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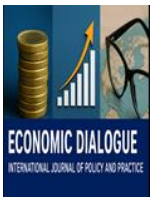

Relationship between Female Labor Force Participation and Economic Growth of Pakistan

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ARTICLE INFORMATION

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ABSTRACT

The empirical knowledge of understanding the importance of increased female participation in the labor market can help the economic growth of country. To this objective, this paper provides empirical analysis of relationship between female labor force participation and economic growth of Pakistan using annual time series data from 1993 to 2023. ARDL based cointegration and Error-correction model (ECM) is used to estimate short-run and long-run elasticities. The results show that female's participation in workforce has positive and significant effects on Gross Domestic Product in the long run, showing that 1 percent increase in FLFP lead to increase GDP by 0.098%. However, these effects are negative in the short-run, and this may be due to limited job opportunities and many structural challenges in the labor market may face by females. The speed of adjustment coefficient, based on ARDL Error Correction model, indicates that Gross Domestic Product is adjusted by about 87% and restored to long-run equilibrium after a short-run shock that takes place within the first year. The study also revealed that higher female education has positive effects in improving GDP. This research highlights the importance of women empowerment through improved education access, employment opportunities and supportive polices. Lastly, this study provides recommendations for policymakers to encourage sustainable economic growth by investing in women's development, removing cultural barriers, and enhancing vocational training of females.

1. Introduction

Economic growth (GDP) is an important factor that measures the nation's progress and it is linked with improvement in the quality of life, reduction in poverty and better structure of the labor market. It shows a country's well-being status, also that the country is following the development process, as a result eradication of poverty, illiteracy rates, income disparity and improvement in the conditions of the labor market with multiple opportunities, competition and better quality of life. Labor market plays an important role in the development of the country's economy. This is because when a country has stronger and inclusive labor force in its economy this helps in economic expansion through increase in productivity and human capital. In recent years, females have received more attention, particularly in the labor market sector and females are accepted as a main indicator in helping the economic expansion of nations. Through their participation, improvement in the structure of job market is increasingly possible by improving social and economic progress.

Female Labor Force Participation (FLFP) refers to the percentage of woman aged 15 to 64 who are employed, unemployed but looking for work and available to start work in coming days (World Bank,2024). Female participation in workforce of nation's economy helps in reducing poverty, gender disparity, fertility rate and income inequality, illiteracy rate, and fulfilled the labor shortage problem which results in increasing the economy of the country. Female's participation is crucial indicator of economic growth, when females join the labor force, her participation increases productivity, innovation, human capital development, standard of living, skill development and competition in the workforce which results in economic expansion. Proof from different research suggests that when more women join the labor market, workplaces will become more diverse and creative, helping the economies remain competitive (Garcia et al., 2022).

Female Labor Force Participation (FLFP) is an important indicator of economic growth in one aspect. FLFP has positive relationship with economic development by increased labor supply, improved productivity and assuring better use of human capital. Female labor force participation (FLFP) is therefore a main and important indicator of economic expansion and is generally found to have a favorable relationship with economic achievements, as economies earn strength from increased labor input when more women join the workforce (Sher Verick, 2018). When more women enter the workforce, household income increases, fertility rates decrease, savings go up and huge investments are made in health and education, which help long-lasting and sustainable economic growth. Lower fertility rates and slower population growth are also associated with female education (Dauda, 2013). As, more female join the labor force, economies will have more

strength to grow in response to more labor inputs as female force enters more (Sher Verick, 2018). Increased participation of females in the work market has the power to help growth of GDP through a greater labor supply, increased productivity and modified economic resilience [(Salleh & Mansor, 2022), (Kabeer & Natali, 2013), (Klasen & Lamanna, 2009)].

But on the other side, Female's participation in workforce is also an issue that is generated by some challenges and barriers so they cannot fully contribute to their potential. Pakistan holds male dominant society where females are not freely allowed to enter in labor market and gender disparity is seen at greater number. Gender disparity in the workforce effects the economic growth just like educational disparities (Baliamoune-Lutz, 2007). World Bank estimates that reduction in gender gap in the workforce helps in increasing of global GDP by trillion dollars. This happen because, large pool of workers (female workers are the main participants) are working as fuel to innovation and economic growth. Equal opportunities for men and women in the labor market play a key role in generating wider social benefits for society as a whole (Besamusca et al., 2015) Females in the workforce are not earning income for herself; she invests the income in different household needs. Also, if she's earning more than household's want, she invests sufficient amount of income in different ways, she can also become entrepreneur through which she can provide job opportunities for other females in a society. Such all contribution helps in societal well-being as well as overall economic growth of country. Increased FLFP contributes to empowering women in lowering inequality, poverty and helps in nation's social and economic development (Andalib and khan, 2018).

