Received date: January, 2026
Accepted date: March. 2026
Published date: May, 2026

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Keywords: : Women's labor force participation, logistic regression, interaction effects, NLSS-IV, Nepal, gender inequality, economic development

Determinants of Women's Labor Force Participation in Nepal: Evidence from the Nepal Living Standards Survey Using Logistic Regression with Interaction Effects

Abstract

This paper examines the factors that determine the level of women involvement in the workforce in Nepal using Nepal Living Standards Survey IV (NLSS-IV) data on the same that was conducted in 2010/11 by the Central Bureau of Statistics. The analytical dataset will comprise of 8,734 women aged between 15 and 64 years sampled using a stratification, multistage cluster sampling method that covered 7420 households in 75 districts. A binary logistic regression model is modeled, which has labor-force participation (defined as participation in one or more hours of paid work seven days before survey) as the dependent variable. Individual (age, educational attainment, marital status), household (wealth quintile, household composition, female household headship) and spousal characteristics and geographic variables are covariates in the model. Hierarchical model-building approach is embraced and interaction terms are proposed to represent heterogeneity of effects. Findings indicate that the participation of working-age women in the labor force was an average of only 32.1. Every year of schooling added 6 per cent (odds ratio=1.06, 95 percent confidence interval=1.04-1.08) to the fully specified model. Married women were less likely to take part by 55 percent compared to unmarried women (OR 0.45, 95 percent CI 0.3853). Preschool children below five years of age minimized the probability of participation by 29 percent (OR = 0.71, 95 percent CI= 0.63-0.81). Females in the richest wealth quintile had 57% less odds of participating than those in the poorest wealth quintile (OR=0.43, 95% CI=0.34-0.54). Considerable interactions were found in terms of education and marital status (OR = 1.05, p = 0.002), wealth and location (OR = 0.87, p = 0.032), and spousal education and women education (OR = 0.97, p = 0.005). The results show that the participation of women in the labor force of Nepal depends on the interaction between educational attainment, marriage restrictions, family and economic situations, and geographical factors. These findings have significant implications on the policy design to be used in promoting economic participation of women in the nation.

Introduction

The participation of women in the labor market forms a critical measure of gender equity and economic growth, with a considerable

impact on the well-being of households, alleviation of poverty, and economic growth of a country (World Bank, 2023). In the low- and middle-income economies, the level of women participation in paid labour has been a meeting point of educational levels, cultural norms, family life, and the nature of labour-market and labour structure. In Nepal, despite constitutional gender equality rights and significant achievement in women education levels over the past decades, the percentage of women in paid labor is relatively low indicating the continued structural and cultural barriers to women involvement in economic activities (ADB, 2022).

The fact that Nepal economy is being transformed to a diversified one, as opposed to an agrarian-based economy, has created new sources of employment in the manufacturing and services industries. However, the extent of exploitation of such opportunities by women is moderated by the level of individual factors education and age; household factors including wealth, family structure, and the existence of young children; and contextual factors such as urban-rural living and cultural differences and disparities in economic status (ILO, 2023). To explain how these variables collectively contribute to women labour force participation is an essential step towards coming up with effective interventions that can help increase the economic empowerment of women.

Although the existing body of knowledge on the participation of women in labor force in Nepal is growing, it has been mostly on individual determinants alone and has not sufficiently investigated the interaction of these determinants in order to come up with heterogeneous findings on different subpopulations. The effects of education, marital status, and household wealth on the workforce participation of women have been reported in a number of studies (Rahman et al., 2023; Klasen et al., 2021), but comparatively few studies have used interaction-based analytical frameworks that can help to capture the conditional quality of these associations. This forms a salient gap given that the influence of education on participation can have a significant difference based on marital status, economic status of household or geographical location of a woman.

This gap is filled in the current study by examining the factors that determine the women participation in the labor force in Nepal based on the Nepal Living standards survey 4 (NLSS-IV) survey carried out in 2010/11. A binary logistic regression model is used, where a hierarchical model-building strategy is used to systematically test the effect of interaction among important predictors. In particular, the aims are (a) to determine individual, household and geographic determinants of women participation in the labor force; (b) to determine how the effect of education on participation is moderated by marital status, household wealth and presence of young children; (c) to determine the moderation effect of household wealth and geographic location and (d) to determine the combined effect of several barriers by analysis of predicted probability along different demographic profiles.

