Young Economists Research Competition

Meghnad Desai Academy of Economics

A Regional Analysis Of Female Workforce Participation Across Indian States

An inquiry into the recent decline in female labour force participation in India

Co-authored By:

Pritika Nayak (SYBA) Smriti Natarajan (TYBA)

St. Xavier's College, Mumbai

Abstract

The sharp decline of female labour force participation in India since 2005 remains a cause of distress. While this decline has been discussed extensively on a macro-level, a regional analysis of female labour force participation helps to understand the trend better and aid in effective policy-making. Thus, this paper aims to analyse the recent decline in female participation by addressing two aspects- i) the relationship between Per Capita Income and Female LFPR and ii) assessing the decline through inter-state differences in Female LFPR. A polynomial regression model has been used to map the relationship between Per Capita Income in India and Female LFPR over time. A multiple regression model with dummy variables has been incorporated to quantify regional disparities and comprehend its relative economic repercussions. It was found that per capita income and Female LFPR are negatively related thereby providing empirical support to the household income effects hypothesis. In the regional analysis, it was found that the Southern and Western States performed better to the Northern and Eastern States. The prevalence of patriarchal institutions, coupled with lack of availability and accessibility to jobs deterred female participation in the workforce in the North and East. Whereas, high participation in the MGNREGA programme and higher literacy levels was responsible for the relatively higher Female LFPR in the South and West. After studying labour policies of various states and assessing determinants of labour force participation of women, the paper proposes policy recommendations on four key dimensions. It suggests the use of nudge theory to encourage behavioural change, increased job creation with financial support services, enforcing stronger legal rights for women across states and expanding public transport systems.

Introduction

Over the last two decades, India has undergone significant economic and social transformation. With education levels having improved considerably, females are increasingly better educated, have fewer children and are enabled with greater opportunities to engage in the labour market. However, according to a Deloitte report, participation of women in the labour force has fallen from 36.7% in 2005 to 26% in 2018. This decline in participation is rather puzzling as it occurred at a time when India was experiencing high average annual GDP growth of 8.2% along with rising incomes (World Bank, 2018).

It is critical to examine this phenomenon because female labour force participation is a significant driver of growth. **Lawson (2008)** estimated that per capita income in India could be 10% higher by 2020 if women matched men in workforce participation. In addition to boosting economic growth, increased female participation has been found to have spur productivity, alleviate poverty and enhance child health and education. Hence, fully capitalizing on the female labour force has spillover benefits essential for an inclusive and sustainable development process. Not surprisingly, the falling Female LFPR (labour force participation rate) has raised concerns about the inclusive nature of growth and status of gender equality in the country.

Some of the causes for the overall decline include increased household income (which reduces the need for females to work), lack of job opportunities or higher female attendance in educational institutions. There are also significant regional differences in female labour force participation rates across India thereby making it imperative to analyse the same. This paper aims to analyse the recent decline in female participation by addressing two aspects- **i)** the relationship between Per Capita Income and Female LFPR and **ii)** assessing the decline through inter-state differences in Female LFPR. The paper will also shed light on economic and sociocultural factors, which operate at multiple levels in society and hinder women's mobility and access to wage employment in the formal labour market across different regions in India. A polynomial regression model has been used to map the relationship between Per Capita Income in India and Female LFPR over time. A multiple regression model with dummy variables has been incorporated to quantify regional disparities and comprehend its relative economic repercussions. Lastly, assessing and comparing determinants of labour force participation across regions can aid us to understand trends and develop policy insights. New insights are recommended taking into account existing programmes like Mahatma Gandhi National Rural Employment Guarantee Scheme (MGNREGS).

Until the Periodic Labour Force Survey (PLFS) was launched in 2017, the quinquennial Employment and Unemployment surveys (EUS) of the National Sample Survey Organization (NSSO) have been the primary source of data on various indicators of labour force participation. The Employment and Unemployment NSSO survey conducted in 2009-10 exhibited a sharp decline in female labour force participation with 22.6 million fewer women in the labour force in 2010 than 2005. This is further supported by the PLFS which notes that the decline was highest

by 7% for rural female workers between 2011-12 and 2017-18. While existing papers on this subject use EUS data, this paper aims to utilize the data of the PLFS, the latest data made available to the public by the NSSO along with the EUS data from 2009-2016.

Research Questions

1. What is the nature of the relationship between per capita income of a state and Female labour force participation?
2. Are there regional differences in female labour force participation rates between different states in India?

Literature Review

An International Labour Organization (ILO) report lays out 4 key reasons for the decline in female workforce participation in India- 1) rising educational enrolment of young women; 2) lack of employment opportunities; 3) effect of household income on participation; and 4) measurement **(ILO, 2014).**

Claudia Goldin postulates that the participation of females in the labour force in comparison with the national income and economic growth is supposed to be U-shaped **(Goldin, 1994)**. An explanation for this hypothesis is that an increase in household income leads to a decline in participation through the household income effects whereby wealthier households do not require additional economic support from female members of the household. One study confirmed the existence of a U-shaped pattern of female LFPR in Pakistan, concluding that high rates of economic development encourage women to participate in the workforce as it increases opportunities for them to work. Therefore, women are taking full advantage of these increased opportunities by increasing their level of education attainment **(Fatima & Sultana, 2009).**

According to **Mazumdar and Neetha, 2011; Rangarajan et al.,2011**, increasing participation in education has to some extent contributed to restricting female employment. It was observed that between 2004-2005 and 2009-2010, 44% of females who opted out of the labour force cited education as their reason. However, in the long run, it is essential to impart skill training to draw women into the labour force and reap the benefits of demographic dividend. **Klasen and Pieters (2012)** highlighted that poorly educated women in the labour force participated out of necessity and dire economic situations, whereas highly educated women were influenced by the availability of employment opportunities with reasonable wages. Thus, female LFPR exhibits a U shape across education levels as well with highest rates for those with low education, falling to the lowest levels as females move into higher education and rising again after graduation and further. Contrastingly, some studies also elucidate that greater educational attainment leads to higher participation in the labour force as well as increased productivity. Moreover, a World Bank Study on employment in South Asia **(World Bank, 2012)** corroborates the direct linkage between education and enhanced job opportunities.

