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# Impacts of Female Education and Labor Force Participation on Economic Growth: A Panel Data Analysis

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***Abstract***
*This research examined cases from Bangladesh, Bhutan, India, Sri Lanka, and Pakistan to evaluate whether women's education and their involvement in labor force had an impact on economic growth. The selection of these nations was influenced by the fact that they share a number of comparable religious and cultural norms and values, as well as the fact that women in this region have a lower average literacy rate and labor engagement than men. Over the period 2000–2020, an essentially balanced panel was compiled, and ordinary least square models with fixed effects were utilized for the inquiry. All the variables studied in this article, namely the elementary and tertiary education of women and their participation in the labor force, have a statistically significant impact on the economic growth of countries, whereas only the effects of fertility rate have been shown to be statistically insignificant. This study concludes that women's primary and tertiary education, as well as their engagement in the workforce, is essential for economic growth and development.*

***Key words:*** *Female Education, Labor Force Participation, Economic Growth, Panel Data Regression*

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## I. INTRODUCTION

Napoleon (1769–1821) once remarked, "Give me an educated mother, and I'll give you an educated nation," a statement that captures the significance of female education in the economic development of a nation. If not, one can listen to Begum Rokeya (1880-1932), one of the world's most prominent and pioneering female thinkers, who compared a nation to a two-wheeled vehicle and declared women to be one of the wheels. Therefore, for a society to flourish economically, it must focus equally on the physical and mental health of women as it does on the male-wheel. Otherwise, the nation-cart may go as quickly as it can, but it will not reach its destination because the female wheel will malfunction and causing it to circle in place.

In many ways, however, South Asian women are deprived of even their most fundamental necessities. Many of them do not have the opportunity to enroll in school, and those who do drop out extremely quickly for a variety of reasons, including poverty, early marriage, religious restrictions, etc. This is why there is a significant gender disparity in the region, especially at the secondary and university levels of education. This hinders economic progress in many nations, impacting several variables including GDP per capita, asset and income distribution, governance quality, public policies, and initiatives for different factors related to human development. The issues faced by women vary based on the locale or geographic region in which they reside. Urban poor have even less access to services such as education and healthcare than their rural counterparts, and must rely on cash to survive. It is extremely difficult for the poor to obtain good jobs because they lack a proper education.

Education is one of the important factors that can help both individuals and nations achieve their intended development goals. It has major positive social impacts on individuals, society, and the economy by stimulating creativity, entrepreneurship, and productivity among individuals. Given that education improves people's income and raises their level of living, it is apparent that there is a substantial relationship between female education and economic development. Education serves as a catalyst for economic progress in all of these ways, and without high-quality education for women, no nation can achieve economic success. According to a second view, education can assist reduce the prevalence of gender discrimination. Nonetheless, some experts argue that gender inequality eventually retards economic development. And because there is controversy over whether or not female education contributes to economic growth, the author believed there was potential to investigate whether or not female education and regular workforce participation had an impact on economic growth.

This study explores the extent to which women's education affects economic growth in five Asian countries, Bangladesh, Bhutan, India, Sri Lanka, and Pakistan, which have very comparable circumstances in terms of gender discrimination and an eerily similar fate in terms of economic progress. Historically, many of these nations were a united nation, but political and social factors led to their separation. Nonetheless, the inhabitants of these countries receive very identical treatment. Even though research indicates that investing in the education of women yields numerous benefits, these nations have not been able to capitalize on this potential for various social and economic reasons. In the past, it was customary for women to reside outside their homes and do only domestic duties. Even in these countries, the times have begun to change, and an increasing number of female students are leaving their home-like cages to receive an education and participate in the work force for progress. While traveling for this study, the author pondered the extent to which they were able to impact the economic prosperity of various nations. Consequently, the focus of this research has been on the relationship between investments in female education and economic growth in the sample nations.

