Archives of Educational Studies
Vol. 4, No. 1, June, 2024, 59-77
ares.pk/ojs/index.php/ares/inde

Examining the Link between Education and Total Fertility Rate in Pakistan: An Analysis of Time Series Data

Dr. Hina Ali[1] & Dr. Syed Inaam Ullah Shah[2]

[1]Associate Professor, Department of Economics, The Women University Multan, Pakistan. E-mail: hinaali@wum.edu.pk
[2]Academic In-Charge, Superior University, Lahore, Rahim Yar Khan Campus. E-Mail: inaam.ullah@superior.edu.pk

Abstract

The study endeavors to explore the correlation between education and the total fertility rate in Pakistan, utilizing time series data spanning from 1990 to 2021. Education is identified as a notable influencer of the total fertility rate. However, previous literature lacks a conclusive relationship between education and the total fertility rate. Employing econometric and statistical techniques, the first step involves assessing data stationarity through the Augmented Dickey-Fuller test. Based on this analysis, all variables are determined to be either at I(0) or I(1), prompting the utilization of the Auto-Regressive Distributed Lag technique by the researchers. The model probes into the impact of education on the total fertility rate, considering the total fertility rate as the dependent variable. The independent variables encompass education, population by age, self-employed females, completeness of birth registration, and the proportion of females in senior management positions within firms. Primary education and the share of employed females in senior management within firms exhibit a negative and significant impact on the total fertility rate. Conversely, population by age, self-employed females, and the completeness of birth registration display a positive and significant influence on the total fertility rate. Education emerges as a pivotal factor in reducing the fertility rate, with better-educated women often securing higher-paying jobs, making the opportunity cost of childcare more significant for them.

Keywords: Total fertility rate, education, time series analysis, ARDL test, Pakistan.

*Corresponding Author

Introduction

In many developing nations, a pressing challenge is the rapid growth of the population, giving rise to a host of social and economic issues. These countries often exhibit a high fertility rate of approximately 3.0, a rate that is twice as high as that observed in industrialized nations (UNPD, 2000). Various factors contribute to this elevated fertility, with early marriage standing out as a significant element. Early marriages are prevalent due to social and economic circumstances (Kabir et al., 2001). Pakistan, as a developing nation, grapples with severe overpopulation challenges. In 2005, the annual population growth rate was recorded at 1.87%, one of the highest globally (Economic Survey, 2008-9). Consequently, this surge has resulted in issues such as unemployment, inflation, strain on infrastructure, and environmental concerns. Pakistan's total fertility rate remains notably higher than that of developed countries, although it has witnessed a decline from 7.0 per woman in 1980 to 4.3 in 2004 (WDI, 2005).

Education emerges as a pivotal factor influencing women's choices regarding family size. Educated women typically exert more control over their reproductive decisions (Nasir et al., 2022). Even when considering their husband's education, women with higher educational attainment are more inclined to use modern contraceptives (Omariba, 2005). The impact of education on fertility is most pronounced at the secondary level (Akman, 2002, Ali et al., 2021). Additionally, urbanization stands as another influential factor capable of altering women's fertility patterns. Urban living presents compelling incentives that can lead to shifts in fertility behavior (White et al., 2002). The utilization of contraceptives serves as a strategic tool to manage rapid population growth. Its adoption is contingent on the education levels of both partners, contraceptive accessibility, and awareness regarding their proper usage. Other factors, such as a woman's age, the number of sons, religious beliefs, and the area of residence, also influence decisions about contraceptive use (Chacko, 2001, Iqbal et al., 2021)

Objectives of the Study

In any economic system, such as that of Pakistan, paramount objectives encompass the attainment of elevated education levels and a reduction in the fertility rate. This study seeks to address the critical goals:

1. The primary aim is to thoroughly investigate the relationship between education and the total fertility rate, with a keen emphasis on Pakistan's economic landscape.
2. Another crucial objective is to discern and comprehend the short-term as well as long-term correlations linking education levels and the total fertility rate within the context of Pakistan.
3. The study endeavors to put forth tangible and actionable policy recommendations that can effectively guide strategies aimed at managing and reducing the total fertility rate in Pakistan, considering the intricate interplay of education and societal dynamics.

