The Female Labour Force Participation and Long-run Development; Evidence from Sri Lankan Experience

S.A.U. Niranjala [1*], H.A.B.W. Hettiarachchi [1]

[*] *Correspondence: niranjala@ssh.rjt.ac.lk*

[1] Department of Economics, Faculty of Social Sciences and Humanities, Rajarata University of Sri Lanka, Sri Lanka

Abstract

The female labor force plays a substantial role in the economic development of a country. The investigation of this study was to find the relationship between economic development and female labor force participation in the case of Sri Lanka from 1990 to 2019. The data was gathered from the World Development Indicators database, and Central Bank Reports in Sri Lanka. Unit root tests, the ADF and PP unit root tests, have been applied to test the stationarity properties of the variables. The ARDL cointegration method examined the long-run relationships between economic development and female labor force participation. The findings confirm a U-shaped relationship between female labor force participation and economic development in Sri Lanka.

Keywords: *Co-integration, Economic development, Female labor force participation, Sri-Lanka, Unit root.*

1. Introduction

Female labor force participation is one of the most promoting factors for inclusive growth in a country. A higher level of female labor force participation leads in achieving a higher level of economic development (Verick, 2018). The increase women participation in the labor force leads to increase economic growth establishing a long-run U-shaped relationship (Sinha, 1965). The argument behind this is that when a country is poor, women work only for necessity, mainly in subsistence agriculture or home-based production. As a country develops, economic activities shift from agriculture to industry, and it derives benefits for both men and women in the labor force. At a higher level of economic development, educational levels rise, and fertility rates fall. If so, women can take advantage of new jobs in the service sectors that are more family-friendly and accessible (Lechman and Kaur, 2015; Verick, 2018).

Even though the relationship between female labor force participation and economic growth is relatively stable, different research findings are available in other countries and groups of countries (Lechman and Kaur, 2015). Examination of the relationship between economic development and female labor force participation is essential for many reasons. First, the U-shaped relationship states that there is some trade-off between gender equality and economic growth in developing an economy. Second, understanding the relationship between female labor force participation and economic development is vital for scholars and policymakers to identify the trends in participation in the female labor force and design and implement policies (Gaddis and Klasen, 2012; Chapman, 2015).

Considering the Sri Lankan contest, trends of female labor force participation rates have been particularly puzzling. Figure 1 shows that the female labor force participation rate is low compared to the male participation rate in Sri Lanka from 1990-2020. Moreover, Figure 1 shows a slight increase in the female Labor force participation rate from 2010 to 2020. The studies have explained several reasons behind this increase, including the increased school enrollment and more job opportunities for women. Fatima and Sultana (2009) prove that female labor force participation has a positive and strong relationship with economic growth. Female labor force participation is an important driver of economic development of a country (Boserup, 1970 ; Samarakoon, 2018). Therefore, this research aims to find the relationship between female participation and country development in Sri Lanka.

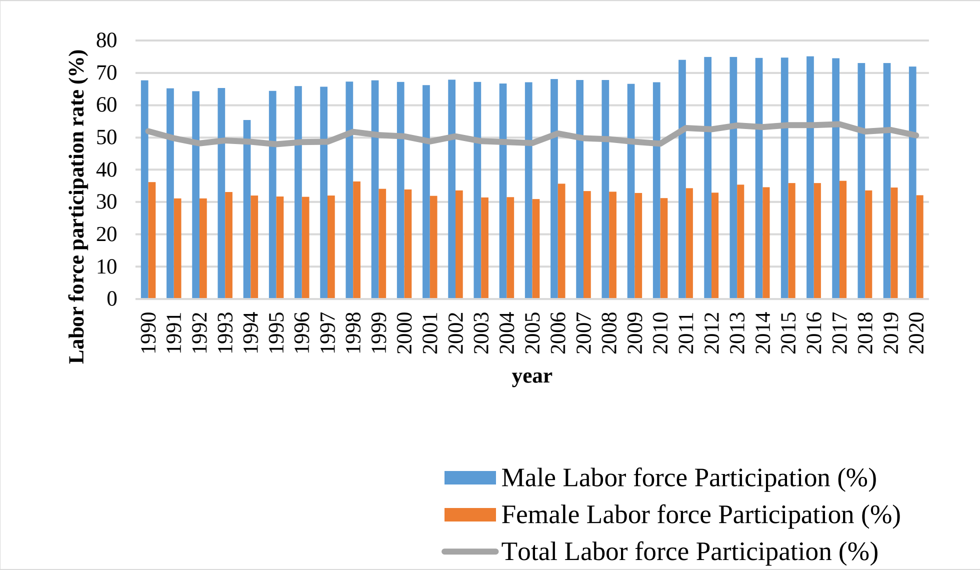


Figure 1: Gender inequalities in labor force participation rates in Sri Lanka (1990–2020)