An **OECD paper** titled 'Determinants of the Low Female Labour Force Participation in India' explains that the low female participation in the Northern states is perhaps due cultural and religious tendencies. Whereas, socioeconomic factors like caste play a stronger role in the South and West. Women from the upper castes are the least likely to work, followed in order by women from other backward classes, scheduled castes, and scheduled tribes (ST). Sociologists have coined the term 'Sanskritization' or an upward mobility strategy when this norm is emulated by the lower strata as staying home is perceived to be symbolic to affluence and higher standing in the society. Nevertheless, with higher female LFPR rates and performance in the South, one cannot ignore the role of broader economic policies, state government policies that are shaping the prospects for young women.

Saha, Verick, Mehrotra and Sinha (2016) draw on the examples of Uttar Pradesh (Northern State) and Gujarat (Western State) to discuss declining Female LFPR. They describe problems at the workplace and challenges endured by working women at home to be detrimental to workforce participation. An interesting observation was that contrary to their counterparts in UP, women not engaged in any economic activity in Gujarat identified themselves to be 'unemployed' instead of being housewives. Gujarat, being more developed than UP has a greater proportion of women working, indicating greater employment opportunities and higher motivation to work amongst females. Women in Gujarat considered themselves to be a part of the labour force and hence, identified themselves as unemployed despite being engaged in domestic chores. Thus, perceptions amongst females influenced by societal norms vary substantially across regions and need to be thoroughly examined to catalyze positive change.

Part A: Polynomial Regression Analysis for testing the Household Income Hypothesis

Methodology

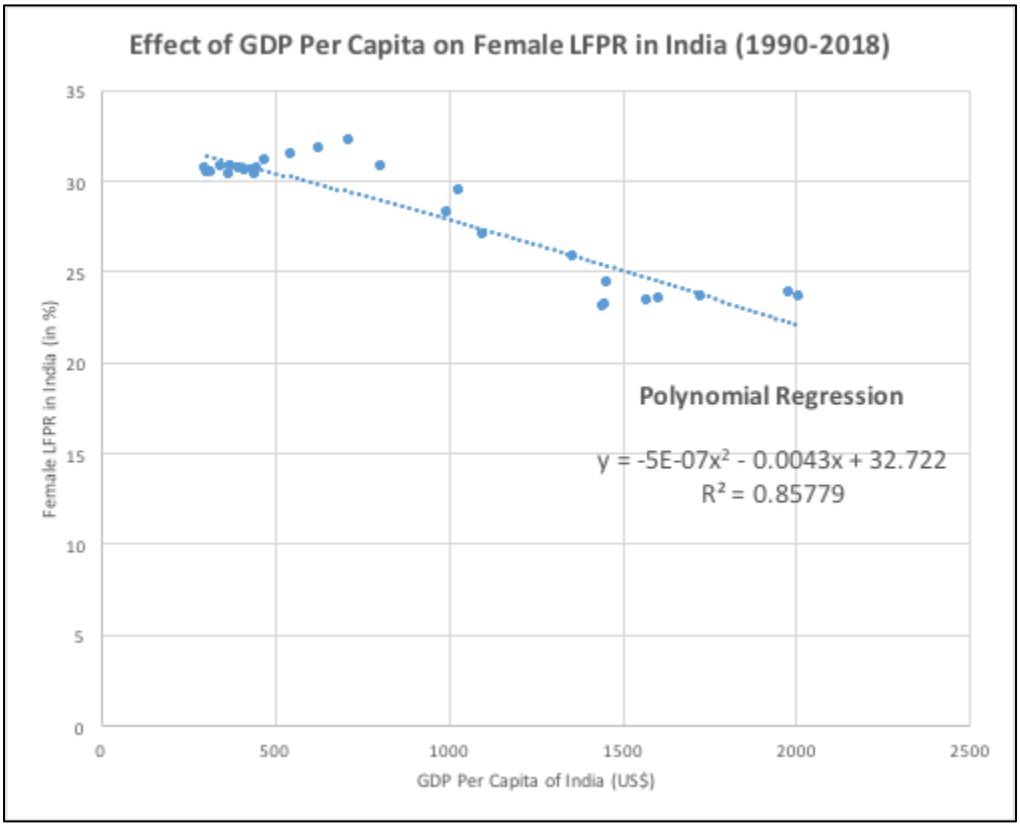
In this regression, we have chosen to regress Per Capita Income in India (**PCI)** on Female LFPR (**FLFPR)** to determine if the Household Income Effects Hypothesis can explain the recent decline in female workforce participation. The time period we have considered is for the years 1990-2018 (total of 29 observations). GDP Per Capita (in current US$) has been used as an estimate of Per Capita Income. Female LFPR has been calculated as the percentage of the female population ages 15+ who are part of the workforce (modeled ILO estimate). Data has been sourced through the World Bank database.

