Rural Livelihood Diversification Strategies in Nepal

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This article constructs a rural livelihood strategy using the Nepal Living Standard Survey Measurement from 1996 and 2004 and explores the determinants of rural livelihood strategies. This study finds that education, ethnicity, and location play an important role in livelihood diversification outside agriculture, and suggests the importance of keeping children in school for non-farm livelihood diversification and poverty reduction. Important policy implications of the current study include the need for investment in education, as the current literacy rate in Nepal is quite low. Investing in education will help households to diversify their livelihood outside of the farm and pave a way out of poverty.

KEY WORDS: Nepal, education, livelihood strategy, rural household, employment

Introduction

Rural livelihood diversification in developing countries has become important for reducing risk and poverty and enhancing the well-being of rural households. This subject has gained attention from researchers in recent years (Bernstein, Crow, & Johnson, 1992; Ellis, 1998; Fafchamps & Quisumbing, 1999, 2003; Fafchamps & Shilpi, 2003; Haggblade, Hazell, & Brown, 1989; Micevska & Rahut, 2008; Rahut & Micevska Scharf, 2012a, 2012b; Reardon, 1997; Reardon, Berdegué, & Escobar, 2001; Saith, 1992; von Braun & Pandya-Lorch, 1991).

On average, non-farm income contributes to 42 percent of the total income in Africa, 40 percent in Latin America, and 32 percent in Asia (Reardon et al., 1998). In India, approximately 34.4 percent of rural households are employed in the non-farm sector (Lanjouw & Shariff, 2004). In the Eastern Himalayan region of India, non-farm activities generate 60 percent of the rural household income (Micevska & Rahut, 2008). Non-farm income accounts for more than 60 percent of total household income in rural Cambodia (Rahut & Micevska Scharf, 2012b). The contribution of the non-farm sector to rural employment in developing countries

varies from 20 percent to 50 percent (Islam, 1997). Non-farm activities generate, on average, more than half of a farm household's income in the Mexican Tejido sector (Janvry & Sadoulet, 2001).

Most of the research on livelihood diversification in developing countries has focused on participation in an activity, rather than on the income portfolio or livelihood strategies, although rural households have multiple sources of income (Elbers & Lanjouw, 2001; Ellis, 1998; Rahut & Micevska Scharf, 2012b). Income diversification is the norm and specialization is an exception (Barrett, Reardon, & Webb, 2001). Many parents no longer desire a settled, farming life for their children (Rigg, 2006).

A majority of rural households pursue more than one activity or have more than one source of income for their livelihood. Therefore, it is imperative that livelihood research in developing countries take into consideration that the majority of rural households depend on a portfolio of livelihood activities, rather than on single activities. A few studies have analyzed this livelihood portfolio (Barrett et al., 2001; Berhanu, Colman, & Fayissa, 2007; Damite & Negatu, 2004; Dercon & Krishnan, 1996; Rahut & Micevska Scharf, 2012b).

Rural households diversify, rather than specialize, their livelihood either to reduce financial risk (Alderman & Paxson, 1992; Bryceson, 1996) or to enhance the return to labor, thereby increasing income (Rahut & Micevska Scharf, 2012b). Rural households are motivated to diversify outside the farm because the credit markets, which can help in consumption smoothing, are nonexistent. (Binswanger & Sillers, 1983; Reardon, 1997). For example, the capacity of households to cope with the drought shocks of the mid-1980s in Burkina Faso was strongly correlated with the degree of non-farm diversification (Reardon, Delgado, & Matlon, 1992). Households often use income diversification for pre-risk management or to cope with shocks that have occurred (Reardon et al., 1992; Rosenzweig & Binswanger, 1993).

Livelihood diversification shows the poverty-alleviating impact of the non-farm sector (Ersado, 2006; Ravallion & Datt, 2002; Reardon et al., 1992). Non-farm activities generate, on average, more than half of a farm household's income in the Mexican Tejido sector, and participation in these activities thus helps to reduce poverty (Janvry & Sadoulet, 2001). One empirical regularity emerging from studies of the non-farm economy in developing countries is a positive relationship between non-farm activity and welfare on average (Barrett et al., 2001). In addition, non-farm employment has the potential to reduce inequality, absorb a growing rural labor force, slow rural-urban migration, and contribute to the growth of national income (Lanjouw & Feder, 2001). In a Pakistan case study, agriculture, remittances, and rents tended to increase inequality (principally related to unequal land ownership patterns), while non-farm activities and livestock-keeping tended to reduce inequality (Adams & He, 1995).

In addition to reducing poverty, rural non-farm income is often the major source of savings for farm households in poor areas, which are then used to purchase food in difficult times (Gordon et al., 2001; Reardon et al., 1992).

Literature Review

Although livelihood diversification reduces risk and increases household well-being, not all households can diversify their livelihood. The lack of education and financial capital is a barrier for a household's ability to diversify. Therefore, a household's assets play an important role in its ability to diversity its livelihood. In Madagascar, high-return farm activities provided an important pathway to poverty reduction, despite barriers such as lack of education, lack of access to formal credit, and lack of access to telecommunication services (Stifel, 2010).

Rich literature on income diversification in rural areas has identified a wide range of explanatory factors for activity restructuring out of subsistence farming at the household level (Abdulai & CroleRees, 2001; Barrett et al., 2001; Dercon & Krishnan, 1996; Ellis, 1998; Lanjouw & Lanjouw, 2001; Micevska & Rahut, 2008; Rahut & Micevska Scharf, 2012b; Reardon et al., 1992; Smith, Gordon, Meadows, & Zwick, 2001).

Recent empirical studies have investigated heterogeneities in livelihood strategies across regions, their association with resource management technologies, and the effects of agro-ecological factors, population, and market conditions (Kristjanson, Radeny, Baltenweck, Ogutu, & Notenbaert, 2005; Kruseman, Ruben, & Tesfay, 2006; Pender, Jagger, Nkonya, & Sserunkuuma, 2004; Staal, Baltenweck, Waithaka, DeWolff, & Njoroge, 2002). The underlying theme is that natural, physical, and social capital assets are key factors that determine livelihood options available to households.

The household's education level is an important determinant of its livelihood diversification strategy. Households with higher levels of education are able to diversify into highly remunerative livelihood activities, while households with low levels of education are in a position to diversify into only those activities with low returns. The theory of education and skill/training states that higher education results in a greater likelihood of wage employment, ceteris paribus. A number of studies have established a strong link between education and diversification to non-farm activities (Janvry & Sadoulet, 2001; Lanjouw & Lanjouw, 2001; Micevska & Rahut, 2008; Rahut & Micevska Scharf, 2012a, 2012b; Reardon et al., 2001). In an introduction to seven studies on income diversification in rural Africa, Barrett et al. (2001) argue that educational attainment is one of the most important determinants of non-farm earnings, especially in more remunerative employment. Studies in Asia have confirmed that education is positively correlated to participation in non-farm activities. For instance, Fafchamps and Quisumbing (1999, 2003) argue that better educated males in rural Pakistan earn higher non-farm incomes and divert labor away from farm activities toward non-farm work. Yang and An (2002) show that education improves the allocation of household resources between agricultural and non-agricultural activities.