2. Literature review

Investigating the relationship between economic growth and female labor force participation was treated as macroeconomics research and policy central subjects. There is no clear-cut definition of the relationship between economic growth and female labor force participation. There are many controversial issues and findings of this relationship. In literature, a considerable number of studies proved a U-shaped relationship between economic development and female labor force participation (Shahid, 2014; Lechman and Okonowicz, 2013; Olivetti, 2013; Tsani et al., 2013; Lohati and Swaminathan, 2016; Fatima &Sultana, 2009; Mujahid and Zafar, 2012). Mammen and Paxson (2000) provide evidence for the U-shaped theory in Thailand and India, using cross-country longitudinal data from 1970-1985. Lechman & Kaur

(2015) examine the relationship between economic growth and female labor force participation and show that the U-shaped hypothesis exists for countries with high-income levels, while it does not exist for low-income countries. In low income countries still female labor force participation is low compare to high income level countries (Lechman & Kaur, 2015).

In contrast, some studies found no U-shaped relationship between the economic development of the countries and the female labor force per capita (Tam, 2011, Lahoti and Swaminathan, 2013; Gaddis and Klasen, 2014). Gaddis and Klasen (2014) have also noted nonexistence of a U-shaped relationship among non-OECD countries using cross-country data from 1980–2005. In India, Economic growth has not been employment-intensive. Agriculture and manufacturing sectors are characteristically labor-intensive but have not controlled the overall economic growth. The service sector has been the critical driver of growth but requires high skills that most women do not possess (Lahoti and Swaminathan, 2013).

Moreover, it is essential to examine the factors that can increase female labor force participation in a country, as female labor force participation is an essential component in economic growth (Boserup, 1970). Multifaceted aspects determine women's employment participation: education level, social norms, economic growth, and job creation (Verick, 2018). Family related factors are more influential on female labor force participation rates than personal factors (Chen et al., 2014). Women's low education levels and flexibility in wages reduce women's participation in the labor force. Moreover, women with higher education levels can find jobs more effortlessly in the labor market (Hare, 2016).

3. Methodology

3.1 Data Collection

The study was entirely based on time series secondary data for the period covering from 1990 to 2019. Data for female labor force participation (FLFP) and Gross Domestic Per capita (GDP_p) were obtained from different sources.

FLFP is defined as the women's percentage of the total labor force in the country, age 15 years and over. It consists of employed plus unemployed (actively seeking work) female in the defined age category. The FLFP data were obtained from the Central Bank of Sri Lanka. GDP_p is defined as the gross domestic product divided by the mid-year population of the country, and to approximate the level of economic development, we used gross domestic product per capita based on purchasing power parity (PPP) at constant 2010 international $ (GDPpcPPP). GDPpc data was collected from World Bank open data repository.

Total fertility rate denotes the average number of children born to a woman if she were to live to the end of her childbearing years and bear children according to age-specific fertility rates of the specified year (Altuzarra et al., 2019). In addition to the fertility rate, the unemployment rate is also considered a control variable that affects FLFP. These variables were taken from the Central Bank Report (2020) in Sri Lanka. GDPp is considered an independent variable, and FLFP is regarded as the dependent variable. GDPp has been transformed into differentiated forms as logarithms are a much more useful way to measure economic data. The resulting variables are denoted as Ln GDPp.

3.2 The model

There is a lot of literature to suggest the U-shaped relationship between economic development and female labor force participation (Verme, 2014, Gaddis and Klasen, 2013 and Tsani et al., 2013). Based on the general form of U-shaped relationship between female labor force participation and economic growth is modeled as follows (Eq.1):

$$FLFP = \propto + \beta_1 lnY + \beta_2 lnY^2 + u_t \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots.. (1)$$

Where FLFP is female labor force participation (women's share in the country's total labor force-15 years and above), and Y is the level of economic development. The GDP per capita is used as a proxy for economic development (Chapman, 2015) and takes natural logarithms of national GDP per capita in constant 2010 US$. $LFFP$ is considered as the response variable, and lnY is considered as the explanatory variable. The U-shape hypothesis confirmed if the estimated coefficients are : $\hat{\beta}_1 < 0$and $\hat{\beta}_2 > 0$. It means the U hypothesis holds; labor force participation will decrease initially with an increase in the per-capita net national domestic product ($\hat{\beta}_1$ < 0) and start increasing after attaining a certain level of development ($\hat{\beta}_2$ > 0). Therefore, it is more appropriate to use a fixed-effect estimator (Eq. 2).

$$FLFP_t = \propto + \beta_1 lnY_t + \beta_2 lnY_t{}^2 + \delta_t + u_t \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots. (2)$$

Where, δ_t denotes time effect.

