Vocational Training and Women's Work in Nepal

Abstract

Female labor force participation in Nepal remains low despite rising educational attainment. Using data from the 2017 Nepal Labour Force Survey covering 24,804 women, this paper examines associations between completed formal vocational training and labor market outcomes. Across multiple estimation approaches, training completion is associated with substantially higher labor force participation. These associations are concentrated in business and self-employment rather than wage employment. Traditional skills show strong associations, while computer training shows weak associations. The findings complement experimental evidence and provide system-level insights into how vocational training aligns with labor market opportunities in settings with limited wage employment.

Keywords: Female labor force participation; Vocational training; Self-employment; Nepal; Gender and development

1 Introduction

Female labor force participation in South Asia remains among the lowest globally, posing a persistent puzzle in development economics. In Nepal, this puzzle is particularly stark. Despite substantial gains in female educational attainment over recent decades, women's labor force participation remains low at approximately 27 percent, generating a large and persistent gender gap (World Bank 2021; ILO 2020). This disconnect between educational progress and labor market engagement has important implications for gender equality, household welfare, and aggregate economic growth (Klasen 2019).

A growing literature suggests that formal schooling alone may be insufficient to overcome the constraints limiting women's economic participation in low-income settings. These constraints include skill mismatches between education and available jobs, occupational segregation, social norms restricting mobility and acceptable forms of work, discrimination in hiring, and limited access to capital for entrepreneurship (Jayachandran 2020). In response, governments and development agencies across South Asia have invested heavily in vocational and technical training programs intended to equip women with job-relevant skills and facilitate entry into income-generating activities. Yet policymakers continue to face uncertainty about which skills translate into employment for women under real labor market constraints, and how national training systems should be designed across diverse geographic and demographic contexts.

The empirical evidence on vocational training reflects this uncertainty. Systematic reviews document modest average associations with employment and earnings, alongside substantial heterogeneity across contexts, target populations, and program designs (McKenzie 2017; Chinen et al. 2017). Experimental and quasi-experimental evaluations report both significant gains and null results (Attanasio et al. 2011; Card et al. 2018). In Nepal, Chakravarty et al. (2019) provide compelling experimental evidence that an intensive program combining training with wage subsidies, job placement, and psychosocial support substantially increased employment and earnings among urban youth. While informative, such interventions differ markedly from the typical standalone vocational training programs delivered at scale, limiting the external validity of program-specific

estimates for national training system design.

This paper evaluates vocational training as it is delivered at scale. Using data from the 2017 Nepal Labour Force Survey, we examine how completed vocational training correlates with women's labor force participation and employment composition across the full range of training providers, subjects, and demographic groups observed in the population. We find that training completion is robustly associated with higher labor force participation, with associations concentrated in business and self-employment rather than wage employment, and little evidence of shifts into unpaid family work. These patterns vary sharply across training subjects and demographic groups, highlighting the importance of labor market alignment and context-specific constraints. In doing so, the study contributes to the vocational training literature by providing nationally representative, system-level evidence on how training completion is associated with women's labor force participation and employment composition across skill types and population groups—an area that remains underexplored relative to program-level causal evaluations.

2 Context and Related Literature

2.1 Nepal's Labor Market and Vocational Training System

Nepal remains predominantly agricultural, with approximately 66 percent of the workforce engaged in agriculture as of 2017 (CBS 2019). The official female labor force participation rate of 26 percent masks substantial measurement challenges and heterogeneity. Many women engage in unpaid family agricultural labor that is often undercounted in standard labor force statistics. Traditional gender norms assign women primary responsibility for household and care work, restrict mobility outside the home, and stigmatize certain types of market work, particularly for married women and women from higher caste groups (Jayachandran 2020).

Nepal's formal vocational training system comprises both public and private providers coordinated by the Council for Technical Education and Vocational Training (CTEVT), established in 1989 (CTEVT 2018). Training areas span construction trades, electronics,

hospitality, health sciences, agriculture, information technology, and traditional crafts. Among women who complete training in our data, tailoring is by far the most common subject (41 percent), followed by agriculture (13 percent), other subjects (18 percent), computer training (8 percent), handicrafts (8 percent), beauty services (7 percent), and nursing (3 percent). Recent years have seen increasing emphasis on entrepreneurship development and gender mainstreaming in vocational programs (ADB 2015), though implementation quality and coverage remain heterogeneous across Nepal's diverse geographic and demographic contexts.

2.2 Female Labor Force Participation: Theory and Evidence

The determinants of female labor force participation have long been central to labor economics. Classic models emphasize education's role in raising the opportunity cost of home production and improving market wage offers (Mincer 1962; Becker 1985). However, this framework struggles to explain the persistent disconnect between educational gains and labor force participation in many developing countries, particularly across South Asia (Klasen and Pieters 2015; Klasen 2019).

