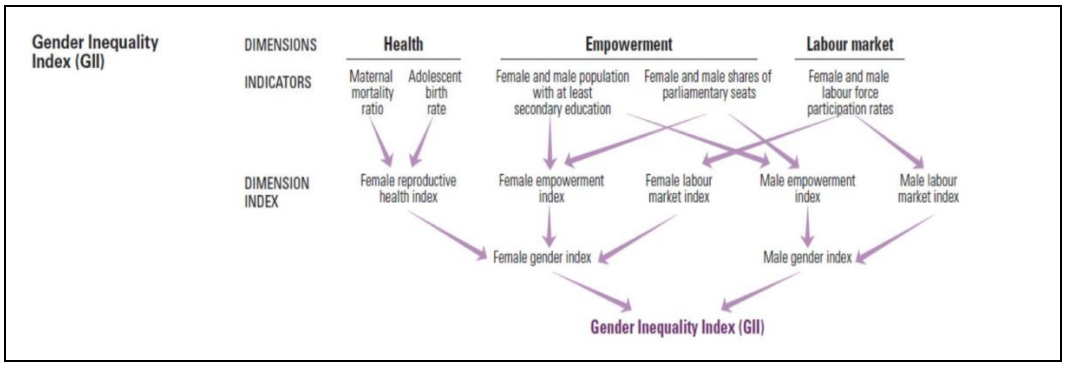

Figure 1. Chart flow of Gender Inequality Index

Source: UNDP, 2020

3.2 Model of the Study

The study has employed the following Cobb-Douglas production function:

$$Y = AL^{\alpha}K^{\beta}e^{it} \qquad (1)$$

"L" and "K" denote labor and capital, respectively; "α" and "β" represent labor and capital shares, respectively, and "A" is the symbol for technology in this case. Besides, 'e' represents the stochastic error term, 'i' is the cross-sectional unit, and 't' denotes time. This technological variable A is an endogenous variable that is influenced by a variety of other factors. We assume that access to electricity (the energy variable), the trade GDP ratio, and gender inequality are all factors that influence technology A.

Therefore, we can write

$$A = \mu(AE)^{\delta}(TO)^{\gamma}(GII)^{\sigma} \quad (2)$$

Where AE represents the access to electricity, TO represents the trade openness (which is trade percentage of GDP), and GII represents the gender inequality index. The notations δ, γ, and σ represent the share of AE, TO, and GII respectively. Now, substituting equation (2) into (1) we get:

$$Y = \mu(AE)^{\delta}(TO)^{\gamma}(GII)^{\sigma}L^{\alpha}K^{\beta}e^{t} \qquad (3)$$

Now, to normalize the equation (3), log transformation of the variables are used and we obtain the following equation:

$$Y = \pi + \beta_2 LnL + \beta_3 LnK + \beta_4 LnAE + \beta_5 LnTO + \beta_6 LnGII + \varepsilon_t \quad (4)$$

Where, π is the constant intercept term, and the parameter β_2, β_3, β_4, β_5, and β_6 represents the output elasticity of the labor, capital, access to electricity, trade openness, and gender inequality, respectively. Equation (4) is the required model for estimation in this study.

3.3 Econometric Methods

The study used data from WDI (WDI, 2021) for labor, capital, electricity access, and trade openness, while the UNDP provided data for the gender inequality index (UNDP, 2020). Data from 2005Q1 through 2019Q4 was used in this research. Yearly data was converted into quarterly data by following the high frequency to low frequency data conversion rule. Statistical software Eviews 10 was used in this regard.

Because this research used time series approaches, the Phillips-Peron unit root test was used to check for stationarity of the data. In addition, the Johansen cointegration test was used to assess the cointegration in this work. The Fully Modified OLS or FMOLS method was used to evaluate the long-run elasticities in this work. Finally, to determine the causal direction, the study used the Granger causality test.

