Impact of Female Education on the Economic Growth: A Case Study of Pakistan

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Abstract

The study emphasizes that closing the gender gap in education enhances individual economic opportunities and contributes significantly to national development. Educated women are more likely to enter higher-paying professions, improve household well-being, and make informed health and family planning decisions. Similarly, investing in male education fosters a more competitive and innovative workforce, driving technological advancements and industrial growth. To maximize these benefits, it is essential to implement targeted policies that improve access to quality education and align educational programs with labour market demands. A well-educated population strengthens economic resilience, reduces income inequality, and paves the way for long-term prosperity in Pakistan.

Keywords: Gender Gap in Education, Economic Opportunities, National Development, Quality Education, Labor Market Demands.

Introduction

Education is pivotal in improving economic conditions, boosting economic activity, and enhancing financial gains. It significantly increases a person's probability of leading a healthy life, improves maternal health, and builds confidence to combat diseases such as HIV and AIDS. Moreover, Education promotes gender equality, reduces child marriages, and fosters peace. It is a cornerstone for human and economic development, as its neglect often results in numerous social and economic issues in developing countries. Education is widely regarded as a key form of investment in human capital and services. Studies have shown that lower education levels, especially among women, negatively impact economic growth. In developing countries, educating women reduces fertility rates, lowers infant mortality, and improves children's education. Increased levels of female education lead to better human development outcomes, such as child survival, health, and schooling. However, gender inequality in education can hinder these benefits, resulting in lower human capital and slower economic progress.

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In Pakistan, gender disparity in education remains a significant challenge. While the gender distribution of the population is nearly equal, the acquisition of education shows stark differences. The Gender Parity Index at the primary level has declined over the years, highlighting reduced female participation and widening disparities. Women traditionally spend more time with their children and could contribute significantly to the labour force if barriers to education were addressed. Educated women enhance the workforce and positively influence societal development by reducing corruption and increasing technological expertise. Furthermore, studies suggest that women's higher earnings are often directed toward their children's health and education, creating a productive development cycle.

The economic implications of female education are multifaceted. Lower wages for women in export-oriented industries can enhance competitiveness and stimulate investment, leading to economic growth. However, reducing gender wage gaps could channel more income into productive areas, such as education and health, further boosting development. Societies prioritizing female education tend to experience faster economic progress, as women's contributions to the labour force significantly raise per capita income and productivity. Despite these advantages, many women in Pakistan face multidimensional social and economic obstacles during their education, particularly in rural areas where gender discrimination and socio-economic hardships prevail.

Historically, female literacy rates in Pakistan have been alarmingly low compared to male counterparts, with rural areas showing even starker disparities. Although some progress has been made over the decades, challenges such as high dropout rates among girls and societal preferences for educating sons persist. This neglect of female education contributes to poverty, unemployment, and reduced societal well-being. Education policies, such as the 1998–2010 framework, aimed to achieve higher enrollment rates but fell short due to governance issues, inefficient resource utilization, and cultural biases.

Education begins at home, with parents playing a crucial role in shaping a child's learning journey. Parental attitudes and cultural characteristics significantly affect children's educational attainment, particularly in patriarchal societies. Educated women are more likely to enter the labour market, earn higher wages, and contribute to family and community decision-making. They also tend to marry and have children later, make informed health choices, and prioritize their children's education and well-being. Despite these clear benefits, gender inequality in educational access and opportunities hinders societal progress in many developing nations.

Female labour force participation is a key driver of economic development and growth. It is positively associated with reduced unemployment, improved infrastructure, and enhanced health and communication in developing countries. However, restrictive policies and societal barriers often limit women's employment opportunities, underscoring the need for targeted government interventions. Promoting female education and participation in the labour force is crucial for reducing poverty, lowering fertility rates, and achieving sustainable growth. Societies that invest in female education experience structural transformations, increased productivity, and long-term economic benefits.

In conclusion, education is vital for economic and social advancement, particularly for women. It enhances individual productivity and contributes to societal well-being and economic growth. Addressing gender disparities in education and empowering women through equitable opportunities are essential for sustainable development. Like other developing countries, Pakistan must prioritize female education and labour force participation to unlock its full economic potential and build a more equitable and prosperous society.

