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Female Labor Market Participation and Economic Growth: The Case of Pakistan

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Abstract

Female labor force plays a significant role in the economic development of a country. The core objective of this paper is to examine the nexus between female labor force participation rate and Pakistan's economic growth using time series data for the period 1990-2014. The data was extracted from World Development Indicators database. Augmented-Dickey Fuller (ADF) test was applied to examine the data for unit root. The results show that both the variables--- female labor force participation rate and economic growth---are stationary at first difference i.e. I(1). The error correction model (ECM) and Johansen co-integration tests were used to examine the co-integration relation between the variables. The econometric results conclude that there is long-run and a U-shaped link between economic growth and women labor force participation rate of Pakistan. The results conclude that lower female labor force participation rate leads to lower economic growth in Pakistan. This paper has important policy implications, suggests that policies intend to remove such barriers could help to enhance the Pakistan's economic growth.

Keywords: Female labor force, Economic growth, Unit root, Co-integration, Pakistan

1. Introduction

This study complements the debate on female labor force participation and economic growth. Female labor market participation plays an important role in the economic development of Pakistan. The economic inquiry of female labor force contribution involved extensive consideration since the revolutionary works of (Mincer, 1962) and (Cain, 1966). Gender disparities decrease due to increase of women involvement in the economy. This improves warm health and increases women employment in various sectors. In the view of modern theorists, economic growth is correlated with female labor force participation. Educational opportunities for women should increase along with the household responsibilities.

Female labor force participation should part of policy strategists. Although extensive leaps and strides was observed that increases the women's participation rate in the labor market. However, there have been a few concerns and challenges that need to be addressed and overcome. Women's rights have expected limited attention so far, in Pakistani society. (Denton, Spencer, Economics, & Population, 1997) examined the population, labor force and long-term economic growth using the trend analysis technique. They found that in Canada ages are more than 65 years and the population growth rate also declines. The main reason is low productiveness rates and further decline are expected if immigration continues at this rate. Now the Canadian economy mostly depends on immigration of labor force.

The structural shifts of women's participation in the labor market are due to income manipulation and replacement effects, and the increase in education levels of women in the population. In the developing countries, agriculture is the main source of income and employment. Women are active participants in the labor force. They contribute as family workers on family farms and crops and livestock enterprises. They are not receiving monetary compensation for this work, but acknowledged as part of the labor force market. Economic growth is usually accompanied by structural changes in the economy. The role of industry is increasing while agriculture loses its predominance. This is due to lower women's participation in the labor force. Jobs in the early stages of industrialization were not attractive

to women because of the social norms against their participation in blue-collar activities. (Mammen & Paxson, 2000) explore evidence of a U-shaped curve for ninety (90) countries for the period 1970, 1975, 1980 and 1985. The results conclude a U-shaped pattern between women labor force and economic growth. The contribution from the richest and the poorest countries are more than 50% rate of participation while for the middle income countries this contribution was 35%. The same results were found by (Goldin, 1994).

(Tansel, 2002) confirms the U-shaped hypothesis that exists between female labor participation and economic development in Turkey for 67 provinces for the years 1980, 1985 and 1990. The findings of this paper have positive and significant impact on female labor supply and negative impact on unemployment. (Cakir, 2008) examined the impact of economic development on women labor supply for the period 1980-2000 in Turkey. The study affirms a U-shaped curve in Turkey. (Fatima & Sultana, 2009) conclude the U-shaped association between female labor force supply and economic development. The study uses cross-sectional data for three periods 1992-93, 1996-97 and 2001-2002. The study affirms a U-shaped association in Pakistan. (Chaudhuri, 2010) has also revisited the U-shaped hypothesis for one hundred and seventy (172) countries for the period 1990-2007. This study also affirms a U-shaped association between economic growth and women labor force participation. The study further concludes that the South Asian countries are under the U-shaped curve. These countries are slightly above the U-shaped curve and having the lowest women labor force participation.

(Ejaz, 2007) examined the factors affecting female labor force participation in Pakistan's economy. This study used the Pakistan Social and Living Standards quantity Survey for the period 2004-05. The study uses the logit and probit techniques. Results of this study conclude that age, level of education and marital status are positively related with female labor force participation. There are more chances to participate in economic activities when female belongs to the nuclear family and have entrance to vehicles. While a huge number of children and the accessibility of home appliances decrease the chance of female labor force participation.