4. Results and Discussions

Table 1 shows the descriptive statistics of the variables, including the mean, median, standard deviation, skewness, Kurtosis, and the Jarque-Bera statistic.

Table 1. Descriptive Statistics

	LNRGDPPC	LNL	LNK	LNAE	LNTO	LNGII
Mean	6.773112	4.080104	3.333049	4.152291	3.699586	-0.526299
Median	6.763596	4.070564	3.341530	4.119037	3.687438	-0.536144
Maximum	7.160707	4.119688	3.452217	4.523960	3.873509	-0.381260
Minimum	6.425748	4.069540	3.251554	3.789403	3.537967	-0.621757
Std. Dev.	0.221946	0.018801	0.067805	0.229946	0.103026	0.074005
Skewness	0.147428	1.489589	0.375901	0.258744	0.274631	0.512738
Kurtosis	1.897877	3.264616	1.799833	1.995564	1.930899	2.173067
Jarque-Bera	3.254039	22.36381	5.014017	3.191713	3.611667	4.338549
Probability	0.196514	0.000014	0.081512	0.202735	0.164337	0.114260
Sum	406.3867	244.8062	199.9830	249.1375	221.9752	-31.57792
Sum Sq. Dev.	2.906338	0.020855	0.271251	3.119626	0.626243	0.323129
Observations	60	60	60	60	60	60

Table 2 shows the correlation matrix, which shows that labor, capital, and electricity access are all favorably connected with economic growth, whereas trade openness and gender disparity are adversely correlated with real GDP per capita. The correlation matrix reveals a significant negative association between LNGII and LNRGDPPC, implying that decreasing gender inequality is linked to rising per capita income.

Table 2. Correlation Matrix

Covariance Analysis: Ordinary

Sample: 2005Q1 2019Q4

Included observations: 60

Correlation	LNRGDPPC	LNL	LNK	LNAE	LNTO	LNGII
LNRGDPPC	1.000000					
LNL	0.688295	1.000000				
LNK	0.977904	0.743838	1.000000			
LNAE	0.974309	0.737880	0.962106	1.000000		
LNTO	-0.056239	-0.502977	-0.097896	-0.109777	1.000000	
LNGII	-0.968433	-0.560654	-0.907503	-0.939893	-0.078061	1.000000

Table 3. Phillips-Perron Unit root test

		UNIT ROOT TEST TABLE (PP)					
	At Level						
		LNRGDPPC	LNL	LNK	LNAE	LNTO	LNGII
With C	t-Statistic	1.3418	-0.2761	1.7526	-0.5423	-1.8959	-2.7528
	Prob.	***0.9986***	***0.9217***	***0.9996***	***0.8748***	***0.3321***	***0.0714***
		n0	n0	n0	n0	n0	*
With C & T	t-Statistic	-5.5461	-1.4377	-2.3426	-3.0901	-1.8826	-1.3729
	Prob.	***0.0001***	***0.8393***	***0.4051***	***0.1182***	***0.6509***	***0.8588***
		***	n0	n0	n0	n0	n0
Without C & T	t-Statistic	17.2665	1.0058	4.4739	2.9857	0.1518	3.3925
	Prob.	***1.0000***	***0.9154***	***1.0000***	***0.9991***	***0.7265***	***0.9997***
		n0	n0	n0	n0	n0	n0
	At First Difference						
		d(LNRGDPPC)	d(LNL)	d(LNK)	d(LNAE)	d(LNTO)	d(LNGII)
With C	t-Statistic	-21.2274	-7.6153	-8.7722	-8.3904	-7.4887	-9.7107
	Prob.	***0.0001***	***0.0000***	***0.0000***	***0.0000***	***0.0000***	***0.0000***
		***	***	***	***	***	***
With C & T	t-Statistic	-27.6394	-7.8094	-10.3484	-8.2992	-7.6972	-12.9714
	Prob.	***0.0001***	***0.0000***	***0.0000***	***0.0000***	***0.0000***	***0.0000***
		***	***	***	***	***	***
Without C & T	t-Statistic	-7.5498	-7.5498	-7.5498	-7.5498	-7.5498	-7.5498
	Prob.	***0.0000***	***0.0000***	***0.0000***	***0.0000***	***0.0000***	***0.0000***
		***	***	***	***	***	***

