Muhammad Irfan Chani[1], Muhammad Shahid[2], Mahboob Ul Hassan[3]

SOME SOCIO-ECONOMIC DETERMINANTS OF FERTILITY IN PAKISTAN: AN EMPIRICAL ANALYSIS

This study aims to investigate the role that various socioeconomic factors like female education, urbanization and female labour force participation play in determining fertility of women in Pakistan. ARDL bound test approach to cointegration is used to analyze the long-run relationship of the variables by using the data for the period from 1980 to 2009. The 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 there is a negative relationship between all 3 determinants with fertility. Female education and urbanization play significant role in reducing fertility but the role of female participation in labour force seems to be insignificant for fertility reduction in Pakistan.

Keywords: *fertility; female education; population; female labour force participation; urbanization.*

Мухаммад Ірфан Чані, Мухаммад Шахід, Махбуб уль Хассан

СОЦІАЛЬНО-ЕКОНОМІЧНІ ЧИННИКИ ВПЛИВУ НА РІВЕНЬ НАРОДЖУВАНОСТІ У ПАКИСТАНІ: ЕМПІРИЧНИЙ АНАЛІЗ

У статті досліджено роль різних соціально-економічних факторів (освіта серед жінок, рівень урбанізації та участь жінок на ринку праці) при визначенні рівня народжуваності у Пакистані. Метод граничних значень використано для аналізу довготермінової залежності між змінними за даними з 1980 по 2009 рік. Результати аналізу виявили існування як довго-, так і короткотермінової залежності між народжуваністю та урбанізацією, а також між участю жінок у розподілі праці та рівнем їхньої освіти. Аналіз даних показав наявність негативного впливу усіх трьох чинників на рівень народжуваності. Жіноча освіта та ступінь урбанізації суттєво знижують рівень народжуваності у Пакистані, вплив участі жінок на ринку праці є незначним.

Ключові слова: *народжуваність; освіта серед жінок; населення; участь жінок у розподілі праці; урбанізація.*

Форм. 6. Табл. 4. Літ. 19.

Мухаммад Ирфан Чани, Мухаммад Шахид, Махбуб уль Хассан

СОЦИАЛЬНО-ЭКОНОМИЧЕСКИЕ ОПРЕДЕЛЯЮЩИЕ УРОВНЯ РОЖДАЕМОСТИ В ПАКИСТАНЕ: ЭМПИРИЧЕСКИЙ АНАЛИЗ

В статье исследуется роль различных социально-экономических факторов (образование среди женщин, уровень урбанизации и участие женщин на рынке труда) при определении уровня рождаемости в Пакистане. Метод граничных значений использован для анализа долгосрочной зависимости между переменными по данным с 1980 по 2009 год. Результаты анализа показали существование как долго-, так и краткосрочной зависимости между рождаемостью и урбанизацией, а также между участием женщин в распределении труда и уровнем их образования. Анализ данных показал наличие негативного влияния всех трех факторов на уровень рождаемости. Женское образование и степень урбанизации существенно снижают уровень рождаемости в Пакистане, влияние же фактора участия женщин на рынке труда является незначительным.

[1] Corresponding Author, Ph.D. Scholar, National College of Business Administration and Economics, Lahore, Pakistan.
[2] Health and Nutrition Supervisor, Health Department, Government of Punjab, Sheikhupura, Pakistan.
[3] Research Scholar, University of Central Punjab (UCP), Lahore, Pakistan.

Ключевые слова: *рождаемость; образование среди женщин; население; участие женщин в оплачиваемом труде; урбанизация.*

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 for goods and services and family income as major factors affecting fertility decisions of households. Bearing a child and taking care of infants 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 at a market and so the opportunity cost for having children increases as womens have to forgo their income for bearing and caring of children. Thus, increase in female education or availability of employment opportunities for women cause the loss of women's lifetime expected income, makes child bearing costly and thus causes decline in fertility (Ellis, 1988).

