ICDD Working Papers | Paper No. 29 | June 2020

ICDD

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Determinants and Forecasting of Female Labour Force Participation Rate in India:

Testing of Feminization U hypothesis

The International Center for Development and Decent Work

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Design / Layout: Nina Sangenstedt, gestaltvoll.de

ICDD Working Papers
ISBN: 978-3-7376-0865-7
DOI: https://doi.org/10.17170/kobra-202005141259

First published 06/2020 in Kassel, Germany

Publishing House:
kassel university press
https://kup.uni-kassel.de

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Determinants and Forecasting of Female Labour Force Participation Rate in India:

Testing of Feminization U hypothesis[1]

1 This paper is a revised version of a paper titled 'Determinants and Forecasting of Female Labour Force Participation Rate in India: Testing of Feminization U hypothesis', presented at The Indian Society of Labour Economics (ISLE), 60th Annual Conference, organized by Indira Gandhi Institute of Development Research (IGIDR), Mumbai, Maharashtra, India, 19–21 December 2018.

Contents

Abstract

Greater involvement of women within the labour force has economic and social impact. The Female Labour Force Participation Rate (FLFPR) for India remains appallingly low at around 27%, while the male labour force participation rate has been 79.9%. In India, during 1990–2016, the FLFPR (% of female population age 15+) showed a declining trend. In this paper, the determinants of FLFPR for India have been estimated using regression analysis for the time period 1990–2016. Data on all the relevant variables have been taken from World Development Indicators, World Bank. It has been found that FLFPR has strong negative linear correlation with LN GDP (constant 2010 US$), LN GDP per capita, PPP (constant 2011 international $), female tertiary school enrollment (% gross), and literacy rate and young female (% of females age 15–24). Results of regression analysis suggest that 87.9% variations in LFPR (% of female population age 15+) in India are explained by independent variables together. To forecast FLFPR, time series analysis with Auto Regressive Integrated Moving Average (ARIMA) has been applied. The ARIMA (1,2,0) model has been found to be the most suitable for forecasting value of FLFPR (for both, in-sample and out-sample). As per out-sample forecast, FLFPR in India will have increasing trend and it will be around 33.55% in 2035. From the results of trend analysis, scatter plot and correlation analysis, it can be concluded that the declining phase of Feminization U hypothesis has clearly been explained in India during 1990–2016. Results of curvilinear regression and out-sample forecast up to 2035, using the ARIMA technique, suggests that FLFPR (% of female population aged 15+) will have increasing trend; this may explain increasing phase of Feminization U hypothesis in India. To conclude, Feminization U hypothesis in India has been partially reinforced and it will be fully supported if forecasting of FLFPR (% of female population age 15+), LN GDP (constant 2010 US$), and LN GDP per capita, PPP (constant 2011 international $) are true. The aim is not only to increase participation of females in labour force, but to create an environment, providing opportunities and freedom for women to attain decent and dignified work which will contribute significantly in the economic empowerment and the holistic development of women, thereby ensuring gender equity in the labour market in India.

Key words: *Auto Regressive Integrated Moving Average, Correlation, Curvilinear Regression, Female Labour Force Participation Rate, Regression Analysis.*

JEL Classification: J16, J21, J82

1 Introduction

In comparison to the rest of the world, India has a very low FLFPR. Low FLFPRs enact as restraints on a country's development, empowerment of its women and consequently their children. Higher participation of women in the labour force has positive social and economic impacts. In recent times, in India, economic growth rate has been increasing and there has been a high, substantial reduction in fertility rate; progress in female education has been noteworthy as well. India is passing through a phase of 'demographic dividend'. As the proportion of working-age people is quite high, per capita growth rates through labour force participation can be boosted; this might be accompanied with savings and investments. If women's participation in the labour force is largely inadequate, India could experience labour shortages in its key leading economic sectors. Empirical evidences suggest that employed women have greater negotiating power, ensuing positive repercussions on their own, along with their families' well-being. Increase in women's participation in the labour market is one of the key challenges in India's development (World Bank, 2001).

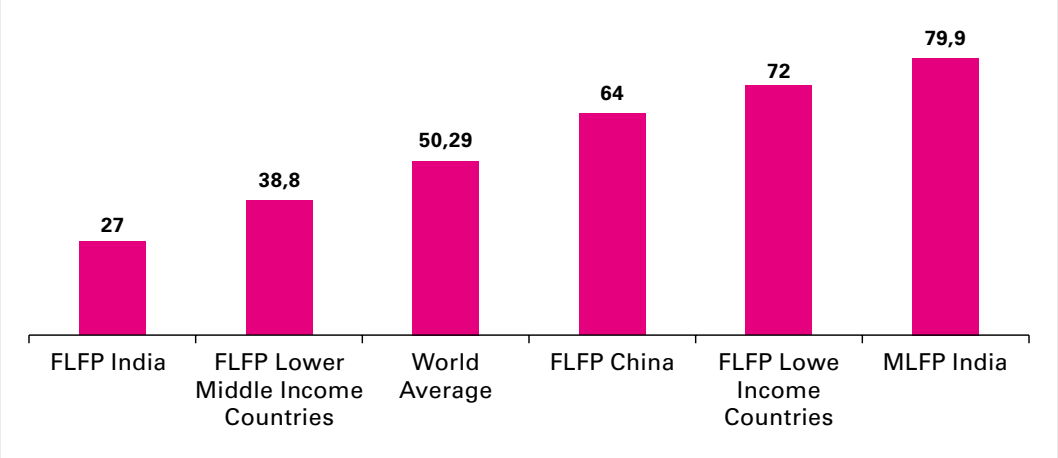
An increase in FLFPRs and earnings can lead to rapid growth and development, decrease in poverty and enhancement of prosperity. It is evident that earning of women will have positive impacts, not only on their own health but on the health and education of their children. Females are investing more from their earnings in the education and health of their children in comparison to males (Qian, 2008).

However, FLFPR for India[2] remains abysmally low at around 27%, while male LFPR (MLFPR) has been at 79.9%. In 2005, FLFP was 33.9% and has shown a decline thereafter. Clearly, the economic progress in India has not permeated to women, at least when you use FLFP as a proxy for women's economic progress. What is more astounding is that the FLFP for a country like China with a similar large population like India is 64% and that of the USA is 56.3% (World Bank, 2017) (see Fig. 1).

Fig. 2 shows that in 2017 India's FLFPR has been 27% which is lower than the world average (50%) and much lower than its competitor China (63.9%). Nepal has a very high FLFPR of 79.9% while that of Pakistan is 24.6%, which is lower than India.

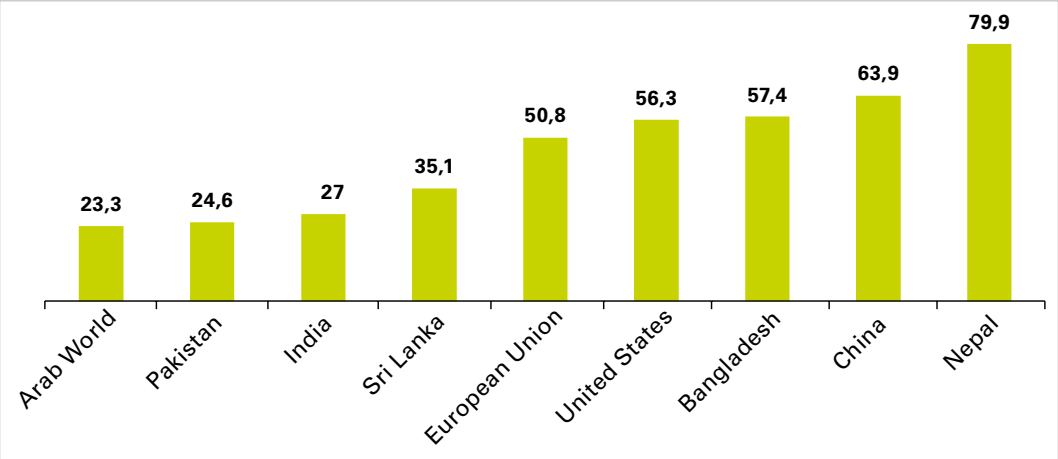
2 https://data.worldbank.org/indicator/SL.TLF.CACT.FE.ZS Retrieved from https://feminisminindia.com/2017/03/21/womens-workforce-data/

Figure 1: Labour Force Participation Rate (%)



Source: World Development Indicators, World Bank, 2017

Figure 2: Female Labour Force Participation Rate (%)