Table 3 shows the findings of the Phillips-Perron unit root test, which shows that all of the variables are nonstationary at their level form but become stationary at their first difference form, indicating that all of the variables studied are I(1) variables.

Table 4. Cointegration test results

Sample (adjusted): 2005Q3 2019Q4
Series: LNRGDPPC LNL LNK LNAE LNTO LNGII

Trace Test

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.667848	116.8193	107.3466	0.0103
At most 1	0.290682	52.89389	79.34145	0.8287
At most 2	0.194762	32.97367	55.24578	0.8441
At most 3	0.173824	20.40986	35.01090	0.6804
At most 4	0.108351	9.334922	18.39771	0.5461
At most 5	0.045211	2.683347	3.841466	0.1014

Trace test indicates 1 cointegrating eqn(s) at the 0.05 level

Maximum Eigenvalue Test

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.667848	63.92544	43.41977	0.0001
At most 1	0.290682	19.92021	37.16359	0.9041
At most 2	0.194762	12.56381	30.81507	0.9772
At most 3	0.173824	11.07494	24.25202	0.8361
At most 4	0.108351	6.651575	17.14769	0.7504
At most 5	0.045211	2.683347	3.841466	0.1014

Max-eigenvalue test indicates 1 cointegrating eqn(s) at the 0.05 level

Because all of the variables in this study are I(1) variables, it is necessary to check for cointegration in order to avoid false regression, and the present study used the Johansen cointegration test to accomplish so. The results of the cointegration test are shown in Table 4. The trace test and the max-eigenvalue test both show that the variables in this study have one cointegrating vector. LNRGDPPC, LNL, LNK, LNAE, LNTO, and LNGII are thus cointegrated variables.

The FMOLS regression approach was used in this study to investigate long-term elaticities. Table 5 summarizes the outcoms of the FMOLS regression.

Table 5. Estimation of the Long run elasticities.

Dependent Variable: LNRGDPPC
Method: FMOLS
Sample (adjusted): 2005Q2 2019Q4

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNL	0.501841	0.245020	2.048160	0.0456
LNK	0.615267	0.228709	2.690177	0.0096
LNAE	0.012798	0.046452	0.275500	0.7840
LNTO	-0.040299	0.029996	-1.343477	0.1850
LNGII	-0.497003	0.219601	-2.263204	0.0278
C	2.276580	0.935540	2.433439	0.0184
@TREND	0.007872	0.001450	5.430338	0.0000
R-squared	0.996287	Mean dependent var		6.778999
Adjusted R-squared	0.995859	S.D. dependent var		0.219075

The results show that the labor, capital, and access to electricity slope coefficients are all significant and positive, which is in line with our assumptions. According to the findings, a 1% increase in labor input accelerates economic growth by 0.50 percent in the long run.

According to the report, a one percent increase in capital will boost economic growth by 0.62 percent, whereas a one percent increase in power access will boost it by 0.013 percent, according to the report.

Trade openness has a large negative impact, which is consistent with numerous earlier empirical findings. This study shows that Bangladesh's trade sector is underdeveloped and that authorities must reform trade policies in order for trade to help Bangladesh's economy grow faster.

Finally, gender disparity is found to have a considerable and unfavorable influence, which is in line with our assumptions. A 1% reduction in gender inequality results in a 0.497 percent increase in economic growth, according to the findings, and vice versa.