Literature Review

Developing nations like Pakistan strive for improved education, with a keen focus on understanding the correlation between education and the total fertility rate—a topic that has engendered considerable interest and debate. The primary objectives for every country are to attain high levels of education and concurrently maintain a low fertility rate. Researchers and studies hold divergent opinions regarding the nature of the relationship between education and the total fertility rate. Extensive research has been carried out over the years, both domestically and internationally, encompassing developed and developing nations. In this section, we present a succinct overview of both empirical and theoretical research, specifically centering on the link between education and fertility rates. Portions 2.1 and 2.2 represent the introduction and review of literature in detail.

Dreze and Murthi (2001) analyzed how the level of education reduces the level of fertility rate and improves the progress of society. For the estimation of this scenario, this study takes sampling data from 1981 to 1991 from different regions of India. Furthermore, this study showed that the fertility rate is affected by different social and economic factors. In the end, the final result of this study indicated that education played a vital

role in improving society's progress and socioeconomic factors of communities, Moreover, a good level of education reduced the level of mortality rate improved child health, and decreased the level of fertility rate.

Breierova and Duflo (2004) examined different institutions built in Indonesia during the tenure of 1973 to 1978 to bring awareness among the majority of the population about how the education of women is more important as compared to men and that decreases the level of fertility and child mortality rate very significantly. The regression result of this scenario showed that the education level of women at the time played a positive role in decreasing the level of fertility. It is shown at the end of this scenario that the level of education and the age of women is considered an influenced factor that is affected by different economic and social factors.

Maitra (2004) analyzed how social and economic factors affect fertility rates and maternal and infant mortality rates in Nepal. For the analysis of this scenario, this study takes data from the survey of the living standard of Nepal that was taken in the year of 1995 to 1996. In this scenario, the total fertility rate is considered the targeted variable, and the predictor variable is the age of the female at the time of marriage. The final result indicated that women who are mature and educated decrease the level of fertility as compared to those women whose early age marriages had positive effects on the fertility rate.

Leon (2004) examined how higher-level education reduces the level of fertility in the United States of America. The secondary data source is used for the estimation of data from the year of 1995 to 1996. The simple regression result of this study showed that in developed countries the good laws of education and the level of higher education decrease the level of fertility rate at the level of schooling going age. That brings positive results that improve the progress of Western societies. Osili and Long (2008) examined that the education of women is very important and has direct and significant effects on the reduction of the level of total fertility in the different regions of Nigeria. For the preparation of good results, this study takes data from the population health survey of Nigeria at the time of 1999. The final result that is prepared by the employment of different regression

techniques indicated that an early level of education decreases the level of fertility rate. The research revealed that educated women residing in regions with a significant implementation of UPE had a lower number of births compared to women in the control group.

Monstad, Propper, and Salvanes (2008) delved into the connection between education and fertility, employing educational reform as an instrumental variable to address selection bias. They utilized regression analysis to obtain their findings. The research concluded that increased education resulted in a delay of initial childbirth, transitioning away from teenage motherhood towards women having their first child in their twenties, or, in a smaller segment, in their late thirties to early forties. Monstad et al. (2008) additionally clarified the adverse causal correlation between declining fertility rates and levels of women's education. They utilized the Ordinary Least Squares (OLS) technique, treating the total fertility rate as the dependent variable and education as the independent variable. Their results pointed to a higher likelihood for women with extended educational pursuits to have fewer or no children.

In their study, Khattak et al. (2011) investigated the direct effect of education on the fertility rate in Pakistan. The secondary data source is taken from the years of twenty-seven data that ranges from (1981 to 2008) for the preparation of good results. Different techniques of multiple regression and cointegration are used for the final results. The predicted variable that is taken as a total fertility rate and predictor variable is age at the time of the wedding showed that late marriages bring positive and significant effects on the reduction of fertility rate in Pakistan.