Source: World Development Indicators, World Bank, 2017

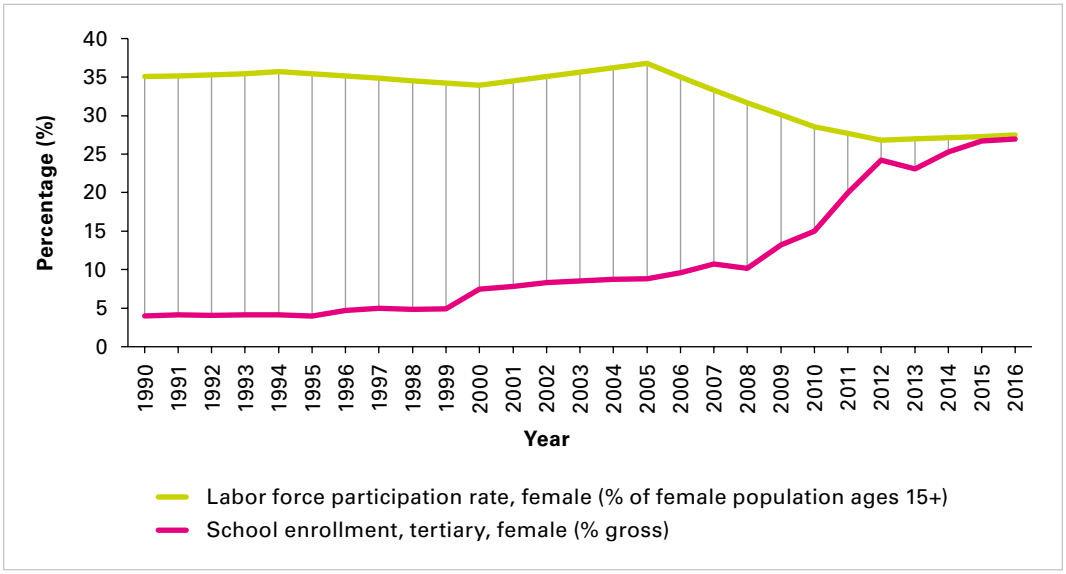
Overall, LFPR is higher in rural areas[3] (54.7%) than in urban areas (47.2%); particularly, during 2015–16; under the Mahatma Gandhi National Rural Employment Guarantee Act (MNREGA) scheme in India, 57% women were engaged in employment. However, there is no denying the fact that the FLFP for India remains a point of contention, and economic and societal progress both remain linked to the number of women in the workforce (GoI, 2016)

3 http://pib.nic.in/newsite/PrintRelease.aspx?relid=136875

2 Interrelationships between FLFPR and Education

Education should lead to jobs—this logical link is broken in India. In rural India, 67% girls who are graduates do not work. In towns and cities, 68.3% women who graduate don't have paid jobs (UNDP, 2015). Even more, women went missing from the workplace at precisely the same time that girls were making massive advances in education. Paradoxically, in India, the enrolment rate of girls in elementary education is nearly 100% (MHRD, 2016).

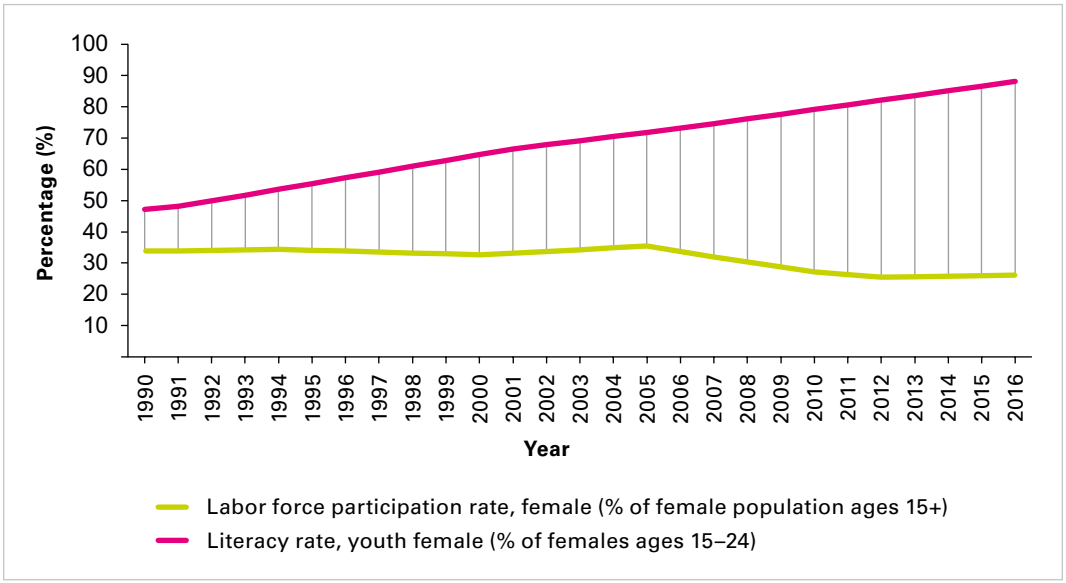
Figure 3. Female Labour Force Participation Rate and Percentage of Female Tertiary School Enrollment in India (1990 to 2016)



Source: World Development Indicators, World Bank, 2017

Female tertiary school enrollment in India has increased significantly from 4.03% to 26.96% during 1990–2016. During the same time period, literacy rates, youth female (% of female age between 15–24 years) has also increased significantly from 48.45% to 89.34% (see Figs. 3 and 4).

Figure 4. Female Labour Force Participation Rate and Percentage of Youth Female Literacy Rate in India (1990 to 2016)



Source: World Development Indicators, World Bank, 2017

3 Female Labour Force Participation Rate and GDP

Females outside the labour force constitute the underused human capital and diminish the country's potential economic growth. A number of researches endorse that low FLFPR is a hindrance on GDP growth. According to a 2015 study by the McKinsey Global Institute, a think tank, if women participated in the economy at par with men, by 2025, India could increase GDP by up to 60% or $2.9 trillion. At present, women contribute a mere 17% to the country's GDP, well below the global average of 37% (Harvard Kennedy School, 2015). GDP growth could accelerate to over 9% if India closed half the FLFPR gap with Nepal (World Bank, 2017). Further, by equalizing male and female labour force participation rate at 27% of GDP (Aguirre et al., 2012), there can be potential economic gains.

4 Review of Literature

Inequality between women and men persists in global labour markets with respect to opportunities, treatment and outcomes. Over the last two decades, significant educational achievements of women have not shown comparable improvements in their positions at work. In many regions in the world, women are more likely to become and remain unemployed, have fewer chances to participate in the labour force, and even if they do, they often have to accept lower quality jobs. Progress in surmounting these obstacles has been slow and is limited to a few regions across the world. Even in many of those countries where gaps in labour force participation and employment have narrowed down and women are seen shifting away from contributing to family work and moving to the services sector, the quality of women's jobs remains a matter of concern. The unequal distribution of unpaid care and household work between women and men and between families and the society is an important determinant of gender inequalities at work (International Labour Organization, 2016).

A decline in FLFPR in India has been a dilemma for academicians, researchers and policy makers. It is difficult to measure the participation of women in labour force because of the nature of the work they do, i.e., home-based work, agricultural labour, etc. (Nigam, 2013).

Women in India are over-represented in certain occupations. About 26% women are engaged in elementary occupations, 19% associated with craft and related trade works and 11% in sales and service along with technicians; only 7% occupy administrative, executive and managerial occupations. There is a clear separation of women in sectors that are characterized by low wages, long hours and informal working engagements. Even within the sectors where women dominate, they rarely hold upper managerial posts and key positions (Nigam, 2013).

Despite their wish to join the labour force in higher proportion, they seem to lack possession of adequate skills; further, social norms limit their mobility. Women who work apart from agriculture are normally associated in the informal sector and involved in home-based occupations (Pande et al., 2016).

In India, there are four key factors responsible for the decline in FLFPR in recent years—rising enrolment in secondary schooling; increase in household incomes, where women formed a part of the agricultural labour force; faulty calculation of women's participation in the labour force; and lack of employment opportunities for women in the non-farm sector. In comparison to illiterate women, Indian women with a graduate education have 30% and 20%, respectively, higher chance of being a regular salaried worker in rural and urban areas, respectively (Dasgupta and Verick, 2016).

In India, female labour force participation and education has followed a U-shaped pattern, with the lowest participation rates experienced by women with secondary schooling (Kapsos et al., 2016).

Social norms reinforce the roles of women as caregivers and men as breadwinners. Care needs must be addressed in an intentional and meaningful way—for both women and men—through laws, policies and services. The implications of the unequal distribution of unpaid care work are far-reaching: women are more vulnerable to violence and harassment at work, low and unequal pay, and lack of voice and representation. The current imbalance also means that men work longer hours for pay and miss out on family life. A transformative and measurable agenda for gender equality and the future of work must take these factors into account. Whether women work in the fields, boardroom or through digital platforms, whether they are account workers or managers, the care and paid work conundrum needs to be addressed. Otherwise, work for women in future will simply replicate the past. Over the past century, women have become a significant force in labour markets across the globe, and they continue to break new boundaries. However, decent work for women, including equal rights at work and equal opportunities, remains elusive (International Labour Organization, 2019).

Low engagement of women in jobs will adversely affect the growth prospective of the country. Gender gap in LFPR exists in most of the developing nations; in India it is more than 50%. The Indian government has been taking several measures to enhance participation of women in productive activities by initiating various schemes to working women and also legislative measures to enhance maternity benefits. Women workers are the most deprived in the labour market as they constitute a very high proportion among the low-skilled informal worker category and are engaged in low-productivity and low-paying work (GoI, 2018).