Contemporary research emphasizes the critical role of social norms, occupational segregation, and structural barriers. Jayachandran (2015) documents how norms regarding appropriate work for women restrict labor supply decisions across developing countries, with particularly strong effects in South Asian contexts. In India, Bangladesh, and Nepal, mobility restrictions, concerns about family honor, and stigma associated with certain occupations significantly constrain women's labor market participation (Asadullah and Wahhaj 2017). Jensen (2012) demonstrates that providing information about employment opportunities to young women in India increased labor force participation and delayed marriage, indicating that changing expectations and information can shift behavior even in the face of normative constraints.

These findings suggest that policies aiming to increase female labor force participation must address both supply side constraints (skills, information, preferences) and demand side factors (job availability, workplace norms, discrimination). Vocational training

programs potentially operate on multiple margins: building skills, providing credentials that signal productivity, facilitating entry into less norm-restricted occupations or self-employment, and creating networks and information channels.

2.3 Evidence on Vocational and Business Training

The literature on vocational training in developing countries has grown substantially over the past two decades, moving from largely descriptive studies to rigorous impact evaluations. Card et al. (2018) provide a comprehensive meta-analysis of active labor market programs in developed countries, finding that training programs tend to have modest positive effects that emerge over medium to long horizons. Evidence from developing countries, however, is more mixed and context-dependent.

Chinen et al. (2017) conduct a systematic review of vocational and business training programs for women in low and middle income countries, synthesizing evidence from 35 studies. Their review yields several key lessons. First, training programs demonstrate heterogeneous impacts, with some showing substantial improvements in employment and earnings while others show null effects. Second, effect sizes are generally modest when present, with typical employment impacts in the range of 3 to 7 percentage points. Third, programs integrating training with complementary services such as capital access, mentoring, or job placement tend to be more effective than standalone training. Fourth, context matters enormously, with program impacts varying by local labor market conditions, cultural norms, and the specific constraints women face.

Several landmark experimental evaluations illustrate this heterogeneity. Attanasio et al. (2011) evaluate Colombia's Jóvenes en Acción program, finding positive impacts on formal sector employment and earnings, with particularly strong effects for women. The program combined classroom training with on-the-job experience, providing both technical skills and labor market connections. Adoho et al. (2014) assess Liberia's Economic Empowerment of Adolescent Girls and Young Women program, finding short-run improvements in employment and earnings that diminished over time, highlighting sustainability challenges. Bandiera et al. (2020) study an integrated program in Uganda

combining training, capital transfers, and mentoring, finding sustained improvements in employment and earnings for poor women.

2.4 Nepal-Specific Evidence

In the Nepal context, the most rigorous evidence comes from Chakravarty et al. (2019), who evaluate the Employment Fund program using a randomized controlled trial. The program targeted urban youth aged 16 to 25, providing three months of intensive training combined with wage subsidies for employers, job placement services, and psychosocial support. The authors find substantial impacts: a 9.3 percentage point increase in employment for young women and a 31 percent increase in earnings. Importantly, their analysis reveals that women's gains were concentrated in business and self-employment rather than wage employment, suggesting that training helped women circumvent barriers to formal sector access by enabling entrepreneurship in norm-compatible activities.

While the Chakravarty et al. (2019) study provides valuable causal evidence on an intensive, comprehensive intervention for urban youth, several questions remain for broader policy design. First, what are the labor market associations of typical vocational training as delivered at scale across Nepal, which generally consists of shorter, less intensive programs without integrated job placement or subsidies? Second, how do training associations vary across the full age distribution of women, including prime-age and older women who face different constraints than youth? Third, which specific training subjects show the strongest associations with employment, given Nepal's particular labor market structure? Fourth, how do training associations vary across the diverse demographic, geographic, and ethnic contexts that characterize Nepal?

This paper addresses these questions using nationally representative data that span all ages, geographic areas, ethnic groups, and types of vocational training programs. We explicitly position this contribution as complementary to experimental and quasi-experimental program evaluations rather than as a substitute for causal identification. Experimental studies provide internally valid estimates of specific program impacts on selected populations, answering the question: what is the causal effect of being offered

or admitted to a particular program for participants at that program's margin? Our approach answers a different question: across all women who have completed vocational training through diverse programs and providers, how do their labor market outcomes compare to observably similar women who have not completed training, and how do these associations vary across training types and demographic contexts?

This population-level evidence serves several purposes. First, it provides nationally representative estimates of training associations that reflect the aggregate patterns of the vocational training system as it actually operates, including variation in program quality, subject mix, and participant characteristics. Second, it allows detailed examination of heterogeneity across dimensions not typically feasible in single-program evaluations, such as variation across multiple training subjects, fine-grained age and education categories, and diverse ethnic groups. Third, it generates descriptive evidence on where training associations are strongest and which populations show the largest differences, informing targeting and program design decisions that must account for national diversity.

Methodologically, our use of matching and weighting methods with national labor force survey data follows the approach demonstrated by ADB (2020) in their analysis of technical and vocational education and training in the Philippines. That study similarly employs propensity score matching with nationally representative data to estimate associations between TVET participation and labor market outcomes, finding positive associations concentrated among certain demographic groups. Our research extends this approach by examining employment composition in detail, conducting more extensive heterogeneity analysis, and focusing specifically on women in a South Asian context where gender norms create distinctive constraints.