The fixed effects capture cultural, social, and other unobservable impacts on women's economic activities. While equation (2) accounts for fixed effects, it does not include potentially important model variables. Although the researcher couldn't include all variables in the model, fertility rate and unemployment rate have been included as control variables provided by the model employed by Altuzarra et al. (2019) and Cahpman (2015).

$$FLFP_t = \propto + \beta_1 lnY_t + \beta_2 (lnY_t)^2 + \beta_3 Fertality + \beta_4 Unemployment + \delta t + u_t \ldots\ldots\ldots (3)$$

The added control variables were fertility rate and unemployment rate. The U-shaped hypothesis holds if: $\hat{\beta}_1$< 0 and $\hat{\beta}_2$> 0. Altuzarra et al. (2009) show that the shape of the FLFP–GDP per capita relation may be different across groups of countries and individual countries because different groups of countries may be transiting on a different pattern of the U curve during the period considered. According to them, $\hat{\beta}_1$ >0 and $\hat{\beta}_2$> 0 for U-shape transitions, $\hat{\beta}_1$> 0 and $\hat{\beta}_2$> 0 for positive transitions and

$\hat{\beta}_1 < 0$ and $\hat{\beta}_2 < 0$ for negative transitions and also it is possible to find inverted U-shaped changes with $\hat{\beta}_1 > 0$ and $\hat{\beta}_2 < 0$.

Further considering the control variables, the researcher expects the coefficients on unemployment and fertility to be negative. Because these results would be consistent with the arguments made in the literature, is expected a negative relationship between fertility rate and FLFP. Because when socio-cultural attitudes change, the productive activity of women is more valued than their reproductive role. Result that, more women enter the labor market (Goldin, 1995). In addition to the fertility rate, the unemployment rate is an essential variable to describe the labor market situation; a high level of the unemployment rate, more women difficult to find a job. Therefore, unemployment would have a negative influence on FLFP (Ozerkek, 2013).

To find the long-run relationship between female labor force participation and economic development, scholars have employed the ARDL model (Mujahid N. and Zafar, 2012; Dogan & Akyuz, 2017). Therefore,this research also used the ARDL model to explain long-run relationships and short-run dynamics. Furthermore, this model is suitable for apply in a small sample (Pesaran et al., 2001). The specific ARDL model used in this analysis is expressed as follows (Eq.4).

$$\Delta FLFP_t = \beta_0 + \beta_1 LFP_{t-1} + \beta_2 lnY_{t-1} + \beta_3 lnY^2{}_{t-1} + \beta_4 F_{t-1} + \beta_5 U_{t-1} + \beta_6 T_{t-1} + \sum_{i=1}^{q_1} \gamma_1 \Delta LFP_{t-i} + \sum_{i=0}^{q_2} \gamma_2 \Delta lnY_{t-i} + \sum_{i=0}^{q_3} \gamma_3 lnY^2{}_{t-i} + \sum_{i=0}^{q_4} \gamma_4 \Delta F_{t-i} + \sum_{i=0}^{q_5} \gamma_5 U_{t-i} + u_t \quad (4)$$

Where difference operator is indicated by Δ, T is trend variable and u_t is the residual term assumed to have a normal distribution with finite variance and zero means. $\beta_2 - \beta_6$ correspond to the long-run relationships and $\gamma_1 - \gamma_5$ show the short-run dynamics. The next step is to compute the ARDL F-statistic to examine whether cointegration between the variables exists or not.

After establishing the long-run relationship between economic development and female labor force participation, it is necessary to find the short-run impact of economic development on female labor force participation in Sri Lanka. Error correction method (ECM) can be applied to find short-run impact and ECM model as follows (Eq.5).

$$\Delta FLFP_t = \propto_0 + \sum_{i=1}^{q_1} \propto_{1i} \Delta LFP_{t-i} + \sum_{i=0}^{q_2} \propto_{2i} \Delta lnY_{t-i} + \sum_{i=0}^{q_3} \propto_{3i} lnY^2{}_{t-i} + \sum_{i=0}^{q_4} \propto_{4i} \Delta F_{t-i} + \sum_{i=0}^{q_5} \propto_{5i} U_{t-i} + \gamma ECT_{t-1} u_t \quad (5)$$

Where, ECT_{t-1} is an error correction term that measures the speed of adjustment from short-run towards long-run equilibrium. γ is the estimate of lagged error term that captures the speed of adjustment. This ECM model elucidated those differences in female labor force participation are explained by differences in the linear (non-linear) term of real GDP per capita, differenced of fertility, differenced of unemployment rate plus error term, and stochastic term.

3.3 Estimation Methods

This paper applies the Bound test approach to the relationship and Autoregressive Distributed Lag (ARDL) model proposed by Pesaran et al. (2001). Since time series variables were used in the model, examining and confirming the variables' stationarity is necessary to avoid spurious regression in model estimation. To obtain reliable regression results, first, the model must be able to be subject to "spurious regression”. Therefore, firstly, the study tests the nature of the time series to determine whether they are stationary or non-stationary. Unit root tests were used to estimate whether the time series data were stationary. When time-series data is non-stationary and used for analysis, it may give spurious results because estimates obtained from such data will possess a non-constant mean and variance. In this regard, Augmented Dickey-Fuller (ADF) and PP tests were used to test for unit roots. The Dickey-Fuller test was applied to both variables to detect if these variables were stationary or non-stationary. Both variables proved to be non-stationary; regression tests were applied to the first differences.