There is some research which has discussed why the FLFP remains so low in India. Some of the factors are listed below:[4]

- The gap in education between men and women—female literacy rate was 65.4% compared to the male literacy rate of 82.14% (GoI, 2011).
- With rising household income, it is considered unnecessary for women to work, and participation rates have started to taper off. Further, childcare and household responsibilities are considered the primary responsibility of women, and thus their work might be the most dispensable in a family setting.
- In India, gender pay gap is 25%.[5] This means that women make 25% less than what men make for the same work. This could also be a strong normative disincentive for women to enter the work force.
- Further, male education has a negative effect on FLFP—for every extra year of male education, there is a drop in female labour force participation by 1%. This effect is more than the positive effect of female education on FLFP. This could be due to the fact that increasing male education legitimizes the need for women to opt out of the workforce, not only within the family (since the male is likely to be more educated) but also on the demand side; gender inequality in society affect hiring and bias people more towards educated men than equally competent women.
- The social norms in the society also have a direct impact on the FLFP. Ideas like women should not work after marriage or not come back home late at night are just a few examples showing how restrictions may be influencing the FLFP.

4 https://feminisminindia.com/2017/03/21/womens-workforce-data/

5 http://www.business-standard.com/article/economy-policy/women-earn-25-per-cent-less-than-men-monster-salary-index-2016-117030700397_1.html

The FLFPR for India remains very low at around 27%; the MLFPR is 79.9%. The FLFPR age shows a declining trend during 1990–2016. The FLFPR age has strong negative linear correlation with LN GDP (constant 2010 US$), LN GDP per capita, PPP (constant 2011 international $), female tertiary school enrollment (% gross) and literacy rate, youth female (% of females age 15–24) in India. Results of the regression analysis suggest that 87.9% variations in FLFPR in India can be explained by independent variables (Gaurang, 2018).

Reasons for Low and Declining FLFPR in India

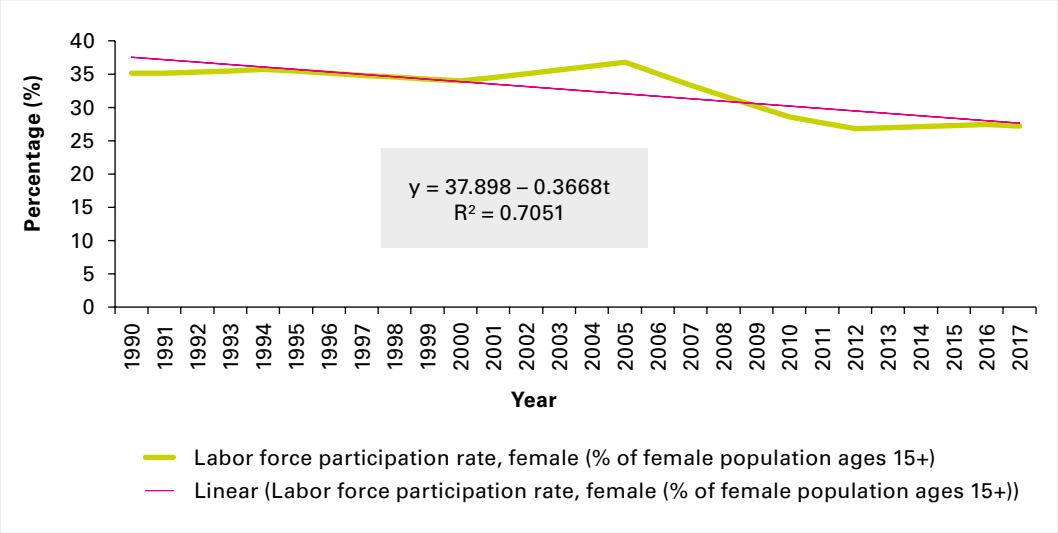
In *India Development Updates: Unlocking Women's Potential*, the World Bank has discussed and described the various reasons for the low and declining FLFPR in India:

- Around 30% decline in FLFPR in India is due to younger women undertaking more education as both secondary and tertiary enrolment rate have increased substantially.
- FLFPR declined along the rural–urban gradation. It means as areas are becoming more urbanized, chances for the women residing in those areas to work are decreasing.
- 42% India's science and technology graduates are women; this denotes a significant 'brain drain' from the modern service sector.
- The FLFPR for college graduates and above is only around 34%.
- During 2009–10, the FLFPR declined for women of all levels of education as compared to 2004–05.
- Jobs for Indian women remain primarily in the agriculture sector. The share of women in service and industry is less than 20%, which is lower compared to the overall FLFPR.
- Women enter the workforce at an older age and exit early. Nearly all men between the age group of 24–49 are in the labour force.
- Among the working age (15+), only 25% working age women work, as compared to nearly 80% working age men in 2011–12.
- During 2011–12, the FLFPR declined for women of all age as compared to 2004–05.

5 Data and Methodology

Data on all the relevant variables have been taken from the World Development Indicators (WDI), World Bank and stated in the Appendix. Regression analysis has been used to estimate determinants of FLFPR for India between 1990 and 2016. To forecast FLFPR, time series analysis with Auto Regressive Integrated Moving Average (ARIMA) has been applied. To analyse the declining phase of Feminization U hypothesis, trend analysis, scatter plot and correlation analysis have been used for the time period 1990–2016. Curvilinear regression and out-sample forecast up to 2035 using ARIMA technique has been used to explain the increasing phase of Feminization U hypothesis in India.

Figure 5: Trends of Female Labour Force Participation Rate in India (1990–2016)



FLFPR in India has reduced from 31.11% in 1990 to 27.45% in 2016. As per linear trend regression, it has reduced by 0.366% every year. From 2012 onwards, FLFPR has started increasing (Fig. 5).

5.1 Scatter Plots of Female Labour Force Participation Rate with other Variables

Fig. 6 reveals the scatter plots of FLFPR with LN GDP (constant 2010 US$); literacy rate youth female (% of females age 15–24); LN GDP per capita, PPP (constant 2011 international $); and female tertiary school enrollment (% gross) during 1990 to 2017 in India.

Figure 6: Scatter Plots of Female Labour Force Participation Rate with other Variables

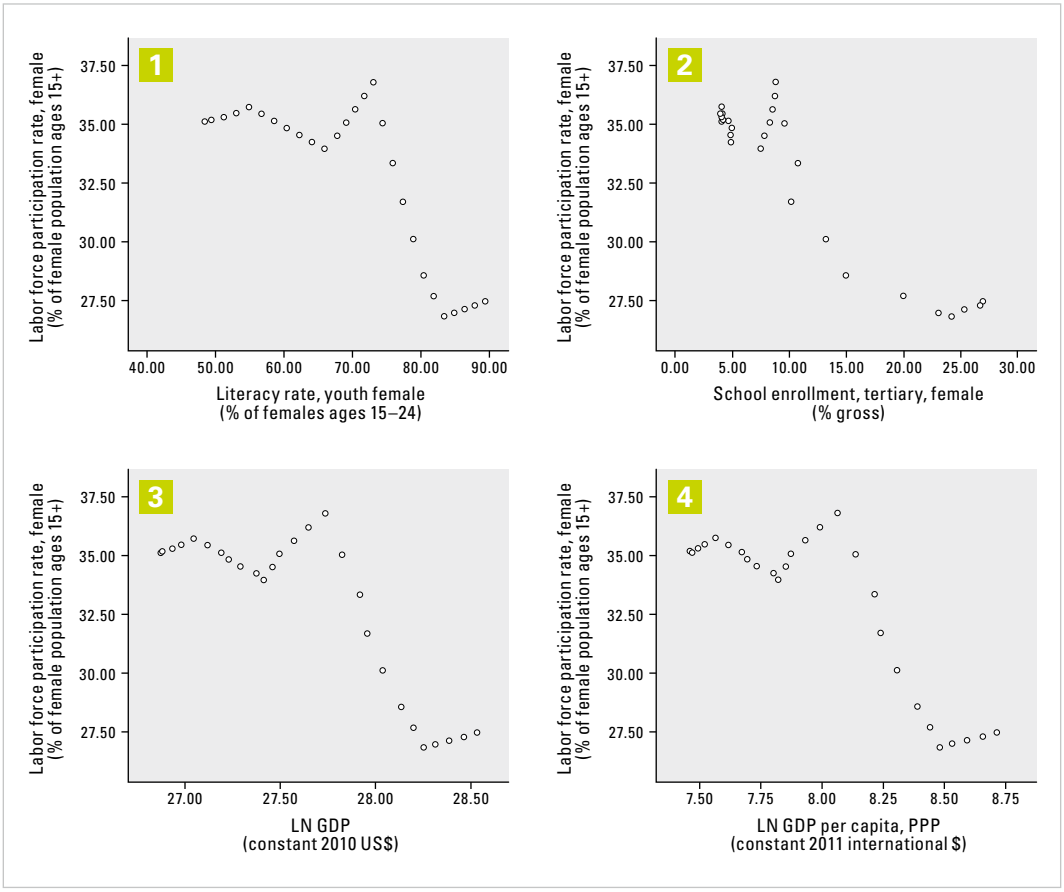


Fig. 6 shows that FLFPR (% of female population aged 15+) has negative linear correlation with (1) LN GDP (constant 2010 US$); (2) literacy rate, youth female (% of females aged 15–24); (3) LN GDP per capita; PPP (constant 2011 international $); and (4) female tertiary school enrollment (% gross) during 1990 to 2017 in India.

To know the exact direction and magnitude of association between the above variables, the Pearson correlation method has been applied.