(Nooreen Mujahid & uz Zafar, 2012) have examined the nexus between the economic growth and women labor force participation in the context of Pakistan. The study uses the time series data for the period 1980-2010. Error correction model (ECM) was applied to explore the correlation between the economic growth and female labor force participation. The results show long-run correlation between women labor force participation rate and Pakistan's economic growth.

(Noreen Mujahid, 2013) also analyzed the women's labor force participation in Pakistan using time series data. The study uses trend analysis technique. The results conclude that women labor force participation in Pakistan is below the international standard. Most of the female are working in the informal sector. The study further shows that the gender discrimination adversely affects the female labor force participation in Pakistan.

The previous economic literature gives a rich discussion on the association between women labor force participation rate and economic growth in developed and developing countries. Individual education levels, urbanization and unemployment seem to work to their disadvantage in the process of decision-making. There is considerable empirical evidence that

the relationship of women labor force participation rate and economic growth is U-shaped, See, for example [Ester (1970), Durand (1975), Kottis (1990), Schultz (1991), Tam (2011)].

Rest of the paper is organized as follows: Section two gives methodology of the paper. Section three explains results and discussion of the paper. Conclusion is given in section four. This section is followed by references.

2. Methodology

This section gives methodology of the paper. It explains the model used in this study. It also gives the type and data sources. This section also explains the procedure how to conduct the unit root test. This section also gives the procedure for conducting vector error correction mechanism (VECM) to examine the long-run relation.

2.1 The Variables

The objective of this study is to examine the association between Pakistan's economic growth and women labor force participation using time series data for the period 1990-2014. The data were taken on Gross Domestic Product (GDP) and Female Labor Force Participation (FLF).

2.2 The Model

In light of theoretical literature and empirical studies, LGDP and its square are used to capture the U-shaped pattern between women labor force participation rate and economic growth of Pakistan. The general function is as under:

$$FLF_t = f(LGDP_t, LGDP_t^2) \quad (1)$$

Where;

FLF_t is female labor force participation rate at time period "t".

$LGDP_t$ is natural log of GDP at time period "t".

$LGDP_t^2$ is square of log of GDP at time period "t".

The following general econometric model is used to examine the impact of independent variables on dependent variable.

$$FLF_t = a + b\,LGDP_t + c\,LGDP_t^2 + e_t \quad (2)$$

Where;

e_t is white noise at time period "t" supposed to be independently and normally distributed with zero mean and constant variance.

2.3 The Data

The core objective of this paper is to examine the nexus between economic growth and women labor force participation in Pakistan's economy. This paper uses time series data for the period 1990-2014. The data have been taken from World Bank and Pakistan Economic

Survey (various issues).

2.4 Unit Root Test

Most time series data is not stationary at level. So it is necessary to examine the data for unit root. This study uses Augmented Dickey-Fuller (ADF) test to examine the data for unit root (Dickey & Fuller, 1981).

Unit root test is used to detect whether the data is stationary or not. A data is said to be stationary if its mean, variance and covariance remain constant over time. Consider the following model AR (1) model:

$$Y_t = \phi Y_{t-1} + \varepsilon_t \tag{3}$$

$$\Delta Y_t = \gamma Y_{t-1} + \sum_{i=1}^{p} \beta_i \Delta Y_{t-1} + e_t \tag{4}$$

$$\Delta Y_t = \alpha_o + \gamma Y_{t-1} + \sum_{i=1}^{p} \beta_i \Delta Y_{t-1} + e_t \tag{5}$$

$$\Delta Y_t = \alpha_o + \gamma Y_{t-1} + \alpha_{2t} + \sum_{i=1}^{p} \beta_i \Delta Y_{t-1} + e_t \tag{6}$$