Gunes (2015) examined the direct effect of education on women in the early years of schooling and the fertility rate in Turkey. For good results, preparation enrollment of females education at different levels of education and the reason for late marriages are taken as a predictor variable, and the fertility rate is taken as a targeted variable. The final result indicated that women's education at the age of school going to teenage marriages played a vital role in the reduction of the fertility rate and improved the activity and production level of agriculture. (Nosheen et al., 2021).

Mahanta's (2016) examined the relationship between education and fertility rate in the terrible areas of India which is considered the most populated region of Assam state. Primary data techniques were employed for the preparation of good results in the large terrible state of India. The response variable is fertility rate, and the education of males and females is taken as a regressor variable. So, the final results showed that a higher level of education reduced the level of fertility as compared to men's education.

Bagavos and Tragaki (2017) investigated the relationship between education, employment the total level of fertility rate in Greece. Fourteen-year data was taken from the year 2000 to 2014 for the estimation of data analysis. Different data techniques are employed to prepare the good results that bring awareness among the majority of the families that higher levels of education have positive impacts on the reduction of population. The final ending result showed that education has a positive impact on decreasing the level of fertility rate but has negative effects on the level of employment activities.

Bongaarts' (2020) analyzed the increasing trend of fertility rate in the region of Africa. The secondary data source is taken from the website of a population health survey of twenty-five African countries from the period of 1989 to 2019. The regressor variable is taken as education and family planning and the regressed variable is the total fertility rate. For the development of economies improvement of social economic factors is very important and that is possible only when the education level improved in females to decrease the level of fertility in African countries.

Tonnessen (2020) analyzed how the level of fertility in Norway decreased by employing the time series data of seventeen years from 2000 to 2017. The purpose of this study is to bring awareness of the method of decomposition and how its outcomes in upcoming times bring a positive impact to decrease the level of fertility. The targeted variable is considered fertility rate and the regressor variable is taken as an immigration effect on fertility rate. The final result showed that the stay period of immigrants has positive effects on decreasing the level of fertility rate.

Bora et al. (2021) examined how different social and economic factor affects the level of education and different programs of family planning in

Bangladesh. The purpose of this study is to slow down the level of fertility in different regions of Bangladesh the rate rises from 5.5 to 22.1 from 1985 to 2017. The result of this study showed that a negative relationship is found between fertility and the enrollment of education. Moreover, the level of female education has a positive impact on decreasing the level of fertility.

DeCicca and Krashinsky (2023) examined that the impact of higher education is positive and significant in decreasing the level of total fertility rate from the period 1960 to 2010. The main variable is taken as the fertility rate and the regressor variable is education considered. So, education is an important factor in decreasing the level of overall fertility as compared to other factors. (Nosheen et al., 2021).

Data Collection and Methodology

Model Specification

$TFRt = \beta 0 + \beta 1\ (PE)t + \beta 2\ (PBA)t + \beta 3\ (SE.\ F)\ t + \beta 4\ (LCOBR)t + \mu t$ ..... (4.1) Where,

TFR= Fertility rate total

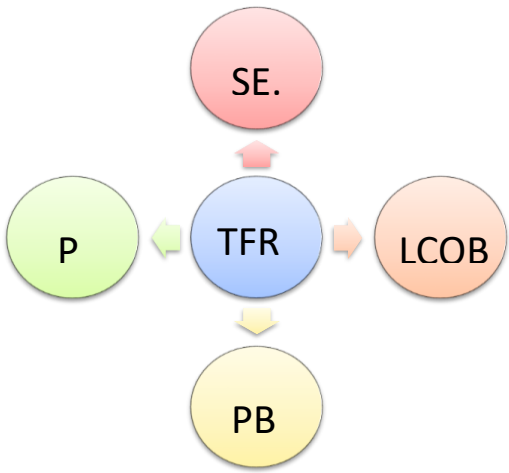
PE= primary education level of female

PBA= population by age

SEF =Self-employed female

LCOBR = Log completeness of birth Registration

Figure 1: *Model specification*



Source: Drawn by using MS Word

Data Collection

To check the positive impact of education on the level of total fertility rate in Pakistan, the data collected from the website of the World Development Indicator (WDI) of different variables: fertility rate total (TFR), primary education level of female (PE), population by age wise (PBA), self-employed level of females (SEF), and the logarithm of birth registration completeness (LCOBR). The time series data is used from the period of 1990 to 2021, that is reported in 2023 by the World Bank.