In the following, to find the relationships, Auto-Regressive Distributed Lags (ARDL) Bounds test was used to find cointegration between variables. The ARDL bounds testing approach to cointegration explained by Pesaran et al. (2001) does not require a unique integration order for cointegration estimation. The null hypothesis ($H_0: \beta_1 = \beta_2 = \beta_3 = \beta_4 = 0$) states that there is no cointegration and the alternative hypothesis ($H_1: \beta_1 \neq \beta_2 \neq \beta_3 \neq \beta_4 \neq 0$) states that the existence of cointegration between variables. The long-run relationship is investigated by comparing the F- statistic with the upper and lower bounds of critical values. If the calculated F value exceeds the upper bound critical value at the considered significance level, it indicated a long-run relationship between variables to reject the null hypothesis. If the calculated F value is lower than the lower bound of bound critical value at the considered significance level, it indicated no long-run relationship between variables, as acceptation of the null hypothesis. However, F statistic lies between the upper bound of critical value and the lower bound of the critical value decision is inconclusive.

The next step is to find short and long-run elasticities using the ARDL-ECM model to determine the long-run relationships.

A model to be trusted must be robust. The robustness of an estimated model can be done using various diagnostic tests. The Breusch Godfrey serial correlation LM test, the Breusch–Pagan Godfrey Heteroskedasticity test, and the Jarque–Bera test are some of the tests encountered in these applications. CUSUM and CUSUM OF SQVARES tests were examined and analyzed to find stability.

4. Results and Discussion

4.1 Basic statistic results

Table 2 presented basic statistics of the selected variables. According to Table 1, the Sri Lankan female labor force participation is 33.7%. The maximum female labor force participation in Sri Lanka was 37%, and the minimum value of female labor force participation was 30.9%. In the same period, the average unemployment rate is at 8% in Sri Lanka. The maximum unemployment rate from 1990-2019 in Sri

Lanka was 15.9%, while the minimum unemployment rate reported at 4%. Meanwhile, the average female unemployment rate is 12.3%.

Table 2: Basic statistics of the model, 1990–2019.

Variable	Mean	SD	Min	Max
FFP	33.7	1.803636	30.9	37.00
GDP_P	2366.7533	928.79524	1189.66	4009.24
Fertility rate	2.2689	0.067380	2.188	2.48
Female Unemployment rate	12.3300	5.64197	6.30	23.40
Unemployment rate	8.0333	3.693175	4.00	15.90

FFP: Female Labour Force Participation; GDP_p: Gross Domestic Product per capita.

Before presenting the estimated results of the model, it is worth first focusing on the visual representation of the data. Figure 1 displays the scatter plots of the association between female labor force participation and GDP per capita for Sri Lanka. Figure 2 explains that Sri Lanka follows a slight U pattern over the period 1990–2016. This relationship can be explained by using an estimated model.

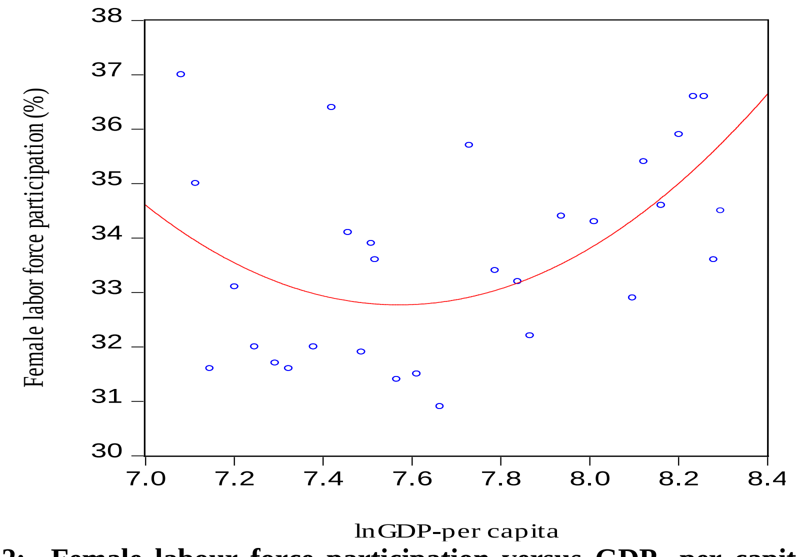


Figure 2: Female labour force participation versus GDP- per capita in Sri Lanka 1990-2019

4.3 Unit Root Analysis

Before testing cointegration, two-unit root tests (Augmented Dickey-Fuller (ADF) test and Phillips Perron (PP) test) were used to check the order of integration for each variable. The ARDL bounds testing approach assumes that the series under investigation should be integrated at I (0) or I (1). The results of ADF and PP unit root tests are detailed in Table 3

The results indicate that real GDP per capita has a unit root problem at the level with the trend and intercept. It means LnY is not integrated into I(0) but stationary at 1st difference indicated by statistics of ADF and PP unit root tests. It reveals that both variables are integrated at I (1). Further, the test results confirmed that no variables exceeded the order of integration I (1), and variables are a mixture of integration I (0) and I (1) and supports applying the ARDL approach to testing for cointegration (Pesaran et al.,2001).