5.2 Pearson Correlation Coefficient of Female Labour Force Participation Rate with Other Variables

The calculated value of correlation coefficient using Pearson method between FLFPR and LN GDP (constant 2010 US$) is –0.851 whereas correlation coefficient between FLFPR and LN GDP per capita, PPP (constant 2011 international $) is -0.868. The results of Pearson correlation coefficient suggests that there is strong negative linear correlation existing between FLFPR and LN GDP (constant 2010 US$) and LN GDP per capita, PPP (constant 2011 international $).

Table 1: Pearson Correlation Coefficient of Female Labour Force Participation Rate with Other Variables

CORRELATIONS						
		Labour force participation rate, female (% of female population age 15+)	**Literacy rate, youth female** (% of females age 15–24)	**School enrollment, tertiary, female** (% gross)	**LN GDP** (constant 2010 US$)	**LN GDP per capita, PPP** (constant 2011 international $)
Labour force participation rate, female (% of female population age 15+)	Pearson Correlation	1	–.803**	–.929**	–.851**	–.868**
	Sig. (2-tailed)		.000	.000	.000	.000
Literacy rate, youth female (% of females age 15–24)	Pearson Correlation	–.803**	1	.894**	.993**	.987**
	Sig. (2-tailed)	.000		.000	.000	.000
School enrollment, tertiary, female (% gross)	Pearson Correlation	–.929**	.894**	1	.926**	.938**
	Sig. (2-tailed)	.000	.000		.000	.000
LN GDP (constant 2010 US$)	Pearson Correlation	–.851**	.993**	.926**	1	.999**
	Sig. (2-tailed)	.000	.000	.000		.000
LN GDP per capita, PPP (constant 2011 international $)	Pearson Correlation	–.868**	.987**	.938**	.999**	1
	Sig. (2-tailed)	.000	.000	.000	.000	

**. Correlation is significant at the 0.01 level (2-tailed). N = 27

The correlation coefficient between FLFPR and female tertiary school enrollment (% gross) is -0.929; this means there is a strong negative linear correlation existing between FLFPR and female tertiary school enrollment in India. The correlation coefficient between FLFPR and literacy rate, youth female (% of females age 15-24) is -0.803; this indicates there is strong negative linear correlation existing between FLFPR and the literacy rate, youth female (% of females age 15–24) in India. All the calculated correlation coefficients are statistically significant at 0.01 level, i.e., 99% confidence level.

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6 Determinants of Female Labour Force Participation Rate (FLFPR) in India

Based on the above review of literature and results of correlation analysis the following determinants (explanatory/independent variables) have been used in linear regression analysis to estimate FLFPR – a dependent variable – in India. Data for all the relevant variables have been taken from the WDI, World Bank from 1990 to 2016 (see Appendix for data).

1. LN GDP (constant 2010 US$)
2. Literacy rate, youth female (% of females age 15–24)
3. LN GDP per capita, PPP (constant 2011 international $) and
4. Female tertiary school enrollment (% gross)

Two different regression models have been estimated separately for LN GDP (constant 2010 US$) and LN GDP per capita, PPP (constant 2011 international $).

(Model –1)

FLFPR *(% of female population age 15+)* **= a ± b_1LN GDP** *(constant 2010 US$)* **± b_2 tertiary school enrollment of female** *(% gross)* **± b_3 literacy rate, youth female** *(% of females age 15–24)*

(Model –2)

FLFPR *(% of female population age 15+)* **= a ± b_1LN GDP per capita, PPP** *(constant 2011 international $)* **± b_2 tertiary school enrollment of female** *(% gross)* **± b_3 literacy rate, youth female** *(% of females age 15–24)*

6.1 Results of Regression Analysis: Model – 1

Value of R Square in Model Summary suggests that about 87.9% variations in FLFPR in India are together explained by LN GDP per capita; PPP (constant 2011 international $); female tertiary school enrollment (% gross); and literacy rate, youth female (% of females age 15–24).

Table 2: Regression Analysis: Model – 1 – Model Summary

MODEL SUMMARY				
Model	**R**	**R Square**	**Adjusted R Square**	**Std. Error of the Estimate**
1	.945[a]	.893	.879	1.21655

a. Predictors: (Constant), Literacy rate, youth female (% of females age 15–24), female tertiary school enrollment (% gross), LN GDP (constant 2010 US$)

Estimated value of F statistics in ANOVA table is 64.11 and its associated significance value is <0.0001 which is lower compared to 0.01; this suggests that the model is specified correctly and all explanatory variables are meaningful in explaining variations in the dependent variable at 99% confidence level.

Table 3: Regression Analysis: Model – 1 – ANOVA

ANOVA[a]						
	Model	**Sum of Squares**	**df**	**Mean Square**	**F**	**Sig.**
1	Regression	284.650	3	94.883	64.111	.000[b]
	Residual	34.040	23	1.480		
	Total	318.690	26			

a. Dependent Variable: Female labour force participation rate (% of female population age 15+)

b. Predictors: (Constant), Literacy rate, youth female (% of females age 15–24), female tertiary school enrollment (% gross), LN GDP (constant 2010 US$)

Keeping female tertiary school enrollment (% gross) and literacy rate, youth female (% of females age 15-24) constant; a 1% increase in LN GDP (constant 2010 US$) will reduce FLFPR by 13.65%. When LN GDP (constant 2010 US$) and literacy rate, youth female (% of females age 15–24) remains constant; a 1% increase in female tertiary school enrollment (% gross) will reduce FLFPR by .293%. When LN GDP (constant 2010 US$) and female tertiary school enrollment (% gross) remains constant; a 1% increase in literacy rate, youth female (% of females age 15–24) will increase FLFPR by .512%. Estimated value of t – statistics and associated significance levels for all explanatory variables were less compared to 0.05; this suggests that all the estimated beta coefficients, i.e., b_1, b_2 and b_3 are statistically significant at 95% confidence level—means they are non-zero.

Table 4: Regression Analysis: Model – 1 – Coefficients

COEFFICIENTS[a]						
Model		**Unstandardized Coefficients**		**Standardized Coefficients**	**t**	**Sig.**
		B	Std. Error	Beta		
1	(Constant)	377.971	142.072		2.660	.014
	LN GDP (constant 2010 US$)	–13.659	5.662	–2.057	–2.412	.024
	School enrollment, tertiary, female (% gross)	–.293	.099	–.660	–2.970	.007
	Literacy rate, youth female (% of females age 15–24)	.512	.201	1.830	2.548	.018

a. Dependent Variable: FLFPR (% of female population age 15+)

6.2 Results of Regression Analysis: Model – 2

Value of Adjusted R Square in Model Summary suggests that about 87.9% variations in FLFPR in India are together explained by log of GDP per capita, PPP (constant 2011 international $), female tertiary school enrollment (% gross) and literacy rate, youth female (% of females age 15–24).

Table 5: Regression Analysis: Model – 2 – Model Summary

MODEL SUMMARY				
Model	**R**	**R Square**	**Adjusted R Square**	**Std. Error of the Estimate**
2	.945[a]	.893	.879	1.21866

a. Predictors: (Constant), Literacy rate, youth female (% of females age 15–24), female tertiary school enrollment (% gross), LN GDP per capita, PPP (constant 2011 international $)

Estimated value of F Statistics in ANOVA table is 63.86 and its associated significance value is .000 which is lower compared to 0.01; this suggests that the model is specified correctly and all explanatory variables are meaningful in explaining variations in the dependent variable at 99% confidence level.

Table 6: Regression Analysis: Model – 2 – ANOVA

ANOVA[a]						
	Model	**Sum of Squares**	**df**	**Mean Square**	**F**	**Sig.**
2	Regression	284.532	3	94.844	63.863	.000[b]
	Residual	34.158	23	1.485		
	Total	318.690	26			

a. Dependent Variable: FLFPR (% of female population age 15+)

b. Predictors: (Constant), Literacy rate, youth female (% of females age 15–24), female tertiary school enrollment (% gross), LN GDP per capita, PPP (constant 2011 international $)

When female tertiary school enrollment (% gross) and literacy rate, youth female (% of females age 15-24) remains constant, a 1% increase in log of GDP per capita, PPP (constant 2011 international $) will reduce FLFPR (% of female population age 15+) by 14.03%. When LN GDP per capita, PPP (constant 2011 international $) and literacy rate, youth female (% of females aged 15-24) remains constant; a 1 % increase in female tertiary school enrollment (% gross) will reduce FLFPR by .270%. LN GDP per capita, PPP (constant 2011 international $) and tertiary school enrollment of female (% gross) remains constant; a 1% increase in Literacy rate, youth female (% of females age 15–24) will increase FLFPR (% of female population age 15+) by .369. Estimated value of t – statistics and associate significance level for all explanatory variables were less compared to 0.05; this suggests that all the estimated beta coefficients, i.e., b1, b2 and b3 are statistically significant at 95% confidence level; it means they are non-zero.