Statistical Examination

This portion describes the statistical analysis and correlation of various variables mentioned above. various techniques employed for the estimation of data that include descriptive statistics, correlation and regression analysis, and more advanced methods to understand the different factors that influence the level of education on the total fertility rate in Pakistan.

Descriptive Statistics

This portion summarizes descriptive statistics that are mentioned in our dataset. It explains the primary features of the dataset comprehensively to understand the concept of the paper. The main feature of this study is to know in detail the concept of central tendencies and variations in the dataset and the distribution of the sample. Another important property of this portion is to explain the quantitative features of the dataset that is collected from the years 1990 to 2021. Table five point one presents the mean, median, standard deviation, skewness, and kurtosis of all variables that are used in our dataset.

Table 1

Descriptive Statistics of Variables

	TFR	P.E	PBA	SE. F	LCOBR	FSOE
Mean	8.60	45.38	4.55	65.94	18.31	7.91
Median	10.33	46.83	4.36	65.91	18.32	7.70
Maximum	17.07	54.71	6.16	69.42	18.73	8.87
Minimum	-5.44	32.63	3.34	62.66	17.86	7.29

Std. Dev.	6.51	6.92	0.91	1.99	0.27	0.55
Skewness	-0.39	-0.75	0.36	0.06	-0.09	0.43
Kurtosis	1.80	2.40	1.74	1.88	1.73	1.60
Jarque-Bera	2.75	3.51	2.81	1.67	2.17	3.62
Probability	0.25	0.17	0.24	0.43	0.33	0.16
Sum	275.50	1452.36	145.79	2110.31	586.08	253.42
Sum Sq. Dev.	1316.34	1487.44	26.11	123.31	2.32	9.38

Note: All the calculations are carried out by E-views

The mean values of the specified percentages for the respective variables are as Percentage of Total Fertility Rate (TFR): 8.60%, Percentage of Primary Education (PE): 45.38%, Percentage of Population by Age (PBA): 4.55%, Percentage of Self-Employed Female (SE. F): 65.94%, Percentage of Log of Completeness of Birth Registration (LCOBR): 18.31%, Percentage of Firms' Share of Employed in Senior Management: 7.91%. Variance is a measure used to estimate the spread of data points around the mean values, and the square root of the variance is referred to as the standard deviation. Skewness and kurtosis are additional statistical measures used to describe the shape and distribution of the data. Regarding skewness Total Fertility Rate, Primary Education, and Log of Completeness of Birth Registration are negatively skewed. The percentage of Self-Employed Females, Percentage of Population by Age, and Percentage of Firms' Share of Employed in Senior Management are positively skewed. Regarding kurtosis, all the variables in this research exhibit a platykurtic distribution, as their kurtosis values are less than 3. A kurtosis value less than 3 indicates a flatter distribution compared to a normal distribution.

The mean values for the specified percentage variables are as Percentage of Total Fertility Rate (TFR): 8.60%, Percentage of Primary Education (PE): 45.38%, Percentage of Population by Age (PBA): 4.55%, Percentage of Self-Employed Female (SE. F): 65.94%, Percentage of Log of Completeness of Birth Registration (LCOBR): 18.31%, Percentage of Firms' Share of Employed in Senior Management: 7.91%. Variance is a measure that estimates the dispersion of data points around the mean values, and the square root of the variance is the standard deviation. Additionally, skewness and kurtosis are statistical measures used to

characterize the shape and distribution of the data. Regarding skewness Total Fertility Rate, Primary Education, and Log of Completeness of Birth Registration are negatively skewed. The percentage of Self-Employed Females, Percentage of Population by Age, and Percentage of Firms' Share of Employed in Senior Management are positively skewed.