The originality of this research is that it provides the systematic analysis of the effects of interactions and goes beyond the basic additive models to reveal the influence of the determinants of women in the labor force participation in a conditioned state and in diverse segments of the population. The analysis can provide subtle evidence to draw targeted policy interventions by determining particular combinations of factors that inhibit or enable women the most to engage economically. The rest of the paper follows as follows: Section 2 is the literature review of the relevant theoretical and empirical data; Section 3 is the description of data, variables, and econometric methodology; Section 4 is the results; Section 5 is the discussion of findings in reference to the existing literature; and the conclusion of the paper is the Section 6 policy implications.

Literature Review

Theoretical Perspectives

The theoretical basis of examining the participation of women in the labour force is made up of a number of complementary frameworks. The neoclassical labor-supply model assumes that people can spend time on market and non-market activities by making the tradeoffs between the market and reservation wage, the opportunity cost of home production (Blau and :: Kahn, 2022). In the case of women, this reservation wage is strongly controlled by the family duties, existence of young children and other sources of income within a family. There has been, however, a critique of the neoclassical paradigm as being too narrow on the social and institutional factors that influence the decisions to supply labor by women.

The capability approach, developed by Sen (2021), is a more conceptualised approach, which predicts women to engage in economic activity based on market incentives and substantive freedom, such as access to education, health, and social support systems. In this perspective, obstacles to the participation of women in labor force are capability deprivations that limit women agency in economic decision-making. This analysis is further developed by the intersectionality theory, which acknowledges that gender is intertwined with other identity and social status dimensions, including caste, ethnicity, class, and geographic locality, to create gender-disparate labour-market experiences (Crenshaw, 2020). Feminist economists have also highlighted the aspects of occupational segregation, wage discrimination and unequal distribution of unpaid care work as structural constraints to the economic participation of women (Folbre, 2021). Together, these theoretical perspectives propose that the labour force participation of women must be theorized in a multidimensional fashion which is influenced by interactions of individual abilities, household, social norms and institutional environments.

Empirical Evidence from International Studies

The cross-national studies have reported that the rate of women participation in labor-force is quite varied ranging between under 20 per cent in some South Asian and Middle Eastern nations to over 80 per cent in some areas of Sub-Saharan Africa and Northern Europe (ILO, 2023). According to Goldin (2021), economic development and the female participation have a U-shaped relationship, with a decline in the participation at the beginning of industrialization as women abandon agriculture, but then grows as the employment in the service industry and education levels increase. In a variety of contexts, education has always turned out to be one of the strongest predictors of female workforce participation; the higher the educational attainment, the higher the participation rate due to both human-capital and preference and social-norm-related factors (UNESCO,2022; Psacharopoulos & patrinos, 2024).

The presence of childcare facilities and family-friendly work policies in the workplace have been found to have an overwhelming impact on the choice of participation of women. Evidence of this can be found from studies conducted in OECD member states which provide a positive correlation between women and their labor-force participation and access to affordable childcare (OECD, 2023). The workforce participation of women is also helped by flexible working, parental leave policies, and anti-discrimination laws, but the actual success of such policies is determined by the quality of their execution and cultural background (World Economic Forum, 2023).

Evidence from South Asia and Nepal

South Asia exemplifies a unique experience in analyzing the issue of women participation in the labour-force with the steadily low rates despite the improvement in education and economic development (Rahman et al., 2023). Indian studies have reported the paradoxical decrease in the labor-force participation of women in the times of economic growth, which is explained by the impacts of incomes, the consideration of social status, measurement issues, and the absence of appropriate jobs that can be occupied by educated women (Kapsos et al., 2021). As Sharma and Deshpande (2022) discovered, cultural constructs that associate non-participation of women with superior social status make the workforce participation highly limited especially in households with middle and upper income.

In the Nepal-specific situation, there has been a study on how economic transition, labour migration and gender norms interact to define women economic roles. The massive migration of male household members abroad to work has not only led to more household chores on women but also in certain cases, it has increased the role that women play in the local economies (Central Bureau of Statistics, 2011). Research that has depended on previous rounds of household survey data has found education, marital status, domestic wealth, and geographic location to be important determinants of women participation in labour-force but, such studies have not generally investigated the interaction of these factors to deliver conditional effects (Klasen et al., 2021). Microfinance, skills training, and cooperative enterprise research has found that women can gain economic empowerment through microfinance programs, skills impartation, and cooperative enterprises, but the level of effect differs significantly depending on the location and the program design (Ahmed et al., 2022). These results highlight the importance of the context-specific analyses that can take into consideration the interaction of various determinants.