According to the "gender and culture" theory of employment, females are more likely to take care of the home, and are discriminated against in employment and poorly paid. Women appear to be poorly placed vis-à-vis non-farm sectors even after controlling for education, age, and other household

characteristics (Lanjouw & Lanjouw, 2001). The evidence on the role of gender has been mixed: while some studies find that males dominate the non-farm sector (e.g., Fafchamps & Quisumbing, 2003), others observe that in certain types of non-farm activities, women are more heavily represented than men (Corral & Reardon, 2001; Elbers & Lanjouw, 2001). In the rural areas of some developing countries, culture also plays an important role in participation in non-farm activities. For example, in India and Nepal, lower castes (sudra) work as blacksmiths (Kami), tailors (Damai), and cobblers (Sarki), while Brahmin work as priests.

Households closer to markets have more opportunities to diversify into non-farm activities than households located in far-flung villages. Households closer to local markets are more likely to participate in the non-farm sector than those with illiterate heads (Abdulai & CroleRees, 2001). Infrastructure has a positive association with a household's capacity to engage in non-farm activities (Lanjouw & Lanjouw, 2001); hence, households with better access to infrastructure are better able to diversify into rural non-farm activities.

A household's capacity to supply labor to the non-farm sector is determined by the household size and structure (Micevska & Rahut, 2008; Rahut & Micevska Scharf, 2012a, 2012b; Reardon, 1997). Therefore, larger households with a large proportion of young male members are able to diversify into non-farm sectors, which require skills and physical energy. Rural young people between the ages of 16 and 30 in China are more likely to be involved in full-time non-agricultural activities, compared to the elders. The extent to which this occurs varies across regions (Tuan, Somwaru, & Diao, 2000).

The contribution of this article is threefold. First, it constructs a distinct livelihood portfolio for a typical rural household of Nepal; second, it examines the determinants of rural livelihood strategies against the participation in each activity separately; and third, it explores the impact of ethnicity on livelihood diversification, as the caste system plays an important role in the occupation choice in Nepalese society.

Background of Nepal

Nepal is a small landlocked country in the Himalayas, surrounded by India on three sides and China in the north. Nepal is also the poorest country in South Asia, and over 30 percent of Nepalese people live on less than US$14 per person per month. However, over the last decade, Nepal has made considerable progress toward reducing poverty, with the headcount poverty rate falling dramatically from 42 percent to 31 percent between 1995/1996 and 2003/2004.

Approximately 80 percent of Nepal's population live in rural areas and depend on subsistence farming for their livelihoods. Household food insecurity and poor nutrition are major concerns in these areas, where about half of children under five years of age are undernourished. Most rural households have little or no access to primary health care, education, safe drinking water, sanitation, or other basic services (International Fund for Agricultural Development, 2012).

The life expectancy at birth is 63 years, which is lower than that of its neighboring countries. Infant mortality rates are among the highest in the region. Due to high maternal mortality, life expectancy for women is lower than for men. Nepal's literacy rate is one of the lowest in South Asia, with high levels of gender disparity. The overall literacy rate in Nepal is only 60.5 percent; the literacy rate is 73 percent among males and 43 percent among females.

Population growth has led to fragmented landholdings and the depletion of forests upon which much of the rural population depends for their livelihood. Nepal's population of 28 million is growing at 2 percent per year, and the ratio of population to arable land is one of the highest in the world. Though community forestry has become a success, national forests are becoming degraded over the years.

Conflict and a lack of economic opportunity have stimulated the migration of a large number of the productive members of rural households in recent years. In fact, Nepal is one of the world's highest recipients of remittances, amounting to US$5.1 billion. Yet almost 80 percent of remittance income is used for daily consumption; 7 percent is used for loan payment, and less than 3 percent is used for capital formation.

The gross domestic product (GDP) growth at factor cost was 3.6 percent in 2003/2004 and 3.1 percent in 2002/2003 against a negative growth of −0.3 percent in 2001/2002. Although the total expenditure to GDP ratio increased from 18.9 percent in 2001/2002 to 19.2 percent in 2005/2006, the development expenditure to GDP ratio declined from 7.4 percent to 6.8 percent during the same period. An increase in budget allocation to security resulting from Maoist insurgency was the main cause for the sharp increase in the regular expenditure, whereas conflict and political instability were the main reasons for the declining trend in development and capital expenditure. The fiscal deficit as a percentage to GDP decreased from 3.6 percent of GDP in 2001/2002 to 1.7 percent of GDP in 2004/2005 and increased to 2 percent in 2005/2006. As components of the GDP, exports accounted for 10.5 percent in 2005/2006 as compared to 11 percent in 2004/2005; however, the imports to GDP ratio rose to 30 percent in 2005/2006 from 28 percent in 2004/2005.

High poverty rates concentrated in the rural areas; large populations living in rural areas; huge migrations from rural Nepal to abroad; huge disparities among gender, caste, ethnic groups, and regions; poor economic performance and political instability have all motivated this article to examine the role of education, gender, and ethnicity in rural livelihood diversification among the farming community of Nepal.

Livelihood Strategies Framework

Unlike the conventional view, rural households in developing countries have a number of income-generating activities to choose from based on their abilities. A household's ability to choose these non-farm employments depends on its assets, position, and the availability of these activities. Rational households will choose activities that maximize the household income subject to budget constraints. Equation (1) shows that household income is the sum of the income

from different activities.

$$\text{Max } Y = Y_1 + Y_2 + Y_3 + Y_4 \tag{1}$$

Y_1, Self-employment in agriculture; Y_2, Wage income from agriculture; Y_3, Self-employment in non-agriculture; Y_4, Wage employment in non-agriculture

Equation (1) can be written as:

$$Y = w_1 l_1 + w_1 l_1 + w_1 l_1 + w_1 l_1 \tag{2}$$

Taking derivatives of both sides of Equation (2) with respect to asset endowment represented by X (X includes land, education of working male, education of working female, intergeneration transfer, etc.):

$$\frac{dy}{dx} = \left[\frac{dw_1}{dX}l_1 + \frac{dw_2}{dX}l_2 + \frac{dw_3}{dX}l_3 + \frac{dw_4}{dX}l_4\right] + \\ \left[\frac{dl_1}{dX}w_1 + \frac{dl_2}{dX}w_2 + \frac{dl_3}{dX}w_3 + \frac{dl_4}{dX}w_4\right] \tag{3}$$

The term in the first bracket can be interpreted as Welch's or Schultz's worker effect, which is the effect of asset endowments on marginal productivity of labor. The second bracket can be called Welch's or Schultz's worker effect that is the effect of asset endowments on the allocation of labor on both activities. The first bracket can be called the marginal productivity of labor in the activities after choosing the activities, and the second bracket can be interpreted as the marginal productivity of choice of activities. When we are talking about the choice, the first bracket is assumed to be zero and the household is dealing only with the second bracket.

$w_1 l_1$, Marginal productivity of labor in agriculture and labor allocated; $w_2 l_2$, Wage in agriculture and labor allocated; $w_3 l_3$, Marginal productivity of labor in non-agriculture and labor allocated; $w_4 l_4$, Wage in non-agriculture and labor allocated.

