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# Some Socio-Economic Determinants of Fertility in Pakistan: An Empirical Analysis


## Abstract

This study is aimed at empirical investigation of the role that various socio-economic factors like female education, urbanization and female labour force participation play in determining fertility of women in Pakistan. ARDL bound testing approach to co-integration is used to analyze the long run relationship of the variables by using the data for the period of 1980 to 2009. Empirical results show that there exists a long run as well as short run relationship between fertility and urbanization, female labour force participation and female education in Pakistan. The analysis indicates that there is negative relationship between all three determinants with fertility. Female education and urbanization of the society play significant role in reducing fertility but the role of female participation in labour force seems to be in insignificant in fertility reduction in Pakistan.



**Keywords:** Fertility, female education, population, female labour force participation, urbanization.


## 1. Introduction

The empirical work on fertility determinants widely discusses the role of female education, female labour force participation and urbanization in determining fertility rates. Economic theories and models of fertility consider prices of goods and services and family income as major factors affecting fertility decisions of households. Bearing a child and taking care of infant's needs are considered to consume women's time intensively. Increase in income earning opportunities for female enhances the value of women's time. Similarly, increase in women's education is also considered to enhance the value of women's time in market and so the opportunity cost for having children increases as women's have to forgo their income for bearing and caring of children. Thus increase in female education or availability of employment opportunities for women causes the loss of women's life time expected income, makes the child bearing costly and thus causes decline in fertility (Ellis, 1988).

The issue of gender discrimination in employment opportunities got a lot of attention of researchers since 1980s and the recent research on the issue focuses on the degree of success that different societies have achieved to shrink the gender gap in labour force participation. Since ealy1990s female labour force participation shows increasing trend in most of the countries but in developing countries, however, the growth of female participation in labor force remained slow.

Theoretically, urbanization is considered to have negative relationship with fertility. In urban society cost of raising children is usually more than that in rural areas. Urban housing is more expensive, and children probably contribute less in household production as compared with children in rural areas. Differences in ideology, believes and attitudes about the size of family also exist in the residents of urban and rural areas. Furthermore, urban residents may have better access to modern birth control and health facilities. This facilitates the urban women to fulfill the desire of having fewer children. Better health facilities in urban areas may also be associated with decline in mortality rates and as a result low fertility rate is desired to replace the population. Thus, increasing degree of urbanization is considered to increase the price for bearing and caring children.

Some societies favor high fertility and consider children as a sign of social and economic well-being. But the other societies prefer low fertility rates and consider children as an economic liability. An overview of fertility trends all over the world indicates that fertility rates are different from country to country and these fertility differences have demographic, socio-economic, and cultural determinants.

Pakistan is selected for empirical analysis because the country's high fertility rate began to decline gradually after the late 1980s and has continued to fall since then. According to World Bank (2010a) Pakistan achieved 40 percent decline in fertility between 1980 and 2006 although progress in this way remained uneven and signs of slowdown in fertility reduction have been observed in recent years. Fertility reduction in Pakistan may not be considered as success story but the partial success and shortcoming in implementation of fertility reduction programs leave lessons as well as challenges for population planners in Pakistan. The purpose of this study is to

empirically investigate the role that various socio-economic factors like female education, urbanization and female labour force participation have played in determining fertility in Pakistan.

## 2. Literature Review

With the passage of time the literature on female development and their participation in economic activities is increasing tremendously. Now female related every field is covered in literature such like importance of female education, participation in the labor market and social improvement. Neoclassical economists suggest that more human capital formation increase female participation in labor market and change the fertility rates and in this way few children are liked by female (Singh, 1994). If we see the empirical evidences from developed as well as developing countries that show female education is strongly associated with low fertility rates (Schultz, 1973, 2008; Ainsworth et al., 1996; Vavrus and Larsen, 2003; Sackey, 2005). With increasing schooling of female increase the share of female in labor market and in this increase the economic value of female time in the society. Higher he female education lowers the number of children per female is seen by empirically (Schultz, 1973, 2008; Singh, 1994). Schultz (1973) approves that female education is linked with smaller desired family sizes across the world.

According to (UN, 1985) there is negative relationship between female participation in labor market and fertility of female on sociological and economic point of view. If we see the sociological aspect of female participation in labor market it is reducing the traditional role of female as mother and homemakers. So there is negative relationship between female employment and fertility of female. On the other hand if economic value of female force them to look better and healthy than their older so in this way female like to born fewer children. If few see the economic and social life for female it is difficult for female to combine with child and employment, so there exists negative relationship between fertility and work of female.