The following polynomial model of order 2 was used to do the regression-

$$\mathbf{FLFPR} = \boldsymbol{\beta}_0 + \boldsymbol{\beta}_1\mathbf{PCI} + \boldsymbol{\beta}_2\mathbf{PCI}^2$$

Result

FLFPR = -5E-07**PCI**^{2}- 0.0043**PCI** + 32.722



Graph 1.1: Effect of Per Capita Income on Female LFPR in India (1990-2018)

Graph 1.1 shows a negative trend indicating that an increase in Per Capita Income has led to a decrease in Female LFPR in India. A high R squared value of 85.78% also suggests that a high proportion of the variance in Female LFPR is explained by the independent variable i.e. Per Capita Income. A one-tailed F-test was conducted to test the two-sample variances. The f-calculated value obtained was 29386.57402, which was found to be significant at a 95% confidence interval.

The results found correspond to the 'household income effects' mentioned in the literature review. In developing countries, women from poorer households may find the need to provide additional income by working in order to fulfill minimum subsistence needs or help recover from sudden economic shocks that hit the household. However, as household income increases and the households become wealthier, the need to work diminishes and women confine themselves within the domestic sphere to engage in familial responsibilities.

Despite there being the prospect of additional household income, a deeply conditioned patriarchal system implies that with rises in income, women do not need to work anymore and hence, they withdraw from the labour force, causing a decline in female LFPR.

Part B: Dummy Variable Regression Analysis for Regional Differences in Female LFPR in India

Methodology

In this regression, we have used qualitative dummy variables to capture the effect of region and time on Female LFPR across 16 states in India. The time periods considered in this regression are 2009-10, 2011-12, 2012-13, 2015-16 and 2017-18. Data for the years 2010-2011 and 2016-2017 were found to be unavailable. The panel data consists of a total of 96 observations. Data has been sourced from Employment and Unemployment surveys (EUS) of the National Sample Survey Organization (NSSO) and the Periodic Labour Force Survey.

Independent Variable Region (R)

This paper studies Female LFPR patterns in 16 states divided into 4 categories- North, South, East and West.

North	South	East	West
Uttar Pradesh	Andhra Pradesh	Bihar	Maharashtra
Punjab	Karnataka	Odisha	Madhya Pradesh
Rajasthan	Kerala	West Bengal	Chhattisgarh
Himachal Pradesh	Tamil Nadu	Jharkhand	Gujarat

Base region for comparison- East
R1- South region dummy = 1 if state belongs to South category, =0 otherwise
R2- North region dummy =1 if state belongs to North category, =0 otherwise
R3- West region dummy =1 if state belongs to West category, =0 otherwise

Independent Variable Time (T)
Base year for comparison - 2009-10
T1- Time dummy for 2011-12 = 1 if year is 2011-12, =0 otherwise
T2- Time dummy for 2012-13= 1 if year is 2012-13, =0 otherwise
T3- Time dummy for 2013-14 = 1 if year is 2013-14, =0 otherwise
T4- Time dummy for 2015-16= 1 if year is 2015-16, =0 otherwise
T5- Time dummy for 2017-18= 1 if year is 2017-18, =0 otherwise

Dependent Variable (Y) Female Labour Force Participation Rate of state

To calculate Female LFPR, the EUS utilizes worker population proportion for persons aged 15 years and above according to usual principal and subsidiary approach for combined (rural and urban female). This was converted into percentage terms to ensure uniformity of data units obtained from different sources. For Female LFPR from PLFS, it uses labour force participation rate (LFPR) (in percent) according to usual status (ps+ss) for all aged persons and combined (rural and urban female).

Resultant Equation:

$\mathbf{Y_{it} = \beta_0 + \beta_1 R1 + \beta_2 R2 + \beta_3 R3 + \beta_4 T1 + \beta_5 T2 + \beta_6 T3 + \beta_7 T4 + \beta_8 T5}$

Result

$\mathbf{Y_{it}} = 12.95 + 10.67\mathbf{R1} + 1.70\mathbf{R2} + 9.63\mathbf{R3} + 9.6\mathbf{T1} + 19.69\mathbf{T2} + 14.07\mathbf{T3} + 9.41\mathbf{T4} + 2.07\mathbf{T5}$

Table 1.1 summarizes the results of the regression. It includes the regional beta coefficient values (Region East has no beta coefficient as it is the base category against which other regions are compared) and the estimated average Female LFPR for three of the six time periods. The results of the regression show that in comparison to Female LFPR in Eastern states, Southern states fare the best, followed by Western states and Northern states. A quick look at the estimated Female LFPR reveals that all regions are seeing a decline in female workforce participation in the past few years, since 2013-14.

Region	***Regional Beta Coefficient***	***P-values***	***Estimated FLFPR (in %)***		
			2009-10	***2013-14***	***2017-18***
South	*10.67*	*0.00098588*	*23.63*	*37.69*	*25.7*
West	*9.63*	*0.002789528*	*22.59*	*36.65*	*24.66*
North	*1.7*	*0.587561167*	*14.66*	*28.73*	*16.73*
East	-	-	*12.95*	*27.02*	*15.03*

Table 1.1: Summary of the results of the dummy variable regression

In order to test the significance of the beta coefficients of the multiple regression, we have used the F-Test with level of significance at 5% through our regression analysis. We observe that the calculated f-calculated value of 4.670299 is significant, proving that there exist regional differences.