2.5 Co-Integration Test

This test is used to examine the long-run correlation between women labor force participation rate and Pakistan's economic growth. Variables having integration of the same order could be tested for co-integration (Engle & Granger, 1987). Therefore, these variables are examined for co-integration. Johansen co-integration test is applied to examine the long-run movement of the variables (Johansen, 1988); (Johansen, 1991). This test is based on the maximum likelihood estimation of m-dimensional Vector Auto-regression (VAR) having 'p" order. The eigenvalue and trace statistics are applied (Johansen, 1988); (Johansen & Juselius, 1990). If the trace eigenvalue test and maximum eigne value test gives different results then the results of the maximum eigenvalue test are used. The maximum eigenvalue test having great power as compared to trace eigenvalue test (Johansen & Juselius, 1990). The order of Vector Auto-regression (VAR) of order "p" in the error correction model (ECM) model is determined by minimizing the Schwartz Bayesian criterion (SBC) and Akaike information criterion (AIC). The Granger causality test based on Vector Error Correction Models (VECMs) is as under:

$$\Delta FLF_t = \delta_1 + \sum_{i=1}^{j} a_{1i} \Delta FLF_{t-1} + \sum_{i=0}^{j} \beta_{1i} \Delta lGDP_{t-1} + \sum_{i=0}^{j} \gamma_{1i} \Delta IGDP^2_{t-1} + ECT_{t-1} + e_t \tag{7}$$

Where:

Δ is the difference operator

ECT_{t-1} = error correction term at time period 't-1'.

The significant error correction term is interpreted as the long run causal effect.

3. Results & Discussion

3.1 Gross Domestic Product and Female Labor Force Participation

Figure I shows graph between natural log of GDP with time period. This graph shows that gross domestic product (GDP) is increases with time. Similarly graph II shows that female labor force participation rate versus years in case of Pakistan's economy. Female labor force participation rate (% of total population) has been taken along the vertical axis and years along the horizontal axis. The graph depicts that female labor force participation is increasing with passage of time.