According to Ellis (1988) nurturing of infants required much time and energy of female, so female economic and social activities are disturb by the more children. But in case of more education, urbanization and modernization the opportunity cost of female stay in home and taking care of children is high. Because activities related to children take much of time of female instead of earning income. So urbanization and female education affects the fertility rate of female.

Bettio and Villa (1998) investigated the negative relationship between fertility and unemployment in Italy. According to them if the female participation in labor markets it will generate income for household in negative shocks of the partner employment. Moreover for remaining in the labor market female leave the childbearing years, so in this way fertility rates decline.

Mammen and Paxson (2000) expanded the work of Goldin (1995) and found the relationship of female per capita income and female participation rates of employment are U-shaped. They found in the poor and agriculture economies female participation in employment is high because in these economies combined family and employment can easily handle. But in low urbanized and middle income countries where manufactured sector is dominated, combined family and employment duties cannot be handling by female. In this way fertility rates are high in middle income countries but in those countries where urbanization is high there female participation in labor market is high. So urbanization affects the fertility rates and female participation in labor market.

Kravdal (2002) concluded that there is strongly negative relationship existed between community education and fertility rates. The results of the his study confirms the neoclassical theory which emphasis investment in human capital formation increase the women participation in the labor market and in the long run it change the fertility behavior of household in this way fewer children were liked by females.

## 3. Methodological Framework and Data Sources

Keeping in view the work of Bloom et al. (2007) this study propose the regression model given in equation (1) to estimate the effects of different socio-economic variables, like female education, urbanization of the population and female labour force participation, on fertility in Pakistan.

$$\mathrm{FRTR}_t = +\beta_0 + \beta_1 \mathrm{LABPF}_t + \beta_2 \mathrm{FEDU}_t + \beta_3 \mathrm{URB}_t + \mu_t \qquad (1)$$

Where, FRTR, LABPF, FEDU, URB represent the fertility rate, labour force participation of female, female education measured by secondary school education of female and degree of urbanization respectively. The subscript ‘t’ represents the value of variable in t time period and μ represents the residual of the regression. In this study t ranges from 1 to 30 as the study uses the annual data ranging from 1980 to 2009.

### 3.1 Data Sources

This study uses the variables of total fertility rate, female education, female labour force participation and urbanization for empirical analysis. The time series data used in the study covers the period from 1980 to 2009. The variable of female education is proxied by secondary school enrollment of female and data for urbanization is used is urban population as a percentage of total population. Labor force participation rate of female is taken as the female labour force as a percentage of female population above 15 years of age. Data for all four variables is taken from World Development Indicators (WDI) online database by World Bank (2010).

### 3.2. Econometric Methodology

Most of the time series and economic data faces the problem of non-stationarity due to the presence of time trend in it. In such situation regression results may be misleading and unauthentic (Granger and Newbold, 1974). According to Philips (1986), in the absence of co-integrating relationship among the variables, regression results obtained from Ordinary Least Square (OLS) method may be spurious. Thus the regression results obtained through Ordinary Least Square (OLS) method are reliable only if the variables are stationary and co-integrated. Hence verifying stationarity and co-integration is necessary at the first step.

#### 3.2.1. Augmented Dickey-Fuller Test

Augmented Dickey-Fuller test proposed by Dickey and Fuller (1979, 1981) has been used by this study to check the stationarity of the variables. The following regressions are used for the application of this test.

$$\Delta X_t = \alpha + \delta X_{t-1} + \sum_{j=1}^{q} \gamma_j \Delta X_{t-j} + \in_{1t} \tag{4.4}$$

$$\Delta X_t = \alpha + \beta t_1 + \delta X_{t-1} + \sum_{j=1}^{q} \gamma_j \Delta X_{t-j} + \in_{1t} \tag{4.5}$$

$$\Delta\Delta X_t = \alpha + \delta \Delta X_{t-1} + \sum_{j=1}^{q} \gamma_j \Delta\Delta X_{t-j} + \in_{2t} \tag{4.6}$$

$$\Delta\Delta X_t = \alpha + \beta t_1 + \delta \Delta X_{t-1} + \sum_{j=1}^{q} \gamma_j \Delta\Delta X_{t-j} + \in_{2t} \tag{4.7}$$

where

$$\Delta X_t = X_t - X_{t-1}$$

$q =$ number of lags in the dependent variable.