Analysis

North Region States Analysis (Uttar Pradesh, Punjab, Rajasthan & Himachal Pradesh):

On average, northern region states observe a Female LFPR that is **1.70375 percentage points higher** than the Female LFPR of Eastern region states. For the year 2009-10, the dummy variable regression shows us that the average Female LFPR for states in the North region was 14.66%. This number showed a steady increase in the following years. However, by the end of 2017, Female LFPR **was only 16.73%.** Overall, FLFPR in Northern Indian states is substantially lower compared to South and West India.

Most North Indian states are predominantly engaged in **agriculture and allied activities**. The poor state of farming and agriculture in India makes it hard for women to find short- or long-term employment opportunities. The gendered division of labour in agriculture has also **prevented women from formally entering the workforce** with women often participating in agricultural work as unpaid subsistence labour. Additionally, as women move away from working in agriculture, they haven't been able to secure better jobs elsewhere. For example, rural Rajasthani female workers are predominantly engaged in manual work such as construction in urban Rajasthan.

Another common attribute among North Indian states is the **high-levels of out-migration**. Given the lack of job opportunities in North Indian states such as U.P. and Punjab, the workforce has traditionally migrated to the south and west in search of better employment. The case with women is slightly different. Census 2011 revealed that women form almost 70 percent of the internal migrant community. However, this migration is mostly due to reasons associated with family or marriage. There is still a resistance towards women migrating to other states to improve their job prospects, which often limits them to pursuing traditional jobs or remaining underpaid, eventually discouraging them from joining the workforce. This is further heightened in light of the widening gender pay gap where daily wage working women earn 34% less than men (ILO).

The social and cultural context of North Indian states could also help explain the regional disparity in female participation in the workforce. The Patriarchy Index developed by Surbhi Ghai (2018) finds that states with high levels of patriarchy, as estimated by the index, are also states with a larger proportion of higher-educated (graduate or higher degrees) women out of the labour force. Ghai's index supports the commonly cited **'north-south divide'**, which suggests that discrimination against women in India decreases as one travels from the North to South. North Indian states, especially U.P. and Rajasthan have **fared poorly on several indicators of women empowerment** (such as percentage of married women employed, percentage of those earning cash and percentage of those earning more or the same as the husband).

An exception to this overall trend among North Indian states is Himachal Pradesh, which has consistently maintained a high FLFPR. This can be attributed to a high sex ratio at birth and successful educational initiatives by the state government. During the period from 2004–2005 to 2011–2012, Himachal Pradesh was the only major state that did not witness an increase in the gender gap between male and female rural labour force participation. It has also been noted that women from hill states have traditionally been an important part of the workforce.

South Region States Analysis (Andhra Pradesh, Karnataka, Kerala & Tamil Nadu):

On an average, Southern States observe a Female LFPR that is 10.67 percentage points higher than the Female LFPR of Eastern region states. This coefficient is also higher than the North and West region thereby indicating that Southern states are performing better or rather best compared to the national average.

Andhra Pradesh observed a relatively high rate in the South with the maximum participation of 49.6% in the year 2013-14. This is mainly because the proportion of women agricultural labour is higher than male labour in all districts. The dropping out of men out of agriculture has led to an increase in women's share of the agricultural workforce and an expansion of their role in the sector. Furthermore, it is important to note that Andhra Pradesh is one of the few states in the country with **high participation of women in MGNREGA**. Since the female wages are far above in the MGNREGA scheme in Andhra Pradesh, it attracts females in large numbers and stimulates economic participation.

Whereas, Kerala ranked last amongst the South states studied in the sample. It is paradoxical that despite having the highest female literacy levels in the nation, the custom of matrilineal inheritance and a favourable female sex ratio, the state is unable to engage female workforce participation. A possible reason for this can be traced to the fact that those exiting out of the labour market are typically young, educated women qualified for professional occupations, suggesting '**educated unemployment'** fueled by widening gender pay differentials in top occupations. Hence, it is evident that earnings pay a crucial role in determining the economic decisions of women in Kerala. On one hand, this state has excelled in achieving equal socio-demographic advances for males and females. However, gender imbalance and exploitation in the workplace continues to deter females from joining the labour force and thus, requires immediate attention.

Karnataka observed an increase in FLFPR from 25.3% in 2009 to 33.3% in 2015 before suddenly reducing to 20.4% in 2017. The state observed a decline in participation of rural women in the agricultural sector as they displayed entrepreneurial tendencies by starting eateries and other small businesses. This has been possible due to easy access to funds under government schemes thereby highlighting the role of **access to financial services** as a determinant of FLFPR. However, compared to Andhra Pradesh, MGNREGA has performed rather poorly due to programmatic and implementation issues.

An interesting difference to note in the Southern state of Tamil Nadu is that although the FLFPR has been declining, when women work, they by and large have similar types of jobs as men. Perhaps the **diminishing gender gaps** in the workplace could be the reason why Tamil Nadu has the second highest FLFPR in the Southern region. Moreover, education is one of the main factors determining women's labour supply decisions in Tamil Nadu. Below Kerala, with the second **highest female literacy rate** of 79% in the region, we can infer that the higher the literacy rate and education, the higher the likelihood of female participation.

West Region States Analysis (Maharashtra, Chhattisgarh, Madhya Pradesh & Gujarat):

On average, Western States observe a Female LFPR that is 9.632 percentage points higher than the Female LFPR of Eastern region states. It is not surprising that the GSDP of Western States in India is highest compared to other regions. This brings into relevance the economic relationship between GSDP and FLFPR, with the latter being one of the many determinants of GSDP and economic growth.

