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FEMALE LABOUR FORCE PARTICIPATION IN RURAL PRAYAGRAJ: EVIDENCE FROM PRIME-AGE WOMAN

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ABSTRACT

This paper analyzes the factors influencing female labor force participation (FLFP) in rural Prayagraj, using primary survey data of 414 women and a binary logistic regression model. The paper defines FLFP according to ILO/NSSO standards, FLFP includes women who are either working or looking for work. The empirical model links participation to age and its square (with age in quadratic form), years of schooling, income level, marital status, caste, and number of kids. The results are based on Huber-White robust standard errors. The results show a clear life-cycle pattern: the predicted chance of participation follows a hump-shaped curve, going up through the twenties and thirties, peaking at about 38 years old, and then going down. A high level of education is a strong predictor; all other factors being constant, each extra year of school raises the odds of participation by about 6–7 percent. The negative slope in household income is consistent with the income effect, which indicates that women from higher-income households are less likely to engage in employment. It is consistent with an income effect in a context where better-off rural households face limited access to high-quality, white-collar employment for women. There is a clear disparity in participation rates by caste, with women from OBC and SC/ST households having significantly higher odds of participation than General-category women. This suggests that disadvantaged groups have a stronger economic necessity to participate. In contrast, after controlling for age, education, income, and caste, there are no strong independent effects of marital status or total children on fertility rates, suggesting that working and non-working women have relatively comparable patterns of having children. The findings underscore the central role of human capital, household resources, and social stratification in shaping rural women's labour supply, and point to the importance of education-oriented and caste-sensitive policy interventions.

KEYWORDS: Female labour force participation, Rural India (Uttar Pradesh), Logistic regression,

education, caste, family income

JEL Codes : J13, J16, J21, J22

1. INTRODUCTION

According to the International Labour Organization (19th ICLS standards), female labour force participation is the engagement of working-age women in the labour force, that is, women who are employed or unemployed but actively seeking and available for work. Globally, about half of working-age women participate in the labour force. However, there is a lot of variation among regions due to differences in demography, sectoral structure, social norms, and measurement conventions. Recent ILOSTAT summaries show that care constraints still exist and that there are many women who say they want to work but aren't. This suggests that participation gaps reflect structural frictions and norms such as childcare availability, mobility, and safety rather than preferences alone. (International Labour Organization. Statistics Department, 2024; World Bank Open Data, n.d.). In India, official PLFS statistics document a marked increase in female labour force participation, the increase was disproportionately accounted for by rural areas, where participation rose far more sharply than in urban India (PLFS, usual status, 15+). Motivated by this pattern, we focus on rural areas and study determinants of FLFP using evidence from rural Prayagraj, a district in Uttar Pradesh with a rural economy that includes both farming and non-farming activities. This district offers unique micro-level analytic opportunities due to its varied demographic and economic environment.

Rural female labour force participation warrants particular attention for three reasons. First, rural women encounter a distinct set of constraints and opportunities in comparison to urban women, such as seasonal and unpaid family work in agriculture, limited formal employment opportunities, mobility and safety concerns, weak childcare markets, and rigid social conventions regarding time use. Second, although overall female labour force participation in India has been on the rise since 2017, analysis of PLFS microdata reveals that most of the increase has come from rural women entering self-employment, especially own-account and unpaid family work in agriculture. This raises questions about the quality and stability of these jobs, despite the fact that overall participation has been improving. (Ara & Shrivastav, 2025), Third, increasing the Female Labour Force Participation (FLFP) in rural areas has first-order implications for economic growth, poverty reduction, and gender equity. A higher participation rate increases the effective labour supply, increases the diversity of household income, strengthens women's bargaining power within the household, and, over time, feeds back into political representation and policy responsiveness. (Iversen & Rosenbluth, 2008). In summary, rural FLFP is both significant and pertinent to policy: without ongoing enhancements in the quality and stability of rural women's employment through childcare, transportation safety, skills development, job placement, and increased labour demand headline progress may stagnate or reverse.