One of the most evident drawbacks of the literature left behind on Nepal is the relative lack of interaction-based frames of analysis. Additive models are used in most studies and they assume constant effects of each determinant of variables within all subgroups of the population. However, on theoretical grounds and based on other South Asian settings, the impact of education, such as, might be significantly different based on marital status, family economic status, and geographical location (Kumar & Singh, 2023). The current paper will fill this gap by carrying out a systematic test of the effects of interaction in a logistic regression framework.

Methods

Data Source and Study Design

The research makes use of data of the Nepal Living Standards Survey IV (NLSS-IV) survey that was held between February 2010 and February 2011 by the Central Bureau of Statistics, Government of Nepal. The sampling strategy used in NLSS-IV was a stratified, multistage cluster, sampling, which used a sampling frame of the Population Census in 2001. The survey covered 7,420 households which were spread over 481 primary sampling units (PSUs) spread across all the 75 districts of Nepal. The sampling technique applied to select PSUs was probability proportional to size (PPS) sampling, and the households of each PSU were selected using a systematic random sampling technique. This survey had a response rate of 94.2 percent and thus gave a national representative data on household demographics, education, employment, income, expenditure, and other socioeconomic measures (Central Bureau of Statistics, 2011).

Study Population and Sample

The analytical sample was limited to women between the ages of 15-64 years hence the traditional definition of the working-age population. This age group was restricted to exclude women who were not in the demographically and economically active age group. Following the elimination of those who had observed a missing data on critical variables (education, marital status, wealth indicators and labor-force participation status) the analytical sample was reduced to 8,734 women. The left-out observations (somewhere around 3.8 percent of the eligible sample) were not shown to deviate in any systematic fashion when compared to the retained sample on major demographic traits as confirmed by the comparison of means and proportions. Survey sampling weights were used in all analyses to consider the complex sampling design and to make them national.

Variable Definitions

Dependent variable. The dependent variable is a dichotomous variable indicating labour-force participation with the coded value 1 when the woman said that she was engaged in any paid work activity on the seven days before the survey and 0 when not. This term is based on the International Labour Organization (ILO) standard of quantifying the participation of the labor-force and reflects participation in the formal and informal paid work.

Independent variables. The independent variables are grouped together into four categories. Personal factors are age (continuous, in years), age squared (to reflect age non-linearity), years of educational attainment (continuous), and marital status (categorical: unmarried, married, divorced/widowed). The categories of education are also created in the following way: no formal education (0 years), primary (1-5 years), secondary (6-12 years) and higher education (13 and above years). Household attributes are wealth quintile (according to household expenditure per capita household spending, calculated using survey weights), household size, presence of at least one child less than 5 years, children under 15 years and female household headship. Spouse features (married women only) are years of spouse education, employment of spouse and marriage age disparity. The geographic factors comprise urban/rural housing, province of housing, ecological zone, and proximity to the facility. Economic indicators in the household sector are land ownership, livestock ownership, and ownership of a business.

Econometric Methodology

The analytical model will be binary logistic regression, which would be suitable in the modelling of a dichotomous dependent variable. Logistic model is an estimation of the log-odds of labour-force participation as a linear sum of the explanatory variables. The overall specification is:

$$\text{logit}(\pi) = \beta_0 + \beta_1(\text{Education}) + \beta_2(\text{Marital Status}) + \beta_3(\text{Age}) + \beta_4(\text{Age}^2) + \beta_5(\text{Wealth}) + \beta_6(\text{Children}) + \beta_7(\text{Location}) + \Sigma\beta_i X_i + \Sigma\gamma_j X_j X_k \quad (1)$$

where π, is the likelihood of labour-force participation, X_i covariates of the main-effect, and X_jX_k, covariates of interaction between chosen pairs of variables. The exponentiated coefficients are expressed as odds ratios (OR) which represent the multiplication change in odds of participation with a one unit increase in the predictor in other things remaining constant. A value above one is an indication of high odds and vice versa. It should be stressed that odds ratios obtained using cross-

sectional data are only able to reflect associations as opposed to causal effects by the fact that it is not possible to eliminate unobserved confounding and reverse causation when experimental or quasi-experimental identification strategies are not in place.

Model-Building Strategy

It is done via a hierarchical model-building technique to determine the incremental value of separate groups of variables. Model 1 contains only individual characteristics (age, age squared, education, marital status). Model 2, includes household composition and economic variables (wealth quintile, household size, children, female headship, land ownership). Model 3 includes geographic variables (urban/rural residence, province, ecological zone). Model 4, which is the complete specification, adds the terms of interaction and spousal attributes. The interactions that are tested include: education × marital status, education × presence of young children, wealth quintile × urban/rural location, education × household wealth, age × marital status and spouse education × woman education (married women).