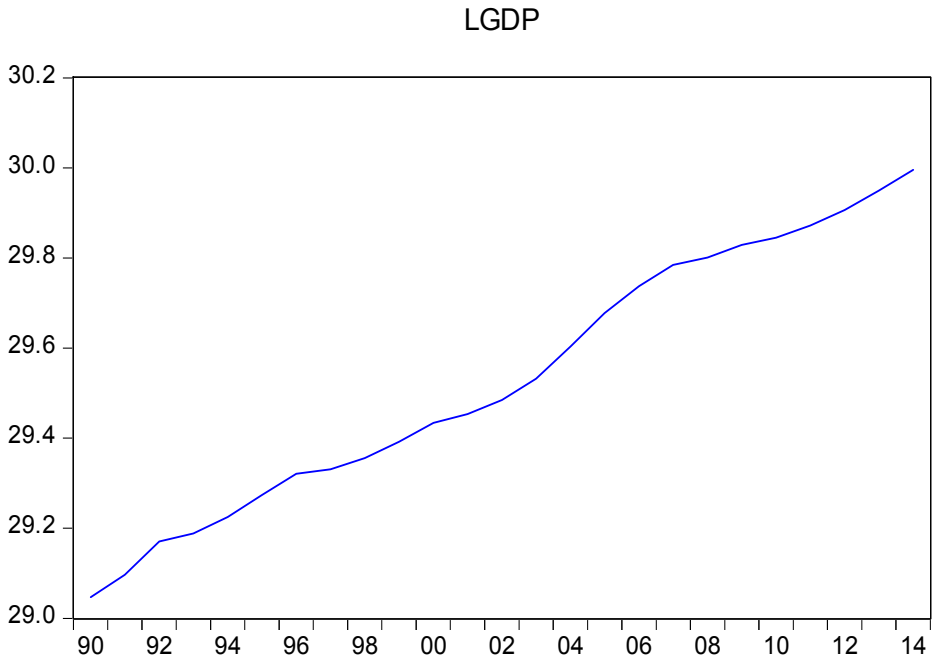

Figure 1. Graph of LGDP versus Time

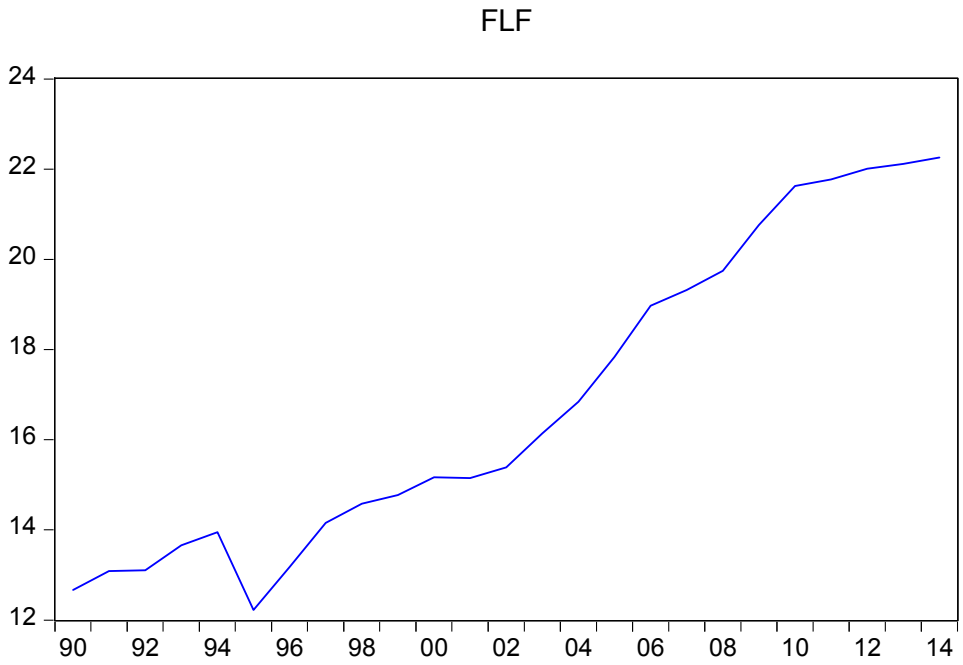

Figure 2. Female labor force participation versus time

3.2 Estimation of Autocorrelation and Partial Autocorrelation Functions

Autocorrelation function (ACF) and partial autocorrelation (PACF) was estimated to diagnose the problem of autocorrelation. Table I gives ACF and PACF for LGDP. The results show ACF does not die down at all for all lags, which confirms that LGDP is integrated and not stationary at level. Table II shows ACF and PACF for DLGDP. The results suggest that ACF dies down at all lags, which concludes that the series is stationary at first difference i.e. I(1).

Table III explains ACF and PACF for FLF. The results shows ACF does not die down at all for all lags, which confirms that the series FLF is integrated and not stationary at level. Table IV shows ACF and PACF for DFLF. The results suggest that ACF dies down at all lags, which concludes that the series is stationary at first difference i.e. I(1).

Table 1. ACF and PACF of LGDP

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
. |******	. |******	1	0.878	0.878	21.667	0.000
. |*****	. | .	2	0.759	-0.050	38.573	0.000
. |*****	. | .	3	0.652	-0.017	51.610	0.000
. |****	. *| .	4	0.542	-0.077	61.043	0.000
. |***	. *| .	5	0.432	-0.069	67.335	0.000
. |**.	. *| .	6	0.324	-0.069	71.060	0.000
. |**.	. | .	7	0.221	-0.058	72.894	0.000
. |* .	. *| .	8	0.111	-0.115	73.387	0.000
. | .	. *| .	9	0.005	-0.083	73.388	0.000
. *| .	. | .	10	-0.092	-0.065	73.767	0.000
. *| .	. | .	11	-0.173	-0.034	75.206	0.000
.**| .	. | .	12	-0.243	-0.051	78.277	0.000

Table 2. ACF and PACF of DLGDP

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
.**| .	.**| .	1	-0.242	-0.242	1.5296	0.216
. *| .	. *| .	2	-0.077	-0.144	1.6929	0.429
.**| .	.**| .	3	-0.207	-0.286	2.9263	0.403
. |**.	. |* .	4	0.271	0.140	5.1423	0.273
.**| .	. *| .	5	-0.211	-0.194	6.5692	0.255
. *| .	.**| .	6	-0.123	-0.262	7.0805	0.313
. *| .	. *| .	7	-0.073	-0.187	7.2712	0.401
. |* .	. *| .	8	0.117	-0.187	7.7983	0.453
. | .	. *| .	9	0.014	-0.097	7.8061	0.554
. | .	. *| .	10	0.005	-0.085	7.8074	0.648
. | .	. *| .	11	0.018	-0.092	7.8227	0.729
. | .	.**| .	12	-0.056	-0.245	7.9857	0.786