In light of this, the purpose of this article is to analyse the factors that determine women's involvement in the labour force by analysing a cross-sectional survey of rural Prayagraj and employing a binary logistic regression model. Inferences are drawn using Huber–White robust standard error.

The rest of the paper is structured as follows. The second section provides a review of the literature, identifies the research gap, and outlines the contribution that the present study makes. In the third section, the data sources are presented, the variables are defined, and the framework for the empirical technique is described. Fourth Section discusses the estimation results. Fifth Section concludes the key findings and policy implications.

2. LITERATURE REVIEW

There is a large body of empirical research that identifies multiple factors that interact with one another to determine female labour force participation. These factors include education and skills, fertility and the burden of caregiving, household income and assets, caste, religion, and the conditions of the local labour market that are present.

Closely related to the life-cycle framework is the role of household income in women's labour-supply decisions. Household income is a major determinant women's labour supply. This influence is mediated by the income effect in the field of labour economics. It was found in the beginning that a decline in women's labour force participation was correlated with a rise in non-labour income or male wages. This suggests that there is less of a need for secondary earners to seek employment (Mincer, 1962; Killingsworth & Heckman, 1986). This negative correlation is supported by empirical evidence from developing countries, which demonstrates that women who live in households with higher incomes are significantly less likely to participate in paid employment when compared to women who live in households with lower incomes, households, where necessity compels labour participation (Shaheen & Awan, 2011; Hosney, 2016). According to the U-shaped hypothesis of female labour participation throughout developmental phases, women initially disengage from the workforce as household wealth increases, but then re-enter the workforce as economies diversify and industries that are favourable to women expand (Goldin, 1994; Olivetti & Petrongolo, 2016). Research in India reveals that rising household earnings, particularly from male salaries, have resulted in a decline in rural female labor market involvement, despite improvements in education (Klasen & Pieters, 2015; Chatterjee, Murgai & Rama, 2015). Recent contributions suggest that the income effect interacts with aspirational norms and household status considerations, indicating that higher-income families may dissuade women's employment to signify upward mobility (Neumark & Postlewaite, 1995; Pintea, 2020). Consequently, wealth is a crucial factor that influences women's economic engagement, both directly via financial limitations and indirectly through social cues and intra-household negotiation processes.

Education is one of the most powerful yet context-dependent determinants of FLFP. Globally, years of schooling raise women's potential wages and employability (human-capital channel), which tends to increase participation where suitable jobs exist (Psacharopoulos & Patrinos, 2018; Goldin, 2006). However, the well-known U-shape of FLFP over the course of development can already be seen at low levels of development. In such settings, rising educational attainment may initially reduce *measured* FLFP: girls and young women stay longer in school and delay entry into the labour market; educated women withdraw from low-status informal or agricultural work; some queue for scarce salaried jobs; and social-status norms may discourage them from taking up manual or low-prestige employment. (Goldin, 1994; Olivetti & Petrongolo, 2016). In India, obtaining a secondary or tertiary education benefits the job market more than obtaining an elementary or middle school diploma (Kingdon & Unni, 2001; Klasen & Pieters, 2015). Education is more easily translated into employment in urban areas due to the larger service and clerical/teaching job markets; however, in rural areas, educated women may "wait" for nonfarm salaried work, which keeps their participation low even though they have more schooling (Chatterjee, Murgai, & Rama, 2015; Verick, 2018). Experimental and quasi-experimental evidence confirms that when appropriate opportunities or information arrive (e.g., call-center recruitment or job-information programs), educated young women's employment rises sharply (Jensen, 2012).