Female participation in workforce is different across regions and economic system. Participation rates of women in the labor force, which play a pivotal role in economic stability, alter widely among females across different countries (Altuzarra et al., 2019). In the whole wide world, more and more females are joining the workforce. Female labor force participation rate is 41% in 1996 and 66% in 2012 (World Bank, 2012). It is clear that this shift also gets opportunities and challenges for women's career. Thus, women's employment has increased in the developed countries and their participation is increasing in the developing countries in all sectors and profile (Hasani, 2013).

As per the analysis of Census-2017 Pakistan's total population was 2.1 billion, female's total population was 48.54% and rate of female participation in labor market was only 19.6% which is relatively very low, as female accounts for almost half of the total population and their work force percentage is less than 50% which clearly shows low FLFP in Pakistan. But according to recent census conducted in 2023, Pakistan's total population is 2.4 billion with 49.58% (census,2023)

population covered by female. By looking at the workforce sector, the participation rate of female in labor market is only 23.18% (census,2023) which shows only 3.5 % rise in the female involvement in the labor force along with increase in the population size of female. This lower level of female involvement in the workforce, compared to their population size clearly shows a huge loss of productivity and human capital with in Pakistan. Similarly, IMF discussion report reveals on average participation of female in the labor force is 20% lower than the men's involvement, and there is still gender inequality in income and educational attainment continue to exist (Fabrizio et al., 2020). These percentage shows that Pakistan need more female in the labor market because more female in the labor market reflects the economic growth of country. Women's participation in the work market helps women's empowerment by increasing confidence and independence, particularly decision-making within the house, compared to women who do not work (Ashraf & Ali, 2018). Female labor force participation is an important factor in the economic development of developing country. But unluckily in Pakistan female's life is involved in domestic duties, taking care of children and financial contribution limited to informal sector that is agricultural work in rural areas. Female's goal of life is limited to marriage and child responsibilities only making education unnecessary for females (Hassan, 2023).

This study focused to highlight the association between FLFP and GDP of Pakistan and focus on how to increase the Female's Participation Percentage (contribution) in workforce. FLFP also show its relation to education, fertility rates and gender gaps. Through focusing on these objectives, the purpose of this study is to answer some question that will help this study to find gaps and help in the economic expansion of Pakistan. How does FLFP influence GDP? How does female (primary and secondary) education effects the economic growth of Pakistan? What is the impact of fertility rate on economic growth? From the above understanding therefore the purpose of this research is to enhance policymaker's awareness of these dynamics, with the goal of supporting sustainable economic growth.

2. Literature Review

2.1 Female Labor Force Participation and Economic Growth:

There is a vast research work available on relationship between Female Labor Force Participation and economic growth and it's hard to review all of it. Therefore, some relevant studies are reviewed, but these literature results are not same all over the world with different income levels. In one study, Mujahid et. al., (2012), used time series of 30 years for Pakistan to analyze the association between

FLFP and GDP. They used ARDL method in their research and found that in long run, U-shaped association is present between FLFP and GDP. U-shaped link between FLFP and economic growth tells us that at early stages FLFP decreases and later FLFP increases as economies grows.

Similarly, Lachman et. al., (2015), analyzed panel data of 162 countries and confirmed the U-shaped relationship of FLFP on economic growth across the world. However, the U-shaped relationship does not exist for low-income countries. The study of Khaliq et., al., (2017), used time series data from 1990-2014 to examine the relation between FLFP and economic growth. They employed ADF, ECM and Johansen cointegration test and found that FLFP has long run correlation and U-shaped relationship with economic growth of Pakistan. Also, Uwimana and Olive (2021), through ARDL analysis on data of 28 years, confirmed U-shaped association between FLFP and economic growth in Rwanda. Initially, economies develop FLFP decreases but later it increases as economy expands. Moreover, Apire et. al., (2023), uses Uganda's 31 years data and found a significant short-term unfavorable relationship between FLFP and economic growth, with no long-term impact.

On the other hand, different trends are found in some studies. Dogan et., al. (2017), studied the relationship between FLFP and economic growth of Turkey. They used time series from 2000 Q1-2013Q4 and employed ARDL model in their study. They find out inverted U-shaped (∩-shaped) relationship between FLFP and economic growth. Inverted U-shaped relationship indicates that initially economic growth increases FLFP but later it decreases FLFP. Likewise, Anyanwu et. al., (2021), investigated the same relationship by using OLS analysis. The research also shows that FLFP has an inverse correlation with economic growth of Nigeria.