3 Data

3.1 Data Source

The analysis uses data from the Nepal Labour Force Survey (NLFS) 2017, a nationally representative household survey conducted by the Central Bureau of Statistics with

technical assistance from the International Labour Organization (CBS 2019). The survey employs a two-stage stratified sampling design covering all 75 districts of Nepal and includes approximately 14,000 households. The NLFS provides detailed information on labor force participation, employment characteristics, and vocational training and is the most recent nationally representative source for these outcomes in Nepal.

The questionnaire collects information on demographic characteristics, educational attainment, labor market activity, employment status, occupation, industry, and hours worked. Importantly for this study, the survey includes a module on vocational and technical training that records whether respondents have completed formal training, the subject of training, and the duration of training in months.

3.2 Sample Construction and Variable Definitions

The analysis sample consists of women aged 17 to 65 years, yielding 24,804 observations. Among these, 2,544 women (10.2 percent) report having completed formal vocational or technical training. The average duration of training among completers is 4.17 months, with substantial variation across training subjects.

The primary treatment variable is an indicator equal to one if a respondent reports having completed formal vocational training. Training subjects are classified into seven categories: tailoring, agriculture, computer training, handicrafts, beauty services, nursing, and other subjects. We also examine the intensive margin using reported months of training.

The primary outcome is labor force participation, defined following International Labour Organization conventions as being employed or actively seeking employment during the reference period. We separately examine employment and unemployment. To characterize employment composition, we distinguish between paid employment, business and self-employment, and unpaid family work. These categories are mutually exclusive among employed women. We also examine weekly hours worked.

Control variables include a standard set of individual, household, and geographic characteristics. Individual controls include age, marital status, education, household

composition, and ethnicity. Household controls include land ownership, housing quality, and a standardized asset index constructed from durable goods ownership and housing characteristics. Geographic controls include an indicator for urban residence and district fixed effects. All standard errors are clustered at the primary sampling unit level.

4 Empirical Strategy

This paper examines how completion of vocational training is associated with women's labor market outcomes using cross sectional, nationally representative survey data. Because participation in vocational training is not randomly assigned, the analysis adopts a selection on observables framework and estimates adjusted associations between training completion and labor market outcomes using multiple complementary estimators.

4.1 Baseline Specification

We estimate the relationship between vocational training completion and labor market outcomes using the following baseline specification:

$$Y_i = \alpha + \beta \, \text{Training}_i + X_i'\gamma + \delta_d + \varepsilon_i, \tag{1}$$

where Y_i denotes a labor market outcome for woman i. Outcomes include labor force participation, employment status, employment type, and weekly hours worked. Training_i is an indicator equal to one if the respondent reports having completed formal vocational or technical training. The vector X_i includes individual, household, and socioeconomic characteristics, and δ_d denotes district fixed effects. Standard errors are clustered at the primary sampling unit level.

The coefficient of interest, β, captures the association between training completion and labor market outcomes conditional on observed characteristics. Throughout, estimates are interpreted as adjusted differences rather than causal effects.

4.2 Estimation Approaches

Our baseline estimates are obtained using logistic regression for binary outcomes. We report average marginal effects evaluated at sample means for ease of interpretation. This approach efficiently uses all available observations but relies on parametric functional form assumptions.

To assess robustness to functional form and modeling assumptions, we complement regression estimates with several selection on observables estimators. First, we implement propensity score matching using nearest neighbor matching with replacement, where propensity scores are estimated as a function of the full set of covariates in X_i and district indicators. Second, we apply nearest neighbor matching based on Mahalanobis distance, which avoids reliance on a scalar propensity score and matches directly on observed covariates. Third, we estimate regression adjustment models that predict potential outcomes under training and non training and compute adjusted differences for training completers. Finally, we employ inverse probability weighting with regression adjustment, a doubly robust estimator that remains consistent if either the treatment assignment model or the outcome model is correctly specified.

Across all matching and weighting approaches, we report average treatment effect on the treated style estimands. These estimands summarize adjusted outcome differences for women who completed vocational training, rather than average differences for a randomly selected woman.

4.3 Identification Assumptions and Interpretation

All estimators rely on the conditional independence assumption, namely that, conditional on observed characteristics, training completion is independent of potential labor market outcomes. While this assumption is not directly testable and may be violated by unobserved factors such as motivation or ability, the analysis takes several steps to assess robustness.

First, we condition on a rich set of covariates capturing education, demographics, household characteristics, assets, and geographic location. Second, we assess covariate

balance and overlap in the matched samples and report standardized differences and variance ratios. Third, we compare results across multiple estimators with different identifying assumptions and sensitivity to functional form. Consistency of results across these approaches increases confidence that the documented patterns are not driven by a particular specification.

Importantly, the analysis focuses on training completion rather than training offers or assignment. Completion reflects both access to training and persistence through the program. As a result, estimated associations may reflect positive selection into completion and should be interpreted as upper bounds on causal effects.

4.4 Heterogeneity and Robustness Analysis

In addition to baseline estimates, we examine heterogeneity along policy relevant dimensions. We estimate separate specifications by training subject to assess alignment between skill content and labor market opportunities. We also examine heterogeneity by education level and location, capturing complementarities between general education and vocational skills and differences in opportunity structures across urban and rural settings.