Research Objectives

The following objectives were specified for the study.

1. To find the impact of female education on GDP
2. To find the effect of male education on GDP
3. To find the impact of female labour force participation on GDP
4. To find the effect of birth rate on GDP
5. To find the impact of investment education on GDP

Significance of Study

Education is a fundamental right for females; better education enhances their living standards and socio-economic conditions. Female education positively impacts GDP by boosting growth and increasing female labour force participation. It ensures a better future for upcoming generations and allows women to contribute to various sectors. The study emphasizes that gender discrimination in Education hinders economic and social development and must be addressed by maximizing educational opportunities. Increased female education improves productivity, expands the labour force, and reduces fertility rates. It creates a multiplier effect on the quality of the nation's human resources for future generations. Women, who disproportionately bear the burden of poverty in developing societies, can significantly impact breaking the cycle of poverty and inadequate schooling through education.

Organization of the Study

The first chapter introduces the topic, providing the background of the study, a statement of the problem, research questions, goals, and significance. The second chapter reviews existing literature on the subject. The third chapter discusses the research methodology, including estimation techniques, research population, sampling, and data analysis. The fourth chapter presents the results, conclusions, and discussion. Finally, the fifth chapter summarizes the findings and provides recommendations for promoting female education and its impact on economic growth.

Literature Review

Various studies about female education and the GDP growth rate have been presented. The majority of this research has been done nationally.

Empirical Review

Nowak and Dahal 2016 attempted to examine the association between education and economic growth in Nepal from 1995 to 2013. Employing the OLS and Johansen Co-integration techniques revealed a significant and positive relationship between education and economic growth in the long run. This study recommends that policymakers pay serious attention to the development of the education system and make efforts to improve the quality of primary, secondary, and higher education levels that further lead to economic growth.

Parveen, 2008 concluded that development is not only characterized by the growth of production and income but also closely linked with and necessitates the evolution and transformation of economic and social structure, which results from the will for change of the governments in power and the mobilization of national efforts.

The literacy rate of males has been estimated at 69.5 per cent in FY 2008-09 while it has been a mere 45.2 per cent for females, a percentage that makes up mostly the girls in the urban areas of

the nation that have been fortunate and privileged and those that belong to the high-income families dwelling in the metropolitan areas. Likewise, in the case of gender parity in primary education, the situation is not up to the mark. Gender Parity improved from 0.82 to 0.85 points in the first half of this decade. Still, thereafter, a 1 per cent decline was witnessed from 2004-2005 to 2008-2009, indicating that under current circumstances, female participation in education has reduced, increasing the disparity between the participation of female and male counterparts in society.

Pakistan's vigorous GDP growth of almost 6% in recent years and the prominence of its female political leaders have not been translated into welfare and productivity gains for its women. According to the Gender Parity Index (GPI), in 2005, the combined Primary completion rate of both genders was 63.2. However, in the same year, the Primary completion rates of boys and girls were 73.4 and 52.5, respectively. The years 2001, 2003 and 2004 respectively.

Qayum (2008) 1981 Census of Population shows that females comprise 48% of the population, and 16% are literate compared to 35% of males. However, the rate was only 7% for females against 26% for males in rural areas. The literacy rate for females was raised to 21% and 47% for males in 1991. The primary enrollment rate of girls was 46% compared to 80% of boys in 1987-88, and a higher dropout rate among girls reflected the low priority given to girls' education.

Sawada 1997 explored a distinct gender difference in education in rural households of Pakistan using household panel data for the period of (1986-87 to 1990-91). He estimated the regression model using variables such as entrants and dropouts, implying that households in Pakistani villages might be credit-constrained. Investment in daughters' education may not yield much economic returns for parents due to various customs and traits of society.

Temple 2000 examined the importance of education in economic growth. He viewed education as having more significant benefits, resulting in high productivity and a positive influence on economic growth. Moreover, he emphasized that education has a central role in the development of different sectors of the economy.

In his paper, Kerr (2001) explained the importance of education in generating economic growth. This conference will be a source for bringing together different views on education policy designs. In designing an education policy, the issue is not how this policy will be implemented; the problem is that the policies should reflect the best advances for the country's economic and social goals.