In order to check the stationarity following hypotheses are tested;

$H_0 : \delta = 0$ ($X_t$ is Non-Stationary)

$H_a : \delta < 0$ ($X_t$ is Stationary)

### 3.2.2. ARDL Bound Testing Approach to Cointegration

After finding the stationarity level of variables, bounds testing approach to co-integration based on Auto Regressive Distributed Lag (ARDL) model recommended by Pesaran et al. (2001) is utilized for finding co-integrating relationship of the variables female fertility rates (LFRTR), labor force participation of female (LABPF), secondary school education of female (LSSEF) and urbanization of society (LURB). This method of co-integration is usually applied when there is mixed order of integration as some of them are I(0) and others are I(1). The other advantages of this approach include its ability to check for short run dynamics without loss of long run information as this approach is based on the following Unrestricted Vector Error Correction Mechanism (UECM).

$$\Delta y_t = \lambda_0 + \lambda_1 t + \lambda_2 x_{t-1} + \lambda_3 y_{t-1} + \lambda_4 z_{t-1} + \sum_{i=0}^{p} \gamma_i \Delta x_{t-1} + \sum_{j=1}^{p} \alpha_i \Delta y_{t-j} + \sum_{s=0}^{p} w_s \Delta z_{t-s} + \varepsilon_t$$

Where $\lambda_0$ represents the intercept and $\varepsilon_t$ embodies a white noise series of residuals. The optimum lag length is selected for each variable included in ARDL model through parsimonious method by using either Schwarz information criteria (SIC), Akaike Information Criteria (AIC) or any other criterion used for optimal lag selection. Wald based F-statistics is used for testing the null hypothesis $H_\circ : \lambda_2 = \lambda_3 = \lambda_4 = 0$ stating that there is no co-integration among the variables

included in ARDL model against the alternative hypothesis $H_1 : \lambda_2 \neq \lambda_3 \neq \lambda_4 \neq 0$ stating that co-integration exists among them. Pesaran et al. (2001) developed two critical bounds to check the presence of co-integration. When the included variables are *I(0)* the lower critical bound is treated a decisive bound if all the included variables are I(1) or have mixed order, then upper critical bound is considered as decisive bound. If the included variables are co-integrated, then the long run as well as short run coefficients of variables are considered consistent and reliable.

## 4. Estimation Results

ADF unit root test is applied for checking the stationarity of time series data in logarithmic form. According to these results variable of labor force participation of female (LABPF) is stationary at level. But other variables like female fertility rates (LFRTR), secondary school education of female (LSSEF) and urbanization of society (LURB) are stationary at I(1). This shows that the null hypothesis of unit root for all variables is rejected when we use the first difference of the variables. Thus the variables have mixed order of integration. Some of them are I(0) (integrated of order zero) and the other are I(1) (integrated of order one).

**Table 1: Augmented Dickey-Fuller (ADF) Test for Unit Root**

| Variables | ADF Test at Level | | ADF) Test at 1st Difference | |
|---|---|---|---|---|
| | t-statistics | Prob. Values | t-statistics | Prob. Values |
| LFRTR | -1.305615 | 0.6126 | -3.517513 | 0.0168 |
| LLABPF | -3.652443 | 0.0434 | -5.163212 | 0.0003 |
| LSSEF | -0.575614 | 0.8613 | -4.293853 | 0.0023 |
| LURB | 2.125055 | 0.9998 | -3.631251 | 0.0124 |

Appropriate lag order is selected to calculate the F-statistics for co-integration. We take lag 1 using the minimum values of AIC based on vector auto regressive (VAR) approach. Table-2 shows the estimates for ARDL bound testing approach to co-integration. The calculated F-statistics is 55.5972 when female fertility rates (LFRTR), labor force participation of female

(LABPF), secondary school education of female (LSSEF) and urbanization of society (LURB) are included in the model. The critical bounds generated by Pesaran et al. (2001) have been used. The F-statistic is higher than upper critical bound of Pesaran et al. (2001) at the 5 % level of significance. This implies that co-integration exists among female fertility rates (LFRTR), labor force participation of female (LABPF), secondary school education of female (LSSEF) and urbanization of society (LURB) over the period of 1972-2008 in case of Pakistan.