Table 7: Regression Analysis: Model – 2 – Coefficients

COEFFICIENTS[a]						
Model		**Unstandardized Coefficients**		**Standardized Coefficients**	**t**	**Sig.**
		B	Std. Error	Beta		
2	(Constant)	122.490	36.536		3.353	.003
	LN GDP per capita, PPP (constant 2011 international $)	–14.032	5.867	–1.602	–2.392	.025
	Female tertiary school enrollment (% gross)	–.270	.107	–.608	–2.531	.019
	Literacy rate, youth female (% of females age 15–24)	.369	.145	1.321	2.549	.018

a. Dependent Variable: FLFPR (% of female population age 15+)

In both models, coefficient of literacy rate, youth female (% of females age 15–24) is positive and statistically significant. This may be due to lower level of income and education; women usually work out of necessity and in poor quality jobs, largely in agriculture. As household income increases when men find jobs in industry or services, women may choose to drop out from the labour market as higher household incomes allow women to stay at home, which is often a preferred household choice (World Bank, 2017).

7 Forecasting Female Labour Force Participation Rate (FLFPR), LNGDP (constant 2010 US$), LNGDPPEC (PPP) (constant 2011 international $) in India

To have a better and appropriate forecasting value of FLFPR, LNGDP (constant 2010 US$), LNGDPPEC (PPP (constant 2011 international $); time series analysis with sophisticated forecasting model like Auto Regressive Integrated Moving Average (ARIMA) has been applied. For the purpose of forecasting, IBM SPSS Statistics 21 software package is used with expert modeler.

7.1 Model Description

Among different ARIMA models; expert modeler suggests that ARIMA (1,2,0) model was found to be the most suitable for forecasting value of FLFPR (for both, in-sample and out-sample) whereas ARIMA (0,1,0) found to be more appropriate in the case of LN GDP (constant 2010 US$) and LN GDP per capita, PPP (constant 2011 international $). Following are the results of model fit and model statistics.

Table 8: Forecasting Female Labour Force Participation Rate in India – ARIMA Model Description

MODEL DESCRIPTION			
			MODEL TYPE
Model ID	Labour force participation rate, female (% of female population age 15+)	Model_1	**ARIMA (1,2,0)**
	LN GDP (constant 2010 US$)	Model_2	**ARIMA (0,1,0)**
	LN GDP per capita, PPP (constant 2011 international $)	Model_3	**ARIMA (0,1,0)**

7.2 Model Fit

The estimated mean value of R-square, RMSE, MAPE, MaxAPE, MAE and MaxAE for ARIMA (1,2,0) model is given in above table. The mean value of R-square is 0.99 which indicates that on an average this estimated model through ARIMA procedure has the capacity to explain about 99% variations in FLFPR, LN GDP (constant 2010 US$) and LN GDP per capita, PPP (constant 2011 international $). The mean of MAPE is 0.096 which is less than 1%. Maximum values of MAPE are 0.193 and minimum value of MAPE is 0.042; this is also less than 1%. This indicates that the maximum mean absolute percentage error is 0.193 which is very small, so one can rely on the forecasting. Mean of MaxAPE is 0.219 and their maximum and minimum values are 0.403 and 0.112, respectively. On the basis of values of MaxAPE, one can rely more on the forecasting values because maximum value of this model has forecasting error 0.403 which is less than 1%. So these models give even at MaxAPE level more than 99% accuracy in forecasting.

Table 9: ARIMA – Model Fit

MODEL FIT											
Fit Statistic	**Mean**	**SE**	**Minimum**	**Maximum**	**Percentile**						
					5	**10**	**25**	**50**	**75**	**90**	**95**
Stationary R-squared	.516	.418	.270	.999	.270	.270	.270	.279	.999	.999	.999
R-squared	.999	.001	.998	1.000	.998	.998	.998	.999	1.000	1.000	1.000
RMSE	.020	.002	.018	.023	.018	.018	.018	.019	.023	.023	.023
MAPE	.096	.084	.042	.193	.042	.042	.042	.053	.193	.193	.193
MaxAPE	.219	.160	.112	.403	.112	.112	.112	.142	.403	.403	.403
MAE	.015	.001	.014	.015	.014	.014	.014	.015	.015	.015	.015
MaxAE	.038	.010	.032	.050	.032	.032	.032	.034	.050	.050	.050
Normalized BIC	-7.396	.523	-7.749	-6.795	-7.749	-7.749	-7.749	-7.644	-6.795	-6.795	-6.795

SE: Standard Error, **RMSE**: Root Mean Square Error, **MAPE**: Mean Absolute Percentage Error, **MAE**: Mean absolute error, **MaxAPE**: Maximum Absolute Percentage Error, **MaxAE**: Maximum Absolute Error

7.3 Model Statistics

Model statistics suggest that there are five outliers in case of FLFPR whereas there is one outlier in case of LN GDP (constant 2010 US$) as well as LN GDP per capita, PPP (constant 2011 international $). Calculated value of Ljung-Box Q[6] is 13.027, 14.180 and 17.254, respectively, and their associated significance values are 0.734, 0.717 and 0.506, respectively, which are greater compared to 0.01 (at 99% confidence level); this means the residuals are independent.

Table 10: ARIMA – Model Statistics

MODEL STATISTICS									
Model	**No. of Predictors**	**Model Fit statistics**				**Ljung-Box Q(18)**			**No. of Outliers**
		Stationary R-squared	**R-squared**	**MAPE**	**MaxAPE**	**Statistics**	**DF**	**Sig.**	
Labour force participation rate, female (% of female population age 15+) – Model_1	0	.999	1.000	.042	.142	13.027	17	.734	5
LN GDP (constant 2010 US$) – Model_2	0	.270	.999	.053	.112	14.180	18	.717	1
LN GDP per capita, PPP (constant 2011 international $) – Model_3	0	.279	.998	.193	.403	17.254	18	.506	1

6 https://en.wikipedia.org/wiki/Ljung%E2%80%93Box_test

Hypothesis testing using Ljung-Box Q:

H0: The data are independently distributed (i.e., the correlations in the population from which the sample is taken are 0, so that any observed correlations in the data result from randomness of the sampling process).

Ha: The data are not independently distributed; they exhibit serial correlation.

7.4 Actual and Predicted Value of FLFPR for India (1990 to 2016)

Above table provides information on actual and predicted value of FLFPR along with its residuals based on results obtained using ARIMA (1,2,0) model for the year 1990 to 2016. ARIMA (1,2,0) predicts the value of FLFPR during 1990 to 2016 with more than 99% accuracy as value of residual (gap between actual value of FLFPR and predicted value of FLFPR) for all years during 1990 to 2016 is almost zero (0). Hence one can rely up on this model for out sample forecast.

Table 11: Actual and Predicted Value of FLFPR for India (1990 to 2016)

YEAR	ACTUAL FLFPR	PREDICTED FLFPR USING ARIMA (1,2,0)	RESIDUAL (PREDICTED – ACTUAL)
1990	35.107	N.A.	N.A.
1991	35.172	N.A.	N.A.
1992	35.287	35.24	-0.047
1993	35.463	35.45	-0.013
1994	35.722	35.69	-0.032
1995	35.431	35.47	0.039
1996	35.13	35.17	0.039999
1997	34.83	34.82	-0.01
1998	34.532	34.53	-0.002
1999	34.238	34.24	0.002001
2000	33.951	33.95	-0.001
2001	34.501	34.5	-0.001
2002	35.058	35.06	0.002001
2003	35.624	35.62	-0.004
2004	36.199	36.2	0.000999
2005	36.784	36.78	-0.004
2006	35.032	35.01	-0.022
2007	33.334	33.31	-0.024
2008	31.69	31.68	-0.01
2009	30.097	30.09	-0.007
2010	28.555	28.55	-0.005
2011	27.67	27.68	0.01
2012	26.809	26.82	0.011
2013	26.961	26.97	0.009
2014	27.117	27.13	0.012999
2015	27.267	27.28	0.013
2016	27.448	27.41	-0.038

Note: Two observations, i.e., 1990 and 1991;
were not predicted because series become stationary using second difference.

7.5 Out Sample Forecast

To get the future pattern of FLFPR (% of female population age 15+), LN GDP (constant 2010 US$) and LN GDP per capita, PPP (constant 2011 international $) in India; out sample forecasting has been done using appropriate ARIMA models. Following are the result of Out Sample forecasted value during the year 2017 to 2035.