Table 6 shows the outcome of the Granger causality test. The link between work and economic growth is shown to be unidirectional, implying that labor plays a part in Bangladesh's economic progress. Bangladesh has more opportunities to build the economy by employing its labor in the productive sector because it is a labor-intensive country.

The conservation hypothesis is supported by evidence of unidirectional causality between economic growth and access to electricity. Economic expansion, according to the conservative premise, increases electricity consumption or access. There is also a unidirectional correlation between trade openness and economic growth, implying that greater trade openness promotes Bangladesh's economic growth. Furthermore, capital

accumulation and economic growth have a bidirectional causal relationship. This means that capital accumulation accelerates Bangladesh's economic growth, and growing economic activity further accumulates capital, which fosters growth. Gender inequality and economic growth have a bidirectional causal relationship. Because the relationship between the two is negative, this loop causation indicates that reducing gender inequality will enhance economic growth, which will further reduce gender inequality.

Table 6. Granger Causality tests results

Null Hypothesis:		Obs	F-Statistic	Prob.
LNL	LNRGDPPC	56	5.71324***	0.0008
LNRGDPPC	LNL		1.77958	0.1488
LNK	LNRGDPPC	56	8.40983***	0.0000
LNRGDPPC	LNK		8.71201***	0.0000
LNAE	LNRGDPPC	56	1.16725	0.3373
LNRGDPPC	LNAE		6.79457***	0.0002
LNTO	LNRGDPPC	56	11.2191***	0.0000
LNRGDPPC	LNTO		0.73901	0.5701
LNGII	LNRGDPPC	56	12.9670***	0.0000
LNRGDPPC	LNGII		9.10908***	0.0000
LNK	LNL	56	1.53242	0.2082
LNL	LNK		0.20567	0.9340
LNAE	LNL	56	1.09899	0.3682
LNL	LNAE		0.01188	0.9997
LNTO	LNL	56	0.32402	0.8605
LNL	LNTO		0.29099	0.8824
LNGII	LNL	56	0.70776	0.5907
LNL	LNGII		1.69657	0.1666
LNAE	LNK	56	0.44137	0.7781
LNK	LNAE		1.19298	0.3263
LNTO	LNK	56	0.55562	0.6959
LNK	LNTO		0.95556	0.4407

LNGII	LNK	56	5.15418***	0.0016
LNK	LNGII		3.28540**	0.0187
LNTO	LNAE	56	0.14750	0.9632
LNAE	LNTO		0.94677	0.4454
LNGII	LNAE	56	2.19854*	0.0835
LNAE	LNGII		0.23762	0.9157
LNGII does not Granger Cause LNTO		56	0.96430	0.4359
LNTO does not Granger Cause LNGII			7.51023***	0.0000

5. Conclusions and Recommendations

Inequality between men and women leads to inefficient resource allocation and human capital buildup, which can stymie a country's economic growth. In addition, gender inequality has long-term indirect repercussions on economic growth and development. As a result, a profusion of research studies on the influence of gender inequality on economic growth is necessary. In light of this, the current study makes an attempt, and as a result, Bangladesh is chosen as the study country.

The results show that the labor, capital, and access to electricity slope coefficients are all significant and positive, which is in line with our assumptions. A 1% increase in labor input, according to the findings, accelerates economic growth by 0.50 percent. one percent rise in capital will boost economic growth by 0.62 percent, whereas a one percent increase in access to power will boost it by 0.013 percent. It is consistent with numerous earlier empirical findings that trade openness has a large negative influence on economic growth. This study shows that Bangladesh's trade sector is underdeveloped. As a result, officials must modify trade policies so that trade may help Bangladesh's economy grow faster.

Finally, gender inequality has a considerable and unfavorable influence, which is in line with the expectations. A 1% reduction in gender inequality leads to a 0.497 percent increase in economic growth, according to the findings, and vice versa. Because gender inequality has a negative relationship with economic growth, governments must establish suitable policies to eliminate gender inequality in order to achieve the desired economic growth.

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