Fertility remains a crucial demographic factor affecting women's labor supply. Classical time-allocation models emphasize the trade-off between childbearing and market labor, indicating that the probability of female participation diminishes as the number or age of young children increases (Mincer, 1962; Becker, 1965). Empirical research conducted internationally substantiates that the presence of young children, particularly those not yet of school age, significantly impedes mothers' participation in the labor force (Angrist & Evans, 1998; Bloom, Canning, Fink, & Finlay, 2009). In developing nations, this effect is intensified by limited access to childcare and societal expectations regarding women's caregiving duties (Heath & Jayachandran, 2017; Verick, 2018). Evidence from India supports these trends: Higher fertility rates and the presence of preschool-aged children significantly reduce women's employment prospects, particularly in rural areas where alternative childcare options are scarce and societal norms dissuade participation in the labor market (Klasen & Pieters, 2015; Chatterjee, Murgai, & Rama, 2015).

Marital status impacts how women utilize their time, make decisions, and perceive themselves. Marriage alters the allocation of time each spouse dedicates to market and domestic production, potentially affecting their threat point and bargaining power, thereby influencing their incentives to engage (Becker, 1965; Manser & Brown, 1980; McElroy & Horney, 1981; Lundberg & Pollak, 1993). Cross-Country evidence indicates that never-married women generally demonstrate greater participation than their married counterparts in contexts where traditional domestic labor division is

firmly established. Conversely, divorced or separated women are more inclined to participate due to financial necessity (Verick, 2018). In addition to resources, societal norms regarding respectability, female mobility, and suitable employment directly affect choices and limitations (Akerlof & Kranton, 2000; Jayachandran, 2021), influencing the impact of education and income on female labor force participation (FLFP). In developing countries, these factors are exacerbated by childcare shortages and low demand in the service sector: research on India shows that married women have lower FLFP, with penalties being more severe in areas where gender norms and safety/mobility concerns are strong (Klasen & Pieters, 2015; Chatterjee, Murgai, & Rama, 2015; Verick, 2018). Urban areas, which have more concentrated markets and more salaried service jobs, help to ease these problems. This means that when formal employment, transportation, and childcare services are available, there are fewer penalties for being married. Conversely, in rural contexts, the interplay of household production obligations and stringent social norms hinders participation, even among educated women.

Existing work on female labour force participation (FLFP) in India relies predominantly on large secondary datasets (NSS, IHDS, PLFS) and focuses on national- or state-level patterns. While this literature documents low and stagnating FLFP and highlights the roles of education, household income, social norms and caste, there is relatively little small-area micro-evidence that links these determinants to the specific conditions of local rural labour markets. Against this backdrop, the present study provides new primary micro-data for an under-studied rural district in eastern Uttar Pradesh and offers a district-level perspective that complements existing state- and national-level analyses.

3. DATA AND METHODOLOGY

3.1 Study Area and Sampling Design

Prayagraj district is located in eastern Uttar Pradesh and has a rural economy that relies primarily on agriculture alongside non-farm linkages to nearby market towns. This study uses primary survey data collected in July–August 2025 in rural Prayagraj (Uttar Pradesh). The survey was administered using a structured schedule.

The sampling design was two-stage: villages were treated as the primary sampling units (PSUs), and households within selected villages constituted the secondary sampling units. We stratified by block and worked in two rural blocks, Handia and Karchhana (defined using the official Census 2011 village frame). Within each block, we selected 12 villages by simple random sampling (SRS). To limit within-village correlation, we randomly selected 17–18 households per village, distributing selections across hamlets. From each sampled household, one eligible woman aged 15–45 years (reproductive age) was randomly selected and interviewed. The final sample consists of 413 observations. The sampling frame and block/village boundaries followed the District Census Handbook, Allahabad (Prayagraj), 2011, and the associated Primary Census Abstract materials.

3.2 Variables

This study examines the determinants of female labour force participation (FLFP) in rural Prayagraj using a binary logistic regression framework. The dependent and independent variables are described below.