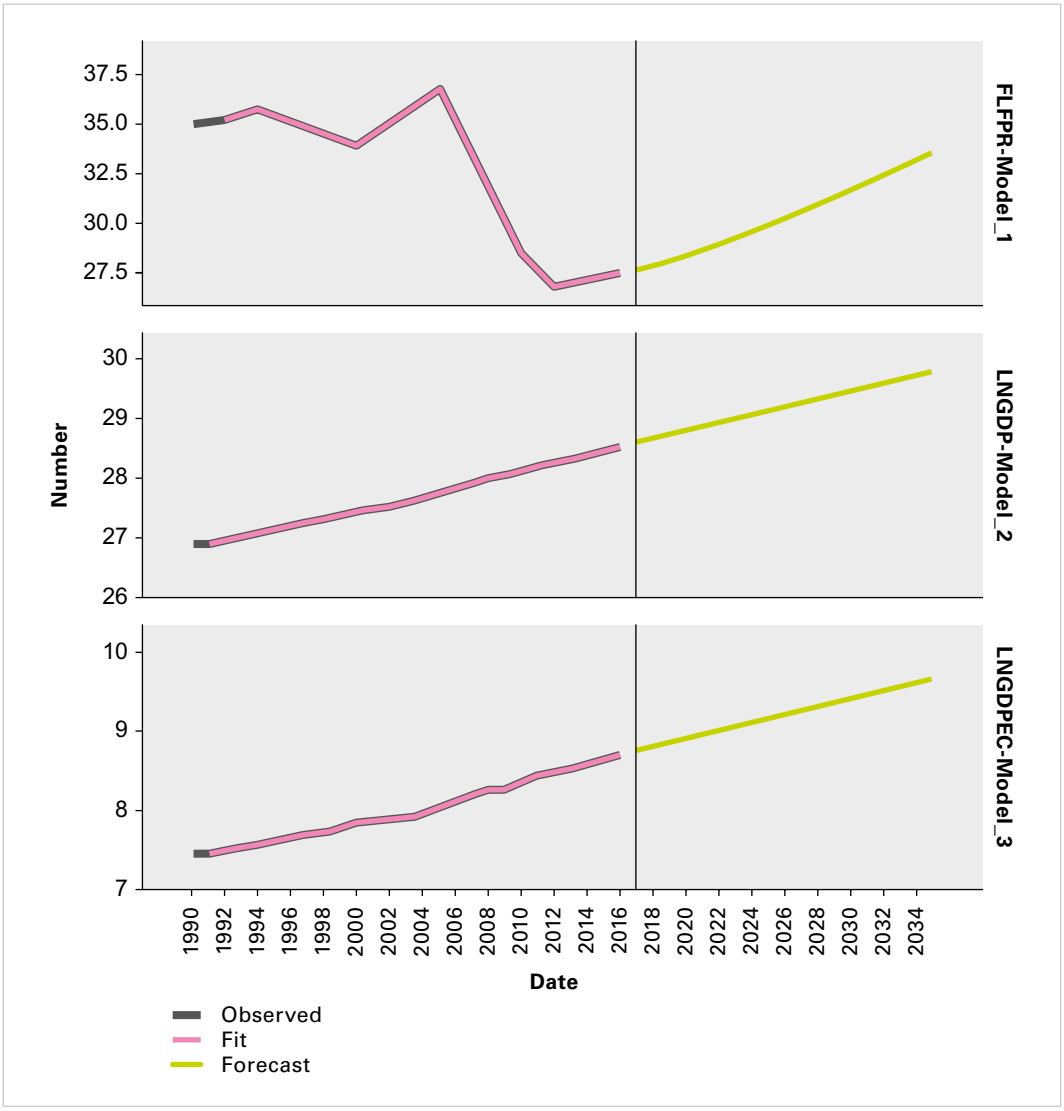
Table 12: Out sample forecast of FLFPR, GDP (Constant) and GDP per capita (PPP) for India (2017 to 2035)

YEAR	FORECASTED VALUE OF LABOUR FORCE PARTICIPATION RATE, FEMALE (% of female population age 15+) – MODEL_1	FORECASTED VALUE OF LN GDP (constant 2010 US$) – MODEL_2	FORECASTED VALUE OF LN GDP PER CAPITA, PPP (constant 2011 international $) – MODEL_3
2017	27.66	28.6	8.77
2018	27.89	28.67	8.82
2019	28.14	28.73	8.87
2020	28.41	28.8	8.92
2021	28.69	28.86	8.97
2022	28.99	28.93	9.02
2023	29.3	29	9.07
2024	29.62	29.06	9.12
2025	29.95	29.13	9.17
2026	30.29	29.19	9.22
2027	30.64	29.26	9.27
2028	30.99	29.33	9.32
2029	31.34	29.39	9.37
2030	31.7	29.46	9.42
2031	32.07	29.53	9.47
2032	32.43	29.59	9.52
2033	32.8	29.66	9.57
2034	33.18	29.72	9.62
2035	33.55	29.79	9.67

As per our sample forecast, it can be seen that FLFPR (% of female population age 15+) in India will have an increasing trend and will be around 33.55% in the year 2035. Similarly, the forecasted value for LN GDP (constant 2010 US$) and LN GDP per capita, PPP (constant 2011 international $) will have an increasing trend and it will be 29.79 and 9.67 respectively in 2035.

Figure 7 depcits the obsevered, fit and forecast value of FLFPR (% of female population age 15+), LN GDP (constant 2010 US$) and LN GDP per capita, PPP (constant 2011 international $) for India during 1990 to 2035.

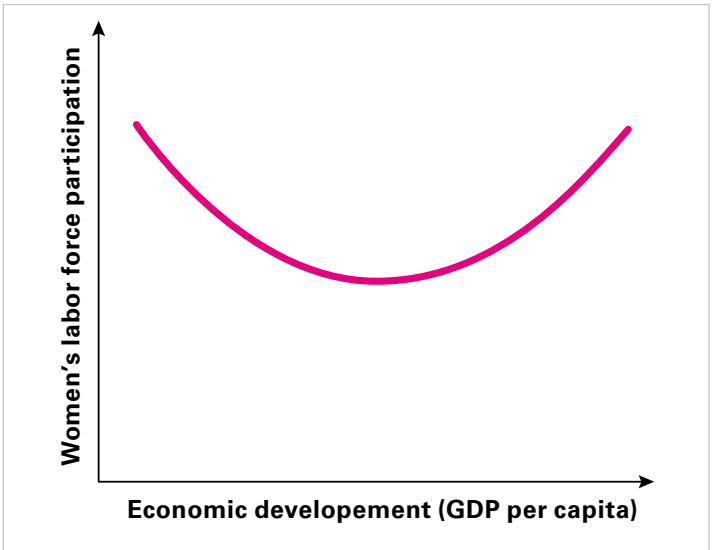
Figure 7: Obsevered, Fit and Forecast value of Labour force participation rate, LN GDP and LNGDP per capita



8 Feminization U hypothesis for Female Labour Force Participation

The Feminization U hypothesis suggests that initially, female labour force participation will reduce with increasing economic growth, but will ultimately increase as the economy grows and undergoes substantial structural changes. Feminization U hypothesis explains there is a curvilinear relationship between FLFPR and economic development (Fig. 8). If the feminization U shaped hypothesis is established, then the decrease in labour force participation is transitory and it reflects the growth process which would correct itself in due course of time. Feminization U hypothesis was first mentioned by Sinha (1967) and popularized by Goldin (1995).

Figure 8: Feminization U hypothesis



According to the Feminization U hypothesis, in the development process, female labour force participation first declines and then rises. The hypothesized mechanisms for the decline are rising incompatibility of work and family duties as the workplace moves away from agriculture and the home, income effect of husband's earnings, and stigma against females working outside of home (in other new sectors). The rising portion then comes with receding stigma, high potential earnings of females as their education improves further, as well as decline in fertility, and better options to combine work and family duties (Sher Verick, 2017).

8.1 Testing of Feminization U hypothesis for Female Labour Force Participation in India

Declining phase of Feminization U hypothesis was tested using trend analysis, scatter plot and correlation analysis using data from 1990 to 2016; increasing phase explained using forecasted value of LFPR, female (% of female population age 15+) using data from 2017 to 2035. Based on this analysis the following conclusions were drawn:

1. FLFPR (% of female population age 15+) in India has reduced from 31.11% in 1990 to 27.45% in 2016. During this time, FLFPR (% of female population age 15+) showed a declining trend. As per liner trend regression, it has reduced by 0.366% every year. This indicates the declining phase of Feminization U hypothesis in India.

2. Results of scatter plot between LN GDP (constant 2010 US$) and LN GDP per capita, PPP (constant 2011 international $) with FLFPR (% of female population age 15+) indicates that as there is increase in LN GDP (constant 2010 US$) and increase in LN GDP per capita, PPP (constant 2011 international $); FLFPR (% of female population age 15+) declines except some exceptions. This confirms the declining phase of Feminization U hypothesis in India.

3. As per the declining phase of Feminization U hypothesis, it is expected that FLFPR has negative correlation with LN GDP (constant 2010 US$) and LN GDP per capita, PPP (constant 2011 international $). Calculated value of correlation coefficient using Pearson method between FLFPR and LN GDP (constant 2010 US$) is –0.851 whereas correlation coefficient between FLFPR(% of female population age 15+) and LN GDP per capita, PPP (constant 2011 international $) is –0.868. Results of Pearson correlation coefficient suggests that there is strong negative linear correlation exists FLFPR and LN GDP (constant 2010 US$) and LN GDP per capita, PPP (constant 2011 international $).

4. As per the declining phase of Feminization U hypothesis, additionally FLFPR has negative correlation with female tertiary school enrollment (% gross) and literacy rate, youth female (% of females age 15-24). Correlation coefficient between FLFPR (% of female population age 15+) and female tertiary school enrollment (% gross) is –0.929 and the correlation coefficient between FLFPR and literacy rate, youth female (% of females age 15–24) is –0.803. This suggests there is strong negative linear correlation exists between FLFPR with female, tertiary school enrollment, (% gross) and FLFPR with literacy rate, youth female (% of females age 15-24) in India. This result also supports the claim of declining phase of Feminization U hypothesis in India. *Note: All the calculated correlation coefficients are statistically significant at 0.01 level, i.e., 99% confidence level.*

5. Increasing phase of Feminization U hypothesis was explained using forecasting technique. ARIMA (1,2,0) model found to be the most suitable for forecasting value of FLFPR (for both, in-sample and out-sample). As per out-sample forecast, FLFPR will have increasing trend and it will be around 33.55% in the year 2035 in India. From 2012 onwards FLFPR in India has started increasing and as per out sample forecast it is expected to increasing trend. This may explain increasing phase of Feminization U hypothesis in India.