**Table 2: Bound Testing Approach to Cointegration**
**ARDL (1,0,1,0)**

| **F-Statistic** = 55.5972***** | | |
|---|---|---|
| **Level of Significance** | **Pesaran et al. (2001)** | |
| | **Lower Bound Value** | **Upper Bound Value** |
| **5%** | 3.7190 | 5.0449 |
| **10%** | 3.0429 | 4.1713 |

* denote the significant at 5 percent level. Critical values boundscomputed by Pesaran et al. (2001)with unrestricted intercept and unrestricted trend.

Table-3 shows the partial effects of independent variables on LFRTR. LABPF is negatively and insignificant related to LFRTR. If we increase the female participation in labor market it will lower the fertility rates in turn. The coefficient of LSSEF indicates that LSSEF has significant but negative effect on LFRTR. In the society when the rate of female education is significantly increased it will lower the female wish for more children (Kravdal, 2002). In this way LURB negatively and significantly effects on LFRTR because more urbanization will increase the living expenses of children so fertility rates will decrease in the long run (Mammen and Paxson, 2000). So if we want to decrease the fertility rates of female we must increase the level of education of female, female labor force and urbanization in the society.

**Table 3: Long Run Relationships**

**ARDL (1,0,1,0)**

| Dependent Variable: LFRTR | | | |
|---|---|---|---|
| Regressor | Coefficient | Standard Error | T-Ratio[Prob] |
| LLABPF | -0.014573 | 0.064775 | 0.22498[.824] |
| LSSEF | -0.31513 | 0.046982 | -6.7075[.000] |
| LURB | -1.0682 | 0.29353 | -3.6393[.001] |
| C | 6.1814 | 0.80609 | 7.6684[.000] |

Table 4 shows that short run results explain the similar relationship among the variables as indicated by the results of long run. The results indicate that LABPF is negatively and insignificantly related to the level of LFRTR (Bettio n Villa, 1998). Although there is miner decrease in fertility rate with increase in female participation in labor market but it effects negatively. The short run coefficient of LSSEF indicates that LSSEF has negative and significant effect on LFRTR. An increase of 1% LSSEF decreases 0.02% of LFRTR in the country. The short run impact of LURB is negative on LFRTR in case of Pakistan and one percent increase in LURB will decrease the LFRTR level by 0.16 percent (Goldin, 1995).

**Table 4: Short Run Dynamics**

**ARDL (1,0,1,0)**

| Dependent Variable: DLFRTR | | | |
|---|---|---|---|
| Regressor | Coefficient | Standard Error | T-Ratio[Prob] |
| DLABPF | -0.0022734 | 0.010187 | -0.22317[.825] |
| DLSSEF | -0.026181 | 0.0096056 | -2.7256[.012] |
| DLURB | -0.16664 | 0.057079 | -2.9195[.008] |
| ECM(1) | -0.15600 | 0.022269 | -7.0053[.000] |

The coefficient of $ECM_{t-1}$ shows speed of adjustment from short run to long run equilibrium and it should be statistically significant with negative sign which is the case here. Bannerjee et al. (1998) note that significant lagged error term with negative sign is way to prove that established long run relationship is stable. Our estimated coefficient of $ECM_{t-1}$ is equal to -0.15600. This suggests that any short run deviation from equilibrium path or shocks to variables

included in our fertility model may take more than six years to achieve the same long run equilibrium again as the rate of convergence to long run equilibrium path of our model is 15.60 percent per year.

## 5. Conclusion and Recommendations

This study is aimed at empirically investigating the role that various socio-economic factors like female education, urbanization and female labour force participation have played in determining fertility in Pakistan. ARDL bound testing approach to co-integration is used to analyze the long run relationship of fertility, urbanization, female labour force participation and female education by using the date for the period of 1980 to 2009. Empirical results show that there exists a long run as well as short run relationship between fertility and urbanization, female labour force participation and female education in Pakistan.

The results indicate that degree of urbanization play major role in fertility reduction and it is followed by female education as an effective factor for reducing fertility rate in Pakistan. The negative signs and statistical significance of the coefficients both urbanization and female education indicate that both factors are inversely related to fertility rate. Increase in female education or urbanization causes reduction in total fertility in Pakistan and their role is of vital importance in population policy. The female participation in labour force is inversely related to total fertility but our analysis show that the role of female participation remained insignificant to reduce fertility in the country. The reasons may include lack of opportunity for participation of female in labour force, disregard of promotion of female labour intensive industries by the government and etc.

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