Equation (1) can be written as:

$$Y = \sum_{i=1}^{4} Y_i \tag{4}$$

Equation (2) can be written as:

$$Y = \sum_{i=1}^{4} w_i l_i \tag{5}$$

Subject to:

$$l_1 + l_2 + l_3 + l_4 + \text{leisure} = L \tag{6}$$

w_i is the marginal productivity of the labor (MPL), which is the function of L (total labor available in the households); leisure; S_m (average years of schooling of working adult male); S_f (average years of schooling of working adult female); A (household assets: land, livestock, etc.); Z (household characteristics). Thus, $w_i = \text{MPL} \propto S_m, S_f, A, Z$.

Given the household assets, characteristics, and human capital, a rational household will allocate its labor such that the MPL is similar across activities and the overall marginal productivity of the household labor is maximized.

Households with low asset endowments (both human capital and physical assets, that is, with low (S_m, S_f, A, Z) will have to fall back on non-farm employment with low entry costs and low productivity in terms of schooling and asset holdings. Households with high asset endowments will be attracted by the activity with high marginal productivity labor, where the entry barrier and returns are high. Therefore, a household's asset position plays a crucial role in determining whether that household is distress pushed or demand pulled for participation in non-farm livelihood activities.

Data and Setting

The Central Bureau of Statistics conducted the Nepal Living Standards Survey 2003/2004 (NLSS II) as a follow-up survey of NLSS 1995/1996 (NLSS I). Table 1 summarizes the sample size and sampling procedure of the NLSS I and NLSS II. The survey followed the Living Standards Measurement Survey (LSMS) methodology developed at the World Bank. It used a two-stage stratified sampling scheme to select a nationally representative sample.

In the first sampling stage, wards (the smallest administrative units) were selected with probability proportional to size (PPS) within each of four ecological strata: mountains, hills (urban), hills (rural), and terai (plain). The measure of size for this selection was the number of households in the ward. Within each ward, 12 households were interviewed (16 households per ward in the Far-Western Region).

In NLSS I, the sample frame considered all 75 districts in the country, and indeed 73 of them were represented in the sample. The two districts not selected

Table 1. Sample Size and the Sampling Procedures

Descriptive	Nepal Living Standards Survey (NLSS)	
	1995/1996	2003/2004
Survey methodology followed	LSMS	LSMS
Sampling procedure used	Two-stage stratified	Two-stage stratified
Number of PSUs (and households) selected	275 (3,388)	434 (5,240)
Number of PSUs (and households) enumerated	274 (3,373)	421 (5,072)
Urban PSUs (and households) enumerated	59 (716)	97 (1,164)
Rural PSUs (and households) enumerated	215 (2,657)	229 (2,748)
Survey period	June 1995 to June 1996	April 2003 to April 2004

in the sample, due to their scarce population, were Rasuwa and Mustang. In NLSS II, 96 households and eight primary sampling units (PSUs), mostly from the Far-Western Development Region, were not enumerated as a result of ongoing conflict in those areas.

Livelihood Strategies

Rural households tend to diversify and pursue a portfolio of activities rather than a single activity for their livelihood (Barrett et al., 2001; Dercon & Krishnan, 1996; Ellis, 1998; Janvry & Sadoulet, 2001; Rahut & Micevska Scharf, 2012b); hence, it is important to look into a livelihood portfolio rather than a single activity. Therefore, this article has classified the livelihood strategies of the rural Nepalese households into five different types:

D1: Purely agriculture, includes those households dependent only on agriculture for their livelihood;

D2: Agriculture plus self-employment in non-farm activities, includes households dependent on agriculture plus self-employment in non-farm for their livelihoods;

D3: Agriculture plus wage in non-farm employment, includes households dependent on agriculture and wage in non-farm for their livelihoods;

D4: Agriculture plus both wage and self-employment, which includes households engaged in both self and wage in non-farm besides agriculture;

D5: Purely non-agriculture, these include households engaged purely in non-farm activities (it could be self in non-farm, wage in non-farm, or both wage and self in non-farm). Households pursuing D5 strategies do not engage in agriculture.

Table 2 shows that 47.2 percent of the households pursue D1 strategies (purely agriculture) for their livelihood, 13.8 percent of the households pursue D2 strategies (agriculture plus self-employment in non-farm activities), 30.2 percent pursue D3 strategies (agriculture plus wage in non-farm), 6.1 percent pursue D4 (agriculture plus both self and wage in non-farm) and only 2.6 percent pursue D5 (purely non-agriculture). This analysis shows that over 50 percent of the households have diversified outside the farm. The diversification strategies are similar in both the survey period 1995/1996 and 2003/2004.

Table 2. Livelihood Diversification Strategies

	Livelihood Diversification Strategies	Percent		
		Combined	2003/2004	1995/1996
D1	Agriculture	47.2	45.4	49.1
D2	Agriculture plus self in non-farm	13.8	14.5	12.9
D3	Agriculture plus wage in non-farm	30.2	30.3	30.2
D4	Agriculture plus both self and wage in non-farm	6.1	6.8	5.5
D5	Completely non-agriculture (non-farm self and wage)	2.6	3.0	2.2

Table 3. Schooling and Land Assets by Livelihood Diversification Strategies

Variable	Agriculture	Agriculture Plus Self in Non-Farm	Agriculture Plus Wage in Non-Farm	Agriculture Plus Both Self & Wage in Non-Farm	Purely Non-Farm (Non-Farm Self & Wage)
Years of schooling of head	1.50	2.22	2.35	2.64	5.17
Average education of male	2.41	3.39	3.42	4.19	5.06
Average education of female	1.37	1.60	1.25	2.26	2.71
Dry land in hectares (Bari)	0.38	0.36	0.37	0.38	0.03
Wetland in hectares (Khet)	0.48	0.50	0.33	0.47	0.10

Table 3 shows data on years of schooling and land assets by livelihood diversification strategies. It clearly shows the impact of schooling on a household's diversification into non-farm activities. Heads of household pursuing D1 (purely agriculture) had, on average, 1.5 years of schooling, D2 (agriculture plus self in non-farm) had 2.2 years, D3 (agriculture plus wage in non-farm) had 2.4 years, D4 (agriculture plus both self and wage in non-farm) had 2.6 years, and D5 (purely non-farm) had 5.2 years. This indicates that diversification into non-farm activities is a function of education. A similar relationship is seen between livelihood diversification and average years of schooling of the adult household members.

Households with a larger land size completely depend on agriculture or have agriculture as one of the most important activities in their livelihood portfolio. But the households with small landholdings (0.03 hectare of wetland and 0.10 hectare of dry land) abandon agriculture and pursue D5 (purely non-farm).

Empirical Analysis

Using the multinomial logit model (MNL), this article analyzes the factors influencing rural households' decisions on livelihood diversification strategies in Nepal.

The multinomial logit model was estimated for a household's choice of livelihood diversification strategies in Nepal, and the empirical results are presented in Table 4. The base category is participation in agriculture activities, while the other categories included in the model are agriculture and wage in the non-farm sector; agriculture and self in non-farm; agriculture, self, and wage in non-farm; and purely non-farm. In MNL, all the logits are estimated simultaneously, which enforces logical relationships between the parameters and uses the data more efficiently (Long, 1997). The relative odds of one alternative being chosen over a second should be independent of the presence or absence of an unchosen third alternative (Luce, 1959). On the basis of the literature review and the rural background of Nepal, this article uses a number of variables that influence a rural household's choice of livelihood strategy.