On the work front, Maharashtra has observed a high participation from rural women compared to other states. However, **female farmers do not own the land they cultivate** and thus, they are victims of lower economic and social security. Much like other Indian states, property rights in Maharashtra are skewed in favour of men. The **cultural norm** of women not having the right to hold land, perpetuated by the patriarchal orientation poses a threat to stable female participation rates in the future. Although, the state along with Chhattisgarh leads in the **quality and quantity of jobs available to females in the urban sector**.

In the year 2015, Chhattisgarh observed highest FLFPR in not only the Western region but the nation with 54.2%. In rural areas of Chhattisgarh, total female workers are increasing compared to the total male workers, indicating an increase in women's work force participation rate in agricultural activities. With higher child sex ratio compared to other states, there are more females available to work in the population. Recently, female participation in the urban sector has risen due to an increase in the number of jobs available.

In the case of Gujarat, growth has not materialized in higher employment opportunities for females. Thus, the availability of employment opportunities plays an active role in impacting labour decisions of females. Especially, the **availability of jobs in the vicinity of one's neighbourhood.** Furthermore, the all-time low in Gujarat's FLFPR to 15.4% in 2017 can also be attributed to low participation of females in the MGNREGA programme.

Madhya Pradesh recorded a sudden fall in FLFPR in 2015 to 17.2% from 34% the previous year. In response, the state government promoted a **Policy for Women (2015)** to reduce gender disparities, develop competencies and skills among women to make them employable. Thus, this highlights the active role of the MP government towards making women self-reliant and economically strong through the policies and programmes undertaken. The MP government is also

the first state government in the nation to have a gender-based budget. An important policy was the '**Special Education Zone for Women'** which could have resulted in a fall in the FLFPR temporarily as more females pursued higher education and professional courses. This would however, stimulate labour force participation in the long run along with a more productive female workforce. While a significant proportion of the Madhya Pradesh population is engaged in agriculture, female labour in the agricultural sector goes unrecorded even though the quantum of work is higher and more tedious than men. In a research conducted by Yale University, it was found that rural women from Madhya Pradesh believe that financial literacy and access to financial services would better equip them to join the workforce. Having a bank account to deposit wages would entrust females with independence, financial autonomy and foster a sense of security thereby encouraging them to be economically active. Furthermore, financial autonomy helps gender norms become more progressive and dilute patriarchal control.

East Region States Analysis (Bihar, Odisha, West Bengal & Jharkhand):

The East region was used as the base category for comparison in the dummy variable regression. It can be seen that the average FLFPR in the region has been the lowest compared to other regions. The estimated average level of female participation in the region in 2017-18 is 15.03% which is substantially **lower than the national average of 23.3%.** It is important to note that North-Eastern states have not been included in this analysis. These states have historically had higher rates of FLFPR.

The case of Bihar is important to study as it has the **lowest FLFPR in the country** (7.2% among rural women) and the **highest gender pay gap** (women are paid 63% less than men). A Patna National Sample Survey report said that despite various interventions at the supply and demand-level, that facilitate greater economic engagement among women, their access to opportunities remained constrained ("Work Participation of Women in India & Bihar", 2010).The report elaborates that ***access*** is a gendered phenomenon which denotes the ability to reach and use various resources including access to information, rights, land, money, education, skills, political participation and voice. Poor infrastructure and limits to mobility of women in the public domain also affect workforce participation. This is likely true for most eastern region states as they are some of the poorest states in the country (in terms of output and GSDP) and therefore lack in basic infrastructure and transport facilities. The primary means of livelihood in these states is through farm activities that are associated with low labour productivity and unstable incomes. The states of Bihar, Jharkhand and West Bengal also rank in the bottom ten in the average number of persons worked under employment schemes such as MGNREGA.

A unique case among states in East India (and most North-Eastern states) is that of **tribal women**. Tribal women have usually enjoyed a higher social status in their own communities than Indian women in general, with some tribes in following matriarchy (Naresh, 2014). In terms of equitable gender work participation, while states like Mizoram, Manipur and Nagaland fared well, tribal

women in Bihar, Odisha and West Bengal showed some of the highest gender disparities. This has been attributed to the low levels of literacy in the state and financial problems women face in migrating to urban areas.

Policy Recommendations

Due to the complexity of the factors driving FLPR, it is not possible to design one policy measure that can be applied to the entire nation. However, based on the analysis and insights of this paper, four key policy dimensions are suggested:

i. **Using the principles of nudge to encourage behavioural change:** The East and North region observed high levels of patriarchy and cultural sanctions towards women joining the workforce. Thus, the government should prioritize on investing an appropriate proportion of the budget towards regional social campaigns which focus on changing societal stereotypes and promote the idea of women working. The Economic Survey 2018-19 emphasized on the need for initiatives to become women-led from women-centric.

ii. **Job creation along with financial support services:** Although MGNREGA has generated jobs for rural women and witnessed higher participation in the Southern states, there still exist implementation barriers and poor performance in other regions, especially the North and East. Furthermore, women are not appropriately trained regarding the direct bank deposits. Thus, the need of the hour is a macroeconomic environment that supports quality job creation. In rural areas, this should be supplemented by financial literacy programmes to encourage financial autonomy. Whereas, to further stimulate urban female participation, states should focus on creating jobs that target to combat 'educated unemployment' whereby women are encouraged to work as they feel it is fulfilling by rewarding them on a fair basis according to their competencies rather than gender.