Further subgroup analyses by age, marital status, land ownership, household size, and ethnicity are conducted to explore how training associations vary across demographic and socioeconomic contexts.

Robustness and sensitivity checks include alternative estimators, alternative outcome definitions, balance diagnostics, and full regression results. These analyses are reported in the Results section and the Appendix.

5 Main Results

This section presents descriptive differences and adjusted association estimates between women who completed vocational training and observably similar women who did not. We begin by documenting raw differences in labor force participation and employment composition by training status. We then present adjusted association estimates using

regression and selection on observables approaches. Next, we examine heterogeneity across policy relevant dimensions, focusing on training subject, education, and location. We conclude with robustness and sensitivity checks. Additional descriptive statistics, balance diagnostics, alternative specifications, and subgroup results are reported in the Appendix.

5.1 Descriptive Patterns and Selection into Training

Women who complete vocational training differ systematically from women who do not in both labor market outcomes and observable characteristics. Table 1 reports summary statistics by training status. Trained women exhibit labor force participation of 47.6 percent, compared to 24.8 percent among non-trained women, implying a raw gap of 22.8 percentage points.

This gap is concentrated in market oriented activities. Trained women are substantially more likely to report paid employment and, in particular, business or self-employment. In contrast, differences in unpaid family work are small. Trained women also report nearly double the number of weekly work hours relative to non-trained women.

Table 1: Descriptive Statistics by Training Status

	Mean			
Variable	No Training	Training	Difference	Significance
Labor force participation	0.248	0.476	0.228	***
Employed	0.218	0.414	0.195	***
Unemployed	0.030	0.063	0.033	***
Paid employment	0.080	0.142	0.062	***
Business or self-employment	0.071	0.183	0.112	***
Unpaid family work	0.083	0.094	0.011	*
Weekly hours worked	7.834	14.750	6.916	***
Observations	22,260	2,544		

Notes: NLFS 2017. Women aged 17 to 65. Training indicates completed formal vocational training. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

Full descriptive statistics for demographic, household, and geographic characteristics are reported in Appendix Table A1. These statistics reveal substantial positive selection into training completion. Trained women are younger, more educated, more likely to

live in urban areas, and come from households with higher asset ownership and better housing quality. These differences motivate the use of adjusted estimation strategies to account for observable selection.

5.2 Training and Labor Market Outcomes

Table 2 presents the core adjusted association estimates. Panel A reports average marginal effects from logistic regressions that control for individual, household, and geographic characteristics. Panel B reports selection on observables estimates obtained using propensity score matching, nearest neighbor matching, regression adjustment, and inverse probability weighting with regression adjustment.

Across all specifications, vocational training completion is positively associated with female labor force participation. Logistic regression estimates indicate that training completion is associated with a 10.8 percentage point higher probability of labor force participation. This association is driven primarily by business and self-employment rather than wage employment, with little association with unpaid family work.

Selection on observables estimates yield larger magnitudes but a consistent pattern. Across matching and weighting methods, training completion is associated with an 18.5 to 20.3 percentage point higher probability of labor force participation. Relative to the sample mean participation rate of 27.1 percent, these adjusted differences are economically large.

Table 2: Associations Between Vocational Training and Labor Market Outcomes

	Labor force	Employed	Unemployed	Paid work	Business work	Unpaid work
Logit marginal effects						
Training completed	0.108***	0.074***	0.016***	0.015**	0.056***	−0.001
	(0.013)	(0.012)	(0.004)	(0.007)	(0.007)	(0.008)
Selection on observables estimates (ATET)						
Propensity score matching	0.185***	0.158***	0.027***	0.041***	0.110***	0.007
Nearest neighbor matching	0.185***	0.158***	0.028***	0.041***	0.105***	0.007
Regression adjustment	0.203***	0.174***	0.029***	0.050***	0.110***	0.010
IPWRA	0.203***	0.174***	0.029***	0.050***	0.110***	0.010
Sample mean	0.271	0.238	0.033	0.086	0.082	0.084

Notes: All models condition on individual, household, and geographic controls with district fixed effects. Standard errors clustered at the PSU level. ATET-style estimates summarize adjusted differences for training completers. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

Decomposition by employment type shows that business and self-employment account for the majority of the association. Paid employment contributes more modestly, while associations with unpaid family work remain small and statistically insignificant. This pattern indicates that training completion is associated with entry into income generating activities rather than increased unpaid household labor.

Balance diagnostics and matching sample sizes are reported in Appendix Tables A2 and A3, with a graphical summary in Appendix Figure A1. These diagnostics show excellent balance on observables after matching, supporting interpretation of the estimates as adjusted differences under conditional independence assumptions.

5.3 Heterogeneity by Training Subject

Training associations vary sharply across training subjects, reflecting differences in labor market demand and the feasibility of entrepreneurship under prevailing constraints. Table 3 reports adjusted log odds estimates by training subject.