## II. LITERATURE REVIEW:

Lack of knowledge is the primary cause of poverty, not the lack of resources or cash (World Bank, 1999). Ghana's per capita GDP was equal to Korea's in 1958, but in just 30 years, by the end of the 1990s, the Korean per capita GDP had increased to approximately six times that of Ghana. The World Bank showed, using the Solow model, that there is a positive correlation between economic development and education and that Korea's higher achievement in acquiring and using knowledge accounted for half of the disparity. The World Bank further affirmed the need for a basic education for all people in order to promote the retention of information. Girls and other groups that previously didn't have as much access to education were prescribed to be given extra attention.

According to the findings of the World Bank, better child nutrition, good health, and decreased fertility are advantages of women's education. Numerous authors have discovered comparable findings, including Ainsworth, Beegle, and Nyamete (1996) who examined the association between female education and cumulative fertility and the usage of contraceptives in fourteen Sub-Saharan African nations and found that higher levels of education for women are associated with decreased fertility. The same outcomes are discovered by Klasen (2002). A decreased fertility rate and an increase in human capital and economic growth are statistically correlated, as this author demonstrated. According to a cross-sectional study by Barro and Sala-i-Martin (2003), higher GDP per capita is associated with lower fertility rates, and higher levels of education have greater associations with fertility, with higher levels of education for both women and men being associated with lower fertility rates.

The importance of women's education for both social and economic growth has been shown by recent studies. There are also numerous theoretical and empirical researches on the contribution of women's empowerment and gender equality to eradicating poverty and promoting economic prosperity. Lawson (2008) concluded that more investments in women's education have been shown to boost life expectancy and, potentially, GDP growth by 0.2% per year (the "growth premium") for both women and men. Therefore, he backed up the idea that educating women may boost the economy in a number of ways. To begin, if women are educated, their families will benefit in higher incomes and employment opportunities; lower rates of fertility and mortality rates, healthier lifestyles, successful entrepreneurship, and intergenerational advantages. Second, women's education fosters macroeconomic expansion by raising the proportion of women who work in tertiary fields, improving human capital and productivity, boosting returns on investment, and fostering the "demographic transition" in agriculture.

In 2007, study by Morrison, Raju, and Sinha showed that granting women equal rights and a voice in life choice positions helped reduce poverty and increased production at both the individual and household levels. Additionally, they demonstrated how, on a macro level, gender equality and poverty reduction and economic growth are related. By examining the economic aspects of women's education, Özpolat and Yıldırım (2009) looked into the connection between women's education and economic growth. As it has long been established that women's education contributes to economic progress in all communities, particularly in emerging nations, and they urged for greater focus on women's education. They also mentioned that women receive higher net returns from education and training than do men.

The first economist to examine the differences in worker productivity by gender depending on their job experience and education was Schultz (1961). Additionally, according to Becker and Thomes (1994), workers' earnings varied according to their degree of education, amount of training, and level of experience. In their study from 2002, Bourguignon and Morrison looked at how rising per capita income and falling child death rates result in lower fertility rates. Barro (1999) found that households with greater education are more likely to be more productive and have fewer children, proving that there is a negative correlation between education and fertility rate.

But spending on children's health and family planning is more effective than investing in women's education in improving children's health and welfare and reducing fertility, say Baden and Green (1994). Dollar and Gatti (1999) also looked at the connection between economic growth and gender disparities in educational attainment. They provide an explanation of the beneficial link between women's educational attainment and economic growth. In addition, in a 41-year study, Klasen and Lamanna (2008) examined how discrimination against women in the workforce and educational opportunities affected emerging countries' economic development (1960-2000). Since women's education has a major impact on reproduction and the development of human capital for future generations, they discovered that these characteristics can inhibit economic growth and that reducing gender discrimination would encourage it. In addition to demonstrating the strong correlations between gender inequality in employment and labor force participation, Klasen (2008) also discovered that women's educational opportunities are restricted to lower levels. If marginal returns on education for women are higher than for men, increasing male education will hurt economic performance. Many economic theories claim that reducing the fertility rate per woman and the child death rate will enhance economic growth, and that encouraging women to further their education is one of the most effective approaches.