Table 3. ACF and PACF of FLF

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
. |****** |	. |****** |	1	0.9	0.9	22.767	0
. |****** |	. *| . |	2	0.794	-0.082	41.265	0
. |***** |	. *| . |	3	0.682	-0.09	55.542	0
. |**** |	. *| . |	4	0.567	-0.085	65.862	0
. |*** |	. *| . |	5	0.445	-0.104	72.553	0
. |**. |	. *| . |	6	0.303	-0.194	75.822	0
. |* . |	. | . |	7	0.179	-0.012	77.017	0
. | . |	. | . |	8	0.063	-0.05	77.177	0
. | . |	. *| . |	9	-0.046	-0.077	77.265	0
. *| . |	. | . |	10	-0.139	-0.025	78.139	0
.**| . |	. | . |	11	-0.213	0.005	80.324	0
.**| . |	. | . |	12	-0.275	-0.063	84.244	0

Table 4. ACF and PACF of DFLF

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
. | . |	. | . |	1	0.046	0.046	0.0571	0.811
. *| . |	. *| . |	2	-0.200	-0.203	1.1926	0.551
. |* . |	. |* . |	3	0.129	0.156	1.6901	0.639
. | . |	. | . |	4	0.000	-0.065	1.6901	0.793
. *| . |	. | . |	5	-0.099	-0.037	2.0103	0.848
. |* . |	. |* . |	6	0.128	0.115	2.5799	0.859
. | . |	. | . |	7	0.050	0.007	2.6712	0.914
. *| . |	. *| . |	8	-0.144	-0.087	3.4818	0.901
. | . |	. | . |	9	-0.034	-0.039	3.5294	0.940
. *| . |	. *| . |	10	-0.130	-0.195	4.2815	0.934
.**| . |	. *| . |	11	-0.238	-0.204	7.0073	0.798
. |* . |	. | . |	12	0.081	0.050	7.3520	0.834

3.3 Impulse Response Functions

Results of impulse response functions are given in Figure III. Response of LGDP to LGDP is positive for all periods. The response of LGDP to FLF is also positive for all periods. The response of FLF to LGDP has positive impact on LGDP. Similarly the response of FLF to FLF is positive and decreasing for all periods.