Abu-Ghaida and Kalsen (2004) suggest that gender equity in education promotes economic growth and reduces fertility, child mortality, and undernourishment. The authors estimated the costs of missing the gender-related millennium development goals. The simulations suggest that by 2005, the countries that are off track in gender-related goals are likely to suffer 0.1–0.3 percentage points lower per capita growth.

Kiani and Kauser (2007) attempted research to examine the relationship between education and the economic growth of Pakistan over the period (1980 to 2007). They take four levels of education: primary, middle, high, and other school enrollment, with different variables like experts, BHUS, literacy rate, and labour force. The data was taken from an economic survey of Pakistan and processed through a simple linear regression model (OLS). It suggests that there is a positive relationship between education and economic growth. Experts, BHUS, and the labour force also positively impact economic growth. The government should take a special interest in primary education, the foundation for boosting the literacy rate. They stated that quality of education is preferred over quantity of education.

Sundaram and Vanneman (2008) found that in the areas where the share of women is higher in the labour force in India, the female literacy rate is lower. The reason is that the participation rates of girls in the labour force depress their literacy and education. Gender inequalities in literacy are,

therefore, an exception to the usual egalitarian impact of women's labour force participation, and there exists a multidimensionality of gender inequalities.

Chauhdry and Rehman (2009) analyzed gender differences in education in rural area units in Asian nations. They used the logit model of regression findings, finding that education and earners harm impoverishment.

Zahid et al. (2009) researched the impact of gender inequality on Pakistan's economic growth. They take four independent variables: labour force, investment trade openness, and gender inequality. Data was collected from a financial survey of Pakistan, the World Bank indicator, and Parvaiz and Rasheed's past papers. Data was stationary at 1st difference, so co-integration and VAR are used for lag. The paper suggests that the government should implement policies that can make women's lives favourable and that gender inequality should be addressed due to its intrinsic value and investment value for economic growth.

Khattak et al., 2011 attempted to examine the relationship between female education and the fertility rate from 1981 to 2008 in Pakistan. Employing the Multiple Regression Model and Johansen Co integrations reveals that female education is vital to reducing the fertility rate. In 1989, the total fertility rate was 7.0; after government policies, it decreased to 3.0 in 2008. Female age at marriage has a negative relationship with the fertility rate. This study recommends that to reduce the fertility rate, the government should pay attention to the education of both males and females.

Gross Domestic Product

Gross Domestic Product (GDP) will be measured in rupees. It is the total market value of all final goods and services produced within a country during a fixed period. Female education refers to the percentage of female literacy relative to total literacy, measured as a percentage. Male education refers to the rate of male literacy relative to total literacy, also measured as a percentage. education investment is crucial for enhancing economic productivity. It involves spending on education, which leads to higher economic output and better societal development.

Labor Force Participation

The labour force consists of two types of workers: highly skilled and low-educated. Highly educated workers typically experience lower unemployment, earn higher wages, and are more adaptable to technological changes. A trained labour force can foster economic growth through innovation and higher productivity. The birth rate is the number of live children born to women of a specific age during a year as a proportion of the average annual female population of the same age.

Model Specification

The model investigates the impact of various factors (female education, male education, education investment, labor force participation, and fertility rate) on the Gross Domestic Product (GDP):

$$Y=\beta0+\beta1(I)+\beta2(ME)+\beta3(FE)+\beta4(LFP)+\beta5(FR)+\mu Y$$

Where: Y, GDP (dependent variable), III: Education investment, ME: Male education, FE Female education, LFPLFPLFP: Labor force participation, FRFRFR: Fertility rate, μ: Error term.

Diagnostic Test

Diagnostic tests are employed to examine data and identify potential issues, such as stationarity. To assess data stationarity, the Augmented Dickey-Fuller (ADF) test and the Akaike Information

Criterion (AIC) are used. This tests whether the data is stationary. The null hypothesis states that the data has a unit root (i.e., non-stationary), while the alternative hypothesis asserts that the data does not have a unit root (i.e., it is stationary). The ADF test has three variations, depending on the model specification.