Household characteristics such as age, size, and demographic composition influence the household's ability to diversify into non-farm livelihood activities. The results show that younger households do not diversify into non-farm sectors,

Table 4. Determinants of Livelihood Strategies: Multinomial Logit

	Agriculture Plus Self in Non-Farm	Agriculture Plus Wage in Non-Farm	Agriculture Plus Both Self & Wage in Non-Farm	Purely Non-Farm (Non-Farm Self & Wage)
	D2-Strategy	D3-Strategy	D4-Strategy	D5-Strategy
Demographic				
Age of household head	0.919*** (0.009)	0.952*** (0.008)	0.896*** (0.013)	0.973 (0.029)
Age squared of household head	1.001*** (0.000)	1.000* (0.000)	1.001*** (0.000)	1.000 (0.000)
Male-headed household[a,b]	1.644*** (0.243)	2.241*** (0.266)	1.708** (0.384)	0.953 (0.298)
Human capital (school)				
Below primary (<5 grade)[a,c]	1.568*** (0.222)	1.084 (0.125)	1.045 (0.218)	3.007*** (1.052)
Primary completed (>5 & <10 grade)[a,c]	1.479*** (0.184)	1.150 (0.114)	1.226 (0.212)	6.073*** (1.630)
SLC completed (>10 & <12 grade)[a,c]	2.725*** (0.843)	2.754*** (0.698)	2.621** (1.023)	29.737*** (13.903)
Inter completed (>12 & <15 grade)[a,c]	3.017** (1.459)	4.381*** (1.680)	2.132 (1.450)	19.887*** (14.678)
Bachelor's completed (>15 grade)[a,c]	0.001 (0.000)	9.810*** (5.743)	20.149*** (13.522)	182.252*** (145.838)
Locational dummy				
Mountains of Central Dev Region[a,d]	0.697* (0.145)	1.006 (0.169)	0.634* (0.173)	1.071 (0.608)
Mountains of West Dev Region[a,d]	0.516*** (0.108)	0.964 (0.162)	0.389*** (0.114)	1.763 (1.010)
Mountains of Mid-West Dev Region[a,d]	0.446*** (0.114)	1.069 (0.196)	0.336*** (0.116)	1.627 (1.057)
Mountains of Far-West Dev Region[a,d]	0.717 (0.222)	1.255 (0.281)	0.603 (0.260)	0.000 (0.000)
Hills of East Dev Region[a,d]	1.154 (0.232)	0.954 (0.169)	0.610* (0.180)	1.311 (0.778)
Hills of Central Dev Region[a,d]	1.222 (0.246)	0.758 (0.135)	0.756 (0.211)	0.493 (0.331)
Hills of Western Dev Region[a,d]	0.554** (0.161)	0.794 (0.183)	0.494* (0.198)	0.480 (0.374)
Hills of Mid-West Dev Region[a,d]	0.738 (0.217)	0.953 (0.222)	0.283** (0.159)	0.000 (0.000)
Hills of Far-West Dev Region[a,d]	0.528** (0.165)	0.644* (0.158)	0.506* (0.203)	0.000 (0.000)
Terai of East Dev Region[a,d]	0.823 (0.175)	0.834 (0.153)	0.640 (0.191)	0.226** (0.154)
Terai of Central Dev Region[a,d]	0.551*** (0.123)	1.003 (0.177)	0.611* (0.179)	0.213** (0.140)
Terai of Western Dev Region[a,d]	0.360*** (0.119)	1.042 (0.242)	0.237*** (0.116)	0.323 (0.231)
Terai of Mid-West Dev Region[a,d]	0.606* (0.184)	1.246 (0.285)	0.456* (0.190)	2.318 (1.508)
Terai of Far-West Dev Region[a,d]	1.313 (0.388)	2.362*** (0.539)	2.496*** (0.813)	1.498 (1.234)
Labor assets				
Number of children (under 15 years)	1.027 (0.027)	1.055*** (0.022)	1.027 (0.037)	0.853** (0.061)
Number of adult males (above 15 years)	1.529*** (0.093)	1.780*** (0.088)	2.403*** (0.179)	1.294 (0.218)
Number of adult females (above 15 years)	1.006 (0.054)	0.889*** (0.039)	0.980 (0.072)	0.565*** (0.096)
Access to facilities				
Time taken to reach primary schools	0.996* (0.002)	0.999 (0.001)	0.992** (0.003)	0.961*** (0.012)
Time taken to reach health centers	0.998** (0.001)	1.000 (0.000)	0.999 (0.001)	0.985*** (0.004)
Time taken to reach bus stations	1.000 (0.000)	1.000 (0.000)	1.000 (0.000)	1.000 (0.000)
Time taken to reach market centers	1.000 (0.000)	1.000 (0.000)	1.000 (0.000)	1.000 (0.000)
Time taken to reach banks	1.000 (0.000)	1.000 (0.000)	1.000 (0.000)	1.000 (0.000)
Land assets				
Total dry land (Bari) in hectares	0.974 (0.046)	0.942 (0.037)	0.950 (0.065)	0.001*** (0.001)
Total paddy land (Khet) in hectares	0.916 (0.042)	0.737*** (0.038)	0.823*** (0.063)	0.098*** (0.045)
Ethnicity				
Bahun ethnic group[a,e]	0.714** (0.115)	0.632*** (0.076)	0.502*** (0.114)	1.724* (0.571)
Magar ethnic group[a,e]	0.909 (0.200)	0.785 (0.120)	1.038 (0.289)	0.815 (0.487)
Tharu ethnic group[a,e]	0.881 (0.183)	0.910 (0.141)	0.424*** (0.132)	1.211 (0.596)
Tamang ethnic group[a,e]	0.706 (0.181)	1.288 (0.206)	0.529* (0.188)	2.731* (1.667)
Newar ethnic group[a,e]	2.371*** (0.494)	1.117 (0.212)	1.595* (0.454)	0.746 (0.386)
Kami Damai and Sarki ethnic group[a,e]	3.617*** (0.607)	1.950*** (0.270)	3.121*** (0.692)	3.395*** (1.300)
Yadav ethnic group[a,e]	0.365*** (0.109)	0.366*** (0.085)	0.198*** (0.097)	0.658 (0.605)
Muslim ethnic group[a,e]	2.117*** (0.475)	1.161 (0.229)	0.953 (0.323)	9.597*** (4.083)
Rai ethnic group[a,e]	1.703** (0.432)	1.096 (0.255)	0.931 (0.357)	0.000 (0.000)
Gurung ethnic group[a,e]	2.618*** (0.735)	1.558* (0.367)	1.855 (0.798)	2.351 (1.413)
Limbu ethnic group[a,e]	0.952 (0.285)	0.749 (0.193)	0.660 (0.295)	0.000 (0.000)
Other ethnic groups[a,e]	1.781*** (0.349)	1.211 (0.192)	0.742 (0.214)	3.352*** (1.441)
Time dummy				
Year 2004[a,f]	1.184* (0.124)	1.066 (0.087)	1.598*** (0.234)	1.117 (0.305)
Iteration 40: log likelihood	−5885.2			
Number of observations	5,279			
LR chi^2 (180)	5,222			
Prob > chi^2	0.000			
Pseudo R^2	0.3073			
Log likelihood	−5885.2			

Note: The coefficients represent the relative risk ratios in comparison only to agriculture. Robust standard errors corrected in parentheses. [a]Dummy variables; [b]excluded category: female-headed household; [c]excluded category: no education; [d]excluded category: mountain of Eastern Development Region [e]excluded category: Chhetri ethnic group; [f]year 1994/1996.***, **, and * indicate significance at the 1 percent, 5 percent, and 10 percent levels, respectively.

whereas older households do. The number of adult male members of the household plays a significant role in diversification into non-farm activities. The number of adult male members of the household is significant and positive for strategy D2 (agriculture plus self in non-farm), strategy D3 (agriculture plus wage in non-farm), and strategy D4 (agriculture plus both self and wage in non-farm). The number of adult female members is significant and negative for strategy D3 (agriculture plus wage in non-farm) and strategy D5 (completely non-agriculture). The number of children under 15 years is significant and positive for strategy D3 (agriculture plus wage in non-farm) and significant and negative for strategy D5 (completely non-agriculture). The results confirm previous studies (i.e., Adams, 1994; Ellis, 1998; Reardon et al., 2001).