Bloom and Williamson (1998) studied the association between higher education and economic development, focusing on "demographic gifting," or how lowering fertility rates 20 years later produce a beneficial demographic constellation. They also discovered that higher-earning women have more leverage at home. A rise in women's incomes also boosts economic growth and savings. According to the Human Capital Theory, investing in education has a higher rate of return than other types of investments since it increases people' productivity by improving their abilities. Brown (2006) examined data from rural China and came to the conclusion that the return on investment in a child's education is greater for mothers than for fathers. Thomas (1994) found that whereas fathers' education affects their sons' schooling, mothers' education affects their daughters'.

Kizilgol (2012) also looked into how Turkey's poverty is impacted by gender imbalance in the classroom. The likelihood of ending poverty would rise, according to this study, if there were a greater proportion of women than men who were literate, had at least a 10-year education, and had income. Ince (2011) also investigated the value of women's education on Turkey's growth. She stated that, particularly in Turkey, where it may improve societal wellbeing, education is a fundamental component of social and economic success. She also came to the conclusion that one way to anticipate human capital is through education. The impact of women's education in eradicating poverty was also taken into account by Oxaal (1997), who pointed out that women in developing nations have less opportunities to attend school than men do. She also discovered that girls from impoverished homes are less likely to have access to educational opportunities due to poverty. For poor families, sending girls to school comes at a very high opportunity cost because they can take the place of their mothers in jobs like caring for younger siblings by using their labor instead.

***2.1 Overview of the Literature and Hypothesis development:***

According to the literature, optimistic groups believe that female education has a direct or indirect positive impact on economic growth. However, many other academics contend that female education has little impact on the development of the nation. There is also a school of thinking that claims that the impact of female education on economic growth vary depending on the degree of schooling (primary and tertiary). Now, it is clear that there have been numerous studies on the relationship between female education and economic growth, but none of them have sought to focus on countries like Bangladesh, Bhutan, India, Sri Lanka, and Pakistan, which have a lot in common and seem to be very similar to one another. That is the area of interest this study has been initiated to carry out. The aforementioned studies have aided the author in identifying the variables required to account for how women's education affects economic growth in these South Asian nations. This research is empirical in nature and on the premise of this understanding, the current study proposes hypothesis 1 ($H_1$) as follows.

*$H_1$: $\beta_1 \neq 0$; Female's Primary Education affects, positive or negative, economic growth.*

To capture the extent to which women's tertiary education affect economic growth, the 2nd hypothesis ($H_2$) is given to be:

*$H_2$: $\beta_2 \neq 0$; Female's Tertiary Education affects, positive or negative, economic growth.*

To capture the extent to which women's labor force participation affect economic growth, the current study sets the 3rdhypothesis ($H_3$) to be

*$H_3$: $\beta_3 \neq 0$; Female's Labor Force Participation affects, positive or negative, economic growth.*

To capture the extent to which fertility rate affects economic growth, the current study proposes hypothesis 4 ($H_4$) as follows.

*$H_4$: $\beta_4 \neq 0$; Female's fertility affects, positive or negative, economic growth.*

***2.2Research Objective:***

The objective of this study is to find out the nature of the impacts Female Education and Labor Force Participation have on annual economic growth.

## III.METHODOLOGY OF THE STUDY

Multiple studies have demonstrated that various forms of capital—including technological capital, capital formation, structural capital, and social resources—influence the growth rate of real GDP, which helps to explain GDP swings. However, not every aspect of these capitals that contributes to the explanation of economic growth can be included in the model. This study predicts that human capital will increase in unison with educational attainment. Due to the fact that the impacts of education on growth vary by education level (primary, secondary, and higher) and are correlated with fertility and labor force participation, an econometric panel model has been created.