3.2.1 Dependent Variable

Female Labour Force Participation (FLFP)

The dependent variable is a binary indicator taking the value 1 if the respondent is either employed or unemployed but actively seeking work, and 0 if she is out of the labour force that is, not working and not seeking employment (for example, engaged solely in domestic duties, studying, or retired). This definition follows the standard conventions of the International Labour Organization (ILO) and the National Sample Survey Office (NSSO).

3.2.2 Independent Variables

The variables on the right are divided into two groups (i) main explanatory variables, which show socio-economic status and household constraints (ii) control variables, which account for life-cycle and fertility-related heterogeneity in labour supply.

3.2.2.1 Primary Explanatory Variables

Education (Years of Schooling: YEARS_{EDU})

Education is measured as the number of years of formal schooling completed. Respondents report their education level as, *Illiterate, Primary, Middle, High School, Intermediate, Graduate, and Post-Graduate and above* which is converted into their corresponding years of education. Education is expected to have a positive association with female labour force participation, by improving human capital and access to non-farm employment. Prior Indian studies indicate that the schooling–participation relationship may be non-linear, with larger gains after secondary education. However, in our baseline specification, education is measured in years, implying a constant marginal effect per additional year; the estimated coefficient therefore captures the average schooling gradient in participation. To examine potential non-linearities suggested by the literature, we also estimate an alternative model using categorical education dummies (results reported in Appendix **Table 4**)

Household Income (INCOME)

Monthly household income excluding the woman's own income, classified into four categories: (i) up to ₹10,000, (ii) ₹10,001–₹25,000, (iii) ₹25,001–₹50,000, and (iv) above ₹50,001.

Dummy variables are created for each category, with the first income band used as reference group. Income is expected to have a negative effect on FLFP due to the income effect, whereby higher family income reduces the economic necessity to work (Mincer, 1962; Goldin, 1994)

Marital Status (MARITAL):

The marital status of the respondent, categorized as *Unmarried, Married, Widowed and Separated*. Dummy variables were created with *Unmarried, Widowed and Separated* combined as the reference category. Married women are expected to participate less, reflecting household specialization and normative constraints (Manser & Brown, 1980; Lundberg & Pollak, 1993; Verick, 2018).

Caste (CASTE)

Caste is categorized as *General, OBC, SC, and ST*. Given the small ST subsample, SC and ST are combined to form an SC/ST group. Accordingly, caste is represented by three categories *General, OBC, and SC/ST* entered through dummy variables with *General* as the reference group. Caste is expected to be associated with FLFP through differences in economic vulnerability, occupational structure, and social norms; disadvantaged groups may display higher participation due to greater economic necessity.

3.2.2.2 Control Variables***Age (AGE)***

The respondent's age in completed years. Age captures lifecycle effects and is expected to have a non-linear relationship with participation. The effect initially rises as women enter working age and declines after middle age. To account for this curvature, both AGE and its squared term (AGE^2) are incorporated. For the estimation, age is first centered around its sample mean and then squared to reduce mechanical collinearity between the age and age-squared terms; however, all reported effects and the calculated turning point are interpreted with respect to age measured in actual years.

Number of Children (NUMBEROFCHILDREN)

The number of living children is included as a fertility control. Greater childcare responsibilities are expected to reduce women's likelihood of labour force participation; however, the impact may differ based on household resources and support structures.

3.3 Model Specification

A binary logistic regression model has been used to analyse the determinants of Female Labour Force Participation (FLFP) among rural women in Prayagraj. The choice of a logit model is appropriate since the dependent variable, FLFP, is dichotomous, coded as 1 if the respondent is either employed or unemployed but actively seeking work, and 0 if she is not participating in the labour force. The model estimates the probability of a woman participating in the labour market as a function of her demographic and socioeconomic characteristics.