Table 3: Heterogeneous Associations by Training Subject

Training subject	Labor force	Paid work	Business work
Tailoring	0.72***	−0.20*	1.17***
Agriculture	0.74***	−0.26	0.98***
Computer	0.21	−0.40*	−0.31
Handicrafts	0.28*	−0.14	1.05***
Beauty services	0.08	−1.07***	1.00***
Nursing	1.33***	2.06***	0.09
Other	0.97***	1.11***	0.49***

Notes: Log odds estimates from logit models. Reference group is women without vocational training. All models include controls and district fixed effects. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

Traditional and locally viable skills exhibit the strongest associations. Tailoring and agriculture training are strongly associated with labor force participation and business or self-employment. Nursing stands out as the only training type strongly associated with paid employment. In contrast, computer training shows weak or negative associations with employment and a positive association with unemployment, consistent with demand side constraints or aspirational job search.

5.4 Heterogeneity by Education and Location

Training associations also vary systematically by education and location. Table 4 shows that associations are largest for women with intermediate levels of education, consistent with complementarities between general education and vocational skills.

Table 4: Heterogeneous Associations by Education Level

	Up to 3rd	8th grade	10th grade	12th grade	College+
Labor force participation	0.816***	0.797***	0.677***	0.582***	0.131
	(0.124)	(0.100)	(0.098)	(0.123)	(0.193)
Employed	0.806***	0.801***	0.589***	0.476***	0.033
	(0.122)	(0.105)	(0.103)	(0.127)	(0.205)
Unemployed	0.381	0.248	0.507***	0.437*	0.425
	(0.337)	(0.242)	(0.180)	(0.242)	(0.411)
Paid employment	0.227	−0.000	0.257*	0.378***	−0.032
	(0.207)	(0.189)	(0.155)	(0.145)	(0.204)
Business or self-employment	0.994***	1.132***	0.890***	0.664***	0.782**
	(0.157)	(0.128)	(0.131)	(0.243)	(0.323)
Unpaid family work	0.399**	0.162	−0.069	0.087	−0.328
	(0.180)	(0.167)	(0.140)	(0.217)	(0.339)
Weekly hours worked	4.404***	4.253***	4.041***	3.178***	0.829
	(1.038)	(0.873)	(0.893)	(1.137)	(1.878)
Observations	12,483	4,965	4,529	1,985	842

Notes: Logit models estimated separately by education category. Reported coefficients are log odds estimates for training completion. All models include individual, household, and geographic controls and district fixed effects. Standard errors clustered at the PSU level. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

Location based heterogeneity is reported in Table 5. Training completion is associated with larger labor force participation differences in urban areas, while rural associations are concentrated in business and self-employment.

Additional heterogeneity by age, marital status, land ownership, household size, and ethnicity is reported in Appendix Tables A8 through A12.

5.5 Robustness and Sensitivity Checks

We assess robustness to estimator choice, functional form, and outcome definition. Balance diagnostics and matching sample sizes are reported in Appendix Tables A2 and A3 and Appendix Figure A1. Full regression results and alternative outcome specifications are reported in Appendix Tables A4 through A7. Results are stable across estimators and

Table 5: Heterogeneous Associations by Location

	Rural	Urban
Labor force participation	0.566***	0.893***
	(0.069)	(0.099)
Employed	0.481***	0.884***
	(0.070)	(0.105)
Unemployed	0.496***	0.263
	(0.127)	(0.246)
Paid employment	0.046	0.558***
	(0.096)	(0.140)
Business or self-employment	0.888***	1.069***
	(0.088)	(0.129)
Unpaid family work	0.039	0.233
	(0.101)	(0.153)
Weekly hours worked	3.238***	5.411***
	(0.590)	(0.837)
Observations	15,122	9,697

Notes: Logit models estimated separately for rural and urban subsamples. Reported coefficients are log odds estimates for training completion. All models include individual and household controls and district fixed effects. Standard errors clustered at the PSU level. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

specifications and consistently indicate that training completion is associated primarily with business and self-employment rather than unpaid family work.

6 Discussion

This study provides population-level evidence on how vocational training completion is associated with women's labor market engagement in Nepal. The dominant pattern that emerges is that training is linked to higher female labor force participation primarily through business and self-employment rather than wage work. This association is consistent across estimation strategies and subgroups, and it reflects how skills are translated into economic activity within the constraints of Nepal's labor market and social environment.

The prominence of self-employment as the main channel through which training is associated with women's economic participation is unsurprising in light of Nepal's labor market structure. Formal wage employment remains limited, particularly outside urban areas, and most employment is informal and locally embedded (CBS 2019). For women,

these structural constraints are compounded by social norms that restrict mobility, shape occupational acceptability, and assign primary responsibility for household and care work. In such contexts, vocational training appears to facilitate labor market engagement not by easing access to scarce wage jobs, but by lowering barriers to home-based or locally viable enterprises. This interpretation aligns closely with evidence from Nepal showing that even intensive training programs combining wage subsidies, job placement, and psychosocial support generated employment gains concentrated in self-employment rather than wage work (Chakravarty et al. 2019). Our results indicate that this pattern is not confined to specific interventions, but characterizes the vocational training system more broadly.