iii. **Generating female employment opportunities in non-agricultural sectors, especially in the Northern States**: With declining availability of agricultural work due to reduced land holdings and structural changes in farming, it is essential to generate employment in non-agricultural sectors for rural women. However, employment avenues made available to women must be commensurate with their skill level unless the government can supplement opportunities with formal training. An effective policy would target increasing and promoting traditional activities like local embroidery work, which can also be taken up as a home-based activity.

iv. **Enforcing stronger legal rights for women across states:** Legal rights relate to property and land, equal pay, safe working conditions etc. Except Kerala, all the states in the sample studied had a custom of patrilineal inheritance thereby weakening social and economic security of females. Formulating policies regarding legal rights can increase women's bargaining power within the household and workplace. Furthermore, having property which can be used as collateral to secure loans would positively boost female entrepreneurs

in rural areas. Corrective measures to equalize pay structures between the genders will again attract women to join the workforce.

v. **Focus on expanding public transport systems in Eastern States (Bihar, Odisha):** In the East, poor infrastructure hinders FLFP. In India, women prefer to work in the vicinity of their neighbourhood. However, accessing jobs in a safe and secure manner remains a challenge and thus, deters participation. Investing in infrastructure capacities related to enhanced public transportation can facilitate women's entry in the labour market.

Limitations of the study

i. This paper groups the 16 states on the basis of their geographical location and proximity to assess regional differences in female LFPR. In doing this, individual differences and similarities between different states may be neglected.

ii. Traditional estimates of Female LFPR, like those used in this paper, do not take into account many forms of domestic work and unpaid services that women are often engaged in.

iii. Existing papers emphasize on concerns regarding the NSSO survey conducted in 2009-2010 as it has been revealed that this survey made use of contract workers who may not have been trained adequately in classifying individuals according to NSSO standards.

iv. PLFS has been implemented with certain changes in survey methodology and data collection mechanism. Thus, there exists a degree of uncertainty to the extent that EUS and PLFS can be compared.

Conclusion

In conclusion, Part A established the negative relationship between per capita income and Female LFPR thereby providing empirical support to the household income effects hypothesis. In Part B, the regional analysis, it was found that the Southern and Western States performed better to the Northern and Eastern States. For the year 2017-18, South had the highest estimated Female LFPR of 25.7% whereas East observed the lowest with 15.03%. The prevalence of patriarchy coupled with lack of availability and accessibility to jobs deterred females from participating in the workforce LFPR in the North and East. Whereas, high participation in the MGNREGA programme and higher literacy levels were responsible for the relatively higher female LFPR in the South and West.

References

Bhalla, S.; Kaur, R. 2011. Labour force participation of women in India: Some facts, some queries, Working Paper No. 40 (London, Asia Research Centre, London School of Economics and Political Science).

Bonner, K., & Daum, J. (2012). MGNREGA Implementation: A Cross-State Comparison. Retrieved 3 February 2020, from http://www.indiaenvironmentportal.org.in/files/file/MGNREGA%20Implementation%20A%20Cross-State%20Comparison.pdf

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*, *36*(1/2), 182-198. doi: 10.1108/03068290910921253

Gender Pay Gap in the Formal Sector: 2006 - 2013. (2013). Retrieved 3 February 2020, from https://wageindicator.org/documents/publicationslist/publications-2013/gender-pay-gap-in-formal-sector-in-india-2006-2013

Ghai, S. (2018). The anomaly of women's work and education in India. Retrieved 3 February 2020, from https://icrier.org/pdf/Working_Paper_368.pdf

Goldin, Claudia. 1994. "The U-shaped Female Labor Force Function in Economic Development and Economic History." In Investment in Women's Human Capital and Economic Development, edited by T Paul Schultz. University of Chicago Press.

Klasen, S. and Pieters, J.2012. 'Push or pull? Drivers of Female Labour Force Participation during India's Economic Boom', IZA Discussion Paper No. 6395. (Bonn, IZA)

Lahoti, R.; Swaminathan, H. 2013. Economic growth and female labour force participation in India, Working Paper No. 414 (Bangalore, Indian Institute of Management).

Lawson, Sandra. 2008. 'Women hold up half the sky'. Global Economics Paper No. 164. Retrieved from http://www.goldmansachs.com/our-thinking/investing-in-women/bios-pdfs/women-half-sky-pdf.pdf

Mazumdar I. and Neetha, N. 2011. 'Gender dimensions: Employment trends in India, 1993-94 to 2009-10', Economic and Political Weekly, Vol 47 with Vol. XLVII

Menon, S. and Tomy, D. and Kumar, A. (2019) Retrieved 3 February 2020, from https://www.sattva.co.in/wp-content/uploads/2019/06/Sattva_UNDP_Female-Work-And-Labour-Force-Participation-In-India.pdf

Naresh, G. (2014). Work Participation of Tribal Women in India: A Development Perspective. *IOSR Journal Of Humanities And Social Science (IOSR-JHSS)*, *19*(12). Retrieved from http://iosrjournals.org/iosr-jhss/papers/Vol19-issue12/Version-2/G0191223538.pdf

Saha, P. and Verick, S. and Mehrotra, S. and Sinha, S. (2014). Declining Female Employment in India: Insights from Gujarat and Uttar Pradesh, Transformation of Women at Work in Asia, Pg 104-121

Sorsa, P., et al. (2015), "Determinants of the Low Female Labour Force Participation in India", OECD Economics Department Working Papers, No. 1207, OECD Publishing, Paris.