Model Diagnostics and Robustness

Evaluation of model fit is by HosmerLemeshow goodness of fit test, area under receiver operating characteristic (roc) curve (c-statistic) and classification accuracy. The independent variables are evaluated on multicollinearity through the use of variance inflation factors (VIF); any value of them that is less than five suggests the lack of problematic multicollinearity. Likelihood-ratio tests are used to analyze the statistical significance of the interaction terms by comparing the models with and without the interaction terms. The marginal effects and predicted probabilities are calculated when representative values are used to show substantively how large the estimated effects are. Age group, geographical location, educational level and household wealth subgroup analyses are performed to look at the heterogeneity of the effects. Each of the analyses uses survey-weighted estimation methods to take into consideration the elaborate sampling plan of the NLSS-IV.

Analysis and Results

4.1 Descriptive Statistics

Table 1: *Characteristics of Women by Labor Force Participation Status (N = 8,734)*

Variable	Overall	Participating (32.1%)	Not Participating (67.9%)	p-value
Individual Characteristics				
Average age (years)	32.4 (12.8)	33.7 (11.9)	31.7 (13.2)	<0.001
Years of education	3.2 (4.1)	4.8 (4.7)	2.4 (3.6)	<0.001
Educational Level				<0.001
No formal education	52.3%	38.7%	59.1%	
Primary education	23.4%	28.9%	20.8%	
Secondary education	20.1%	26.2%	17.3%	

Higher education	4.2%	6.2%	2.8%	
Marital Status				<0.001
Unmarried	25.8%	42.1%	17.9%	
Married	67.4%	52.3%	74.8%	
Divorced/Widowed	6.8%	5.6%	7.3%	
Household Composition				
Has children under 5	38.7%	31.2%	42.4%	<0.001
Average children under 15	1.8 (1.9)	1.5 (1.7)	1.9 (2.0)	<0.001
Female-headed household	23.1%	28.4%	20.6%	<0.001
Economic Characteristics				
Wealth Quintiles				<0.001
Poorest	20.0%	28.3%	15.9%	
Second	20.0%	24.7%	17.8%	
Middle	20.0%	19.8%	20.1%	
Fourth	20.0%	16.2%	22.1%	
Richest	20.0%	11.0%	24.1%	
Household owns land	71.2%	78.9%	67.3%	<0.001
Geographic Distribution				
Urban residence	15.8%	18.3%	14.6%	<0.001

Source: Authors' calculations based on NLSS-IV (2010/11) data.

Table 1 shows the descriptive features of the sample according to the labour-force participation status. In the analytical sample consisting of 8734 women, 32.1 percent of the sample was engaged in the paid labour market. The average age of the participants was slightly higher (33.7 vs. 31.7 years) and the level of educational attainment was significantly higher (4.8 vs. 2.4 years of schooling). There were pronounced differences in the distribution of educational attainment: 59.1% of non-participants were not formally educated and 38.7% of participants. The proportion of participants to non-participants was very small (42.1 to 17.9) but the proportion of married to unmarried women was very large (74.8 to 52.3).

The structure of the households was also very different in the groups. A higher percentage of non-participants had children aged under five years (42.4% vs. 31.2%) with an average number of children under fifteen were a little higher. The distribution of wealth showed an opposite trend: participants were overrepresented in the lowest quintile (28.3% vs. 15.9%), non-participants in the richest one (24.1% vs. 11.0%). The statistically significant difference was below 0.001, which demonstrates that the groups of participants and non-participants have diverse differences in the individual, household, and geographic aspect.

4.2 Participation Patterns by Key Characteristics

Table 2: *Labor Force Participation Rates by Demographic and Economic Groups*

Characteristic	Category	Participation Rate	N	p-value
Education Level				<0.001
	No formal education	23.7%	4,568	
	Primary education	39.7%	2,044	
	Secondary education	41.9%	1,756	
	Higher education	47.2%	366	
Marital Status				<0.001
	Unmarried	52.4%	2,253	
	Married	24.9%	5,886	
	Divorced/Widowed	26.4%	595	
Age Groups				<0.001
	15–24 years	35.8%	3,121	
	25–34 years	28.1%	2,897	
	35–44 years	31.6%	1,923	
	45–54 years	35.2%	1,334	
	55–64 years	29.8%	459	
Children Under 5				<0.001
	No young children	35.7%	5,353	
	Has young children	25.9%	3,381	
Wealth Quintiles				<0.001
	Poorest	45.4%	1,747	
	Second	39.7%	1,747	
	Middle	31.8%	1,747	
	Fourth	26.0%	1,747	
	Richest	17.6%	1,746	
Location				<0.001
	Urban	37.2%	1,380	
	Rural	31.1%	7,354	

Source: Authors' calculations based on NLSS-IV (2010/11) data.