The findings also resonate with a wider literature emphasizing how social norms shape women's labor supply in South Asia. When wage employment requires mobility, interaction with unrelated men, or work outside socially sanctioned spaces, women's economic activity tends to be channeled toward forms compatible with domestic responsibilities and local norms (Jayachandran 2015; Klasen 2019). Self-employment offers flexibility and social acceptability, which may help explain why training associations are particularly strong among married women and in rural areas. At the same time, reliance on self-employment raises concerns about job quality, income stability, and access to social protection. Whether training-induced enterprises generate sustainable livelihoods or merely marginal income opportunities remains an open question that cannot be addressed with cross-sectional data.

The heterogeneity across training subjects further underscores the importance of demand alignment. Training in tailoring, agriculture, handicrafts, and beauty services shows stronger associations with employment outcomes than training oriented toward formal-sector skills. These subjects map closely onto activities that can be pursued with low fixed costs, limited mobility, and strong local demand. In contrast, computer training shows weak or negative associations with employment and a positive association with unemployment. This pattern is particularly informative given the policy emphasis on digital skills. In settings with limited formal-sector absorption, basic computer literacy may raise aspirations and job search intensity without translating into employment. The

positive association with unemployment is consistent with queueing for scarce formal jobs or prolonged search driven by higher reservation wages. Similar concerns about misalignment between training content and labor demand are emphasized in systematic reviews of training programs in developing countries (McKenzie 2017; Chinen et al. 2017). These findings caution against expanding training based on perceived modernity rather than observed demand.

The results also highlight complementarities between vocational training and general education. Training associations are strongest among women with intermediate levels of schooling and attenuate among college-educated women, who already exhibit relatively high baseline participation. This inverted-U pattern suggests that vocational skills are most productive when combined with basic literacy and numeracy, rather than serving as substitutes for general education. This finding echoes broader evidence that skills investments are complementary across stages of human capital accumulation, and that vocational training may be less effective when foundational skills are weak.

These findings suggest that vocational training operates within, rather than transforms, existing labor market realities. Training does not appear to overcome structural constraints on wage employment, but it does facilitate economic participation where opportunities already exist or can be created locally. This interpretation is consistent with regional evidence. Studies from Bangladesh and India emphasize the role of norms, information, and local opportunity structures in shaping women's labor supply and the effectiveness of skills programs (Jensen 2012; Banerjee et al. 2015; Asadullah and Wahhaj 2017). Meta-analyses consistently find that training impacts are heterogeneous and context-dependent, with modest average effects masking substantial variation across populations and program designs (Chinen et al. 2017; McKenzie 2017). Our contribution is to document these patterns for a nationally representative sample, identifying which types of training and which contexts are associated with stronger employment differences.

Several policy implications follow, though they should be interpreted cautiously given the associational nature of the evidence. First, the concentration of training associations in self-employment suggests that vocational programs may be more effective when in-

tegrated with entrepreneurship support, such as business skills, access to capital, and market linkages. Skills alone may be insufficient when trainees must create their own employment opportunities. Second, the complementarity with general education implies that vocational training may be most productive when it builds on foundational schooling, or when programs explicitly incorporate basic skills components. Third, the strong heterogeneity across training subjects and locations argues against uniform program designs. Urban and rural labor markets present fundamentally different opportunity sets, and training systems may need to adapt accordingly. Finally, the persistence of associations across age groups suggests that restricting training programs to youth may miss substantial opportunities to support women's economic participation across the life cycle.

These findings should be interpreted in light of several limitations. The analysis identifies associations for training completers rather than causal effects of training assignment, and selection into completion likely reflects unobserved characteristics such as motivation, family support, and access to information, implying that estimated associations may overstate impacts. Reverse causality is also possible if women seek training in anticipation of labor market entry. The cross-sectional nature of the data precludes analysis of employment dynamics, business survival, or long-run income trajectories, and measurement of women's work in settings with substantial unpaid family labor remains imperfect. Moreover, given the breadth of subgroup analyses, heterogeneity results should be interpreted as empirical patterns rather than definitive causal differences. Despite these limitations, the analysis provides valuable system-level evidence on how vocational training operates in practice, complementing program-level experimental evaluations and highlighting the importance of aligning training systems with local labor market conditions. Future research using longitudinal data and exogenous variation in training access would be well suited to assess causal impacts and longer-run economic trajectories.

7 Conclusion

This paper examines how completed vocational training is associated with women's labor market participation in Nepal. Training completion is consistently linked to higher participation, driven primarily by business and self-employment rather than wage work, with little evidence of reallocation into unpaid family labor. These associations vary substantially across training subjects, education levels, and locations, and are strongest where skills align with locally viable economic activities and build on basic schooling. Taken together, the results suggest that vocational training is most closely connected to women's economic engagement when it complements existing opportunity structures rather than substitutes for scarce wage employment. While the analysis is associational, its nationally representative scope and consistency across methods complement program-level experimental evidence and underscore the importance of demand alignment and system-level design in shaping the role of vocational training in women's economic participation

Data availability: The Nepal Labour Force Survey 2017 is available from the Central Bureau of Statistics, Nepal. Replication code is available from the corresponding author upon request.