The issue of gender discrimination in employment opportunities got much attention of researchers since the 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 participation. Since the ealy 1990s female labour force participation shows increasing trend in most of the countries but in developing countries, however, the growth of female participation remains slow.

Theoretically, urbanization is considered to have negative relationship with fertility. In urban society cost of raising children is usually higher 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 a family also exists between residents of urban and rural areas. Furthermore, urban residents have better access to modern birth control and health facilities. This facilitates 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 population. Thus, increased 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. 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, socioeconomic, 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 is continuing to fall. According to World Bank (2010a), Pakistan achieved 40% decline in fertility between 1980 and 2006 although progress in this way remained uneven and signs of slowdown in fertility have been observed in recent years. Fertility reduction in Pakistan may not be considered as success story but 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 participation in economic activities is increasing tremendously. Now female related issues are covered in literature such like importance of female education, participation at the labor market and social improvement. Neoclassical economists suggest that more human capital formation increase female participation at labor market and change fertility rates (Singh, 1994). The empirical evidences from developed as well as developing countries 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 females increases the share of female at the labor market and thus increasing the economic value of female time in the society. Higher female education lowers the number of children per female as seen empirically (Schultz, 1973, 2008; Singh, 1994). Schultz (1973) stated that female education is linked with smaller desired family sizes across the world.

According to UN (1985) there is a negative relationship between female participation at the labor market and fertility of females. If we see the sociological aspect of female participation at labor market it is reducing the traditional role of a female as a mother and a homemaker. So, there is a negative relationship between female employment and fertility of females. On the other hand, if economic value of female force them to look better and healthier than females are likely to have fewer children. In the economic and social life of a female it is difficult to combine children and employment, so there exists a negative relationship between fertility and work.

According to Ellis (1988) nurturing of infants requires much time and energy, so female economic and social activities are disturbed by more children. But in case of more education, urbanization and modernization the opportunity cost of female stay at 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, female participation at labor markets generates income for households and negative shocks for partner employment. Moreover, for remaining at the labor market females leave 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 that in poor and agricultural 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 manufacturing sector is dominated, combined family and employment duties cannot be handling by females. In this way fertility rates are high in middle income countries but in those countries where urbanization is high there female participation at labor markets is high. So urbanization affects fertility rates and female participation at labor market.

Kravdal (2002) concluded that a strong negative relationship existed between community education and fertility rates. The results of his study confirms the neoclassical theory which emphasizes that investments in human capital formation increase women participation at the labou market and in the long run it changes the fertility behavior of households in this way fewer children are boru by females.

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

$$FRTR_t = +\beta_0 + \beta_1 LABPF_t + \beta_2 FEDU_t + \beta_3 URB_t + \mu_t, \quad (1)$$

where *FRTR, LABPF, FEDU, URB* represent the fertility rate, labour force participation of female, female education measured by secondary school education of females 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 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 enrolment of females and data urban for urbanization is used population as % to total population. Labor force participation rate of females is taken as the female labour force as % of female population above 15 years. Data for all 4 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 a situation regression results may be misleading and unauthentic (Granger and Newbold, 1974). According to Philips (1986), in the absence of cointegrating relationship among the variables, the regression results obtained from ordinary least square (OLS) method may be spurious. Thus, the regression results obtained via ordinary least square method are reliable if only the variables are stationary and cointegrated. Hence, verifying stationarity and cointegration is necessary at the first step.

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

$$\Delta X_t = \alpha + \delta X_{t-1} + \sum_{j=1}^{q} \gamma_j \Delta X_{t-j} + \in_{1t}, \quad (2)$$

$$\Delta X_t = \alpha + \beta t_1 + \delta X_{t-1} \sum_{j=1}^{q} \gamma_j \Delta X_{t-j} + \in_{1t}, \quad (3)$$

$$\Delta\Delta X_t = \alpha + \delta \Delta X_{t-1} + \sum_{j=1}^{q} \gamma_j \Delta\Delta X_{t-j} + \in_{2t}, \quad (4)$$

$$\Delta\Delta X_t = \alpha + \beta t_1 + \delta \Delta X_{t-1} \sum_{j=1}^{q} \gamma_j \Delta\Delta X_{t-j} + \in_{2t}, \quad (5)$$

where

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

q = number of lags in the dependent variable.