Since Nepal is a male-dominated society with a low level of literacy among women, gender emerges as an important determinant of rural livelihood strategy in Nepal. The results show that male-headed households are more likely to diversify into strategy D2 (agriculture plus self in non-farm), strategy D3 (agriculture plus wage in non-farm), and strategy D4 (agriculture plus both self and wage in non-farm). It is insignificant in strategy D5 (completely non-agriculture). As expected, the analysis reveals that the female-headed households are disadvantaged in diversifying their livelihood outside agriculture.

Education is another important determinant of livelihood diversification (Abdulai & CroleRees, 2001; Barrett, Clark, Clay, & Reardon, 2005; Canagarajah, Newman, & Bhattamishra, 2001; Dercon & Krishnan, 1996; Ellis, 2000; Escobal, 2001; Fafchamps & Quisumbing, 1999; Lanjouw & Lanjouw, 2001; Lanjouw & Shariff, 2004; Micevska & Rahut, 2008; Rahut & Micevska Scharf, 2012a, 2012b; Reardon, 1997). This article also finds that with an increase in the level of education, the diversification in livelihood strategy D2 (agriculture plus self in non-farm) increases progressively until the intermediate completed level (Year 12), but is insignificant for those with bachelor's degrees. This indicates that those with a bachelor's degree and above will opt out of self-employment in non-farm and diversify into wage in non-farm.

The diversification into livelihood strategy D3 (agriculture plus wage in non-farm) is positively associated with education. It is insignificant for education levels below primary and primary completed, and is significant, positive, and progressively increasing after the completion of Year 10 (School Leaving Certificate), the completion of Year 12 (intermediate) and university. Similarly for strategy D4 (agriculture plus both self and wage in non-farm), it is not significant for education below primary and primary completed, and is significant, positive, and progressively increasing after the completion of Year 10 (School Leaving Certificate), the completion of Year 12, and university. In the case of strategy D4 (agriculture plus both self and wage in non-farm), education is significant only for Year 10 and a completed bachelor's degree.

Analysis shows the strongest association between level of education and strategy D5 (completely in non-agriculture). As the level of education increases, the likelihood of adopting strategy D5 progressively increases, and the marginal effect is highest compared to other livelihood strategies. This confirms that

education plays an important role in livelihood diversification into non-farm activities.

Total dry land is significant and negative only in the case of strategy D5 (completely non-agriculture) , whereas it is negative but insignificant for all other livelihood strategies. Total paddy land (wetland) is significant and negative for strategy D3 (agriculture plus wage in non-farm), strategy D4 (agriculture plus both self and wage in non-farm), and strategy D5 (completely non-agriculture). This indicates that households with large landholdings are more likely to pursue D1 (only farm) as their livelihood strategy without diversifying into rural non-farm activities.

Households farther away from primary school and health care centers are not able to diversify into non-farm livelihood activities, reflecting that remote house-holds do not have access to these activities.

Nepal is divided into five developmental regions (Eastern, Central, Western, Mid-Western, and Far-Western) and three ecological zones (mountains, mid-hills, and terai). There are huge differences in the level of development and accessibility among the developmental regions and ecological zones. We have created 15 location dummies by combining the development region (Eastern, Central, Western, Far-Western, and Mid-Western) and the ecological belt (mountain, mid-hill, and terai) and have used the mountains of the Eastern Developmental Region as the base categories to analyze the effect of location on livelihood diversification. The analysis shows that households in the mountains of the Central, Western, Mid-Western, and Far-Western regions are not able to diversify outside farming. We find that households in the hills of all the developmental regions are less diversified into non-farm sectors as compared to households in the mountains of the Eastern Developmental Region. Households in all the terai are also not able to diversify into non-farm, except the terai of the Far-Western Developmental Region.

Nepal is a country with diverse ethnic groups, and the analysis of ethnicity's role in livelihood diversification makes this study unique. Nepal's 2001 census listed 102 castes and ethnic groups. The Nepalese populations are typically classified into the following ethnic groups: Chhetri, Bahun, Janajati (mountain and hills), Janajati (terai), Madeshi, Newar, and other Nepali. However, in this study we have made the groups more explicit by dividing the population into Chhetri; Bahun; Magar; Tharu; Tamang; Newar; Rai; Gurung; Limbu; Kami, Damai, and Sarki; Yadav; Muslim; and other ethnic groups.

The group Chhetri has been used as a base category, as they are widespread and there is consensus that the Chhetri and Bahun dominate the government and economic activities in Nepal. Compared to the Chhetri ethnic group, the Bahun ethnic group is less likely to diversify their livelihood strategy into strategy D2 (agriculture plus self in non-farm), strategy D3 (agriculture plus wage in non-farm), and strategy D4 (agriculture plus both self and wage in non-farm) and are more likely to diversify into strategy D5 (completely non-agriculture). Bahun are priests with a prominent role in local religion, and thus seem to have a better level of education; therefore, they are in a position to abandon agriculture and earn their living elsewhere. In some of the rural areas, Bahun are not allowed to

use oxen to plow the field; those Bahun who do use oxen to plow will not be allowed to perform rituals in the village.

For the Magar ethnic group, none of the livelihood strategies are significant, indicating that the Magar ethnic group is confined to farming as compared to the Chhetri. Tamang are less likely to diversify into strategy D4 (agriculture plus both self and wage in non-farm) and more likely to diversify into strategy D5 (completely non-agriculture). The Newars, the supposed entrepreneurs of Nepali communities, are more likely to diversify into strategy D2 (agriculture plus self in non-farm) and strategy D4 (agriculture plus both self and wage in non-farm).

The people of Rai ethnicity are more likely to diversify into strategy D2 (agriculture plus self in non-farm). Similarly, the people of Gurung ethnicity are more likely to diversify into strategy D2 (agriculture plus self in non-farm) and strategy D3 (agriculture plus wage in non-farm). Other ethnic groups are more likely to diversify into strategy D2 (agriculture plus self in non-farm) and strategy D5 (completely non-agriculture). Analysis also shows that the Limbu ethnic group does not diversify outside agriculture compared to the Chhetri.

In Nepal, Kami, Damai, and Sarki are considered untouchables, and, as per Nepali Hindu tradition, Kami are supposed to work as blacksmiths, Damai as tailors, and Sarki as cobblers. Given their skills in non-farm activities acquired from their parents and tradition, the Kami-Damai-Sarki ethnic group is likely to diversify into strategy D2 (agriculture plus self in non-farm), strategy D3 (agriculture plus wage in non-farm), strategy D4 (agriculture plus both self and wage in non-farm) and strategy D5 (completely non-agriculture).