From the results of trend analysis, scatter plot and correlation analysis it can be conclude that declining phase of Feminization U hypothesis has clearly explained in India during 1990 to 2016. Results of out-sample forecast using ARIMA technique suggests that FLFPR will have increasing trend; this may explain increasing phase of Feminization U hypothesis in India. To conclude, Feminization U hypothesis in India has been partially reinforced and it will be fully supported if forecasting of FLFPR will be true.

8.2 Curvilinear regression between FLFPR (% of female population age 15+) and LNGDP (constant 2010 US$) as well as LNGDPPEC PPP (constant 2011 international $) in India during 1990 to 2035

To test the Feminization U hypothesis that explains there is a curvilinear relationship exists between FLFPR and economic development, curvilinear regression was applied using predicted data on FLFPR (% of female population age 15+), LN GDP (constant 2010 US$) and LN GD PPEC (where PPP is taken as constant 2011 international $) from 1990 to 2035 for India. Two different models were estimated using following general curvilinear regression form:

$$Y = a - b_1 X + b_2 X^2$$

Here, estimated coefficient of b_1 is expected to be negative and estimated coefficient of b_2 is expected to be positive. Value of b_1 explains the declining phase of U shape curve and b_2 explains increasing phase of U shape curve.

Predicted value from FLFPR-Model_1 (FLFPR, % of female population age 15+) **= a – b_1 Predicted value of LNGDP-Model_2** (constant 2010 US$) **+ b_2 Predicted value of LNGDP-Model_2 ** 2** (constant 2010 US$) ..... **(Model – 3)**

Predicted value from FLFPR-Model_1 (FLFPR, % of female population age 15+) **= a – b_1 Predicted value of LNGDPPEC-Model_3** (where PPP is taken as constant 2011 international $) **+ b_2 Predicted value of LNGDPPEC-Model_3 ** 2** (where PPP is taken as constant 2011 international $) ..... **(Model – 4)**

Table 13: Regression Model – 3

MODEL – 3	UNSTANDARDIZED COEFFICIENTS				F	SIG	ADJUSTED R SQUARE
	B	Std. Error	t	Sig.			
(Constant)	2654.074	339.864	7.80	.000	45.78	.000	.676
Predicted value of LNGDP-Model_2 (constant 2010 US$)	–183.334	23.992	–7.64	.000			
Predicted value of LNGDP-Model_2 ** 2 (constant 2010 US$)	3.201	.423	7.56	.000			

Dependent Variable: Predicted value from FLFPR-Model_1 (FLFPR (% of female population age 15+))

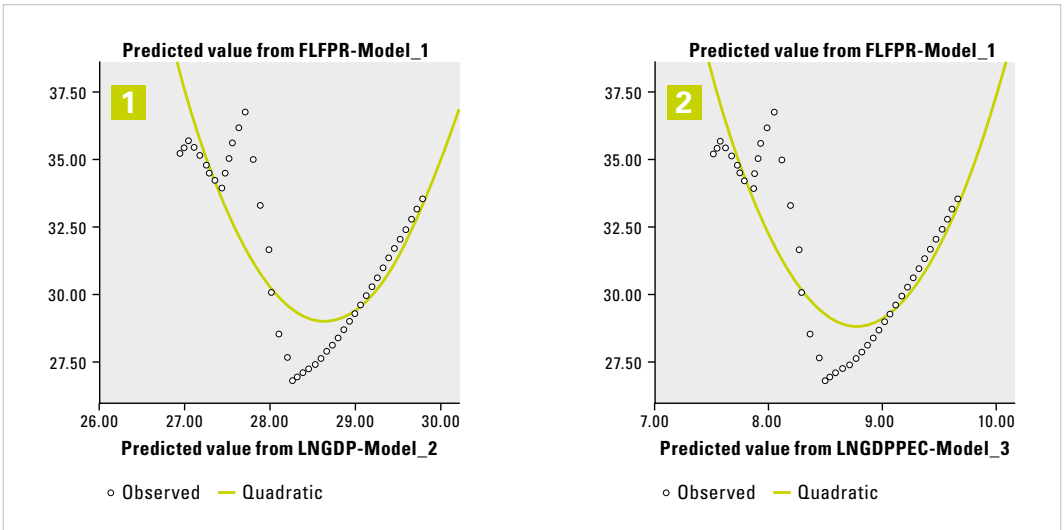
Table 14: Regression Model – 4

MODEL – 4	UNSTANDARDIZED COEFFICIENTS				F	SIG	ADJUSTED R SQUARE
	B	Std. Error	t	Sig.			
(Constant)	469.282	50.511	9.29	.000	53.772	.000	.711
Predicted value of LNGDPPEC-Model_3 (PPP (constant 2011 international $))	–100.391	11.846	–8.47	.000			
Predicted value of LNGDPPEC-Model_3 ** 2 (PPP (constant 2011 international $))	5.721	.691	8.27	.000			

Dependent Variable: Predicted value from FLFPR-Model_1 (FLFPR, % of female population age 15+)

It can be seen from estimated models 3 and 4 which calculated that coefficient of b_1 is negative and estimated coefficient of b_2 is positive. In both the models estimated coefficients b_1 and b_2 are statistically significant at 99% confidence level as the significance value for respective t-statistics is less than 0.01. Value of F-Statistics and its associated significant value suggest both the models are specified correctly. Value of Adjusted R Square is 0.67 and 0.71 for models 3 and 4, respectively. This suggest that about 67% variations in FLFPR (% of female population age 15+) are explained by variations in LN GDP (constant 2010 US$) in India. About 71 % variations in FLFPR are explained by variations in LN GDP PEC PPP (constant 2011 international $) in India. Based on estimated coefficients of b_1 and b_2 along with value of F-statistics and value of Adjusted R square for models 3 and 4, it can be concluded that a curvilinear relationship exists between FLFPR and economic development in India. From Fig. 9 it can be seen clearly that Feminization U hypothesis will be applicable in India.

Figure 9: Predicted value of FLFPR in India – Observed and Quadratic



9 Suggestions regarding improvement in Female Labour Force Participation Rate in India

The goal should not be only to increase FLFPR at any cost, but to provide work opportunities to women, freedom to choose work outside the home and access decent and productive employment. The following suggestions can be proposed in the Indian context: (1) Inclusive growth and job creation (2) Education and skills development(3) Support for reducing time burden (4) Improve transport and infrastructure (5) Legal rights and protection and (6) Measurement (Sher Verick, 2017).

1. Special importance should be given towards more investments in smaller towns and locations. This would lead to job creation and enhance opportunities for entrepreneurship programmes made accessible for women.
2. Tertiary education beyond secondary schooling needs to be encouraged, along with skill-based vocational education and training to enhance opportunities of occupational preferences for women.
3. Systematic efforts to diminish the time burden related with unpaid household work by providing child and elderly care, as well as sharing women's care responsibilities at the household level.
4. Maternity benefits along with flexible work arrangements should be made accessible. The improvement in basic infrastructure, i.e., energy, water and sanitation, would contribute significantly towards making more time available for women to work with salary or payment.
5. More provision of public transport will facilitate the movement of women, especially the lower economic segment of the society, in addition to the provision of infrastructure, such as public toilets and street lighting; this would ensure the safety of women when travelling to job.
6. Legal rights related to protection from violence and sexual harassment, equal pay, safe working conditions, non-discrimination and representation should be strengthened and implemented strictly. Social protection is crucial; it will not only support household incomes, but also inspire mobility of women.
7. Policymakers need to improve quality of data and data collection mechanism on different dimensions of female labour force participation through time-use surveys and well trained enumerators.

10 Conclusions

Gender equality is a universal common goal and an aspiration that can only be reached through solidarity between countries, people and institutions, as emphasized in the 2030 Sustainable Development Agenda. In 2016, FLFPR was very low in India in comparison with MLFPR. It has been found that FLFPR has strong negative linear correlation with LN GDP (constant 2010 US$), LN GDP per capita, PPP (constant 2011 international $), female tertiary school enrollment (% gross) and literacy rate, youth female (% of females age 15–24). The ARIMA (1,2,0) model was found to be the most suitable for forecasting value of FLFPR (for both, in-sample and out-sample). As per out-sample forecast, FLFPR in India will have increasing trend and it will be around 33.55% in 2035. From the results of trend analysis, scatter plot and correlation analysis it can be concluded that the declining phase of Feminization U hypothesis can be clearly explained in India during 1990 to 2016. The results of curvilinear regression and out-sample forecast up to 2035 using ARIMA technique suggests that FLFPR (% of female population age 15+) will have increasing trend; this may explain increasing phase of Feminization U hypothesis in India. To conclude, Feminization U hypothesis in India has been partially reinforced and it will be fully supported if the forecasting of FLFPR (% of female population age 15+) becomes true. The aim should not be to increase female LFPR at any cost, but to increase good work opportunities for women and their freedom to choose to work outside home, and access decent and productive employment. Due to the complexity of the factors driving female labour force participation, no single policy measure can be proposed to improve labour market outcomes for women in India. This will contribute significantly in economic empowerment and holistic development of women and provide gender equity in the labour market in India.