Henry Tam (2010) conducted dynamic panel data estimation of 130 countries to explore the association between FLFP and GDP. His study confirmed U-shaped association between variables over time and intertemporal relationship. Similarly, Naftaly Moses (2024), conducted research to explore the effect of economic growth on female labor market participation in Kenya by using employed Fully Modified Ordinary Least Square method and Granger Causality Test. Findings shows long term, prominent positive effects of economic growth towards female participation in labor market. Also, labor market is dominated by male and female participation in the workforce is also controlled by male. Moreover, Onisanwa et. al., (2024) used time series from 1981-2015 for Nigeria to examine the connection between FLFP and economic growth. Their study reveals positive connection between FLFP and economic growth in the long run. Results also showed that 1% increase in FLFP is linked with 10.9% increase in economic growth of Nigeria.

2.2 Female Education, Martial Status, FLFP and Economic Growth:

Several studies highlight the importance of female's education in improving their ability to join the labor market and help in the growth of an economy. Aysit Tansel (2002), analyzed Turkey's 67 provinces over three different time periods using OLS analysis to explore the relationship between FLFP and economic development. His study reveals U-shaped relation between variables and also draws attention towards education, education has strong positive effects on FLFP and unemployment negatively affects FLFP. Similarly, Khadim et. al., (2013) used time series of 2-years for Pakistan and they used Binary Logistic regression model in their research to see the same thing. Their research findings shows that Higher education level influence FLFP in informal sector and females who are married, living in urban areas and belongs to nuclear families are more likely to involve in work activities. Likewise, Hosny and Sara (2016), used probit model for Egypt and Germany to highlight the role of education, marital status and children in influencing FLFP. Results of their study shows that education has stronger on Egypt's FLFP. Urban residence, marriage and children negatively affect women's participation affects both countries.

In Pakistan, the study of Shaheen et. al., (2011), employed Logit and Ordinary Least Square model for two-year time series for Pakistan to analyze the factors that encourages FLFP in economic development. They discovered that factors such as; education, urban areas, and marital status have a positive relation with FLFP. Similarly, Noreen Mujahid (2014), used times series data from 2005-2006 to highlight the role of higher education in increasing FLFP in Pakistan. The results confirmed that FLFP is influenced by education and higher education level increases FLFP. Similarly, Hassan et. al., (2017), used data of 26 years to explore the impact of education on the economic growth of Pakistan. They employed OLS method and found that 1% increase in female education reduces fertility rate and increases Pakistan's GDP by 96%. Also, Sana Safdar (2022), employed LPM method for 2 years data to examine the link among FLFP and GDP of Pakistan. Study found an inverse relationship between FLFP and education. Inverse relationship shows that increase in one variable cause another variable to decrease. Although women with schooling clearly showed positive FLFP in the informal sector. Moreover, the study of Amber Hassan (2023) used VECM and Johansen cointegration test on Pakistan's time series from 1971-2018 to see the impact of education on FLFP and economic growth. Her study revealed that in long-term relationship between female participation and economic growth is negative. Her finding also highlights that primary and secondary education are the main determinants that influence the economic growth.

2.3 Fertility Rate, FLFP, and Economic Growth:

A lot of researches are available on the relationship of fertility rate and women's employment. A different study conducted by Abu Bakar et. al., (2014), analyzed six Asian countries from 1995-2013 by using cross sectional cointegration and long-run structural estimation. Results finding shows an inverse relationship between FLFP and total fertility rate (TFR). Similarly, Cameron et. al., (2019), through cohort analysis on Indonesia's 17 years data and discovered that industrial shifts tempered the support for FLFP provided by evolving social norms. Also, the study of Uwimana and Olive (2021), employed ARDL on Rwanda's time series from 1990-2019 to find the association between fertility rate and FLFP. Study found that U-shaped association, FLFP initially declined with higher fertility rates but later grew proportionally with economic development. Her study also revealed that FLFP and unemployment is affected by fertility rate and FLFP is reduced by primary education attainment as this encourages to complete higher education. This shows that decisions about having children, the structure of the job market and changes in the economy, these all affect women's ability to work.

2.4 Gender Inequality, FLFP and Economic Growth:

For women, inequality continues to be a big problem when it comes to getting into the workforce and helping the economy to grow. The researchers Altuzarra et. al., (2021) investigated 105 countries panel data and discovered that equal schooling for men and women significantly improves economic growth, particularly within Sub-Saharan Africa. Nevertheless, their findings revealed that the ratio of women to men in the workforce failed to have a statistically significant effect on growth. Similarly, Thaddeus et. al., (2022) employed ARDL and Granger causality techniques based on information from 42 countries in sub-Saharan Africa during the time period 1991–2019. Their research showed a long-term, one-way link between economic growth and FLFP. This means that economic growth can make it less difficult for women to become part of the workforce, even if there are still gaps between men and women.