Analysis shows that the coefficient of the Tharu ethnic group is negative and insignificant except for strategy D4 (agriculture plus both self and wage in non-farm), which is negative and significant at 1 percent; this signifies that the Tharu ethnic group is not able to diversify outside agriculture. The Yadav ethnic group originates in the Indian states of Bihar and Uttar Pradesh and is predominantly farmers. The Yadav ethnic group is less likely to diversify into strategy D2 (agriculture plus self in non-farm), strategy D3 (agriculture plus wage in non-farm), and strategy D4 (agriculture plus both self and wage in non-farm). Muslims are more likely to diversify into strategy D2 (agriculture plus self in non-farm) and strategy D5 (completely non-agriculture).

This study shows that ethnicity plays an important role in rural livelihood diversification in Nepal.

Robustness Test

Instead of the household head's level of education, we used average years of schooling of adult males and females: the result indicates that education plays a significant role in livelihood diversification into non-farm sectors. The average years of schooling of the adult male is significant and positive for diversification into strategy D2 (agriculture plus self in non-farm), strategy D3 (agriculture plus wage in non-farm), strategy D4 (agriculture plus both self and wage in non-farm), and strategy D5 (completely non-agriculture) while the mean education of adult

Table 5. Robustness test on Livelihood Diversification: Multinomial Logit

	Agriculture Plus Self in Non-Farm	Agriculture Plus Wage in Non-Farm	Agriculture Plus Both Self & Wage in Non-Farm	Purely Non-Farm (Non-Farm Self & Wage)
Linear education				
Mean education of adult male	1.051*** (0.015)	1.066*** (0.012)	1.057*** (0.021)	1.184*** (0.034)
Mean education of adult female	1.030 (0.020)	1.003 (0.016)	1.109*** (0.027)	1.201*** (0.043)
Linear education				
Year of school of head	1.051*** (0.015)	1.058*** (0.012)	1.068*** (0.020)	1.283*** (0.034)
Labor supply				
Number of children (under 15 years)	0.837*** (0.039)	0.847*** (0.031)	0.669*** (0.042)	1.008 (0.135)
Household size	1.215*** (0.040)	1.223*** (0.033)	1.496*** (0.062)	0.829* (0.091)
Housing quality				
House with mud roof	1.664 (0.558)	1.031 (0.279)	1.846 (0.869)	1.600 (1.813)
House with wood roof	1.323 (0.502)	1.480 (0.401)	1.084 (0.643)	5.253** (4.443)
House with zinc roof	1.892*** (0.266)	0.924 (0.111)	1.392* (0.284)	7.213*** (2.354)
House with slate roof	1.336** (0.165)	0.999 (0.091)	1.190 (0.203)	3.383*** (1.129)
House with cement roof	3.851*** (0.922)	1.260 (0.264)	2.840*** (0.915)	23.972*** (10.157)
House with other roof	0.599 (0.489)	2.393* (1.136)	0.735 (0.808)	0.001*** (0.000)

Note: The coefficients represent the relative risk ratios in comparison to only in agriculture. Robust standard errors corrected for clustering in parentheses. ***, **, and * indicate significance at the 1 percent, 5 percent, and 10 percent levels, respectively..

females is significant and positive only in strategy D4 (agriculture plus both self and wage in non-farm) and strategy D5 (completely non-agriculture) (Table 5).

Households with many members have more labor and are thus able to diversify their livelihood into non-farm activities, while the capacity of a household to diversify is constrained by the number of children. The number of children under 15 years in a household restrains its livelihood diversification into strategy D2 (agriculture plus self in non-farm), strategy D3 (agriculture plus wage in non-farm), and strategy D4 (agriculture plus both self and wage in non-farm). The number of adult members in a household is significant and positive for diversification into strategy D2 (agriculture plus self in non-farm), strategy D3 (agriculture plus wage in non-farm), strategy D4 (agriculture plus both self and wage in non-farm), and strategy D5 (completely non-agriculture).

The wealth status of the household as measured by roofing material of the house shows that wealth plays an important role in livelihood diversification. Households with wooden roofs are more likely to diversify into strategy D5 (completely non-agriculture); households with zinc roofs are more likely to diversify into strategy D2 (agriculture plus self in non-farm), strategy D4 (agriculture plus both self and wage in non-farm), and strategy D5 (completely non-agriculture); households with slate roofs are more likely to diversify into strategy D2 (agriculture plus self in non-farm strategy) and D5 (completely non-agriculture); households with cement roofs are more likely to diversify into strategy D2 (agriculture plus self in non-farm), strategy D4 (agriculture plus both self and wage in non-farm), and strategy D5 (completely non-agriculture), and the marginal effect is the largest for cement-roofed households.

Conclusion and Recommendation

Using the Nepal Living Standard Survey (NLSS) 1995/1996 and 2003/2004 and the multinomial model, this article constructs rural households' livelihood strategies and investigates the factors influencing their choice.

The article finds that demographics, asset endowment, location, and ethnicity influence livelihood strategy pursued by rural households. Households with younger heads are more likely to be confined to agriculture for their livelihood, while households with older heads diversify outside the farm. The number of household members suggests the labor available within the household; therefore, those households with a larger household size are able to allocate surplus labor for activities outside the farm. However, the number of children under 15 years of age acts against the household's capability to diversify outside agriculture.

This article disaggregates the number of adult members by gender to analyze the role of gender on non-farm livelihood diversification. The number of adult male laborers available increases the probability of livelihood diversification into all non-farm livelihood strategies, while the number of adult female laborers available decreases the probability of livelihood diversification into all non-farm livelihood strategies. The results confirm previous studies (i.e., Adams, 1994; Ellis, 1998; Reardon et al., 2001). This suggests that gender composition in the household plays a critical role in livelihood diversification and that females are disadvantaged in diversifying into non-farm livelihood strategies. Therefore, policy should aim at supporting and encouraging the female population to participate in wage and self-employment in non-farm activities. In addition, gender analysis should move beyond merely analyzing the role of gender of household head; the analysis should examine the effect of gender composition as well, as rural households in developing countries function as a unit rather than as individuals.

Education plays a significant role in the employment sector and livelihood diversification into non-farm activities. Diversification into non-farm activities increases progressively with the increase in the level of education. Livelihood diversification in strategy D2 (agriculture plus self in non-farm) increases progressively with the increase in education up to intermediate completion (Year 12), and is insignificant for those who have completed university, indicating that those who complete university choose self-employment. Livelihood diversification in strategy D3 (agriculture plus wage in non-farm) increases progressively with the increase in education, but only after completion of the School Leaving Certificate (SLC-Year 10), indicating that the activities in strategy D3 (agriculture plus wage in non-farm) require higher skills or level of education. Livelihood diversification in strategy D4 (agriculture plus both self and wage in non-farm) increases progressively with the increase in education, but only after completion of the School Leaving Certificate (SLC-Year 10), and it is not significant for intermediate completion (Year 12). Livelihood diversification in strategy D5 (completely non-agriculture) increases progressively with an increase in every level of education, and the marginal effect is significantly higher compared to

other livelihood strategies. Therefore, policy should be directed to keep children at school, which will enable them to diversify their livelihood into non-farm sectors. As a result, their income will increase and, at the same, productivity per farm laborer will increase, resulting in an overall increase in income.