References

- **Aguirre, D., Hoteit, L., Rupp, C., and Sabbagh, K. 2012**. Empowering the Third Billion: Women and the World of Work in 2012. New York: Booz and Company.
- **Chaudhary, R and Verick, S. 2014**. 'Female Labour Force Participation in India and Beyond', ILO (International Labour Organization) Asia-Pacific Working Paper Series. New Delhi: ILO.
- **Dasgupta, S. and Verick, S. (eds) 2016**. Transformation of Women at Work in Asia: An Unfinished Development Agenda. Geneva/New Delhi: ILO/Sage.
- **Goldin, C. 1995**. 'The U-Shaped Female Labor Force Function in Economic Development and Economic History', in T.P. Schultz (eds), Investment in Women's Human Capital and Economic Development, Chicago: University of Chicago Press, pp. 61–90; http://scholar.harvard.edu/files/goldin/files/the_u-shaped_female_labor_force_function_in_economic_development_and_economic_history.pdf
- **Government of India. 2011**. Census2011. New Delhi
- **Government of India. 2016**. Economic Survey of India – 2016. New Delhi.
- **Government of India. 2018**. Economic Survey of India – 2018. New Delhi; https://www.financialexpress.com/budget/economic-survey-2018-lower-female-labour-force-participation-to-affect-growth-potential/1035062/
- **Harvard Kennedy School. 2015**. 'Identifying the Key Constraints to Young Indian Women's Labor Force Participation'; http://epod.cid.harvard.edu/files/epod/files/epod_skillfinal.pdf>
- **International Labour Organization. 2016**. 'Women at Work: Trends 2016'; www.ilo.org/wcmsp5/groups/public/---dgreports/---dcomm/---publ/documents/publication/wcms_457317.pdf>
- **International Laour Organization. 2019**. A Quantum Leap for Gender Equality: For a Better Future of Work For All; https://www.ilo.org/wcmsp5/groups/public/---dgreports/---dcomm/---publ/documents/publication/wcms_674831.pdf
- **Kapsos, S., Silberman, A., and Bourmpoula, E. 2016**. 'Decline of Women's Labour Force Participation in India: Explaining the Puzzling Trend', in S. Dasgupta and S. Verick (eds), Transformation of Women at Work in Asia: An Unfinished Development Agenda. New Delhi: Sage, pp. 75–102.
- **MHRD. 2016** 'Educational Statistics at a Glance', https://mhrd.gov.in/sites/upload_files/mhrd/files/statistics-new/ESG2016.pdf
- **Nigam, A. 2013**. 'Falling Female Labour Force Participation Rate a Puzzle'; https://www.thehindubusinessline.com/economy/%E2%80%98Falling-female-labour-force-participation-rate-a-puzzle%E2%80%99/article20579779.ece>
- **Pande, R., Johnson, J.and Dodge, E. 2016**. 'How To Get India's Women Working? First, Let Them Out of the House Available from World Wide Web', http://www.indiaspend.com/cover-story/how-to-get-indias-women-working-first-let-them-out-of-the-house-74364
- **Qian, N. 2008**. 'Missing Women and the Price of Tea in China: The Effect of Sex-Specific Earnings on Sex Imbalance', The Quarterly Journal of Economics, 123(3): 1251–1285.

- **Rami, Gaurang. 2018**. 'Trends and Factors Affecting to Female Labour Force Participation Rate in India', Journal of Emerging Technologies and Innovative Research (JETIR), 5(11): 903–910; http://www.jetir.org/papers/JETIRK006137.pdf
- **Sinha, J. 1967**. 'Dynamics of Female Participation in Economic Activity in a Developing Economy', United Nations Department of Economic and Social Affairs, Proceedings of the World Population Conference, Belgrade1965, Vol. 4. New York: UN Publications, pp. 336–337.
- **Stephan, K. 2017**. 'Low, Stagnating Female Labour-Force Participation in India', https://www.livemint.com/Opinion/vgO1ynMV6UMDnF6kW5Z3VJ/Low-stagnating-female-labourforce-participation-in-India.html
- **UNDP. 2015**. 'Women's Voices: Employment and Entrepreneurship in India'; http://www.in.undp.org/content/india/en/home/library/poverty/women-s-voices--employment-and-entrepreneurship-in-india/
- **Verick, S. 2017**. The Paradox of Low Female Labour Force Participation; http://www.ilo.org/newdelhi/info/public/fs/WCMS_546764/lang--en/index.htm
- **World Bank. 2001**. Engendering Development through Gender Equality in Rights, Resources, and Voice; http://documents.worldbank.org/curated/en/512911468327401785/pdf/multi-page.pdf
- **World Bank. 2009**. 'Female Labour Force Participation in Turkey: Trends, Determinants and Policy Framework', Report No. 48508, Washington DC: Human Development Sector Unit, Europe and Central Asia region,.
- **World Bank. 2017**. 'India Development Update – Unlocking Women's Potential'; http://documents.worldbank.org/curated/en/107761495798437741/pdf/115297-WP-P146674-PUBLIC.pdf

Appendix

YEAR	LABOUR FORCE PARTICIPATION RATE, FEMALE (% of female population age 15+)	LN GDP (constant 2010 US$)	LITERACY RATE, YOUTH FEMALE (% of females age 15–24)	LN GDP PER CAPITA, PPP (constant 2011 international $)	SCHOOL ENROLLMENT, TERTIARY, FEMALE (% gross)
1990	35.11	26.87	48.45	7.47	4.03
1991	35.17	26.88	49.35	7.46	4.16
1992	35.29	26.93	51.19	7.49	4.1
1993	35.46	26.98	53.03	7.52	4.13
1994	35.72	27.04	54.87	7.57	4.11
1995	35.43	27.12	56.71	7.62	3.98
1996	35.13	27.19	58.55	7.67	4.72
1997	34.83	27.23	60.39	7.69	4.96
1998	34.53	27.29	62.23	7.74	4.84
1999	34.24	27.37	64.07	7.8	4.9
2000	33.95	27.41	65.91	7.82	7.5
2001	34.5	27.46	67.75	7.85	7.83
2002	35.06	27.5	69.07	7.87	8.32
2003	35.62	27.57	70.39	7.93	8.54
2004	36.2	27.65	71.71	7.99	8.74
2005	36.78	27.74	73.03	8.06	8.81
2006	35.03	27.83	74.36	8.14	9.59
2007	33.33	27.92	75.85	8.22	10.75
2008	31.69	27.96	77.35	8.24	10.17
2009	30.1	28.04	78.85	8.31	13.21
2010	28.56	28.14	80.35	8.39	14.97
2011	27.67	28.2	81.85	8.44	19.99
2012	26.81	28.25	83.35	8.48	24.19
2013	26.96	28.32	84.85	8.53	23.07
2014	27.12	28.39	86.35	8.59	25.31
2015	27.27	28.46	87.85	8.66	26.73
2016	27.45	28.53	89.34	8.71	26.96

Source: World Development Indicators, World Bank, 2017

Note: (1) Data on School enrollment, tertiary, female (% gross) for some interim year was estimated by author using moving average method. (2) Data on GDP (constant 2010 US$) and GDP per capita, PPP (constant 2011 international $) was converted using Natural Logarithm (LM)

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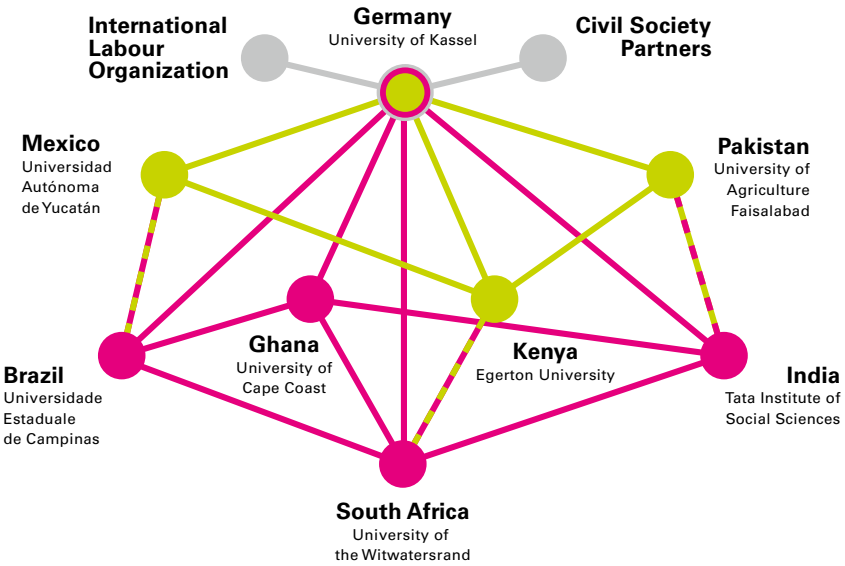

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