The probability of participation is expressed as follows:

$$P_i = P\left(\frac{Y_i = 1}{X_i}\right) = \frac{e^{\{\beta^0 + \beta^1 X_{\{1i\}} + \beta^2 X_{\{2i\}} + \dots + \beta_k X_{\{ki\}}\}}}{1 + e^{\{\beta^0 + \beta^1 X_{\{1i\}} + \beta^2 X_{\{2i\}} + \dots + \beta_k X_{\{ki\}}\}}}$$

where P_i denotes the probability that female i participates in the labour force, and X_i represents the vector of explanatory variables.

Taking the natural logarithm of the odds ratio, the empirical logit model can be specified as:

$$\ln\left(\frac{P_i}{1-P_i}\right) = \beta_0 + \beta_1 AGE_i + \beta_2 AGE_i^2 + \beta_3 YEARS EDUC_i + \beta_4 INC_i + \beta_5 FERT_i + \beta_6 MAR_i + \varepsilon_i$$

where:

- AGE_i and AGE_i^2 capture the non-linear lifecycle effect on participation.
- $YEARS EDUC_i$ denotes the number of years of formal schooling completed.
- INC_i represents household income category dummies.
- $FERT_i$ captures fertility (number of children or fertility dummy), and
- MAR_i includes marital status dummies.

Maximum Likelihood Estimation (MLE) is used to estimate the parameters, assuming a logistic error distribution. The results are presented in regression coefficients and odds ratios. All calculations are done with Stata 13. The model specification adheres to the conventional framework of labour supply theory established by Mincer (1962) and Becker (1965), and later augmented by Killingsworth and Heckman (1986), correlating female labour participation choices with demographic, educational, and household income factors. The classical linear regression assumptions are not applicable because the logit model is estimated using Maximum Likelihood. However, to obtain reliable statistical inference, Huber–White robust standard errors were employed

3.4 Ethical Considerations and Limitations

This research utilizes primary data collected from women residing in rural regions of Prayagraj district, Uttar Pradesh. All participants were apprised of the research's academic objective and told that their involvement was entirely voluntary. Before the interview, verbal informed permission was secured, and participants had the autonomy to refuse any question or withdraw at any point without repercussions. No personally identifying information was recorded, and all data were solely employed for statistical analysis in aggregated form. The research complies with recognized ethical standards for social science, encompassing secrecy, anonymity, and respect for participants' autonomy.

It is essential to acknowledge that even after careful preparation and efficient execution, some limitations still exist. To begin with, the data is cross-sectional, capturing labour force participation at a single point in time, and therefore cannot establish causal relationships. Second, some variables, such as income and number of children, are self-reported and may contain measurement error or recall bias. Third, some subgroups, such as widowed or separated women and those with doctoral degrees,

are very small in number. In the main analysis they are therefore combined with broader categories (e.g., unmarried/widowed/separated; graduate and above) which means that the study cannot identify their independent effects on female labour force participation. Fourth, unobserved cultural, institutional, or local labour-demand characteristics not included in the dataset may potentially affect female participation decisions, resulting in possible omitted-variable bias. Lastly, the findings are representative of rural Prayagraj and should be interpreted with caution when applying them to other areas with differing social and economic situations.

4. RESULTS AND ESTIMATION

Table 1 presents the estimation results from the binary logistic regression model of female labour force participation. The model is estimated by maximum likelihood and Huber–White robust standard errors are employed to obtain reliable statistical inference. The coefficients are interpreted in terms of statistical significance and odds ratios, which indicate the magnitude and direction of the association between the explanatory variables and the likelihood of participation. The set of regressors is jointly significant: the Wald chi-square statistic is 43.68 with 10 degrees of freedom ($p < 0.001$), and the pseudo- R^2 is 0.10, which is in line with cross-sectional micro-evidence on labour supply. To assess multicollinearity, we computed variance inflation factors from an auxiliary OLS regression; all VIF values are well below conventional thresholds (mean VIF ≈ 2.14), indicating that multicollinearity is not a concern.