$\Delta Yt = \gamma Yt\text{-}1 + \sum_{i=1}^{p} \beta i \, \Delta Yt\text{-}1 + et$

$\Delta Yt = a_0 + \gamma Yt\text{-}1 + \sum_{i=1}^{p} \beta i \, \Delta Yt\text{-}1 + et$

$\Delta Yt = \gamma Yt\text{-}1 + a_{2t} \sum_{i=1}^{p} \beta i \, \Delta Yt\text{-}1 + et$

SIC is used to find out the stationary of data to check the lags of the data.

Normality Test

A normality test is used to find out if the sample data has been drawn for a normally distributed population (within some tolerance). Jarque bera test is used to find out whether the residuals are normally distributed or not. If the probability value is greater than 0.05 residuals will be normally distributed.

Multicollinearity

Multicollinearity is the occurrence of high intercorrelations among two or more independent variables in a multiple regression model.

Variance Inflation Factor

VIF is used to find out multicollinearity between independent variables. If the C-VIF value for all variables, is less than 10 there will be no multicollinearity, otherwise, there will be multicollinearity**.**

Error Correction Model

ECM is a technique that is used when there is cointegration or long-run; the relationship among variables. ECM is used when the variables are of order I(1). It is used to run the regression to provide the results in the short run and it also shows the long run factor coefficient Eq (-1)* (speed of adjustment). This means that the economy will deteriorate due to selected variables and having detected its coefficient that will be recovered after one year. It also shows how the model will adjust itself after adverse effects.

Cusum Tests

The CUSUM test assesses the stability of coefficient (β) in a multiple linear regression model of the form Ÿ=χβ+ε. Inference is based on a sequence of sums, or sums of squares, of recursive residuals (standardized one-step-ahead forecast errors) computed iteratively from nested subsamples of the data. Under the null hypothesis of coefficient constancy, values of the sequence outside an expected range suggest a structural change in the model over time.

ARDL

It is OLS OLS-based model that is applicable for both non-stationary time series as well as for time series with mixed order of integration. This study employs the Autoregressive Distributed Lag (ARDL) bounds testing procedure recently developed by Pesaran et al. (2001). The ARDL has several advantages over other techniques of cointegration such as Engle and Granger (1987) and Johansen and Juselius (1990). First, it can be applied irrespective of whether the underlying variables are 1(0), 1(0), or a combination of both (Pesaran and Pesaran, 1997). Second, the ARDL

procedure is statistically a more significant approach to determining the cointegration relation in small samples than that of the Johansen and Juselius cointegration relation in small samples than that of the Johensen and Juselius cointegration technique (Pesaran and Shin,1999). Third, even where some of the model regressors are endogenous.

Co-Integration Regression

Co-integration regression is used to find the long-run relationship between the variables. It is used to find a possible correlation between time series processes in the long term.

Bound Test

The bound test is also used to check to long-term relation between the variables. The associated equilibrium correction was also significant confirming the existence of a long-run relationship.

Table 1: Expected Signs Of Variables

Variable	Signs
ME	+
FE	+
BR	-
FLP	+
EI	-

Results and Discussion

The Unit root test is used to find out whether the selected variables are stationary or not. Augmented dickey fuller test (ADF test) is used for this purpose. The results of the ADF test are given below.