Verick, S. (2014). Women's labour force participation in India: Why is it so low?. Retrieved 3 February 2020, from https://www.ilo.org/wcmsp5/groups/public/---asia/---ro-bangkok/---sro-new_delhi/documents/genericdocument/wcms_342357.pdf

Work Participation of Women in India & Bihar. (2010). Retrieved 3 February 2020, from https://sg.inflibnet.ac.in/bitstream/10603/194007/8/08_chapter%203.pdf

World Bank. 2012. India at a glance. Retrieved from http://www.worldbank.org/en/country/india

Appendix 1: Raw Data table for Per Capita Income and Female Labour Force Participation Rate in India

Source: World Bank Data and ILO estimates

Year	PCI (X)	FLFPR (Y)
1990	367.556609	30.382
1991	303.055605	30.4220009
1992	316.953928	30.5039997
1993	301.159004	30.6340008
1994	346.10295	30.8239994
1995	373.76648	30.7549992
1996	399.950077	30.6760006
1997	415.493797	30.5979996
1998	413.298934	30.5219994
1999	441.99876	30.4489994
2000	443.314193	30.3810005
2001	451.573001	30.7229996
2002	470.986786	31.073
2003	546.726614	31.4300003
2004	627.774247	31.7950001
2005	714.861013	32.1689987
2006	806.753281	30.8080006
2007	1028.33477	29.4969997
2008	998.522339	28.2320004
2009	1101.96084	27.0100002
2010	1357.56372	25.8290005
2011	1458.10353	24.3889999
2012	1443.87953	23.0179996
2013	1449.60591	23.1860008
2014	1573.88149	23.3500004
2015	1605.60543	23.5009995
2016	1729.26802	23.6569996
2017	1981.26871	23.7959995
2018	2009.97886	23.6049995

Appendix 2: Panel data for Female Labour Force Participation Rate across 16 States divided into regions for the years 2009-2010, 2011-2012, 2012-13, 2013-14, 2015-16 and 2017-18

Source: Employment and Unemployment surveys (EUS) of the National Sample Survey Organization (NSSO) and the Periodic Labour Force Survey.

Year	States	FLFPR (X)	s	n	w	t1	t2	t3	t4	t5
2009-10	AP	29	1	0	0	0	0	0	0	0
	Kar	25.2	1	0	0	0	0	0	0	0
	Kerala	15.4	1	0	0	0	0	0	0	0
	TN	28.3	1	0	0	0	0	0	0	0
	Uttar Pradesh	5	0	1	0	0	0	0	0	0
	Punjab	7.9	0	1	0	0	0	0	0	0
	Rajasthan	21.1	0	1	0	0	0	0	0	0
	Himachal Pradesh	13.6	0	1	0	0	0	0	0	0
	Maharashtra	30.4	0	0	1	0	0	0	0	0
	Madhya Pradesh	17.9	0	0	1	0	0	0	0	0
	Chhattisgarh	29.9	0	0	1	0	0	0	0	0
	Gujarat	22.8	0	0	1	0	0	0	0	0
	Bihar	6.2	0	0	0	0	0	0	0	0
	Odisha	10	0	0	0	0	0	0	0	0
	West Bengal	13.6	0	0	0	0	0	0	0	0
	Jharkhand	19	0	0	0	0	0	0	0	0
2011-12	AP	36.16	1	0	0	1	0	0	0	0
	Kar	31.87	1	0	0	1	0	0	0	0
	Kerala	18.23	1	0	0	1	0	0	0	0
	TN	31.8	1	0	0	1	0	0	0	0
	Uttar Pradesh	16.75	0	1	0	1	0	0	0	0
	Punjab	13.91	0	1	0	1	0	0	0	0
	Rajasthan	35.12	0	1	0	1	0	0	0	0
	Himachal Pradesh	44.82	0	1	0	1	0	0	0	0
	Maharashtra	31.06	0	0	1	1	0	0	0	0
	Madhya Pradesh	32.64	0	0	1	1	0	0	0	0
	Chhattisgarh	39.7	0	0	1	1	0	0	0	0
	Gujarat	23.38	0	0	1	1	0	0	0	0
	Bihar	19.07	0	0	0	1	0	0	0	0
	Odisha	27.16	0	0	0	1	0	0	0	0
	West Bengal	18.08	0	0	0	1	0	0	0	0
	Jharkhand	29.1	0	0	0	1	0	0	0	0