Table 1: Determinants of Female Labour Force Participation in Rural Prayagraj (logistic regression). The number of observations is 414, the Log pseudolikelihood is -246.52, Pseudo R^2 is 0.1012 and Wald $\chi^2(15)$ is 43.68***

Explanatory variables	Coefficient (robust SE)
Age (years, centred)	0.0897*** (0.0248)
Age ² (centred)	-0.0075*** (0.0020)
Number of children	-0.1678 (0.1321)
Years of education	0.0635** (0.0275)
Household income ($\leq ₹10,000$ = reference)	
Income: ₹10,001–25,000	-1.1419*** (0.3451)
Income: ₹25,001–50,000	-0.4515 (0.3586)
Income: above ₹50,001	-0.8007 (0.5140)
Marital Status (unmarried/widowed/separated = reference)	
Married	-0.3161 (0.3108)
Caste (General = reference)	
Caste: OBC	0.5563** (0.2481)
Caste: SC/ST	1.0635*** (0.3643)

Explanatory variables	Coefficient (robust SE)
Constant	1.0298 (0.6196)

Notes: Robust (Huber–White) standard errors in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$. Reference categories: income $\leq ₹10,000$; General caste; unmarried/widowed/separated (for marital status).

Age is centred at the sample mean for estimation; all interpretations are in terms of age in years.

The coefficients on centred age (agec) and its square (agec2) are both highly significant and have the expected signs. The coefficient on agec is positive (0.0897, $p < 0.01$) and the coefficient on agec2 is negative (−0.00747, $p < 0.01$), implying an inverted-U or hump shaped relationship between age and the log-odds of female labour force participation. Using the quadratic specification, the turning point in the age profile is obtained as:

$$AGE^* = \overline{AGE} - \frac{\beta_{agec}}{\beta_{agec2}}$$

Where, $\overline{AGE}$ is the mean age in the sample, β_{agec} is the coefficient of centered age and β_{agec2} is the coefficient of square of centred age.

Using the sample mean age (31.58 years) and the estimated coefficients on centred age and its square $\beta_{agec} = 0.0897$, $\beta_{agec2} = -0.0075$, the implied turning point of the quadratic age profile is approximately 37.6 years; we therefore describe the life-cycle pattern as peaking at around 38 years of age. Thus, holding other regressors constant, the likelihood of participation increases with age up to the late thirties and declines thereafter. This pattern is consistent with standard life-cycle labour supply arguments: as women move from schooling and early labour market entry into prime working ages, participation rises, whereas at older ages health limitations, cohort effects, and reduced financial necessity led to withdrawal from paid work. Age is entered in centered form only for numerical reasons (to reduce collinearity between the linear and quadratic terms); all interpretations are in terms of actual age in years.

Education, measured as completed years of formal schooling is positively and significantly associated with female labour force participation. The coefficient on years of education is 0.064 (odds ratio ≈ 1.07), implying that each additional year of schooling increases the odds of female labour force participation by about 6–7 percent, ceteris paribus. This implies, that women with substantially more years of education have much higher predicted probabilities of participation compared with otherwise similar women with little or no schooling. Since education enters linearly in years, this coefficient should be interpreted as the average schooling gradient; robustness checks using categorical education confirm that higher levels of schooling are associated with greater participation, consistent with the view that education enhances access to better jobs and reduces barriers to market work. The pattern

of coefficients in **Table 4** indicates that the gains are concentrated at high school and higher levels: Women who completed high school and women with post-graduate or higher education have, respectively, about 3.5 times and 3.4 times the odds of labour force participation compared with illiterate women, holding other factors constant., whereas primary and middle schooling show weak and statistically insignificant differences. Taken together, these results suggest that education enhances access to better jobs and reduces barriers to market work, but the effects become substantial only once secondary schooling or more is attained.