Households farther away from primary schools and health care centers are not able to diversify into non-farm livelihood activities, reflecting that the remote households do not have access to these activities. The location of the household also affects its access to non-farm activities, and thus its likelihood of pursuing non-farm livelihood strategies. Compared to the mountains of eastern Nepal, the likelihood of diversifying outside is insignificant for all regions, except for the terrain of the Far-Western region of Nepal.

Ethnicity is a critical determinant of livelihood diversification strategies among the rural households of Nepal. Compared to the Chhetri ethnic group, the Bahun ethnic group is less likely to diversify their livelihood strategy outside the farm, but are more likely to diversify into strategy D5 (completely non-agriculture). The Bahun are priests and seem to have a better level of education; therefore, they are in a position to abandon agriculture and earn their living elsewhere. The Newars, the entrepreneurs of Nepali communities, are more likely to diversify into strategy D2 (agriculture plus self in non-farm) and strategy D4 (agriculture plus both self and wage in non-farm).

The Magar, Limbu, Tharu, Yadav, and Tamang ethnic groups are confined to farming as compared to the Chhetri. Therefore, policy should aim at supporting those ethnic groups, who are disadvantaged in participating in non-farm livelihood diversification strategies. Given their skills in non-farm activities acquired from their parents and tradition, the Kami-Damai-Sarki ethnic group is likely to diversify into strategy D2 (agriculture plus self in non-farm), strategy D3 (agriculture plus wage in non-farm), strategy D4 (agriculture plus both self and wage in non-farm), and strategy D5 (completely non-agriculture).

The time dummy shows that time affects the livelihood diversification strategy, as over a period of time and economic development, the supply of non-farm activities increases. The probability of diversification into non-farm is positive in 2004, but it is significant only by association with D2 (agriculture plus self in non-farm) and D4 (agriculture plus both self and wage in non-farm).

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APPENDIX

Table A1 shows the probit model; the dependent variable is one for participation and zero for nonparticipation, and the independent variables are similar to the ones used in the multinomial logit model in the main article. The results illustrate that the gender of the household head influences household participation in different sectors for livelihood. The participation in wage in-farm, wage in non-farm, and self in non-farm by the male-headed household increases by 4.2 percent (significant at 10 percent), 15.1 percent (significant at 1 percent) and 5.3 percent (significant at 1 percent), respectively. This confirms and supports our findings that female-headed households are disadvantaged in diversifying outside agriculture. The number of adult male members is significant and positive, indicating that the male labor force available in the household influences the probability of employment outside agriculture. The number of adult females is negative (−2.2 percent) and significant at 5 percent for participation in wage in non-farm, which indicates bias against women. The number of children under 15 years is significant and positive for wage in non-farm, indicating the existence of child labor in wage in non-farm sectors.

Probit estimation also shows the important role of education in occupational choice. The probability of participation in the wage employment in-farm decreases with the increase in the level of education. Participation in wage in non-farm is insignificant for under primary and primary completed, but it is significant and increases progressively for those households whose head completed a School Leaving Certificate (16.7 percent), intermediate (27.6 percent) and university (41.7 percent). Similarly, self-employment in the non-farm also increases with the increase in the level of education, except for the intermediate level of school, which is insignificant as compared to the uneducated household head.

With the increase in the wetland owned, the probability of participation in wage in-farm and non-farm decreases by 17 percent and 4.7 percent (significant at 1 percent), respectively. However, the ownership dry land asset is not a significant determinant of the labor allocation.

Compared to the mountains of the Eastern Development Region, the households in the mountains of the Central, Mid-Western and Far-Western Development Regions and terai of the Far-Western Development Region are more likely to participate in wage in non-farm. The households in the hills of the Central Development Region and the terai of the Far-Western Development Region have a higher possibility of participating in self in non-farm as compared to the households in the mountains of the Eastern Development Region, while the

Table A1. Determinants of Participation (Probit Estimation)

	Wage Employment In-Farm	Wage Employment in Non-Farm	Self-Employment in Non-Farm
Demographic			
Age of household head	−0.002 (0.003)	0.002 (0.003)	0.004* (0.002)
Age squared of household head	−0.000* (0.000)	−0.000** (0.000)	−0.000* (0.000)
Male-headed households	0.042* (0.022)	0.151*** (0.020)	0.053*** (0.017)
Human capital (school)			
Below primary (<5 grade)[a,c]	−0.143*** (0.020)	−0.004 (0.023)	0.077*** (0.022)
Primary completed (>5 & <10 grade)[a,c]	−0.244*** (0.016)	0.020 (0.020)	0.089*** (0.018)
SLC completed (>10 & <12 grade)[a,c]	−0.328*** (0.017)	0.166*** (0.050)	0.146*** (0.047)
Inter completed (>12 & <15 grade)[a,c]	−0.351*** (0.011)	0.270*** (0.072)	0.071 (0.065)
Bachelor's completed (>15 grade)[a,c]	−0.341*** (0.018)	0.417*** (0.076)	0.192** (0.084)
Locational dummy			
Mountains of Central Dev Region[a,d]	−0.015 (0.037)	0.062* (0.036)	−0.002 (0.028)
Mountains of West Dev Region[a,d]	−0.017 (0.036)	0.031 (0.035)	−0.03 (0.026)
Mountains of Mid-West Dev Region[a,d]	−0.170*** (0.032)	0.066* (0.040)	−0.064** (0.026)
Mountains of Far-West Dev Region[a,d]	−0.101** (0.046)	0.098* (0.051)	−0.018 (0.038)
Hills of East Dev Region[a,d]	0.183*** (0.040)	−0.001 (0.036)	0.084** (0.033)
Hills of Central Dev Region [a,d]	0.266*** (0.040)	−0.028 (0.036)	0.110*** (0.035)
Hills of Western Dev Region[a,d]	0.215*** (0.053)	0.015 (0.049)	−0.014 (0.037)
Hills of Mid-West Dev Region[a,d]	0.027 (0.051)	0.008 (0.049)	−0.025 (0.036)
Hills of Far-West Dev Region [a,d]	−0.135*** (0.044)	−0.026 (0.050)	−0.005 (0.040)
Terai of East Dev Region[a,d]	0.143*** (0.041)	−0.013 (0.037)	0.021 (0.031)
Terai of Central Dev Region[a,d]	0.118*** (0.040)	0.062 (0.038)	−0.041 (0.026)
Terai of Western Dev Region[a,d]	0.044 (0.052)	0.049 (0.050)	−0.096*** (0.028)
Terai of Mid-West Dev Region[a,d]	0.003 (0.051)	0.108** (0.049)	−0.032 (0.035)
Terai of Far-West Dev Region[a,d]	−0.102** (0.044)	0.220*** (0.048)	0.112** (0.045)
Labor assets			
Number of children	0.007 (0.005)	0.009** (0.004)	0.002 (0.003)
Number of adult males	0.020** (0.010)	0.109*** (0.010)	0.043*** (0.007)
Number of adult females	−0.014 (0.010)	−0.022** (0.009)	0.006 (0.007)
Access to facility			
Time taken to reach primary school	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)
Time taken to reach health post	0.000 (0.000)	0.000 (0.000)	−0.000** (0.000)
Time taken to reach bus stop	−0.000*** (0.000)	0.000 (0.000)	0.000 (0.000)
Time taken to market center	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)
Time taken to cooperative bank	0.000 (0.000)	−0.000* (0.000)	0.000 (0.000)
Land assets			
Total land: bari	−0.018 (0.012)	−0.009 (0.009)	−0.001 (0.007)
Total land: khet	−0.170*** (0.026)	−0.047*** (0.012)	−0.007 (0.007)
Ethnicity group			
Bahun[a,e]	−0.087*** (0.024)	−0.088*** (0.022)	−0.011 (0.019)
Magar[a,e]	0.058* (0.034)	−0.03 (0.030)	0.009 (0.027)
Tharu[a,e]	0.175*** (0.036)	−0.028 (0.032)	−0.026 (0.025)
Tamang[a,e]	0.103*** (0.038)	0.057 (0.035)	−0.054** (0.025)
Newar [a,e]	0.001 (0.038)	−0.01 (0.035)	0.156*** (0.036)
Kami, Damai, and Sarki[a,e]	0.220*** (0.029)	0.091*** (0.028)	0.194*** (0.028)
Yadav[a,e]	0.074* (0.045)	−0.167*** (0.034)	−0.103*** (0.025)
Muslim[a,e]	0.067* (0.040)	0.003 (0.038)	0.110*** (0.037)
Rai[a,e]	0.029 (0.049)	0.011 (0.046)	0.099** (0.043)
Gurung[a,e]	0.04 (0.049)	0.055 (0.048)	0.128*** (0.046)
Limbu[a,e]	0.264*** (0.053)	−0.036 (0.050)	0.022 (0.043)
Other ethnic groups[a,e]	0.194*** (0.034)	0.008 (0.032)	0.072** (0.029)