Regarding kurtosis, all variables in this research display a platykurtic distribution, as their kurtosis values are less than 3. A kurtosis value less than 3 indicates a flatter distribution compared to a normal distribution. The correlation matrix reveals the relationship between pairs of variables. When conducting research, the primary objective of using correlation is to identify connections between variables. This relationship is quantified by a correlation coefficient, which serves as a numerical indicator of both the strength and direction of the association. The value of the correlation coefficient lies within the range of -1 to +1.

The mean values for different percentages are shown that the level of total fertility rate (TFR), The primary Education level of females (PE), Population by age (PBA), Self-Employed Female (SE. F), and Log Completeness of Birth Registration (LCOBR) are 8.60%, 45.38%, 4.55%, 65.94%, and 18.31%. respectively.

A variance is a measure that is used to estimate the data spread around the mean values. The standard deviation that gives insights into the data is spread around the mean values are considered the variance of the square root. The shape of probability is described by skewness and kurtosis. The zero value of skewness shows that the distribution is symmetric. The total level of fertility rate, primary education of females, and the log of completeness of birth registration indicate the shape of skewness negative, while the shape of other variables shows positive skewness. For kurtosis, the leptokurtic distribution that values equal or greater than three shows a heavy sharper peak and a tail. Conversely, a kurtosis value less than 3 indicates a platykurtic distribution, which is flatter and has lighter tails. In this research, all variables exhibit a platykurtic distribution.

Correlation Matrix

The correlation matrix uncovers the connections between pairs of variables, a key aspect of research. The main purpose of employing correlation in research is to pinpoint relationships between these variables.

The extent and direction of this relationship are represented by a correlation coefficient, a numerical indicator ranging from -1 to +1, providing insight into both the strength and direction of the association.

Table 2

Correlation Matrix of Variables

STAT	TFR	P.E	PBA	SE. F	LCOBR	FSOE
TFR	1.00					
P.E	0.03	1.00				
PBA	0.44	-0.71	1.00			
SE. F	0.37	-0.71	0.98	1.00		
LCOBR	-0.41	0.69	-0.99	-0.99	1.00	
FSOE	-0.45	0.42	-0.86	-0.90	0.90	1.00

Note: All the calculations are carried out by E-views

The statistical information reveals a perfect correlation for each variable with itself. Put simply, the correlation coefficient for each variable and itself is 1. This indicates a complete linear relationship between a variable and its values, which is expected since a variable will always have a perfect correlation with itself.

Unit Root Test

To check if the identified variables exhibit stationarity, a unit root test was utilized. When a regression lacks validity, the coefficients do not hold the Best Linear Unbiased Estimators (BLUE) properties. To address this concern, economists Dickey and Fuller introduced the Augmented Dickey-Fuller test (ADF test) in 1979. Their method assumes that the error term demonstrates independence and equal variance. This test is crucial for determining the order of differencing and selecting the appropriate analytical approach. Initially, all data is examined at its original level, denoted as I(0), suggesting stationarity. If the data isn't stationary at this level, it is then examined after its first difference, denoted as I(1). The Augmented Dickey-Fuller test encompasses two regression types: one with an intercept but no trend, and the other with both an intercept and a trend. When dealing with time series data, researchers employ the Augmented Dickey-Fuller unit root test to evaluate data stationarity.

Table 3

Unit Root Test

Variable	At level Intercept	Trend and Intercept	At 1st Difference Intercept	Trend and Intercept	Conclusion
TFR	-2.40 (0.14)	-2.89 (0.17)	-7.85 (0.00)	-7.73 (0.00)	I (1)
P.E	-1.63 (0.45)	-1.82 (0.66)	-5.13 (0.00)	-5.07 (0.00)	I (1)
PBA	-2.91 (0.05)	-5.12 (0.00)	-0.60 (0.85)	-2.81 (0.20)	I (0)
SE. F	-3.00 (0.04)	-3.02 (0.14)	-2.00 (0.28)	-2.35 (0.39)	I (0)
LCOBR	-5.00 (0.00)	0.23 (0.99)	0.42 (0.98)	-2.17 (0.48)	I (0)

Note: All the calculations are carried out by E-views

This table illustrates that population by age (PBA), self-employed female (SE. F), and the log of completeness of birth registration (LCOBR) demonstrate stationarity at the level, implying they possess stationarity in their original state. Conversely, at the first difference total fertility rate (TFR) and primary level of female education (P.E) are stationary.