Table 3: Unit root test results

ADF Test statistics (with Trend and Intercept)			
Variable	level	First difference	Order of Integration
LFP	-4.647914**(0.0045)	-4.446123**(0.0082)	I(0), I(1)
LnY	-1.761740 (0.6959)	-3.793985** (0.0321)	I(1)
LnY2	-1.782196 (0.6862)	-3.692495** (0.0397)	I(1)
Fertality	-0.881078(0.9421)	-5.326692**(0.0013)	I(1)
Unemployment rate	-0.843032(0.9493)	- 4.961255**(0.0023)	I(1)
PPT test statistics (with Trend and Intercept)			
Variable	level	First difference	Order of Integration
LFP	-5.082818**(0.0016)	-12.59238***(0.0000)	I(0), I(1)
LnY	-1.727969 (0.7127)	-3.793985** (0.0321)	I(1)
LnY2	-1.765345 (0.6952)	-3.692495** (0.0397)	I(1)
Fertality	-3.805650**(0.0308)	-1.837774(0.6591)	I(0)
Unemployment rate	-9.903353(0.9421)	- 4.958531**(0.0023)	I(1)

Note: ** shows significance at 5%, *** shows significance at 1% ADF: Augmented Dickey-Fuller; PP: Phillips-Perron.
Source: Researcher calculation using E-Views 10.

4.4 Lag Length Criteria

Selecting of appropriate lag length before applying the ARDL test, as inappropriate lag length selection leads to a spurious outcome. Here, the applicable lag length of the variables was selected using the Akaike information criteria (AIC). The criteria show the top twenty models, as shown in Figure 3. The ARDL model proceeded with the lowest AIC (1,1,1,1,0) for this analysis.

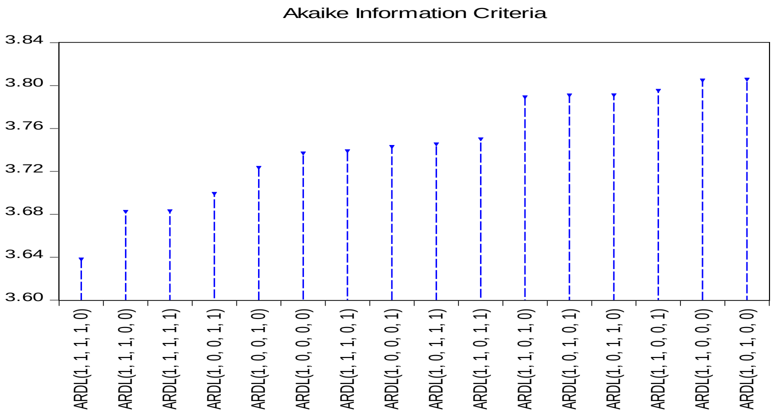


Figure 3. Lag length of each variable.
Source: Researcher calculation using E-Views 10.

4.5 ARDL Bounds Test

The bound test result for the ARDL model is shown in Table 4. According to the bound test null hypothesis (there is no cointegration among variables) is accepted if the calculated F value is below the lower bound. The null hypothesis is accepted if the calculated F value is higher than the upper bound. Therefore, according to the result Calculated F – statistic (6.690880) is greater than the critical value at 1%, 5%, and 10% for the upper bound I(1), then it is concluded that there is cointegration. The findings contain that long-run relationships exist among female labor force participation, GDP, fertility, and female unemployment rate in Sri Lanka.

Table 4: ARDL Bounds Test result

F-Bounds Test		Null Hypothesis: No Levels Relationship		
Test Statistic	Value	Significant Level	Lower Bound Value I (0)	Upper Bound Value I (1)
F-statistic K = 4	6.690880	10%	2.68	3.53
		5%	3.05	3.97
		1%	3.81	4.92

Source: Researcher calculation using E-Views 10.