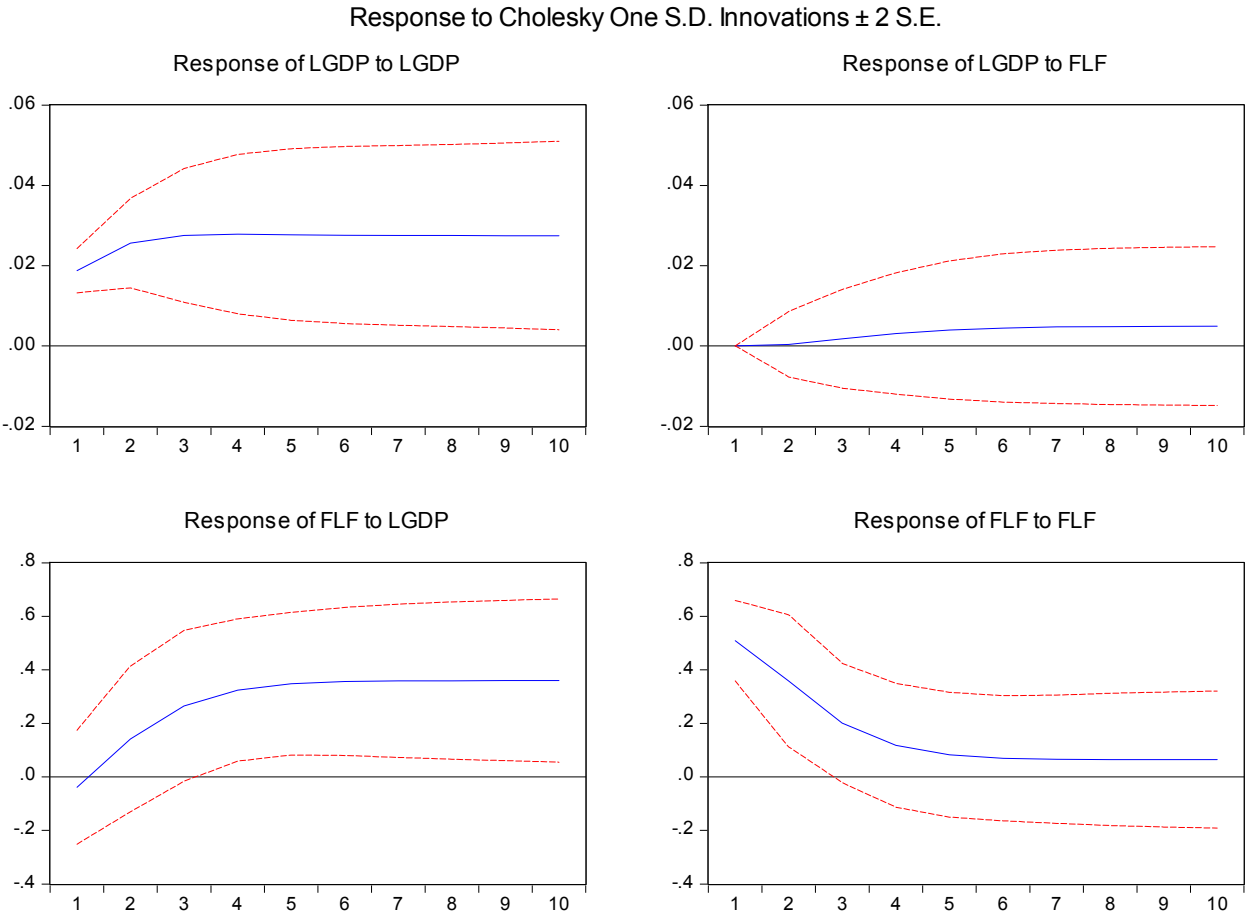

Figure 3. Impulse Response Functions of LGDP and FLF

3.4 Unit Root Test Results

Unit root test is used to check the stationarity property by using the Augmented Dickey Fuller (ADF) before the test of co-integration and granger causality. These tests are applied to conduct the integration on level as well as on first difference. The entire variable where the stationarity are tested at intercept and then trend and intercept. Where the results is obtained from the Augmented dickey fuller (ADF). The result shows that the real GDP and the female labor force (FLF) are stationary at first difference in below Table I.

Table 5. Results of Unit Root Test

Variables	Intercept	Intercept and trend
FLF	1.179686(0.9973)	-1.295507(0.8710)
ΔFLF	-4.171091(0.0028)*	-5.239262(0.0010)*
LGDP	1.387706(0.9985)	-1.724740(0.7167)
ΔLGDP	-4.468818(0.0013)*	-5.158220(0.0012)*
$LGDP^2$	1.387706(0.9985)	-1.724740(0.7167)
$\Delta LGDP^2$	-4.468818(0.0013)*	-5.158220(0.0012)*

Figures without parenthesis shows t-statistics and in parenthesis are p-values.The (*) representing the significance at first difference and at 1%, including both intercept and trend & intercept

Table V gives ADF test of female labor force, l GDP and l GDP2 at the level both intercept and trend & intercept are insignificant. After these test we apply the first difference on female labor force, l GDP and l GDP2 which give the correct answer (significant) at 1%.

3.6 Results of Error Correction Model (ECM)

Error correction mechanism is employed to examine the long-run and short-run relationship which also helps to know about the velocity at which equilibrium will be recovered. ECM also used to represent the dynamic equilibrium of the variables to describe both short run and long run relationship among the variables. Taking the difference of the variables lost the long run relationship. ECM not only corrects the error and makes adjustment of co-integrated variables toward equilibrium but also estimates the speed at which the endogenous variable recovers the equilibrium after a change in an exogenous variable. The higher value of coefficient of ECM represents the faster correction of disequilibrium from short run to long run. Error correction model can used extra lagged.