Table 2 gives the disaggregates of the labour-force participation levels by the major demographic and economic groups. The data indicates that the educational gradient is very steep with only 23.7 per cent of women who have not received formal education participating in it and 47.2 per cent of women who have succeeded to get higher education participating in it. The marital status difference

is also large, as unmarried women are taking part in the dataset at a higher rate of more than two times that of married women (52.4% versus 24.9%). Age changes are not linear; they are relatively large among the youngest cohort (1524y,35.8y) and decreases as the age is in the child bearing years (2534y,28.1y) before a partial recovery in the older age groups. The wealth is a great data point, as the participation declines at a steady rate, starting at 45.4% in the poorest quintile and 17.6 in the richest quintile. The level of participation is higher among the urban women compared to the rural women (37.2% versus 31.1%). All the observed group differences are significant with p<.001.

4.3 Logistic Regression Results

Table 3: *Logistic Regression Models Predicting Women's Labor Force Participation (Odds Ratios)*

Variable	Model 1	Model 2	Model 3	Model 4 (Full)
Individual Characteristics				
Age	1.02**	1.01*	1.01*	1.01
Age squared	1.00**	1.00*	1.00*	1.00*
Years of education	1.12***	1.09***	1.08***	1.06***
Marital Status (ref: Unmarried)				
Married	0.31***	0.41***	0.42***	0.45***
Divorced/Widowed	0.42***	0.52***	0.53***	0.56***
Household Characteristics				
Has children under 5	—	0.68***	0.69***	0.71***
No. children under 15	—	0.94***	0.94***	0.95**
Female household head	—	1.34***	1.31***	1.28***
Household size	—	0.97**	0.97**	0.98*
Wealth (ref: Poorest)				
Second	—	0.81**	0.82*	0.84*
Middle	—	0.62***	0.64***	0.67***
Fourth	—	0.48***	0.50***	0.54***
Richest	—	0.35***	0.39***	0.43***
Household owns land	—	1.28***	1.25***	1.22**
Geographic Factors				
Urban (ref: Rural)	—	—	1.18*	1.15
Province (ref: Bagmati)				
Province 1	—	—	1.23*	1.21*
Province 2	—	—	0.74***	0.76**
Gandaki	—	—	0.89	0.91
Lumbini	—	—	1.15	1.13

Karnali	—	—	1.67***	1.62***
Sudurpaschhim	—	—	1.41***	1.38***
Spouse Characteristics				
Spouse years of education	—	—	—	0.98*
Spouse employed	—	—	—	0.89*
Model Statistics				
Pseudo R^2	0.162	0.219	0.234	0.251
AIC	9,876	9,204	9,134	8,967
Area under ROC	0.721	0.759	0.768	0.778

*Note: *p<0.05, **p<0.01, ***p<0.001. 95% confidence intervals reported in text. — indicates variable not included in model. Survey weights applied. Source: Authors' calculations based on NLSS-IV (2010/11) data.*

A sequence of nested logistic regression models is presented in table 3. Education is a strong positive predictor of labour-force participation in the most detailed specification (Model 4), with an increase in school years which adds 6 per cent to the odds of participation (OR = 1.06, 95 per cent confidence interval = 1.04 to 1. 08). Intermediation by household and geographic variables is indicated by the reduction in the education coefficient in Model 1 (OR =1.12) to Model 4 (OR =1.06). Marital status is very strong with a negative effect: married women are less likely to be affected, which is 55 per cent lower than unmarried women (OR = 0.45, 95 per cent CI = 0.380.53), and those who have been divorced or widowed are less likely to be affected as well (OR = 0.56, 95 per cent CI = 0.430.73 Participation odds are decreased by 29 per cent (OR = 0.71, 95 per cent CI=0.63- 0.81) by the presence of children below five years and 5 per cent (OR=0.95, 95 per cent CI=.92- 0.98) by the presence of children below 15 years. There is a 28 per cent more odds of participation with female headship of the household (OR = 1.28, 95 per cent CI= 1.12-1.47). The wealth gradient is sharp and monotonic: women in the top quintile of wealth have a probability of participation that is 57 per cent lower than women in the lowest quintile of wealth (OR 0.43, 95 per cent CI 0.34 0.54). There is a positive correlation between participation and ownership of land (OR =1.22, 95%CI =1.07-1.40). There is also geographic disparity; women in Karnali Province have 62% more odds compared with Bagmati Province (OR = 1.62, 95% CI = 1.312), and 24% fewer odds in Province 2 (OR = 0.76, 95% CI = 0.63201). When other covariates are adjusted, the gap between the urban and rural population becomes statistically insignificant. The last model has a pseudo-R-square of 0.251 and a value of 0.778 under the ROC curve with which there is satisfactory discriminatory activity.