3. Data and Methodology

3.1 Model Specification:

Auto Regressive Distributed Lag Model is employed to examine the Impact of FLFP on Gross Domestic Product. We use the following General or Economic Model Equation:

$$GDP_t = f(FLFP_t, FPSE_t, FSSE_t) \quad (1)$$

Regression Model Equation:

$$\ln GDP_t = \beta_0 + \beta_1 \ln FLPR_t + \beta_2 \ln FPSE_t + \beta_3 \ln FSSE_t + \varepsilon_t \quad (2)$$

Where As Described above:

- **GDP**: Gross Domestic Product in year t (economic growth).
- $\boldsymbol{\beta_0}$: intercept
- $\boldsymbol{\beta_1}$ to $\boldsymbol{\beta_3}$: (slope) are coefficients to be estimated for the independent variables.
- $\mathbf{FLPR_t}$: Female Labor Force Participation rate.
- $\mathbf{FPSE_t}$: Female Primary School Enrollment ratio.
- $\mathbf{FSSE_t}$: Female Secondary School Enrollment ratio.
- $\boldsymbol{\varepsilon_t}$: error term.

Modeling of ARDL:

$$GDP_t = \alpha_0 + \sum_{i=1}^{P} \alpha_i lnGDP_{t-i} + \sum_{j=0}^{q1} \beta_{1j} lnFLFPR_{t-j} + \sum_{j=0}^{q2} \beta_{2j} lnFPSE_{t-j} + \sum_{j=0}^{q3} \beta_{3j} lnFSSE_{,t-j} + \varepsilon_t \quad (3)$$

Where:

- $\boldsymbol{\alpha_0}$ is a Constant term
- $\boldsymbol{\alpha_i}$ is a coefficient of the lagged dependent variable
- $\boldsymbol{\beta_{1j}}$ to $\boldsymbol{\beta_{3j}}$ are coefficients of independent variables
- **P** is lag length of the dependent variable
- **q1** to **q3** are lag length of the independent variables
- **t** is a current time period and j is the lag number
- **t -j** is the value of a variable j period before current time period
- **t -i** is the i-th lag of the dependent variable
- $\boldsymbol{\varepsilon_t}$ is an error term

Error Correction Term:

$$\Delta GDP_t = \alpha_0 + \sum_{i=1}^{p-1} \alpha_i \Delta \ln GDP_{t-i} + \sum_{j=0}^{q-1} \beta_{1j} \Delta \ln FLFPR_{t-j} + \sum_{j=0}^{q-2} \beta_{2j} \Delta \ln FPSE_{t-j} + \sum_{j=0}^{q-1} \beta_{3j} \Delta \ln FSSE_{t-j} + \lambda ECT_{t-1} + \varepsilon_t \quad (4)$$

Where,

- $\mathbf{p-1}$ is first difference operator and is representing the short run change in a variable
- $\boldsymbol{\lambda}$ is coefficient of error correction term and it shows speed of adjustment from short run to long run
- $\mathbf{ECT_{t-1}}$ is lagged error term of its previous long run time period

Cointegration Equation:

$$\ln GDP_t = \beta_0 + \beta_1 \ln FLPR_t + \beta_2 \ln FPSE_t + \beta_3 \ln FSSE_t + \varepsilon_t \quad (5)$$

3.2 Variables:

Dependent variable:

GDP: (Constant 2015 $) Measures the total and final economic output and is common indicator of economic growth.

Independent variables:

1. Female Labor Force Participation: (% of female population ages 15-64) (modeled ILO estimate). Measures the rate of female participation in the work force.
2. Female Primary School Enrollment ratio: (% of gross) Percentage of female enrolled in school at primary level.
3. Female Secondary School Enrollment ratio: (% of gross) Percentage of female enrolled in school at secondary level.

3.3 Data Sources:

One of the key objectives of this study is to check the association between economic growth and female labor force participation with other helping variables. For this, time series data will be used over time period from 1993–2023 to explore the relationship between female labor force participation and economic growth of Pakistan. Important source of data is World Development Indicator (WDI). We will also take help from State Bank of Pakistan (SBP) Annual Reports, Pakistan Economic Surveys and different reports published by the Pakistan Bureau of Statistic (PBS).