To establish the benefits of women's education on economic growth, the study compiles and analyzes annual data on factors such as the growth rate of real GDP per capita, primary, secondary, and higher school enrollment, fertility rate, and labor force participation. These figures are provided by the World Bank.

The panel regression used is based on theoretical and empirical studies that analyze the connection between women's education and economic expansion. The study uses a balanced panel of 105 observations from five randomly chosen Asian nations between the years 2000 and 2020 (a total of 21 years). Bangladesh, Bhutan, India, Sri Lanka, and Pakistan make up the sample of nations and are representative of the effects of female education on economic development. Here, particular focus is placed on theoretical and empirical research on how education as human capital affects living standards and societal economic development in these nations where female education affects the labor force participation rates of women.

Pooled Ordinary Least Square Regression, Fixed Effects Regression Model, and Random Effects Regression Model were implemented on the dataset to obtain different results, and the author used and determined the results using the fixed effects regression model as suggested by the Hausman test. After many trials, the following regression models, which have been estimated using ordinary least square estimators, were chosen. The first specification of the model to investigate whether women's education affect economic growth is as follows:

$$\boldsymbol{PCGDPG}_{it} = \boldsymbol{\beta_0 + \beta_1 PEFEM_{it} + \beta_2 TEFEM_{it} + \beta_3 LBRFEM_{it} + \beta_4 FERTFEM_{it} + u_{it}} \quad (1)$$

Where

$I$ = 1,2,3,4; $t$ = 1,2,...., 21;

*PCGDPG*-Per Capita GDP growth [Annual percentage growth rate of GDP per capita]

The rests are independent variables used to help the model better predict the effect of these variables' effects on economic growth. The variables incorporated here have been chosen to be used in this model according to similar research literatures which frequently include the variables in the "female education-growth" regressions. These variables are

PEFEM- Primary Education of Female [WB Definition: School enrollment, primary,female (% gross)];

TEFEM- Tertiary Education of Female [WB Definition:School enrollment, tertiary,female (% gross)];

LBRFEM- Labor Participation of Female [WB Definition:Labor force participation rate, female (% of femalepopulation ages 15–64)]; and

FERTFEM- Fertility Rate [WB Definition:Fertility rate, total(births per woman)]

$\beta_1$, $\beta_2$, $\beta_3$, *and* $\beta_4$are the coefficients of interest throughout this paper which measure the effects of female education and labor force participation on per capita GDP growth. And $u_{it}$ represents an error term which is independently and identically distributed (IID) that is, the mean of the error term is zero and their variance is constant.

**Fixed effects regression model specification:**

$$\boldsymbol{PCGDPG}_{it} = \boldsymbol{\beta_0 + \beta_1 PEFEM_{it} + \beta_2 TEFEM_{it} + \beta_3 LBRFEM_{it} + \beta_4 FERTFEM_{it} + \mu_i + \theta_t + u_{it}} \quad (2)$$

Where, with the previously defined variables, two new effects have been incorporated. $\mu_i$ is used to capture the effects that are supposed to be changing over the individual countries but keeping constant over the different time periods, where the effects that are constant over individual countries but changes over time is captured by $\theta_t$.

In summary, the dataset is a panel with 5 countries (N) and the time period (T) is to be 21 years starting from 2000 to 2020. The source of these data is, as mentioned earlier, metadata bank of World Bank statistics. It's a balanced panel; with a total number of observations is NT: 5*21 = 105.

***3.1 Estimation Methods:***

Estimation starts with a simple pooled OLS model (equation 1) without considering any effect. Then two regressions are run with the 2nd specification, one with fixed effects and the other for random effects. Done with these, the Hausman test was employed to find the appropriateness of either fixed effects regression or random effects regression for the panel dataset under use. The test set H0: Random Effect model is appropriate and H1: Fixed Effect model is appropriate. And the test statistic is 9.52 with a p-value of 0.0494, which tells us to reject H0, that is, the result is in favor of fixed effects regression to be used for this study.