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A Appendix Tables and Figures

Table A1: Full Descriptive Statistics by Training Status

Variable	No Training	Training	Difference	Significance
Outcomes				
Labor force	0.248	0.476	0.228	***
Employed	0.218	0.414	0.195	***
Unemployed	0.030	0.063	0.033	***
Paid work	0.080	0.142	0.062	***
Business work	0.071	0.183	0.112	***
Unpaid work	0.083	0.094	0.011	*
Work hours	7.834	14.750	6.916	***
Covariates				
Age	36.586	31.335	5.251	***
Married	0.841	0.794	0.047	***
Urban	0.599	0.697	−0.098	***
Education < 3rd grade	0.542	0.166	0.376	***
Education 8th grade	0.195	0.246	−0.051	***
Education 10th grade	0.167	0.321	−0.154	***
Education 12th grade	0.068	0.182	−0.113	***
College or higher	0.028	0.085	−0.057	***
Own land	0.770	0.712	0.058	***
Pakka house	0.423	0.582	−0.159	***
Asset index (std.)	−0.047	0.414	−0.461	***
Sample size	22,260	2,544	24,804	

Notes: NLFS 2017. Sample includes women aged 17–65. Training indicates completed formal vocational training. *** p<0.01, ** p<0.05, * p<0.10.

Table A2: Matching Sample Sizes

	Before Matching	After Matching
Total observations	24,804	5,088
Trained	2,544	2,544
Controls	22,260	2,544

Notes: Nearest-neighbor propensity score matching with replacement.

Table A3: Covariate Balance Diagnostics Before and After Propensity Score Matching

	Standardized Difference		Variance Ratio	
Covariate	Raw	Matched	Raw	Matched
Age	−0.450	0.000	0.569	0.998
Married	0.102	−0.001	1.115	1.000
Urban residence	0.198	0.002	1.221	0.996
Education up to 3rd grade	0.612	0.004	0.441	1.002
Education 10th grade	−0.431	−0.003	1.384	0.999
Higher education	−0.312	0.001	1.512	1.004
Hill Brahmin/Chhetri	0.093	−0.009	1.045	0.997
Hill Janajati/Adibasi	0.074	−0.002	1.070	0.999
Dalit	−0.088	−0.003	0.804	0.993
Terai Tier 1 and 2	−0.184	0.007	0.529	1.032
Terai Janajati/Adibasi	0.056	0.010	1.164	1.026
Standardized asset index	0.511	0.006	0.503	0.999
Pakka house	−0.325	−0.004	1.402	0.995

Notes: Balance diagnostics for nearest-neighbor propensity score matching with replacement. Standardized differences are defined as mean differences divided by pooled standard deviations. All standardized differences fall below 0.01 in absolute value after matching, and variance ratios are close to unity, indicating excellent balance on observables.

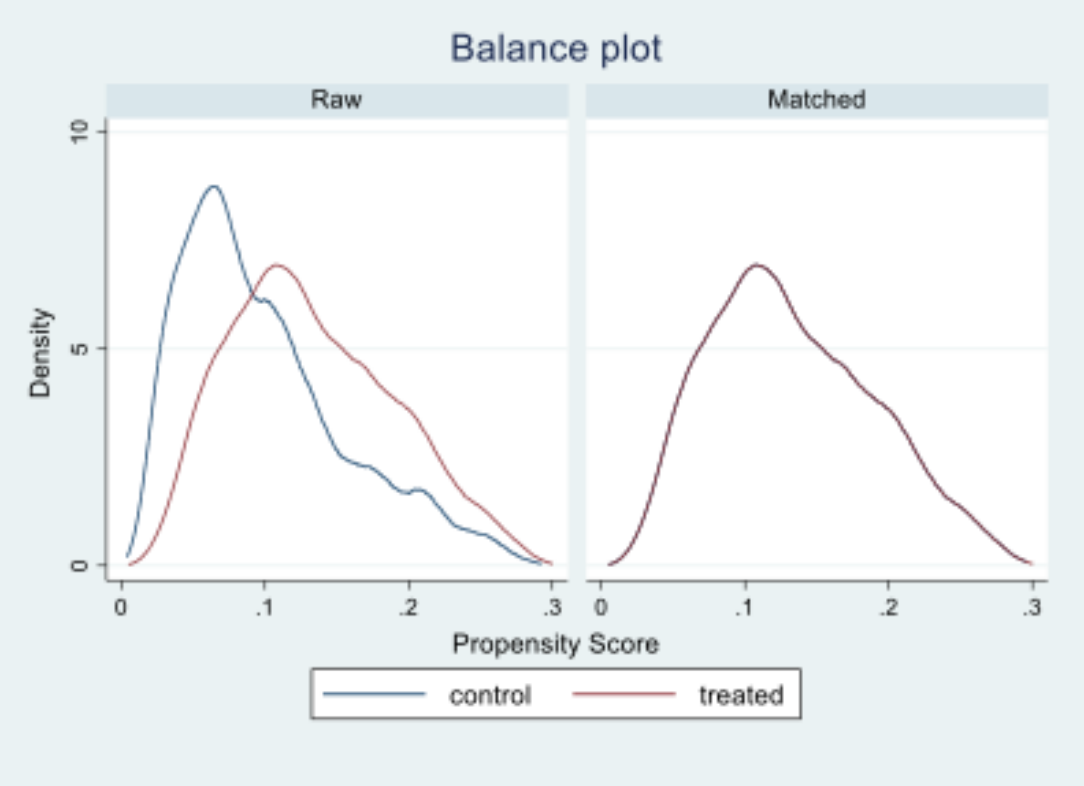


Figure A1: Covariate Balance Before and After Matching

Notes: Standardized differences across covariates before and after propensity score matching.