Table 2: Results of the ADF Test

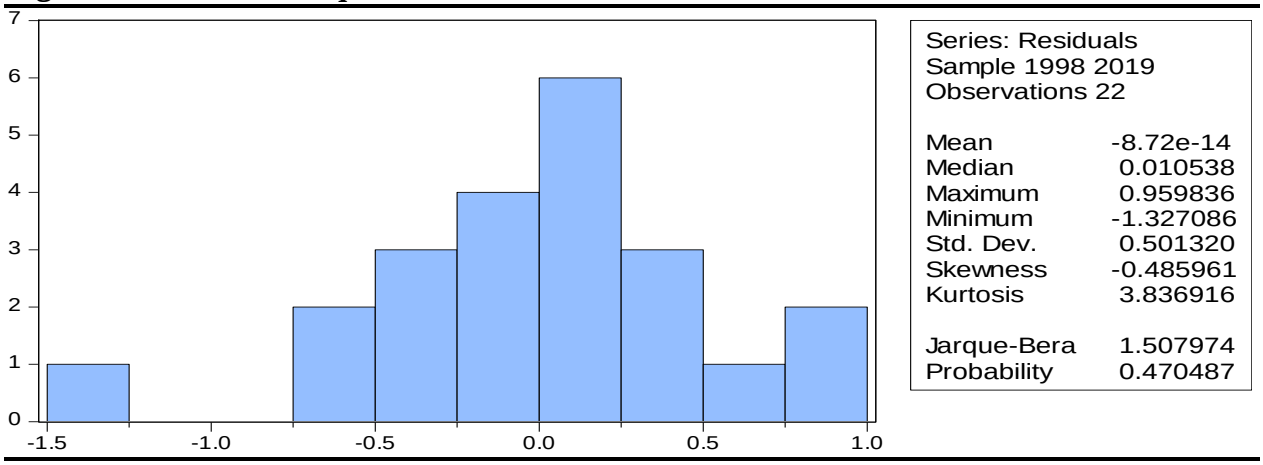
Variables	Lags	t-statistics	Probability	Critical value at 5%
GDP	1	- 4.449382	0.0022	3.004861
ME	1	- 4.405404	0.0028	- 3.020686
FE	1	- 9.471574	0.0000	- 3.004861
BR	0	- 3.200789	0.0337	- 3.004861
FLP	1	- 3.252896	0.0309	- 3.788030
EI	1	- 3.047691	0.0459	- 3.004861

Results show that the selected variables (GDP, FE.ME, BR, FLP, EI) are stationary at the level and 1st difference because there probability value is less than 5% at level or probability became less than 5% at 1st level. It means that the mean, variance and co-variance of the selected variable doesn't remain over time.

Normality Test

It is the assumption of time series econometric that the residual are normally distributed Jarque Bera test is used to find whether the selected variables are normally distributed or not. If probability value is greater than 5% then the selected variables will be normally distributed.

Figure 1: Results of Jarque Bera



The probability value is greater than 5% which shows the selected variables or normally distributed.

Variance Inflation Factor

This test is used to identify the problem of multicollinearity. If the centered VIF value for all variables is less than 10 then there will be no multicollinearity in the model.

Table 3: Results of Variance Inflation Factor

	Coefficient	Uncentered	Centered
Variable	Variance	VIF	VIF
FLP	1.99E-06	1.189276	1.105577
FE	0.007157	88.69951	1.302315
EI	0.987784	39.73684	1.238718
BR	0.909885	113.0837	2.483323
ME	0.017313	487.6192	2.235228
C	0.016995	1113.315	NA

The VIF results show that the c-VIF values for all variables are less than 10, so there is no multicollinearity.

Results of Short Run ARDL Model

This section comprises the results of the short-run ARDL model. Table 4 represents parameter estimates with standard error.

Table 4: Results of Short Run ARDL Model

Variables	**Coefficient**	**Standard error**	**T-statistic**	**Probability**
C	-99.67148	33.62369	-2.964323	0.0210
FLP	-1.882037	0.817189	-2.303064	0.0547
FE	0.193030	0.102912	1.8775676	0.1028
EI	0.501757	1.389355	0.361144	0.7286
BR	-96.58847	56.17899	-1.719299	0.1292
ME	0.170255	0.092460	1.841379	0.1081

In the short run, the Birth Rate has a negative impact on GDP and the results are insignificant in the short run, similarly, FLP has a negative impact on GDP and the results are significant. Female education has a negative impact on GDP in the short run and the results are significant at 10%, similarly, Male education has a positive impact on GDP and the results are significant at 10%. Education Investment has a positive impact on GDP and results are insignificant.

Bound Test

Bound test is used to find the long-run relationship among the variable. If the f-statistic value is greater than the upper bound the result will be significant meaning there is long run relationship among variables. The results of the Bound test are below.

Table 5: Results Of Bound Test

Test Statistic	Value	K
F-statistic	10.21167	5
Critical Value Bounds		
Significance	I0 Bound	I1 Bound
10%	2.26	3.35
5%	2.62	3.79
2.5%	2.96	4.18
1%	3.41	4.68

The results of the bound test show that all variables are significant at 5% because the upper bound value (3.79) is greater than the f-statistic value which means there exists a long-run relationship between the dependent (GDP) and independent variable (FE, ME, BR, FLP, EI).