Before this, it had to be sure whether the data to be used was appropriate for the study. For a dataset to be appropriate, stationarity is one of the most important traits to have. So, all the variables are checked by the Fisher ADF (Augmented Dickey-Fuller) unit root test, to examine whether they are stationary or not. The fertility rate and the first differences of all the other variables (per capita GDP growth rate, primary enrollment female, tertiary enrollment female, and labor force participation female) have been confirmed, by the test results, to have the required level of stationarity. To be more specific, all of the variables in use are integrated to degree 0, I (1), with the exception of the fertility rate, which is integrated to degree 0, I(0).

**Table 1: Results for Unit Root test, Fisher Type (ADF)**

| Variables | At Level 1<br>Fisher Type (ADF) | |
|---|---|---|
| | Intercept only | Intercept and Trend |
| Per Capita GDP Growth | 76.04*** | 74.60*** |
| Primary Education, Female | 60.26*** | 55.54*** |
| Tertiary Education, Female | 73.10*** | 64.82*** |
| Labor Force Participation, Female | 46.75*** | 38.27*** |
| Fertility Rate | 235.35*** | |

*Note: *** significant at p<0.01, ** significant at p<0.05, * significant at p<0.1*

Among others, tests for Heteroscedasticity, and multicollinearity have also been worked out.

## IV. FINDINGS AND DISCUSSION

The test results have been thoroughly discussed in this section. The econometric model created for this study was run through STATA 13.0 with all the specifications specified, and the outputs are shown here. The averages and standard deviations of the cross-sectional time series data were examined as the first step of the study to see how distinct the various nations were from one another. The results were as expected as seen in the summary of the dataset used:

**Table 2: Data Summary (STATA produced)**

| Variable | No. of Observations | Mean | Std. Dev. | Minimum | Maximum |
|---|---|---|---|---|---|
| Per Capita GDP Growth | 105 | 3.89 | 3.33 | -11.07 | 17.03 |
| Primary Education, Female | 105 | 97.66 | 15.82 | 57.01 | 124.98 |
| Tertiary Education, Female | 105 | 11.71 | 7.68 | 1.67 | 31.29 |
| Labor Force Participation Rate | 105 | 34.43 | 14.21 | 16.12 | 65.70 |
| Fertility Rate | 105 | 2.76 | 0.77 | 1.93 | 5.04 |

Source: World Bank Databank, produced by STATA

The GDP per capita varies more between nations than within. An average of 3.89% can be seen for GDP per capita for the time period presented. While the aggregate greatest advancement is 17.03%, the least progress rate averages negative 11.07%. Means and standard deviations correlate to the gross domestic product. The average enrolment rate for females in primary school is 97.66%, indicating that the majority of girls in these nations attend primary or elementary school. With a primary school enrollment percentage of at least 57.01% in these nations, the majority of women are likely to be at least minimally educated. Female tertiary school enrollment is quite low, with an average of 11.71 percent, a minimum of 1.67 percent, and a maximum of 31.29%, suggesting that most females in these nations do not attend middle-high schools. This means women choose lower-level jobs demanding more physical work than brainpower. Average female labor force participation in these countries is 34.43 percent, or one-third. Even if this result doesn't account for returns from the informal economy, minimum (16.12%) and maximum (65.70%) female labor force participation imply its importance in these countries. The average fertility rate in these countries is 2.76 children per woman, with a maximum of five children per woman.