4.6 Diagnostic tests results

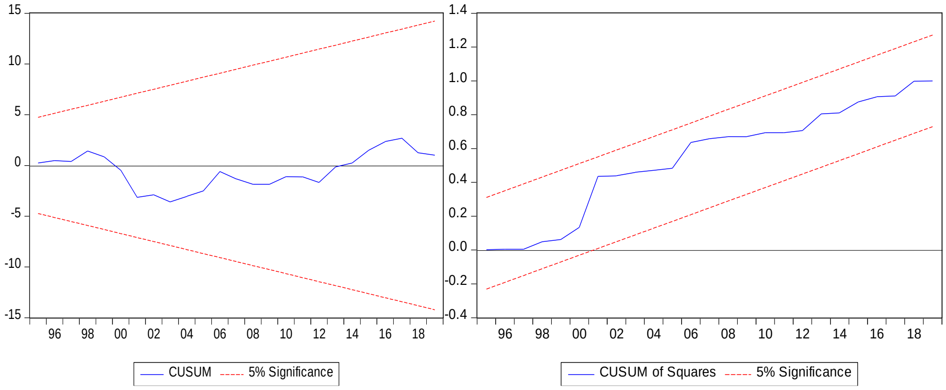
Table 5 shows diagnostic tests for the ARDL (1, 1, 1, 1, and 0) model that is relevant to the study of the relationship between female labor force participation and GDP per capita. Breusch-Godfrey Serial Correlation Lagrange Multiplier test of serial correlation indicates that the residuals are not serially correlated. The normality test (Jarque Bera) highlighted that the hypothesis of normally distributed residuals could not be rejected, and the error is normally distributed. If the Jarque-Bera probability test is non-significant ($p > 0.05$), it tells that the distribution in the sample is not significantly different from a normal distribution (Field, 2005). Moreover, the

Breusch –Pagan- Godfrey test shows that the residuals have not Heteroskdasticity problem.

Table 5: ARDL (1, 1, 1, 1, 0) model diagnostic tests

	Diagnostic test	F statistic	Probability Value
Serial correlation	Breusch-Godfrey Serial Correlation LM Test	0.841101	0.3712
Normality	Normality Test (Jarque-Bera)	1.202218	0.548203
Heteroscedasticity	Breusch-Pagan-Godfrey	1.844306	0.1251

Source: Researcher calculation using E-Views 10.



(a) **(b)**

Figure 4. (a) Cumulative Sum (CUSUM); (b) Cumulative Sum of Squares (CUSUMSQ).

The CUSUM and CUSUMQ plots (Fig 4. a & b) from a recursive estimation of the model also indicate stability in the coefficient over the sample period. The stability of the model parameters was examined using statistics of Cumulative Sum of Recursive Residuals (CUSUM) and Cumulative Sum of Squares of Recursive Residuals (CUSUMSQ). If the statistics were between boundary lines drawn as two separate lines, the null hypothesis claiming stability of parameters would not be rejected. The results of these tests for model estimation are given in Figures 4 –a & b. According to the figures, the model is statistically stable, and the parameters corresponding to GDP, fertility rate, and the female unemployment rate to FP are consistent. In other words, model parameters were stable within 5% critical bounds.

4.7 Estimated long-run coefficients

Table (6) indicates the result of the ARDL model. The dependent variable is female labor force participation whereas, GDP, fertility rate, and female unemployment rate are the independent variables. The R squared value is 0.61, and the adjusted R squared value is 0.42. This means that only 61 percent of total variations in female labor force participation in Sri Lanka are explained by GDP, fertility, and unemployment rate.

Table 6. ARDL (1, 1, 1, 1, 0) Model Estimated Results and Long-Term Coefficients

ARDL (1, 1, 1, 1, 0)
Dependent variable = FLFP

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1419.031	639.0385	2.220572	0.0387**
lnY	-879.1389	404.4665	-2.173577	0.0426**
lnY^2	56.98238	26.33573	2.163691	0.0434**
Fertility	-71.85378	47.58222	-1.510097	0.1475
Unemployment rate	-2.197325	0.799812	-2.747303	0.0128**
@TREND	-0.793810	0.550021	-1.443235	0.1652
R-squared	0.610116			
Adjusted R-squared	0.425434			
F-statistic	3.303603			
Prob(F-statistic)	0.013560			

Note: ** significance at 5 percent level
Source: Researcher's calculation using E-Views 10.

According to the result, the coefficient of lnY and lnY^2 are -879.1389 and 56.98238 respectively, and also statistically significant. If there is U shaped relationship between female labor force participation and GDP per capita $\hat{\beta}_1 < 0$ and, $\widehat{\beta}_2 > 0$. According to findings $\hat{\beta}_1 < 0$ and, $\hat{\beta}_2 > 0$, there is a U-shaped relationship between female labor force participation and GDP per capita. The results of the study are consistent with Shahid (2014), Lechman & Okonowicz (2013), Olivetti (2013), Tsani *et al*. (2013), Lohati & Swaminathan (2016), and Fatima &Sultana (2009) and this study also supports the theory of U shaped relationship between female labor force participation and GDP Per capita.

The parameter estimate of fertility is -71.85378, which is showing a negative relation with female labor force participation, which the researcher accepted, but not significant. Theoretically, the relationship between fertility rate and female labor force participation should be negative. Goldin (1995) and Ozerkek (2013) also have found a negative relationship between female labor force participation and fertility rate.