Results of Long Run ARDL Model

This section comprises the results of the long-run ARDL model. Table represents parameter estimates with standard error.

Table 6: Coefficient results

Variables	**Coefficient**	**Standard error**	**T-statistic**	**Probability**
BR	-1.814815	2.190982	-0.828311	0.4348
FLP	1.357232	0.715825	1.896039	0.0998
FE	0.772956	0.183766	4.206201	0.0040
EI	-0.981699	0.981633	-1.000067	0.3506
ME	0.261721	0.101968	2.566699	0.0372
C	-90.60849	32.08058	-2.824403	0.0256

EC=GDP-(1.8148*FR+1.3572*FLP+0.7730*FE+0.9817*EI+0.2617*ME-90.6085)

Table shows the long-run results of ARDL. In the above table, the coefficient value of female education is 0.77 which is positive and suggests that a 1% change in female education results from a 77% increase in economic growth. The coefficient value of education investment is -0.98, which is negative. The coefficient value of the female labor force is 1.3 which is positive and shows the positive relationship between female labor force participation and economic growth. A 1%

increase in female labor force participation results from a 1.35% increase in GDP. The coefficient value of male education is 0.26, which is positive and suggests a 1% increase in male education results 26% increase in GDP. The coefficient value of the birth rate is -1.81, which is negative and results 1% increase in birth rate will decrease the GDP by -1.81%.

ECM

To capture the short-run relationship between dependent and independent variables, the Error Correction Model is estimated. The results of the error correction model are given below.

Table 7: ARDL Error Correction Regression

Dependent Variable: D(GDP)				
Selected Model: ARDL(1, 2, 1, 2, 2, 1)				
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
D(FR)	-96.58847	28.71358	-3.363860	0.0120
D(FR(-1))	-84.71876	37.45605	-2.261818	0.0582
D(FLP)	-1.882037	0.405743	-4.638499	0.0024
D(FE)	0.193030	0.050256	3.840908	0.0064
D(FE(-1))	-0.287469	0.062548	-4.595995	0.0025
D(EI)	-0.501757	0.653574	-0.767713	0.4678
D(EI(-1))	2.946668	0.672200	4.383619	0.0032
D(ME)	0.170255	0.045929	3.706917	0.0076
CointEq(-1)*	-1.100024	0.126043	-8.727348	0.0001
R-squared	0.914223	Mean dependent var		-0.001364
Adjusted R-squared	0.861437	S.D. dependent var		1.711708
S.E. of regression	0.637166	Akaike info criterion		2.228517
Sum squared resid	5.277753	Schwarz criterion		2.674852
Log-likelihood	-15.51369	Hannan-Quinn criteria.		2.333660
Durbin-Watson stat	2.939485			

The coefficient of adjustment count Eq(-1)* is -1.100024 which shows that if due for any reason the values of independent variables change, there is more than a 100% chance that the independent variables will recover in the next period very quickly.

Cusum Test

The Cusum test is used to find the stability of the model.