In order to check the stationarity the 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 the variables, bounds testing approach to cointegration based on auto regressive distributed lag (ARDL) model by Pesaran et al. (2001) is utilized for finding the cointegrating relationship of the variables: female fertility rates (LFRTR), labor force participation of females (LABPF), secondary school education of females (LSSEF) and urbanization of the society (LURB). This method of cointegration is usually applied when there is mixed order of integration as some of them are I(0) and others are I(1). 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):

$$\Delta y_t = \lambda_0 + \lambda_1 t + \lambda_2 x_{t-1} + \lambda_3 y_{t-1} + \lambda_4 z_{t-1} + \sum_{i=0}^{p} \gamma_i \Delta x_{t-1} + \sum_{j=1}^{p} \alpha_i \Delta y_{t-1} + \sum_{s=0}^{p} w_s \Delta z_{t-s} + \varepsilon_t, \quad (6)$$

where λ_o represents the intercept and ε_t embodies the white noise series of residuals. The optimum lag length is selected for each variable included in the 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_0: $\lambda_2 = \lambda_3 = \lambda_4 = 0$ stating there is no cointegration among the variables included in the ARDL model against the alternative hypothesis H_1: $\lambda_2 \neq \lambda_3 \neq \lambda_4 \neq 0$ stating that cointegration exists among them. Pesaran et al. (2001) developed two critical bounds to check the presence of cointegration. 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 cointegrated, 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 a 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 females (LSSEF) and urbanization of society (LURB) are stationary at I(1). This shows that the null hypothesis of unit root for all the 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. **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 cointegration. 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 of cointegration. The

calculated F-statistics is 55.5972 where female fertility rates (LFRTR), labor force participation of females (LABPF), secondary school education of female (LSSEF) and urbanization of society (LURB) are included in to the model. The critical bounds generated by Pesaran et al. (2001) have been used. The F-statistics is higher than upper critical bound of Pesaran et al. (2001) at the 5 % level of significance. This implies that cointegration exists among female fertility rates (LFRTR), labor force participation of females (LABPF), secondary school education of females (LSSEF) and urbanization of society (LURB) over the period of 1972-2008 in Pakistan.

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

F-Statistics = 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 significance at the 5% 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 insignificantly related to LFRTR. If we increase the female participation at labour 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 increasing it will lower the female wish for more children (Kravdal, 2002). In this way LURB negatively and significantly effects LFRTR because more urbanization will increase the living expenses of children so fertility rates will decrease in the long run (Mammen and Paxson, 2000). If we want to decrease the fertility rates of females we must increase the level of their education, female labour 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 the short run results explain the similar relationship among the variables as indicated by the results of the long run. The results indicate that LABPF is negatively and insignificantly related to the LFRTR level (Bettio and Villa, 1998). Although there is minor decrease in fertility rate with increase in female participation at labour 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% is LSSEF decreases 0.02% of LFRTR in the country. The short run impact of LURB is negative on LFRTR in case of Pakistan and 1% increase in LURB will decrease the LFRTR level by 0.16% (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 adjustment speed 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) noted that significant lagged error term with negative sign is a way to prove that the 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 6 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% per year.

5. Conclusions and Recommendations. This study aims to investigate empirically the role that various socioeconomic factors like female education, urbanization and female labour force participation are playing in determining fertility in Pakistan. ARDL bound testing approach to cointegration 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 from 1980 to 2009. The empirical results show 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 the degree of urbanization plays 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 shows that the role of female participation remains insignificant to reduce fertility in the country. The reasons may include lack of opportunity for female participation in labour force, despite of promotion of female labour intensive industries by the government etc.

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Стаття надійшла до редакції 24.10.2011.