Household economic status is captured by income categories, with the lowest income band, serving as the reference group. The coefficients on the income dummies indicate a generally negative income gradient, although only one category is precisely estimated. Compared with women in households with monthly income up to ₹10,000, those in households with income between ₹10,001 and ₹25,000 have substantially lower odds of participation (odds ratio ≈ 0.32 , $p \approx 0.001$, corresponding to an odds ratio of $\exp(-1.142) \approx 0.32$. This implies that, conditional on other characteristics, women in this income bracket have about one-third the odds of participating or about a 68 percent reduction in the odds compared to women in the poorest households. Coefficients for households with income ₹25,001–₹50,000 and above ₹50,000 are also negative, but not statistically significant at the 5 percent level under robust standard errors. Overall, the pattern is consistent with an income effect in which increases in household resources are associated with lower female labour force participation, though the strongest and most precisely estimated difference is between households with monthly income up to ₹10,000 and those with income between ₹10,001 and ₹25,000.

Marital status is entered as a binary indicator for married women, with unmarried, widowed, and separated women forming the reference category. The coefficient on this dummy is negative (-0.316) but statistically insignificant ($p \approx 0.31$). The associated odds ratio, $\exp(-0.316) \approx 0.73$, suggests that married women have about 27 percent lower odds of participating than otherwise similar non-married women, but the confidence interval is wide and includes unity. This indicates that, once age, fertility, education, income, and caste are taken into account, marriage per se does not have a precisely estimated independent association with female labour force participation in this sample. In other words, the influence of marriage on women's work decisions appears to operate largely through correlated factors such as age profile, number of children, and household income, rather than through marital status alone.

Caste enters the model through two dummies for OBC and SC/ST, with General caste as the reference group. Both caste coefficients are positive and statistically significant under robust standard errors. For women belonging to the OBC category, the coefficient is 0.556 ($p \approx 0.025$), corresponding to an odds ratio of $\exp(0.556) \approx 1.75$; thus, OBC women have about 70–80 percent higher odds of

participating than otherwise comparable General-category women. The effect is even stronger for SC/ST women, whose coefficient is 1.063 ($p \approx 0.004$), implying an odds ratio of $\exp(1.063) \approx 2.9$; conditional on other regressors, SC/ST women have almost three times the odds of labour force participation relative to General women corresponding to roughly a 190 percent increase in the odds relative to General women. These results point to substantial caste-based differentials in participation that persist even after controlling for education, income, age, fertility, and marital status. A plausible interpretation is that women from disadvantaged caste groups face greater economic necessity and are less able to withdraw from the labour market, whereas General-category women are more likely to remain out of the labour force when household resources and social norms permit.

Fertility is proxied by the total number of living children. In the logistic regression (Table 1), the estimated coefficient on the number of children is negative (-0.168) but statistically insignificant at conventional levels ($p \approx 0.20$). In odds-ratio terms, the point estimate implies that each additional child would reduce the odds of female labour force participation by about 15 percent, but the wide confidence interval includes zero effect. This weak and imprecise partial association is consistent with the descriptive evidence in Table 2.

Table 2: Descriptive statistics by labour force status

	Mean children	Standard Deviation	Total
In labour force	1.56	1.41	258
Out of labour force	1.60	1.59	156

The mean number of children is almost identical for women in and out of the labour force (1.56 vs 1.60)

The distribution of fertility by labour force status is very similar across family sizes Table 3: in each category from 0 to 4 children, the shares of employed and non-employed women are close, with no clear monotonic decline in participation as family size increases. Given this limited effective variation, and controlling for age, education, household income, caste, and marital status, the regression has little power to identify a strong independent fertility effect. The insignificance of the fertility coefficient therefore appears to reflect the structure of the sample rather than the absence of any underlying relationship between fertility and women's labour supply.