Figure 2: Cusum Tests

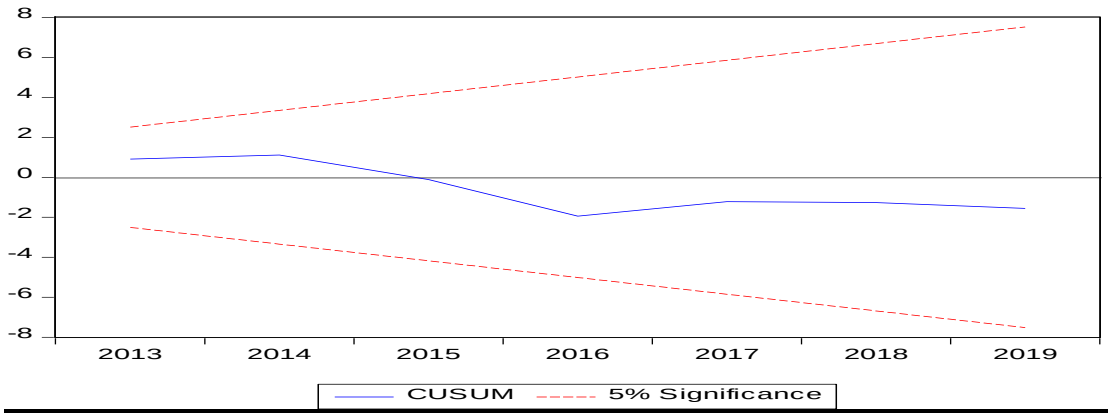


Table shows the results of the cusum test. The null hypothesis is that the model is stable against the alternative at it is not stable. The result of cecum shows that the curve is lying between 5% upper and lower limit which shows the existing model is stable.

Cusum Square Test

It is used to find the stability of the parameters

Figure 3: Cusum square test

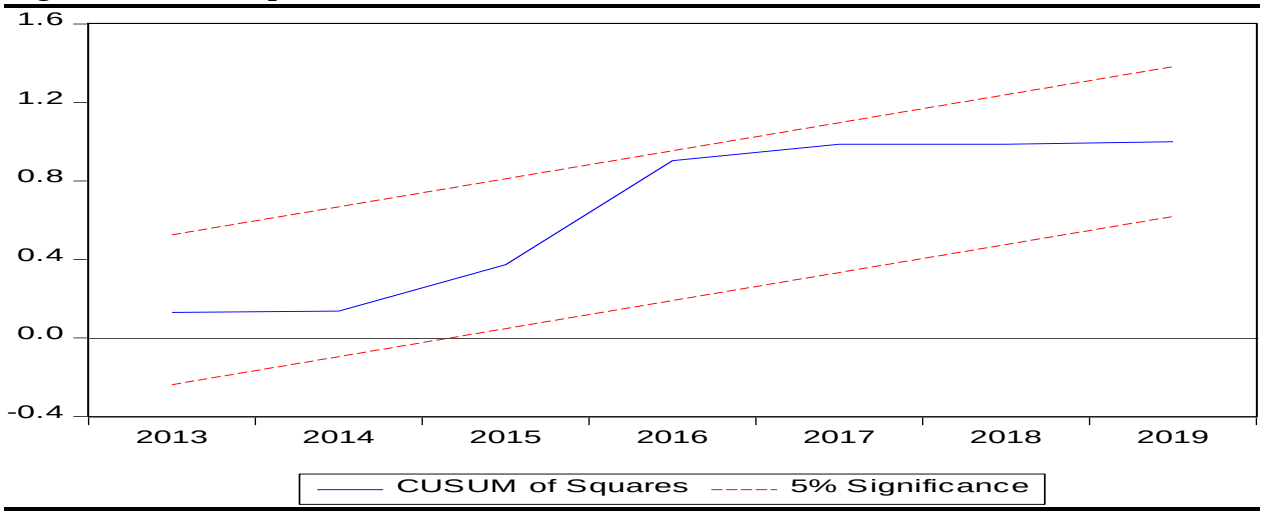


Figure above shows the results of cusum square test. The null hypothesis is that the parameters are stable against the alternative at it is not stable. The graph shows that the curve is lying between upper and lower limit which shows that parameters in the existing model are stable.

Conclusion

The main objective of the study was to examine the long-run impact of female education on Pakistan's economic growth, using male education, female labor force participation, education investment, and birth rate as control variables. Time series data from 1996 to 2018 was sourced from the World Development Indicators, the Economic Survey of Pakistan, and the Bureau of

Statistics. Various econometric techniques, including ARDL, ECM, COSUM, BOUND, JARQUE BERA, UNIT ROOT TEST, and VIF, were applied for analysis. The results revealed a positive and significant long-run relationship between female education and Pakistan's economic growth. Consequently, the null hypothesis was rejected in favor of the alternative hypothesis. The ADF Unit Root Test indicated that all variables were stationary at level and first difference. ARDL testing confirmed a stable long-run relationship among the variables. The findings highlighted that female education significantly contributes to economic growth, with male education, female labor force participation, and education investment also showing significant positive impacts. However, the birth rate's impact on GDP was found to be insignificant.

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