ARDL Test

A statistical method based on ordinary least squares (OLS), the Auto-Regressive Distributed Lag (ARDL) model is well-known for its adaptability in managing time series with different degrees of integration as well as non-stationary time series. This model determines an appropriate number of lags to capture the data generating process within a general-to-specific modeling framework. Table 5.4 presents the short-term results of the variables, playing a pivotal role in the comprehensive analysis. It assists in understanding how variables react to disturbances and irregular changes in the time series of the considered variables. An error correction term in the short run, this estimation ensures that the long-term relationship between the variables is preserved and reduces errors.

Table 4

ARDL Test (Short Run)

Cointegrating Form				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
D (TFR (-1))	0.32	0.18	1.72	0.10
D (P.E)	-0.45	0.37	-1.22	0.24
D (P.E(-1))	0.56	0.38	1.45	0.16
D(PBA)	689.80	237.07	2.90	0.01
D (SE. F)	422.80	161.28	2.62	0.02
D (SE. F (-1))	-437.83	213.06	-2.05	0.05
D(LCOBR)	4518.33	2087.69	2.16	0.04
D (LCOBR (-1))	-4462.41	1646.30	-2.71	0.01
D(FSOE)	-221.15	81.99	-2.69	0.01
D (FSOE (-1))	522.07	150.36	3.47	0.00
CointEq (-1)	-1.29	0.26	-4.93	0.00
Cointeq = TFR - (-1.45*P. E + 534.09*PBA +				
225.10*SE. F + 3854.72*LCOBR -270.71*FSOE -85624.00)				

Note: All the calculations are carried out by E-views

Primary schooling shows a negative and insignificant relationship while the total level of fertility rate shows a positive but statistically insignificant association in the short term. Conversely, population by age, self-employed female, and the log of completeness of birth registration display positive and statistically significant relationships. Moreover, the firms' share of employed females in senior management reveals a negative and statistically significant relationship in the short run.

ARDL Test (Long Run)

Table 5.5 presents the long-term results of the variables, playing a crucial role in the comprehensive analysis.

Table 5

ARDL (Long Run)

Long Run Coefficients				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
P.E	-1.45	0.55	-2.60	0.02
PBA	534.09	179.19	2.98	0.00

SE. F	225.10	110.89	2.02	0.06
LCOBR	3854.72	1547.38	2.49	0.02
FSOE	-270.71	90.27	-2.99	0.00
C	-85624.00	35712.55	-2.39	0.03

Note: *All the calculations are carried out by E-views*

The table above presents the long-term outcomes of the variables used in our specified model. Specifically, both primary education (P.E) and the share of employed females in senior management (FSOE) exhibit a negative and significant impact on the total fertility rate (TFR). On the other hand, population by age (PBA), self-employed females (SE. F), and the log of completeness of birth registration (LCOBR) display a positive and significant impact on the total fertility rate. In the context of this table, the negative coefficient for primary education implies that a 1% increase in primary education is associated with a 1.45% decrease in the total fertility rate. Women's level of education can influence fertility through factors such as women's health, physical capacity to give birth, children's health, desired number of children, and ability to control and knowledge of birth control methods. Educated women may be physically capable of giving birth, but they tend to desire fewer children and have better birth control practices (Monstad et al., 2008). Regarding the coefficient for population by age, its positive value suggests that a 1% change in the population by age corresponds to a substantial 534.09% change in the total fertility rate. When the total fertility rate exceeds 2.1, the population in a given area is projected to increase. Conversely, when the total fertility rate falls below 2.1, the population in that area is anticipated to decrease over time, considering factors like age structure, emigration, or immigration (Khattak et al., 2014).