The coefficient of the unemployment rate is -2.197325, which has a negative and significant effect on female labor force participation, which is according to the hypothesis. It means that a 1 percent increase in the unemployment rate raises 2.19 percent of female labor force participation. Goldin (1995) and Ozerkek (2013) also support the negative relationship between female labor force participation and unemployment. Findings explain that the unemployment rate is an important variable to explain female labor force participation in Sri Lanka.

4.8 Estimated short-run coefficients

Table 7. Result of ECM model

Dependent variable = Δ (FLFP)
ARDL(1, 1, 1, 1, 0)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(FLFP(-1))	0.147305	0.194744	0.756405	0.4598
D(lnY)	569.1428	379.3558	1.500288	0.1519
D(lnY(-1))	-1233.341	529.6624	-2.328541	0.0325**
D(lnY^2)	-37.58970	24.20369	-1.553056	0.1388
D(lnY^2(-1))	78.56039	33.86288	2.319956	0.0330**
D(fertality)	65.89127	136.3862	0.483123	0.6352
D(unemployment)	-3.005399	0.896634	-3.351870	0.0038**
D(fertality(-1))	-39.51100	124.9169	-0.316298	0.7556
ECM(-1)	-1.322275	0.302765	-4.367326	0.0004***
C	1.301175	3.329354	0.390819	0.7008
@TREND	-0.037664	0.150148	-0.250846	0.8049
R-squared	0.720740			
Adjusted R-squared	0.556469			
F-statistic	4.387518			
Prob(F-statistic)	0.003726			

Note: ***, ** Significance at 1 percent and 5 percent level
Source: Researcher's calculation using E-Views 10.

After examining the long-run impact, the next step is to examine the short-run impact of economic development on female labor force participation in Sri Lanka. Error Correction Method (ECM) can be used to find short-run impact; results are indicated in Table 7. The coefficient of ECM_{-1}shows the speeds of adjustment from the short-run towards the long-run equilibrium path. ECT(-1) is -1.322275. It is statistically significant at both 1 and 5 percent levels of significance. This confirms our long-run relationship between economic development and female labor force participation in Sri Lanka.

According to the results, there is sufficient evidence to prove that a U-shaped relationship between economic development and female labor force participation exists in Sri Lanka. The linear and non-linear (squared) real GDP per capita is negative and positive according to expectations and statistically significant. The sign of the coefficient of the error correction term must be negative to provide stability for the model and should be smaller than 1. Narayan and Smith (2006) stated if the coefficient of the error correction term is smaller than 1, it means that the system is

equilibrating by fluctuating. This fluctuating will decrease in each term and then provide the transition to the equilibrium. In this model, the ECM coefficient is greater than 1, and it shows the speed of adjustment was outside what the model expected.
The coefficient of fertility rate is -39.51100, which presents a negative relationship with female labor force participation in the short run. However, the coefficient is not significant. The unemployment rate has a similar impact on female labor force participation both in the short and long run, and the coefficient is also significant. The coefficient of $ECM_{t-1}$is equal to (-1.322275) and greater than 1, and statistically significant. Therefore according to Narayan and Smith (2006), the speed of adjustment was outside.

5. Conclusion

This study examines the relationship between female labor force participation and economic development in Sri Lanka over the period 1990–2019. The ARDL model was employed in this study to find the relationship between female labor force participation and economic development measured by GDP (in PPP) *per capita*. In addition to that, the fertility rate and unemployment rate are also considered in this model. The ARDL bound tests, cointegration, and Error Correction Model (ECM) were used to find long-run and short-run relationships in the model. According to the cointegration result, there is sufficient evidence to confirm the U–shaped relationship between the female labor force and economic development. If there is a U–shaped relationship, low female participation leads to low economic growth and vice versa. According to statistics, it shows a U-shaped relationship.

Further results show the long-run and short-run relationships between female labor force participation and the unemployment rate. There is a negative relationship between the unemployment rate and female labor force participation. It means the reduction of the unemployment rate cause to rise in female labor force participation.

References

Altuzarra, A., Gálvez-Gálvez, C., González-Flores, A. (2019). Economic Development and Female Labour Force Participation : The Case of European Union Countries. Sustainability, https://doi.org/10.3390/su11071962

Boserup, E. (1970). Women’s Role in Economic Development; St. Martin’s Press: New York, NY, USA.

CBSL. Annual Report; Central Bank of Sri Lanka: Colombo, Sri Lanka, 2020.

Chapman, K. A. (2015). Economic Development and Female Labor Force Participation in the Middle East and North Africa: A Test of the U-Shape Hypothesis. Gettysburg Economic Review, Vol.8, no.3, pp.5-22.

Chen J., Xiaokuai S., Ghulam M., and Zhongxiu Z. (2014). Factors that Influence Female Labor Force Supply in China. Economic Modelling, Vol.37, pp.485–491.