Table 6. Result of Error Correction Model (ECM)

Variable	Coefficient	t-statistics	Prob.
C	0.046628	0.147317	0.8839
D(LOG(GDP)	-16.05271	-1.589381	0.1228
$Dlog(GDP)^2$	1.029055	2.259759	0.0315**
E_{t-1}	-0.508894	-3.124085	0.0040*

(*) indicates the significant level at 5% and (**) indicates the significant level at 1%

Table VI shows that there is negative relationship in short run between female labor force rate and GDP on the basis of U-shape hypothesis and then we take a square of real GDP which indicates that the value of t-cal is greater than t-tab which gives a significant result or positive relationships between female labor force (FLF) and gross domestic product (GDP). ECM concludes long-run association between women labor force and GDP of Pakistan. The value of R2 is equal to 0.39 shows that 39 percent variation of endogenous variable is explained by exogenous variable. The probability value of F-statistic (0.002) indicates that overall model is significant and show good fit. The Durban Watson value is 1.700 which is close to 2 indicates that there is no problem of autocorrelation.

3.7 Johansen Co-Integration Test

Since both the variables are integrated of the same order i.e. I(1) so Johansen co-integration test is applied to examine the long-run relationship between or among the variables (Johansen,

1988); (Johansen, 1991). It is based on the maximum likelihood estimation of the m-dimensional Vector Auto-regression (VAR) having order p. The Trace eigenvalue and Maximum eigenvalue statistics are applied to examine the movement of the variables (Johansen, 1988); (Johansen & Juselius, 1990).

Table 7. Co-integration Rank test (trace)

Hypothesized	Trace statistic	5% critical value	Eigen value
None *	69.95305(0.0000)*	29.79707	0.702879
At most 1*	31.11731(0.0001)*	15.49471	0.443267
At most 2*	12.37589(0.0004)*	3.841466	0.320737

Note: *The * indicates significant at 1%. Figures in parenthesis are p-value.*

Table VII gives results of co-integration rank test (trace). As the Trace statistic values are greater that critical values at 5%, shows three co-integrating vectors. This test shows that there is long-run association between women labor force participation and Pakistan's economic growth.

Table 8. Co-integration Rank test (maximum Eigen value)

Hypothesized	Max-Eigen statistic	5% critical value	Eigen value
None *	38.83574(0.0001)*	21.13162	0.702879
At most 1*	18.74142(0.0092)*	14.26460	0.443267
At most 2*	12.37589(0.0004)*	3.841466	0.320737

Note: *The * indicates significant at 1%. Figures in parenthesis are p-value.*

Table VIII gives results of Johansen co-integration test (maximum Eigen value) of the Johansen co integration rank test. There are also three co-integrating vectors as Max-Eigen statistical values are greater than 5% critical values. So maximum Eigen value test also confirms that there is long-run relationship between the economic growth and women rate of participation.

3.8 Descriptive Statistics

Table IX shows the descriptive statistics of gross domestic product (GDP) and female labor force participation (FLF) of Pakistan. The mean GDP was Pak. Rupees 6.97E+12 ranging from 4.12E+12 to 1.06E+13 with standard deviation of 2.01E+12. Similarly the mean female labor participation (FLF) was 16.82% ranging from 12.22 to 22.26 with standard deviation of 3.48.

Table 9. Descriptive Statistics of GDP and FLF (1990- 2014)

Parameters	Mean	Median	Max.	Min.	St. Dev	Kurtosis	Skewness
GDP	6.97E+12	6.38E+12	1.06E+13	4.12E+12	2.01E+12	1.74	0.30
FLF	16.82	15.38627	22.26	22.26	3.48	1.63	0.37

4. Conclusion

The objective of this paper is to examine the relation between Pakistan's economic growth and women labor force participation rate in Pakistan's economy. Augmented Dickey-Fuller (ADF) test was applied to examine the data for stationarity. This test shows that both the variables are stationary at first difference i.e. I (1). Error correction mechanism (ECM) and Johansen co-integration tests were applied to examine the long-run correlation between economic growth and women labor force participation. Both the tests confirmed U-shaped and long-run correlation between Pakistan's economic growth and women labor force participation in Pakistan's economy. This study suggests that lower women labor force participation rate leads to marginally lower economic growth in Pakistan. This paper has important policy implications and suggests that policies intended to remove such barriers could help to enhance the economic growth of Pakistan.

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