Table 3: Labour force status by number of children among rural women in Prayagraj

Number of children	Out of labour force	Out of labour force (%)	In labour force	In labour force (%)	Total
0	63	42.6	85	57.4	148
1	15	25.4	44	74.6	59
2	29	31.2	64	68.8	93
3	26	42.6	35	57.4	61
4	17	40.5	25	59.5	42
5	6	54.6	5	45.4	11
Total	156	37.7	258	62.3	414

5. CONCLUSION AND POLICY RECOMMENDATIONS

The analysis indicates a distinct life-cycle and socio-economic pattern in women's labour force participation in rural Prayagraj. Participation displays a hump-shaped age profile, presents a strong positive correlation with educational attainment, and decreases as household income increases, aligning with an income effect that suggests wealthier households are less dependent on women's market labour. Caste is a significant factor: women from OBC and particularly SC/ST households exhibit higher odds of participating compared to General-caste women. This indicates that economic necessity and social status influence labour supply decisions. In contrast, after controlling for age, education, income, and caste, marital status and total number of children do not show significant independent associations with participation, indicating comparable fertility profiles among working and non-working women in this sample. The findings suggest that in this rural context, female labour force participation is predominantly influenced by human capital, household resources, and caste location, rather than by marital status or family size alone.

The findings emphasize the need to improve rural women's education and employment chances, particularly by helping them transfer to decent non-agricultural professions. The negative income gradient suggests that women withdraw as households prosper, reflecting both income effects and societal norms. Policies that improve the quality and security of women's employment, rather than just its accessibility, may reduce "distress-driven" participation among lower caste groups. The strong caste differentials emphasise the need for caste-sensitive labour market interventions that address structural disadvantages while recognising that women from OBC and SC/ST households are more likely to participate out of economic necessity. At the same time, the limited independent role of fertility in this setting cautions against overemphasising family size as a primary constraint on women's work in isolation from education, caste, and household resources.

The findings of this study should be interpreted in the light of certain limitations, which also suggest

directions for future research. First, the research uses a small cross-sectional sample from rural Prayagraj, which affects external validity and accuracy in estimating fertility impacts. Second, fertility is proxied only by the total number of living children, without finer information on the age of the youngest child, spacing, or childcare responsibilities, which may be more related to women's time restrictions than family size. Third, the study does not explicitly model job quality, salary levels, or sectoral choice, even though the nature of available employment opportunities is likely to interact with education, caste, and income in influencing participation decisions. Future work using larger and more geographically diverse samples, richer measures of childcare burdens and explicit modelling of job quality and sectoral allocation would deepen our understanding of how these determinants jointly influence women's labour supply in rural Uttar Pradesh and comparable contexts.

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Appendix

Table 4: Determinants of Female Labour Force Participation – Logistic Regression with Education Categories (robust standard errors). The number of observations is 414, the Log pseudolikelihood is -242.01, Pseudo R² is 0.118 and Wald $\chi^2(15)$ is 52.51***

Explanatory variables	Coefficient (robust SE)
Age (years, mean-centred)	0.1034*** (0.0266)
Age ² (mean-centred)	-0.0079*** (0.0020)
Number of children	-0.2118 (0.1351)
Education (Illiterate = reference)	
Primary	-0.3823 (0.4582)
Middle	-0.0198 (0.5211)
High school	1.2681** (0.5034)
Intermediate	0.5603 (0.4424)
Graduate	0.6546 (0.4520)
Post-graduate and above	1.2280** (0.5447)
Household income ($\leq$ ₹10,000 = reference)	
₹10,001–25,000	-1.1797*** (0.3522)
₹25,001–50,000	-0.4938 (0.3579)
$\geq$ ₹50,001	-1.0293** (0.5185)
Marital Status (unmarried/widowed/separated = reference)	
Married	-0.4114 (0.3317)
Caste (General = reference)	
OBC	0.5546** (0.2481)
SC/ST	1.1591*** (0.3776)
Constant	1.3904** (0.6465)

Notes: Robust (Huber–White) standard errors in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

Reference categories: illiterate (education), household income $\leq$ ₹10,000, General caste, and unmarried/widowed/separated (marital status). Age is mean-centred for estimation; all interpretations are in terms of age in years.