4.4 Interaction Effects Analysis

Table 4: *Selected Interaction Effects in Women's Labor Force Participation*

Interaction Term	OR (95% CI)	p-value	Interpretation
Education × Married	1.05 (1.02–1.08)	0.002	Education partially offsets the marriage penalty on participation

Education × Has young children	1.03 (1.00–1.06)	0.047	Education attenuates the negative association of childcare responsibilities
Wealth quintile × Urban	0.87 (0.76–0.99)	0.032	The negative wealth-participation association is stronger in urban areas
Education × Household wealth	0.98 (0.97–1.00)	0.043	The positive education effect diminishes at higher wealth levels
Age × Married	0.99 (0.98–1.00)	0.008	The marriage penalty on participation increases with age
Spouse education × Woman's education	0.97 (0.95–0.99)	0.005	Higher spousal education is associated with lower participation among educated women

Source: Authors' calculations based on NLSS-IV (2010/11) data. Interaction terms tested via likelihood ratio tests.

The effects of interaction are shown in Table 4. The education marriage interaction (OR=1.05, p= 0.002) shows that an extra year of education is linked to a 5 percentage point reduction in the marriage penalty. The implication of this observation is that better educated women who are married have a stronger bargaining power at home or have more access to job opportunities that are more family-friendly. The education-young-children interaction (OR = 1.03, p = 0.047) also shows that education also alleviates the adverse relationship between the presence of young children and participation in the labor force, perhaps because education expands access to higher-paid jobs that facilitate childcare strategies.

The relationship between wealth and participation has been found to be inversely related (WU interaction (OR = 0.87, p = 0.032) because in urban regions the social status factor and other household income sources might be more prominent. Education-wealth interaction (OR=0.98, p=0.043) indicates that the positive impact of education on participating decreases with the household wealth, which is consistent with the belief that economic necessity enhances the returns to education in participation in the workforce. The age-marriage interaction (OR = 0.99, p = 0.008) indicates that the marriage penalty is slightly tightened as age progresses, which possibly indicates the accumulation of family obligations throughout the life cycle. The interaction between education of husbands and wives (OR= 0.97, p=.005) indicates that wives of more educated husbands are less likely to be participants, as is consistent with traditional breadwinner models where the income-earning power of husbands replaces the labor force participation of women.

4.5 Predicted Probabilities by Profile

Table 5: *Predicted Labor Force Participation Probabilities by Women's Profile*

Profile Description	Predicted Probability	95% CI
High participation: Unmarried, secondary education, no young children, poorest quintile	0.623	0.587–0.658

Educated married: Married, secondary education, young children, middle-income	0.289	0.254–0.326
Traditional: Married, no education, young children, richest quintile	0.087	0.072–0.105
Female head: Divorced/widowed, primary education, no young children, poorest quintile	0.421	0.379–0.464
Young unmarried: Unmarried, primary education, poorest quintile	0.548	0.512–0.583
Urban educated: Married, higher education, no young children, upper-middle income, urban	0.387	0.334–0.442

Source: Authors' calculations based on NLSS-IV (2010/11) data. Probabilities computed from the full model at specified covariate values.

Table 5 shows the forecasted levels of participation of the labor force based on representative demographic patterns, obtained through the complete model. The likelihoods range between 0.087 on the one end, the so-called traditional profile, i.e., being married, having no education, young children, and being one of the richest quintiles, and 0.623 on the other end, the so-called high participation profile, i.e., being an unmarried woman with secondary education, no young children, and being in the poorest quintile. This seven-fold difference is an indication of the compounding influences of various constraints. The educated married profile has a probability of participation of 0.289 indicating that although education alleviates the marriage penalty to a certain degree, it fails to cover all the limitation of marital status, childcare and mid-income household circumstances. Her moderate probability of participation of 0.421 is seen in female household heads where the economic need to earn money is essential in the absence of a key male earner. The profile of the urban educated, i.e. a married woman with higher education, living in the city, with the upper-middle income bracket but without young children is predicted with a relatively low probability of 0.387, which means that even in relatively favourable conditions of education and location, marital status and increased household income are linked to the lack of workforce engagement.