2012-13	AP	44.9	1	0	0	0	1	0	0	0
	Kar	32.2	1	0	0	0	1	0	0	0
	Kerala	20.3	1	0	0	0	1	0	0	0
	TN	35	1	0	0	0	1	0	0	0
	Uttar Pradesh	11.4	0	1	0	0	1	0	0	0
	Punjab	11.8	0	1	0	0	1	0	0	0
	Rajasthan	27.4	0	1	0	0	1	0	0	0
	Himachal Pradesh	56.6	0	1	0	0	1	0	0	0
	Maharashtra	32.8	0	0	1	0	1	0	0	0
	Madhya Pradesh	32.1	0	0	1	0	1	0	0	0
	Chhattisgarh	44.8	0	0	1	0	1	0	0	0
	Gujarat	16.4	0	0	1	0	1	0	0	0
	Bihar	10.4	0	0	0	0	1	0	0	0
	Odisha	25.3	0	0	0	0	1	0	0	0
	West Bengal	20.6	0	0	0	0	1	0	0	0
	Jharkhand	28.4	0	0	0	0	1	0	0	0
2013-14	AP	49.6	1	0	0	0	0	1	0	0
	Kar	34.5	1	0	0	0	0	1	0	0
	Kerala	27.8	1	0	0	0	0	1	0	0
	TN	39.6	1	0	0	0	0	1	0	0
	Uttar Pradesh	14	0	1	0	0	0	1	0	0
	Punjab	9.4	0	1	0	0	0	1	0	0
	Rajasthan	33.9	0	1	0	0	0	1	0	0
	Himachal Pradesh	59.4	0	1	0	0	0	1	0	0
	Maharashtra	34.6	0	0	1	0	0	1	0	0
	Madhya Pradesh	34	0	0	1	0	0	1	0	0
	Chhattisgarh	51	0	0	1	0	0	1	0	0
	Gujarat	24.5	0	0	1	0	0	1	0	0
	Bihar	16.7	0	0	0	0	0	1	0	0
	Odisha	28.5	0	0	0	0	0	1	0	0
	West Bengal	17.2	0	0	0	0	0	1	0	0
	Jharkhand	45.7	0	0	0	0	0	1	0	0

2015-16	AP	47	1	0	0	0	0	0	1	0
	Kar	33.3	1	0	0	0	0	0	1	0
	Kerala	23.7	1	0	0	0	0	0	1	0
	TN	39.3	1	0	0	0	0	0	1	0
	Uttar Pradesh	12	0	1	0	0	0	0	1	0
	Punjab	9.4	0	1	0	0	0	0	1	0
	Rajasthan	31.9	0	1	0	0	0	0	1	0
	Himachal Pradesh	15.1	0	1	0	0	0	0	1	0
	Maharashtra	32.8	0	0	1	0	0	0	1	0
	Madhya Pradesh	17.2	0	0	1	0	0	0	1	0
	Chhattisgarh	54.2	0	0	1	0	0	0	1	0
	Gujarat	19.9	0	0	1	0	0	0	1	0
	Bihar	17.8	0	0	0	0	0	0	1	0
	Odisha	23.7	0	0	0	0	0	0	1	0
	West Bengal	20.5	0	0	0	0	0	0	1	0
	Jharkhand	48.2	0	0	0	0	0	0	1	0
2017-18	AP	34.4	1	0	0	0	0	0	0	1
	Kar	20.4	1	0	0	0	0	0	0	1
	Kerala	21.3	1	0	0	0	0	0	0	1
	TN	27.2	1	0	0	0	0	0	0	1
	Uttar Pradesh	9.4	0	1	0	0	0	0	0	1
	Punjab	12.3	0	1	0	0	0	0	0	1
	Rajasthan	19.3	0	1	0	0	0	0	0	1
	Himachal Pradesh	39.7	0	1	0	0	0	0	0	1
	Maharashtra	24.1	0	0	1	0	0	0	0	1
	Madhya Pradesh	23.4	0	0	1	0	0	0	0	1
	Chhattisgarh	36.5	0	0	1	0	0	0	0	1
	Gujarat	15.4	0	0	1	0	0	0	0	1
	Bihar	2.8	0	0	0	0	0	0	0	1
	Odisha	15	0	0	0	0	0	0	0	1
	West Bengal	16.4	0	0	0	0	0	0	0	1
	Jharkhand	10.9	0	0	0	0	0	0	0	1

Appendix 3: Results of Dummy Variable Regression Analysis for Regional Differences

SUMMARY OUTPUT

Regression Statistics	
Multiple F	0.54812
R Square	0.30043
Adjusted F	0.2361
Standard I	10.8413
Observati	96

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regressio	8	4391.34	548.917	4.6703	8.88457E-05
Residual	87	10225.4	117.534		
Total	95	14616.8			

	Coefficients	*andard Er*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*ower 95.0%*	*pper 95.0%*
Intercept	12.9541	3.31945	3.90247	0.00019	6.356288033	19.5518	6.35629	19.5518
south	10.6729	3.12961	3.4103	0.00099	4.452475245	16.8934	4.45248	16.8934
X Variable	1.70375	3.12961	0.5444	0.58756	-4.51669142	7.92419	-4.51669	7.92419
X Variable	9.63208	3.12961	3.07773	0.00279	3.411641912	15.8525	3.41164	15.8525
X Variable	9.59688	3.83298	2.50377	0.01415	1.978421271	17.2153	1.97842	17.2153
X Variable	9.69375	3.83298	2.52904	0.01324	2.075296271	17.3122	2.0753	17.3122
X Variable	14.0688	3.83298	3.67045	0.00042	6.450296271	21.6872	6.4503	21.6872
X Variable	9.41875	3.83298	2.45729	0.01598	1.800296271	17.0372	1.8003	17.0372
X Variable	2.075	3.83298	0.54135	0.58965	-5.54345373	9.69345	-5.54345	9.69345

Appendix 4: F-Test Two-Sample for Variances (PCI & Female LFPR from 1990-2018)

F-Test Two-Sample for Variances (PCI & Female LFPR from 1990-2018)		
	Variable 1	*Variable 2*
Mean	878.5964974	28.38672408
Variance	317943.1108	10.81933234
Observations	29	29
df	28	28
F	29386.57402	
P(F<=f) one-tail	5.59529E-56	
F Critical one-tail	1.882079434	