Table A4: Full Logistic Regression Results: Direction and Significance of Covariates

	(1) Labor force	(2) Labor force	(3) Labor force	(4) Labor force	(5) Labor force
Training variables					
Formal training	$+^{***}$	$+^{***}$	$+^{***}$	$+^{***}$	
Training × Basic education				$+^{***}$	
Months of training					$+^{***}$
Control variables (direction and significance)					
Age	∘	∘	∘	∘	∘
Age squared	$-^{***}$	$+^{***}$	$+^{***}$	$+^{***}$	$+^{***}$
Education 8th grade		$-^{***}$	$-^{***}$	$-^{***}$	$-^{***}$
Education 10th grade		$+^{**}$	$+^{***}$	$+^{**}$	∘
Education 12th grade		$+^{***}$	$+^{***}$	$+^{***}$	$+^{**}$
Higher education		$+^{***}$	$+^{***}$	$+^{***}$	$+^{***}$
Married		$-^{***}$	$-^{***}$	$-^{***}$	$-^{**}$
Hill Janajati/Adibasi		$+^{***}$	$+^{***}$	$+^{***}$	∘
Dalit	∘	$+^{***}$	$+^{***}$	$+^{***}$	∘
Terai Tier 1 and 2	∘	∘	$+^{*}$	∘	∘
Terai Janajati/Adibasi	$-^{***}$	∘	∘	∘	∘
Muslim and Others	∘	$+^{**}$	$+^{***}$	$+^{**}$	∘
Rural	$-^{***}$	$-^{***}$	$-^{**}$	$-^{***}$	∘
Household head		∘	∘	∘	$+^{*}$
Own land		∘	∘	∘	∘
Pakka house		$-^{***}$	$-^{***}$	$-^{***}$	$-^{***}$
Standardized asset index		$+^{***}$	$+^{***}$	$+^{***}$	$+^{**}$
Observations	24,804	24,804	24,804	24,804	2,523
Fixed effects	District	District	Province	District	District
Pseudo R^2	0.06	0.10	0.08	0.10	0.07
Clustered SE	Yes	Yes	Yes	Yes	Yes

Notes: Binary logit models with labor force participation as the dependent variable. Training coefficients are reported in log odds; control variables are summarized by direction and statistical significance for compactness. + indicates a positive association, − a negative association, and ∘ no statistically significant association. Standard errors are clustered at the PSU level. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

Table A5: Employment Status by Training Status

Status	No Training	Training	Difference
Employer	0.012	0.035	0.023***
Employee	0.081	0.148	0.067***
Self-employed	0.055	0.144	0.089***
Unpaid family work	0.070	0.087	0.017**

Notes: Difference is Training minus No Training. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

Table A6: Employment Status Logit Results

	Employer	Employee	Self-employed	Unpaid
Formal training	0.85***	0.21***	0.91***	0.12

Notes: Binary logit models estimated separately for each employment status category. Reported coefficients are log-odds estimates for completed vocational training. All models include individual, household, and geographic controls and district fixed effects. Standard errors are clustered at the primary sampling unit (PSU) level. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

Table A7: Employed vs. Unemployed (Multinomial Logit)

	Employed	Unemployed
Formal training	0.22***	0.76***

Notes: Multinomial logit model with non-participation as the omitted base category. Reported coefficients are log-odds estimates for completed vocational training. The model includes individual, household, and geographic controls and district fixed effects. Standard errors are clustered at the primary sampling unit (PSU) level. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

Table A8: Heterogeneity by Age Group

	Under 30	30–45	Over 45
Labor force	0.71***	0.68***	0.54***
Business work	1.18***	0.93***	0.64***

Table A9: Heterogeneity by Marital Status

	Unmarried	Married
Labor force	0.59***	0.68***
Business work	0.99***	0.94***

Table A10: Heterogeneity by Land Ownership

	No Land	Own Land
Labor force	0.73***	0.61***
Business work	1.09***	0.84***

Table A11: Heterogeneity by Household Size

	$\leq$5 Members	>5 Members
Labor force	0.65***	0.68***
Business work	0.78***	1.38***

Table A12: Heterogeneity by Ethnicity

Group	Labor force	Business work
Hill Brahmin/Chhetri	0.67***	0.87***
Hill Janajati	0.46***	0.56***
Dalit	0.59***	1.33***
Terai Upper Caste	0.83***	1.60***
Terai Janajati	1.03***	1.83***