4.6 Subgroup Analysis by Key Demographics

Table 6: *Odds Ratios for Key Determinants by Demographic Subgroups*

Subgroup	Education OR	Marriage OR	Young Children OR	Wealth (Rich vs Poor) OR
Age Groups				
Young (15–29)	1.08***	0.38***	0.64***	0.41***
Middle (30–44)	1.05**	0.51***	0.75**	0.44***
Older (45–64)	1.04*	0.52***	0.82	0.46***

Location				
Urban	1.09***	0.42***	0.68**	0.35***
Rural	1.05***	0.46***	0.72***	0.45***
Education				
No formal	—	0.41***	0.69***	0.42***
Primary+	—	0.48***	0.74***	0.44***
Wealth				
Poor (Q1–Q2)	1.07***	0.39***	0.71***	—
Non-poor (Q3–Q5)	1.04**	0.52***	0.72**	—

*Note: *p<0.05, **p<0.01, ***p<0.001. 95% confidence intervals available in text. — not applicable. Source: Authors' calculations based on NLSS-IV (2010/11) data.*

Table 6 gives subgroup analyses that test the heterogeneity of the estimated effects. The education effect is slightly higher among younger women (OR = 1.08 ages 15 to 29 versus OR = 1.04 ages 45 to 64) and urban dwellers (OR = 1.09 versus OR = 1.05 living in urban areas), indicating that returns to education to labor force participation are higher in those circumstances in which women with education have a larger number of job opportunities. Younger women (OR=0.38) and urban residents (OR=0.42) are the most affected by the marriage penalty. The difference in negative association between young children and participation is highest among younger women (OR = 0.64) and less apparent in older women (OR = 0.82, not significant) probably due to the lack of young children. The negative relationship between wealth and participation is also consistently high (OR of between 0.35 and 0.46) also highlighting the necessity as a result of economic need as a universal factor explaining women in the work force.

Discussion

According to the results of the given research, the involvement in the labor force by women in Nepal is determined by the complicated combination of individual, household and context factors and the interaction between them has strong effects with uneven results based on the subpopular groups. These findings are placed in the known literature as discussed below without losing proper caution on the issue of causal interpretation because the data is cross-sectional.

Education is found to be a uniform positive correlate of women participating in labor force with each year of schooling correlating a 6-percentage point rise in the odds of participation in the full model. The observation is consistent with the vast amount of the international literature that defines education as a strong predictor of the participation of women in the workforce (UNESCO, 2022; Psacharopoulos and Patrinos, 2024). The fact that the education coefficient did attenuate between Model 1 (OR = 1.12) and Model 4 (OR = 1.06), does point to the idea that much of the education-participation relationship is mediated by household economic status and the nature of the geographic setting and not a simple factor of human capital. The size of education effect in Nepal is medium relative to those found in other developing countries (Klasen et al., 2021), implying that structural and cultural factors could be limiting the transformation of education level in labor force participation.

This is because the marriage penalty is one of the most striking results, where the odds ratio of married women participating are 55 per cent lower compared to that of unmarried women. Such connection is aligned with the reports of South Asian settings where the restricting power of marital demands and domestic roles on the economic activity of women has been reported (Sharma and Deshpande, 2022; Rahman et al., 2023). The education marital status interaction shows that education partially mediates this relationship, so that an extra year of schooling decreases the marriageparticipation gap by some 5% on average. However, the marriage penalty that remains so large among educated women even after the usual timeframe implies that education is not enough to break the shackles of traditional gender role ideals and good old fashioned division of labor.

The negative correlation between household wealth and the labor force participation of women (women in the richest quintile are 57 000 per cent less likely to participate in the labor workflow as compared to women in the poorest) represents the evidence that is both consistent with the income-effect hypothesis and with the social status explanations reported in other South Asian contexts (Kapsos et al., 2021). The hypothesis that considerations of social status about non-participation in women are stronger in an urban environment is substantiated in the finding that the wealth-participation relationship is stronger in metropolitan areas as indicated by the wealth-urban interaction effect. The education-wealth interaction also reveals that the returns to education to participate decline with an increase in household wealth, which then suggests that economic need enhances the motivator to cause educated women to join the labor force.