3.4 Diagnostic Test:

This study applies time series econometric methods to investigate the association between female labor force participation and economic growth. The first step involves testing the stationarity of the data, as time series variables are often non-stationary in nature. To check stationarity, the Augmented Dickey Fuller (ADF) unit root test is used when the results of ADF test confirm that the variables become stationary at first difference, the ARDL Model is used to check the presence of long-term relationship within the variables. The ARDL approach is developed by Peseran et. al., (2001) and this approach is suitable for the variables that are integrated of I(0) and I(1) order, or variables combines both order. But, the variables with integrated of I(2) order will not be included in this ARDL approach. After that the optimal number of lags are selected using Akaike Information Criteria. After selecting the optimal number of lags, Bounds test is applied to check the existence of long term relationship and long run cointegration is checked by comparing critical upper bound and critical lower bound values with estimated F-stats value of bound test. If F-stats value is greater than the critical values of upper and lower bound than we reject the H0 that indicates that there's no cointegration between variables. After confirming the existence of cointegration, first we check long-run elasticities using cointegrating relation and than (ARDL-ECM) Error Correction Model is estimated to check short-run equilibrium of all variables. At last, residual diagnostic tests are used to make sure the authenticity of the estimated model. These tests are used to check for potential problems such as Autocorrelation and Heteroscedasticity, ensuring that the model satisfies the standard econometric assumptions.

3.5 Data Processing Tools:

E-View which is a Statistical software will be used as data processing tool for analysis purpose.

4. Estimation of Results and Analysis

First of all, we will check the descriptive statistics of raw data that we are using in our analysis. Descriptive statistics helps to understand the properties or nature of data; mean, median, standard deviation etc. shown in Table 4.1.

We compare mini-value and maxi-value with their mean value e.g. Gross domestic Product's mini-value is 25.568 and maxi-value is 26.715 these both values are close to mean value i.e 26.159 it indicates that these is no problem of errors. Also, the skew-value of FLFPR is (-0.397) indicates a minor negative skewness, distribution is slightly longer on left side than the right one. Kurtosis

value is 1.758 the distribution is flatter than normal distribution with a slighter tail and Jarque-Bera test checks the normality of data e.g. value of FLFPR is 2.807 with a p-value 0.245. The p-value is greater than 0.05 or 5% significance this shows that we fail to reject the H0; data is normally distributed as it is greater than 5%.

Table 4.1: Results of Descriptive Statistics:

	LN_GDP	***LN_FLFPR***	***LN_FPSE***	***LN_FSSE***
Mean	26.159	2.986	8.928	7.726
Median	26.715	3.024	8.983	7.739
Maximum	26.715	3.250	9.320	8.377
Minimum	25.568	2.551	8.324	7.023
Std. Dev.	0.363	0.215	0.290	0.384
Skewness	-0.046	-0.397	00.401	-0.035
Kurtosis	1.722	1.758	2.060	1.877
Jarque-Bera	2.118	2.807	1.973	1.634
Probability	0.346	0.245	0.372	0.441
Sum	810.954	92.572	276.784	239.519
Sum Sq. Dev	3.960	1.396	2.528	4.427
Observation	31	31	31	31

A widely used statistical test that is used to check the stationary or non-stationary of time series data is a unit root. Stationary of data shows constant mean, variance and co-variance over a time while non- stationary series mean, variance and co-variance are not constant. To check unit root Augmented Dickey Fuller test is applied on data by using E-views. Null (H0) hypothesis of this test is there is a unit root in a series of interest, while alternative (H1) hypothesis is that it is stationary at levels. The ADF is performed on each variable and the results are presented in Table 4.2. It can be observed that all variables are non-stationary at their levels, as their p-values are greater than 1%, 5% and 10% statistical significance values. However, all variables are found stationary at first-difference p-value is less than 0.05 as shown in Table 4.2. This implies that all variables are I(1). We can now move to use the Auto Regressive Distributed Lag Model.

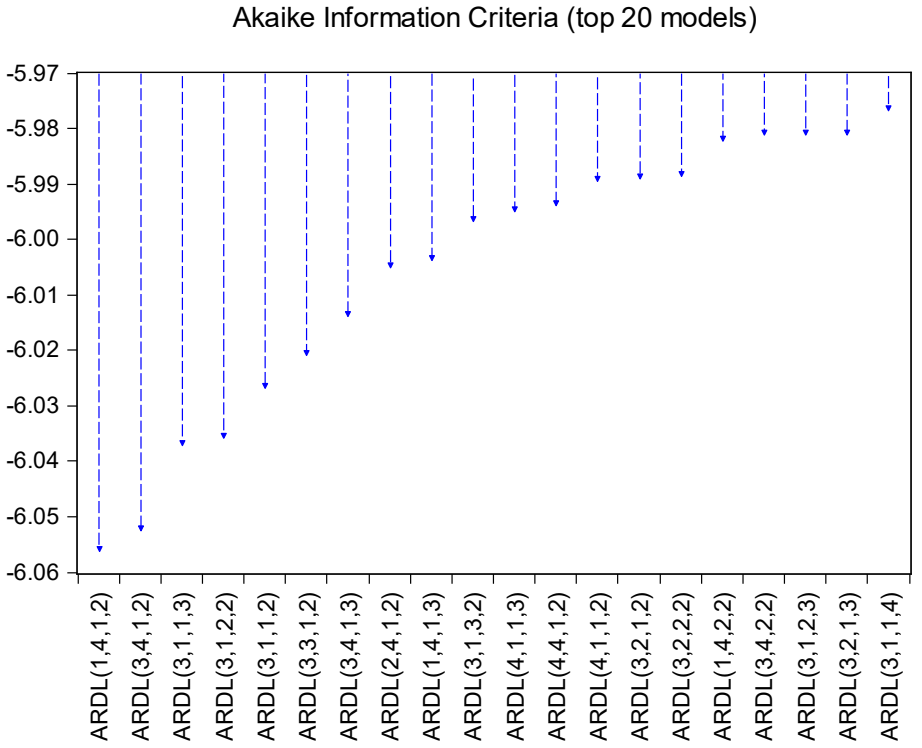
Table 4.2: Results of Augmented Dickey Fuller Test:

Variables	***ADF***			
	LEVEL		1st DIFFERENCE	
	t-statistics	p-value	t-statistics	p-value
lnGDP	-0.702	0.831	-3.820	0.007
lnFLFPR	-0.867	0.784	-5.697	0.000
lnFPSE	-1.939	0.310	-7.036	0.000
lnFSSE	-1.112	0.697	-4.751	0.000

After confirming stationarity through the Augmented Dickey Fuller (ADF) test, to discover the optimal no. of lagged values in time series data, Akaike Information Criterion (AIC) is used. AIC is a most widely used model selection criteria, that helps to determine the optimal number of lag structure in the ARDL model. AIC compare different models, check models balancing that they are good fit with model complexity and it reduces the risk of over fitting. A model that contains lowest AIC value is considered the most suitable and appropriate because lower AIC value indicates that the model is best fit and it includes fewer parameters.

Table 4.3 shows the results of Akaike Information Criterion. Where the optimal lag length for ARDL model is tested by Akaike Information Criterion among top 20 candidate models. The Lowest ARDL(1,4,1,2) shows the lowest AIC value of -6.056 among the top 20 competing specification. This is the lowest AIC value and we select this optimal lag length criteria for ARDL model estimation. After selecting optimal number of lags for ARDL model in the next step we will estimate the Bound test to check the existence of cointegration in the long run.

Table 4.3: Results of AIC:



ARDL Bound test was developed by Pesaran, Shin and Smith (2001). ARDL Bound Test is employed to examine the existence of long relationship between the variables. Bound test is applied to check the existence of long term relationship and this long run cointegration is checked by comparing upper critical bound and lower critical bound values with estimated F-stats value of bound test. If F-stats value is greater than the critical values of upper and lower bound than we reject the H0.

H0: There is no cointegration among the variables.

H1: There is cointegration among the variables.

Table 4.4, shows the results of ARDL Bound test and the estimated F-stats value is 19.754 (significant at 1% significance level). This F-stats value is compared with the critical values of upper and lower bound at 1%, 5% and 10 % significance level. The upper critical values of ARDL Bound test are 3.586, 4.306 and 5.966 at 1%, 5% and 10% significance level. All these three upper Bound values are less than F-stats values as shown in table 4.4 and shows the presence of long-run relationship among the variables. So, we reject the null hypothesis and accept the alternative hypothesis that there is a cointegration between the variables.

Table 4.4: Results of ARDL Bound Test:

Model	*Chosen Order of Lag (ARDL)*	*F-stats*
$GDP_t = f(FLFP_t, FPSE_t, FSSE_t)$	(1,4,1,2)	14.754***
Level of Significance	Critical Value at Lower Bound $I_{(0)}$	Critical Value at Upper Bound $I_{(1)}$
10%	2.676	3.586
5%	3.272	4.306
1%	4.614	5.966
*** and **** Asterisk represents the 5% and 1% level of significance, respectively.*		

After confirming the presence of long run relationships between the variables by using ARDL Bound test. Long run coefficients are estimated using ARDL Cointegrating Relation to examine the relationship between Female Labor Force Participation Rate, Female Primary School Enrollment ratio and Female Primary School Enrollment ratio with Gross Domestic Product of Pakistan. Table 4.5 and 4.6 shows long-run and short run results and here we can also see the asterisk with coefficients. These asterisk shows the value of t-stats at 1%, 5% and 10% significance level. At 1% significance level, value of t-statistics is 2.576 we will add 3 asterisks (***) with its t-value. Similarly, for 5% (1.96) significance level it contains 2 asterisk (**) and at 10% (1.645) significance level we will add 1 (*) asterisk.