The coefficient for female self-employment is positive showing that a one percent variation in this variable translates into a significant 225.10 percent variation in the total fertility rate. So, different social, economic, and cultural factors affect fertility and women's status in the long run. A positive correlation was found between women's status and their fertility rate (McManus, 2001). Furthermore, the positive coefficient of the log of completeness of birth registration shows that a one percent change in this variable brings a significant 3854.7% change in the total level of fertility rate. The balance between birth rates and death rates is affected by

population dynamics. The concept of population growth rate is coupled with decreasing death rates or increasing birth rates (Spoorenberg, 2015). The negative coefficient of female shares employed in senior management shows that a 1% change in this variable brings a 270.71% change in the total level of fertility rate. Generally, there is a negative relationship between income and the total level of fertility rate, within the nations. So, in developed countries, higher levels of education and GDP per capita are linked with lower birth rates. (Bagavos and Tragaki, 2017).

In summary, the long-term analysis showed that different factors influence the total fertility rate (TFR). Primary education, self-employed females, the log of completeness of birth registration, and the share of females employed in senior management all play important roles in decreasing fertility rates (Monstad et al., 2008; McManus, 2001; Spoorenberg, 2015; Bagavos and Tragaki, 2017). The positive coefficient shows a 1% change in the population by age similar to a 534.09% change in the total fertility rate. So, when the total fertility rate exceeds 2.1, that shows a population increase in that area and if it decreases the range lies below 2.1. such as age and emigration. These findings show that various factors social and economic factors influence women's status and total fertility rates (Khattak et al., 2014).

ARDL Bound Test

After ARDL the next following step used the Bound test to evaluate the long-term relationship between the factors, especially those with previous periods. The Bound test is connected to factors that are related to the previous period. The basic properties of the Bound test are as follows:

i) All factors within the show are considered to be endogenous.

ii) The Bound test is applied when the factors illustrate stationarity at both I (0) and I (1) levels.

iii) The test measuring the relationship of short and long-term coefficients of the variables, in different periods.

It produces two basic values:

an upper bound and a lower bound. The long-term relationship exists between variables if the calculated value of the bound is greater than critical values. Alternately, the long run relationship does not exist if the

calculated value of bounds is less than critical values. In summary, it is considered an important be an important instrument for estimating the long-term relationship within the model.

Table 6

Bound Test

ARDL Bounds Test		
Included observations: 30		
Null Hypothesis: No long-run relationships exist		
Test Statistic	Value	K
F-statistic	5.32	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

Note: All the calculations are carried out by E-views

The results mentioned in the table above show that the calculated value of f-statistics is greater than the critical value of bounds. So, there are no long-term relationships found between the variables.

Conclusion

This chapter gives an overview of the study and covers the aspects of where the information comes from, how the scenario was conducted and estimated. The study investigates the strong relationship found between education and fertility rates in Pakistan. And for the estimation of data, this study applied Augmented Dickey Fuller to get good and stable results. Generally, the role of social and economic factors is very important to bring prosperity in all parts of society. Moreover, women's status and education level are very important to decrease the level of fertility rate. The women who are employed in the senior sector are negatively correlated with the level of fertility rate. So, the women with a primary level of education showed a positive relationship with the total fertility rate. In

developing countries like Pakistan, the lower level of education showed a positive relationship with the total level of fertility rate. The reason behind this issue is that lack of knowledge and different social and economic factors are responsible for this issue. The education of women is a crucial factor in decreasing the level of fertility rate as compared to men's education. Early age marriages and lower levels of education influence positively and increase the fertility rate as compared to those women whose level of education is more influenced negatively by total fertility rates.

Policy Implications

The Pakistani government should take the following steps to decrease the total level of fertility rates effectively:

• Formulate and implement population policies for population planning in line with the nation's social and financial goals.

• To bring awareness among the majority of the population with different programs that reduce the population pressure in society and effective methods for birth control.

• Work in collaboration with Islamic scholars that encourage women's education level and give freedom in all sectors of development in that way the ratio of fertility rate decreases.

• Contribute to instruction, especially for ladies, to progress education rates and engage people to form educated choices for family measure and well-being

• The government should implement laws that bring awareness in teenage women that more preference toward a higher level of education, not early age marriages. In those ways, the level of fertility rates will decrease in upcoming times.

• Make financial and social prospects for youth, empowering their dynamic towards higher education and training bringing prosperity at national and improve social and economic factors of economies.