The confining effect of the association of young children with the participation of women in the labor force (29% less likely) demonstrates the conflict of reproduction and production roles that has been central to gender disparity in labor market in developing economies. This association between these more educated women may be attenuated as the education and children interaction shows because of more access to childcare plans or having more flexible working arrangements. The greater childcare limitation identified in younger women and urban population as indicated by the subgroup analysis is indicative of the need of context-specific childcare support infrastructure.

The geographical differences in participation whereby the odds are much higher in Karnali Province and much lower in Province 2 shows the economic and cultural diversity of Nepal. Increasing the economic participation in disadvantaged Karnali is probably due to the greater economic need, and the decreasing participation in Province 2 might be due to less liberal cultural beliefs concerning the economic involvement of women. The fact that the urban rural difference was found to be not significant when other factors were put into consideration indicates that urbanization alone is not going to enhance the economic participation of women unless the structural and cultural factors that hinder their participation are reduced.

This study has a number of limitations that need to be mentioned. To start with, cross-sectional design does not allow the causal interpretation; the calculated relationships might be influenced by unknown confounding factors and reverse causality. By way of example, women who but weaker labor preferences might invest more in education, leading to a selection effect which blows up the estimated education-participation relationship. Second, the NLSS-IV data is dated at 2010/11 and the labor market situation, education level and gender attitudes could have changed during the time. Third, the binary measure of the labor force participation fails to reveal the quality, intensity and type of employment, which could vary significantly among the population subgroups under discussion. Fourth, the research fails to tackle the possibility of endogeneity in the variables of

fertility and household wealth of which, are probable to be co-determined along with labor force participation. One method to resolve these limitations in future research involves panel analysis of data, instrumental variables, or more recent data in surveys.

Conclusion

The current research presents the empirical evidence that the labour force participation of women in Nepal can be determined under the influence of education, marital status, household economic conditions, roles in childcare, and geographical context. Going beyond bare additive models, the analysis indicates that the impacts of key determinants are conditional on other factors, which introduce strong heterogeneity in participation outcomes of different segments of the population. There is a positive relationship between participation and education but this is diluted by marriage, household wealth, and the young children. The marriage penalty is quite large, and enduring, but in part compensated by education. The inverse relationship between participation and household wealth is lower in urban areas. They are in line with the explanation that economic necessity, and not empowerment, is a main correlate of the workforce participation of women in the present Nepal scenario.

These results have major policy implications on the intervention to enhance the economic participation of women. The interaction effects imply that solo interventions based on education only will hardly lead to significant shifts in the rate of participation unless the combination with the measures to mitigate the inhibitory nature of conventional gender roles, ineffective childcare facilities, and the social status circumstances inherent with household wealth. Combined strategies involving educational investment with easy access to childcare facilities, flexible work patterns, and community-based strategies to transform gender norms will probably be more effective in comparison with unsubsidized interventions.

Geographic heterogeneity recorded in the current study also means that policies should be designed to suit local economical and cultural settings and no longer primarily focused on enhancing policies nationally. The low participation rates in Province 2 and the different participation trends in cities and in the countryside prove that context-specific strategies are necessary. Future studies must utilize longitudinal information and quasi-experimental designs to prove the cause-effect relationships and must examine the standard and character of women employment besides the participation levels.

Policy Implications

According to the empirical evidence of the current research, there are some directions in the form of policy that should be considered. To begin with, efforts to invest in education of girls and women must be accompanied by post-education employment initiatives to counter the barriers such as skills training in line with the labour-market demand and opportunities to be entrepreneurs. Second, introducing affordable and accessible childcare services, in urban centres and to women in both formal and informal employment, would alleviate the childcare limitation to labour-force participation. Third, workplace flexibility policies, including part-time employment, telecommuting, and family-friendly workplace policies, can also help women to balance between productive and reproductive responsibilities.

Fourth, the cultural obstacles that particularly limit married women and women in the conservative areas can be overcome through community-based campaigns focused on the change of the old

gender norms and encouraging the positive view of the economic contributions of women, both of which require the involvement of both men and women. Fifth, specific interventions, such as those to support demographic groups with the lowest enrolment rates, such as married women with young children and women in culturally conservative regions, could deal with the combinations of constraints revealed in the interaction analysis. Sixth, tax incentives to motivate working mothers, subsidies on women-owned businesses and social-protection policies which would not penalize women participation in the labour force would help to offset the propensity of women to leave the labour force when their household income increases.

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