Table 4.5: Estimated results of long-run coefficients using ARDL Bound Test:

Dependent variable: LN_GDP

VARIABLES	Co-efficient	Standard Error	t-value
LN_FLFPR	0.098**	0.047	2.053
LN_FPSE	0.533***	0.519	10.272
LN_FSSE	0.521***	0.045	11.532
C	17.121***	0.203	84.313

*** and **** Asterisk represents the 5% and 1% level of significance, respectively.*

In table 4.5, positive coefficient (0.098) indicates increase in Female Labor Force Participation (FLFPR) in workforce is associated with the increase of GDP in the long-run. This means that 1% increase in FLFPR will increase GDP of Pakistan by 0.098% ceteris paribus. So, this clearly shows that an increased female labor force participation rate results in more women are working and contributing to the economy (Noreen Mujahid, 2014). More female participation in the workforce

shows two things, one is women are improving their role in the economy and secondly, they are becoming more empowered (Hosny, Sara Hassan, 2016). The t-statistics is 2.053, which is significant at 5% significance level as its value is greater than 1.96, suggesting that FLFLR has a significant positive impact on GDP.

Similarly other remaining variables i.e. Female Primary School Enrollment ratio (FPSE) and Female Secondary School Enrollment ratio (FSSE) have positive coefficients (as shown in Table 4.5). This means that 1% increase in FPSE and FSSE is expected to increase GDP of Pakistan by the value of their respective coefficients that is shown in table 4.5. These positive coefficients are associated with Human Capital Theory (Becker, 1964) (Schultz, 1961), that states that education is an investment that increases productivity of labor force and help in the economic growth. Female Primary School Enrollment ratio and Female Secondary School Enrollment ratio propose that these variables have positive and meaningful impact on GDP at 1% significance level. Therefore, we add three asterisks with Female Primary School Enrollment ratio and Female Secondary School Enrollment ratio.

Table 4.6: Estimated results of short-run coefficients using ARDL:

ıriable's Error Correction	***Coefficients***	***Standard Error***	***t-statistics***
D(LN_FLFPR)	-0.142**	0.059	-2.407
D(LN_FLFPR (-1))	-0.330***	0.060	-5.499
D(LN_FPSE)	0.297***	0.035	8.299
D(LN_FSSE)	0.184***	0.034	5.323
D(LN_FSSE(-1))	-0.155***	0.051	-3.008
D(LN_FSSE(-2))	-0.177***	0.044	-4.003
D(LN_FSSE(-3))	-0.117***	0.030	-3.806
$\boldsymbol{ECT_{t-1}}$	-0.879***	0.078	-11.185
Diagnostic Tests:			
Autocorrelation LM Test:			
F-stats	Prob.		
2.451	0.124		
Heteroscedasticity White Test (without cross):			
F-stats	Prob.		
1.877	0.127		

After analyzing long-run results based on ARDL, now we will estimate the (ARDL-ECM) Error Correction Model. Error Correction Model is applied to study short-run adjustments toward the long-run relationship and to examine short-run movements among the selected variables. We will also analyze the speed of adjustment (ECT) of equilibrium after having a short-run shock.

Table 4.6, In the short run, the coefficient of Female Labor Force Participation Rate is (-0.142) with a t-value (-2.407) and FLFPR at lag 1 is (-0.330) with a t-value (-5.499), these coefficients are statistically significant at 5% and 1% respectively. This indicates that the coefficients are negative but they are statistically significant. The reason may be due to limited job opportunities, many social barriers and structural challenges in the labor market may faced by females. Therefore, we conclude that the Female Labor Force Participation Rate has a significant impact on economy in short run.

Similarly, Female Primary School Enrollment Ratio has positive effects on GDP of Pakistan. As show in table 4.06, coefficient of FPSE is (0.297) positive and statistically significant at 1 % level of significance. Similarly, Female Secondary School Enrollment ratio has positive coefficient (0.184) and statistically significant at 1% significance level. This shows that in current time period, increase in Female Secondary School Enrollment ratio contributes positively in the economic growth of Pakistan. However, FSSE coefficients at lag 1 (-0.155), lag 2 (-0.177) and lag 3 (-0.117) are negative. But all coefficients are statistically significant at 1% significance level. The reason behind negative coefficient value of FSSE is that they does not contribute immediately, as it takes time for students to complete their education and become part of the labor force.