Now, the test results, shown in Table 3:

**Table 3: Results**

| Variables | Per Capita GDP Growth | |
|---|---|---|
| | Random Effects | **Entity+Time FE** |
| Primary Education, Female | 0.126<br>(0.134) | 0.0949*<br>(0.0550) |
| Tertiary Education, Female | -0.0185<br>(0.0662) | 0.274*<br>(0.156) |
| Labor Force Participation, Female | 0.245<br>(0.142) | 0.250***<br>(0.107) |
| Fertility Rate | 2.918<br>(3.127) | 1.480<br>(1.754) |
| | | |
| Constant | -24.69<br>(19.30) | -31.79**<br>(10.03) |
| | | |
| Observations | 105 | 105 |
| R-squared | 0.153 | 0.599 |
| Number of Country | 5 | 5 |

Note: Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

The regression model (2) where both entity and time fixed effects have been incorporated can be stated as an equation for better understanding as follows:

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| pcgdpg | = | -31.79 | + | 0.09 *pefem* | + | 0.27 *tefem* | + | 0.25 *lbrfem* | + | 1.48 *fertfem* |
| | | (10.03) | | (0.06) | | (0.16) | | (0.11) | | (1.75) |
| | | | | | | $R^2$=0.599 | | | | |

The result indicates that the R-squared value is 59.9%, indicating that the independent variables account for about 60% of the differences in GDP per capita levels across the five selected nations. Test coefficients indicate that all four factors, i.e., school enrollment primary female, school enrollment tertiary female, labor force participation female, and fertility rate, have a positive effect on economic growth, and all variables, with the exception of fertility rate, are statistically significant for the nations included in the analysis.

For a more particular discussion, it can be seen here that for primary education, females have a considerable effect on economic growth, as indicated by a coefficient of 0.095 in our dependent variable GDP per capita of these nations. Tertiary education female and labor force female involvement were found to be significant with coefficients of 0.274 and 0.250, respectively, and had a significantly beneficial impact on these countries' GDP per capita, whereas the fertility rate was determined to be negligible with a coefficient of 1.480. Importantly, the signs of the coefficient estimates demonstrate that all variables, whether statistically significant or not, have a positive effect on the annual growth of the GDP per capita.

Therefore, with the exception of the fourth hypothesis about the effects of fertility rates on economic growth, none of the hypotheses can be rejected, as they are proven to be significant at a 90% and 1% level of confidence. Thus, primary education for females, tertiary education for females, and labor engagement for females are statistically demonstrated to have a statistically significant effect on the economic growth of the countries studied, whereas the fertility rate appears to have no statistically significant effect on economic growth. Therefore, only the fourth hypothesis [H4: 4 0; female fertility affects, positively or adversely, economic growth.] is disproved at a 5% level of confidence.

## V. CONCLUSION

The study studied the importance of female education to long-term economic growth in five Asia-based countries, an area chosen for research due to the acute poverty encountered by many of its inhabitants. According to the results, elementary education female, tertiary education female, and labor participation rate female all have positive and statistically significant effects on annual per capita GDP growth of the countries, leaving only the fertility rate to be shown to have statistically negligible effects on economic growth.

It has been determined that the labor force participation rate has a statistically significant effect on economic growth per capita. Primary and secondary female education can eventually lead to higher labor force participation rates. Women's education is crucial to improving female labor force participation, as an increase in female schooling will result in more educated women who can enter the labor force, get professional employment, and earn higher earnings. In addition, improved female education can alter traditional perspectives on women's roles in society and the workplace.

Multiple obstacles impede women from going to school and working. Perceptions that the return on investment for female education is lower due to income inequality and that entering the workforce "violates" religious traditions are significant impediments. Traditional views that women should remain with their families and that daughters will leave the household after wedding contribute to the low priority placed on women's

education in many countries. Our results indicate that a greater proportion of educated women help to economic expansion.

Reducing child mortality and the fertility rate of women is equally as vital as increasing women's access to and involvement in a more productive and income-generating work force in order to accelerate the spread of education to the next generation. We discovered that educating women in the selected Asian nations will accelerate economic growth. Education for women may be one of the few unusual "win-win" development efforts. Politicians in these nations should give careful consideration to measures that contribute to other critical human development goals, such as reducing newborn and maternal mortality and expanding access to family planning. Future research on the effect of women's empowerment on long-term economic growth should consider more than just the education levels of women.

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