Dogan, B. and Akyüz, M. (2017). Female Labor Force Participation Rate And Economic Growth In The Framework Of Kuznets Curve: Evidence From Turkey, Review of Economic and Business Studies, Alexandru Ioan Cuza University, Faculty of Economics and Business Administration, issue 19, pages 33-54, June.

Fatima, A., Sultana, H. (2009). Tracing out the U-shape relationship between female labor force participation rate and economic development for Pakistan. International Journal of Social Economics, Vol. 36, pp.182–198 https://doi.org/10.1108/03068290910921253.

Field, A. (2005). Discovering Statistics Using SPSS. London: SAGE Publication.

Gaddis, I. and Klasen, S. (2013). Economic Development, Structural Change and Women's Labor Force Participation: A Reexamination of the Feminization U Hypothesis. *Journal of Population Economics*.

Gaddis, I., Klasen, S., (2014). Economic development, structural change, and women's labor force participation. Journal of Population Economics, 27, pp. 639–681.https://doi.org/10.1007/s00148-013-0488-2

Goldin, C. (1995).The U-shaped female labor force function in economic development in economic history. In Investment in Women's Human Capital; Schultz, T.P., Ed.; University of Chicago Press: Chicago, IL, USA.

Hare, D. (2016). What Accounts for the Decline in Labor Force Participation Among Married Women in Urban China, 1991–2011? China Economic Review, Vol. 38, pp.251–266.

Lahoti R. and H. Swaminathan (2013). Economic Development and female labour force participation in India. IIM Bangalore Research Paper, No. 414.

Lahoti, R., Swaminathan, H. (2016). Economic Development and Women's Labor Force Participation in India. Feminist Economics, 22:2, 168-195, DOI: 10.1080/13545701.2015.1066022.

Lechman, E., & Kaur, H. (2015). Economic growth and female labor force participation – verifying the U-feminization Hypothesis. New evidence for 162 countries over the period 1990-2012, Economics and Sociology, 8(1), 246–257. https://doi.org/10.14254/2071

Lechman, E., & Okonowicz, A. (2013). Are Women Important for Economic Development? *Corporate Social Responsibility and Women's Entrepreneurship around the Mare Balticum*, 310.

Lechman, E., Kaur, H. (2015). Economic growth and female labor force participation – verifying the U-feminization hypothesis. New evidence for 162 countries over the period 1990-2012. *Economics and Sociology*, Vol. 8, No 1, pp. 246-257. DOI: 10.14254/2071- 789X.2015/8-1/19

Mammen, K. and Paxson, C. (2000). Women's Work and Economic Development. *Journal of Economic Perspectives* 14 (4), pp. 141-164

Mujahıd N. and Zafar N.U. (2012). Economic Growth-Female Labour Force Participation Nexus: An Empirical Evidence for Pakistan. The Pakistan Development Review, Vol.51, no.4, pp.565–586

Narayan P. and Smyth R. (2006). Do governments lead or lag in fighting crime? *Applied Economics Letters* 13(1): 11-15.

Olivetti, C. (2013). The female labor force and long-run development: the American experience in comparative perspective. NBER Working Paper 19131.

Ozerkek, Y. (2013). Unemployment and labor force participation: A panel cointegration analysis for European countries. Applied Econometrics and International Development, 13(1), 67–76.

Pesaran, M. H., Y. Shin, and R. Smith., (2001). Bounds testing approaches to the analysis of level relationships. Journal of Applied Econometrics, 16, pp. 289-326. Available from: https://www.researchgate.net/publication/322208483_Peasaran_et_al_2001_Bound_Test_and_ARDL_cointegration_Test.

Samarakoon, S.J.M.N. & Mayadunne, G. (2018). An exploratory study on low labour force participation of women in Sri Lanka, Sri Lanka Journal of Social Sciences, 41 (2): 137-151.

Shahid, M. (2014). Impact of Labour Force Participation on Economic Growth in Pakistan, 5(11), 89–94.

Sinha, J. N. (1965). Dynamics of female participation in economic activity in a developing economy, in World Population Conference, Belgrade, 4. Survey report.

Tam H. (2011). U-shaped Female Labor Participation with Economic Development: Some Panel Data Evidence, Economics Letters, Vol. 110, pp.140–142.

Tsani, S., Paroussos, L., Fragiadakis, C., Charalambidis, I., &Capros, P. (2013). Female labor force participation and economic growth in the South Mediterranean countries. *Economics Letters*, 120(2), 323-328.

Verick, S. (2018). Female labor force participation and development Improving outcomes for women takes more than raising labor force participation — good jobs are important too, (December), 1–11. https://doi.org/10.15185/izawol.87.v2

Verme, P. (2014). Economic Development and Female Labor Participation in the Middle East and North Africa – A Test of the U-Shape Hypothesis. *Policy Research Working Papers*. The World Bank.