Error Correction Term in table 4.6, which shows how quickly a variable returns to long-run equilibrium after a short-run shock. If the coefficient of ECT is negative and significant, it indicates that the variable adjusts back to equilibrium but if the ECT is insignificant, there is no long-run correction. A positive and significant ECT coefficient indicates that the variable moves away from its balanced state after a change, which can be a sign of instability in the system. The ECT (-0.879) for GDP is negative and statistically significant with t-value (-11.185) at 1% significance level. This interprets that after having a short-run economic shock, equilibrium will be restored by the corresponding coefficient of ECT term within one year.

After estimating and understanding the long-run and short-run effects of ARDL model, we will estimate ARDL based Residual Diagnostic Tests. Residual diagnostic tests are used to check the problems like auto-correlation and heteroscedasticity within the model. There are different tests that are estimated to check the serial correlation of different time series that is used in a model. Autocorrelation is a problem that arises in a regression model in which errors are correlated with each other over a time due to which results of regression model are not meaningful. We use Breusch Godfrey Serial Correlation Lagrange Multiplier (LM) Test to check the correlation between errors

within a model. According to this test, if p-value is less than 0.05 then we reject the null hypothesis as there is autocorrelation between errors. But, if p-value is greater than 0.05 then we accept the null hypothesis. So,

Hθ: There's no autocorrelation between errors.

Table 4.6 is for serial autocorrelation and F-stat is a diagnostic test statistic that is used to check whether the error of the estimated ARDL model are serially correlated. The F-stats has estimated value (2.451) with its p-value (0.124), this p-value exceeds 0.05 significance level. Therefore, the null hypothesis of no residual serial correlation cannot be rejected. We accept the null hypothesis that errors are not correlated with each other and there's no serial correlation between errors in regression model.

Similarly, Heteroscedasticity is another problem that arises in a regression model in which variance of the error term is not constant over independent variable and the spread of error changes as the value of independent variable changes. In this test, if p-value is less than 0.05 then we reject the null hypothesis and detect the heteroscedasticity. But, if p-value is greater than 0.05 then we accept the null hypothesis. We use Breusch Pagan godfrey's heteroskedasticity test and the hypothesis of this test is:

Hθ: The errors are homoscedastic.

In table 4.6 the results of heteroscedasticity test shows that p-value 0.127 is greater than 0.05 so we fail to reject the null hypothesis. Heteroscedasticity is not detected in our regression model and variance of error term is constant.

5. Conclusion, Recommendations and Limitations

The present study analyzed the Relationship between Female Labor Force Participation and Economic Growth of Pakistan using time series data from 1993 to 2023 of different variables. First step is to check the stationary of data by using Unit Root Test, all variables are stationary at first difference so we used auto Regressive Distributed Lag Model (ARDL) to check the association between variables. First, we select the optimal number of lags based on Akaike Information Criteria which suggests ARDL(1,4,1,2) lags are suitable for our model. After selecting the optimal lags for our model, ARDL Bound test is employed to check the long-run cointegrating relationship between

the variables. F-stats value (19.754) of ARDL bound test is greater than upper and lower bound values, that confirm the presence of cointegration within the variables. ARDL based cointegrating relation are used to estimate long-run coefficients. The results of ARDL based in the Long-run demonstrate a positive and statistically significant relationship between Female Labor Force Participation and Economic Growth, implying that 1% increase in female participation in the workforce helps to increase Gross Domestic Product of Pakistan by 0.098% and other supporting explanatory variables are also positively associated with the GDP. Short-run results are estimated by employing ARDL based Error Correction test. The short run results shows that FLFPR had negative but has significant effect on GDP in the short run. This may be due to transitional challenges such as low level of employment chances, labor-based market disparity and underemployment of female which suppress the sudden benefits of increased FLFP. Similarly, Female Secondary School Enrollment ratio has negative effect on the economic growth of Pakistan. This is because female does not contribute immediately, as it takes time for students to complete their education and become part of the labor force. These results spotlight the importance of empowering women through education, job opportunities and with some important policies, advising that improving female's participation is not enough for gender equality but is a main indicator of sustainable economic growth of Pakistan.

To encourage female participation and help in the economic expansion, this study recommends some policy measures. These includes: Investment in female's Education, particularly at primary and secondary levels. Promote vocational training and skill development programs for women for example, stitching, beautician and computer related courses. Improve access to childcare by introducing child care center and safe transportation for working women to protect them from harassment. Launch some awareness campaigns to reduce cultural and social barriers. And support flexible work possibilities and gender-inclusive workplace policies. Through promoting these policies women can take part in labor sector with their full potential and help in economic expansion of Pakistan.

This study has some limitations. It only used a fewer factors like education to measure the impacts of female participation in Economic Growth. While other important factors such as: income levels, health and job type were not included due to non-availability of data. The data was based on national-level stats, so regional differences within Pakistan were not explored properly. Also, the study relied on secondary data, which may have some gaps or errors.

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