If these measures are taken in developing countries like Pakistan with the collaboration of non-government and developed countries that brings prosperity and development in all sectors of economies for the development of social and economic factors.

References

Ali, H., Ali, M. Z., Nasir, N., & Ali, H. (2021). An Assessment of Sustainable Economic Growth: The Role of Poverty and Education Revisited. *Review of Applied Management and Social Sciences*, *4*(1), 215-222.

Bagavos, C., & Tragiki, A. (2017). The compositional effects of education and employment on Greek male and female fertility rates during 2000–2014. *Demographic Research*, *36*, 1435-1452.

Bongaarts, J. (2020). Trends in fertility and fertility preferences in sub-Saharan Africa: the roles of education and family planning programs. *Genus*, *76*(1), 32.

Breierova, L., & Duflo, E. (2004). The impact of education on fertility and child mortality: Do fathers really matter less than mothers?.

Cleland, J., & Wilson, C. (1987). Demand theories of the fertility transition: An iconoclastic view. *Population studies*, *41*(1), 5-30.

DeCicca, P., & Krashinsky, H. (2023). The effect of education on overall fertility. *Journal of Population Economics*, *36*(1), 471-503.

Drèze, J., & Murthi, M. (2001). Fertility, education, and development: evidence from India. *Population and development Review*, *27*(1), 33-63.

Güneş, P. M. (2015). The role of maternal education in child health: Evidence from a compulsory schooling law. *Economics of Education Review*, *47*, 1-16.

Iqbal, S., Ali, H., Yasmin, F., & Bint e Ajaz, M. (2021). Role of Educational attainment in Married Women's Entry into and Escape from Labor Force in Pakistan. *Review of Education, Administration & LAW*, *4*(2), 381-392.

Khattak, N. R., Khan, J., Tariq, M., Naeem, M., Tasleem, S., & Tahir, M. (2011). The impact of education on total fertility rate in Pakistan (1981-2008). *European Journal of Social Sciences*, *19*(1), 46-53.

Leon, A. (2004). The effect of education on fertility: evidence from compulsory schooling laws. *unpublished paper, University of Pittsburgh*.

Mahanta, A. (2016). Impact of education on fertility: evidence from a tribal society in Assam, India. *International Journal of Population Research*, *2016*.

Maitra, P. (2004). Effect of socioeconomic characteristics on age at marriage and total fertility in Nepal. *Journal of health, Population and Nutrition*, 84-96.

McMahon, W. W. (1998). Conceptual framework for the analysis of the social benefits of lifelong learnings. *Education economics*, *6*(3), 309-346.

Monstad, K., Propper, C., & Salvanes, K. G. (2008). Education and fertility: Evidence from a natural experiment. *The Scandinavian Journal of Economics*, *110*(4), 827-852.

Nasir, N., Aisha, Z., Ali, H., & Farooq, F. (2022). Nexus between Education, Industrialization, Unemployment, and Poverty: A Way Forward to Promote Sustainable Economic Growth in Pakistan: *Competitive Educational Research Journal, 3(1),* 62-74

Nosheen, F., Akbar, S., Nasir, N., & Ali, H. (2021). Measuring the Contribution of Education: New Evidence from Economic Growth Empirics of Pakistan. *Elementary Education Online*, *20*(2), 1417-1417.

Nosheen, F., Ali, H., Naveed, H. A. T., & Qasim, T. B. (2021). Is education the only way to attain women's empowerment goals? An empirical view. *PalArch's Journal of Archaeology of Egypt/Egyptology*, *18*(5), 438-445.

Oppenheim Mason, K. (1987, September). The impact of women's social position on fertility in developing countries. In *Sociological forum* (Vol. 2, No. 4, pp. 718-745). Dordrecht: Kluwer Academic Publishers.

Osili, U. O., & Long, B. T. (2008). Does female schooling reduce fertility? Evidence from Nigeria. *Journal of development Economics*, *87*(1), 57-75.

Tønnessen, M. (2020). Declined total fertility rate among immigrants and the role of newly arrived women in Norway. *European Journal of Population*, *36*(3), 547-573.