Table A1. Continued

	Wage Employment In-Farm	Wage Employment in Non-Farm	Self-Employment in Non-Farm
Time			
Year Dummy[a,f]	−0.041** (0.017)	0.021 (0.016)	0.036*** (0.013)
Number of observations	5279	5279	5279
Wald chi^2 (44)	941	521	347
Prob > chi^2	0.000	0.000	0.000
Pseudo R^2	0.196	0.086	0.067
Log pseudolikelihood	−2836	−3200	−2572

Note: The coefficients represent the relative risk ratios in comparison to only in agriculture. Robust standard errors corrected in parentheses. [a]Dummy variables; [b]excluded category: female-headed household; [c]excluded category: no education [d]excluded category: mountain of Eastern Development Region [e]excluded category: Chhetri ethnic group; [f]year 1994/1996. ***, **, and * indicate significance at the 1 percent, 5 percent, and 10 percent levels, respectively.

households in the mountains of the Mid-Western Development Region, the hills of the Eastern and Central Development Region and the terai of the Far-Western Development Region are less likely to participate in self in non-farm.

The interaction dummy of the development and the ecological dummy shows that location influences the choice of livelihood activities by influencing the supply sides, confirming that supply of non-farm employment opportunities is important.

In comparison to the Chhetri ethnic group, Bahun are less likely to participate in wage in-farm while Magar, Tharu, Tamang, Kami-Damai-Sarki, Muslim, and the other ethnic groups are more likely to participate in wage in-farm. Bahun and Yadav have a lower likelihood of participating in wage in non-farm as compared to the Chhetri ethnic group, whereas Kami-Damai-Sarki has a higher likelihood. Tamang and Yadav are less likely to participate in self in non-farm as compared to Chhetri; Newar, Kami-Damai-Sarki, Muslim, Rai, Gurung, and the other ethnic groups are more likely to participate in self in non-farm.

Instead of the probit model, which evaluates mere participation in non-farm activities, we used the tobit model to estimate the intensity/degree of participation. In the tobit model shown in Table A2, the dependent variable is the ratio between the number of hours engaged in particular activities to the total number of labor hours available in the households, and the independent variables are similar to the ones used in the multinomial logit model in the main article.

The result shows that male-headed households have a higher intensity of participation in wage in non-farm than the female-headed households; this confirms the result obtained with the probit and the multinomial logit model about the importance of gender in the diversification of livelihood strategy. The study also finds that the number of adult males is positive and significant for wage in non-farm and self in non-farm, which indicates the importance of the

Table A2. Intensity of Participation (Tobit Estimation)

	Hours in Wage In-Farm to Total Hours	Hours in Wage in Non-Farm to Total Hours	Hours in Self in Non-Farm to Total Hours
Demographic			
Age of household head	0.006*** (0.002)	−0.007*** (0.002)	−0.021*** (0.003)
Age squared of household head	−0.000*** (0.000)	0.000 (0.000)	0.000*** (0.000)
Male-headed households	0.021 (0.022)	0.130*** (0.024)	0.056 (0.037)
Human capital (school)			
Below primary (<5 grade)[a,c]	−0.157*** (0.022)	0.012 (0.022)	0.129*** (0.037)
Primary completed (>5 & <10 grade)[a,c]	−0.255*** (0.022)	0.057*** (0.019)	0.166*** (0.032)
SLC completed (>10 & <12 grade)[a,c]	−0.536*** (0.078)	0.252*** (0.046)	0.310*** (0.076)
Inter completed (>12 & <15 grade)[a,c]	−0.779*** (0.177)	0.374*** (0.064)	0.175 (0.118)
Bachelor's completed (>15 grade)[a,c]	−0.703*** (0.179)	0.454*** (0.067)	0.338*** (0.126)
Locational dummy			
Mountains of Central Dev Region [a,d]	−0.027 (0.033)	0.033 (0.031)	−0.156*** (0.050)
Mountains of West Dev Region[a,d]	−0.013 (0.034)	−0.013 (0.031)	−0.149*** (0.052)
Mountains of Mid-West Dev Region[a,d]	−0.183*** (0.041)	0.015 (0.034)	−0.225*** (0.063)
Mountains of Far-West Dev Region[a,d]	−0.156*** (0.048)	−0.01 (0.041)	−0.249*** (0.072)
Hills of East Dev Region[a,d]	0.258*** (0.035)	−0.048 (0.033)	0.018 (0.050)
Hills of Central Dev Region[a,d]	0.261*** (0.033)	−0.088*** (0.033)	−0.001 (0.049)
Hills of Western Dev Region[a,d]	0.224*** (0.046)	−0.036 (0.047)	−0.184** (0.076)
Hills of Mid-West Dev Region[a,d]	0.075 (0.048)	−0.064 (0.044)	−0.210*** (0.071)
Hills of Far-West Dev Region[a,d]	−0.059 (0.055)	−0.127*** (0.044)	−0.221*** (0.073)
Terai of East Dev Region[a,d]	0.174*** (0.035)	−0.071** (0.034)	−0.087 (0.054)
Terai of Central Dev Region[a,d]	0.144*** (0.033)	−0.022 (0.032)	−0.240*** (0.053)
Terai of Western Dev Region[a,d]	0.072 (0.047)	−0.001 (0.045)	−0.279*** (0.087)
Terai of Mid-West Dev Region[a,d]	0.008 (0.049)	0.083* (0.044)	−0.183** (0.075)
Terai of Far-West Dev Region [a,d]	−0.121** (0.048)	0.086** (0.036)	0.019 (0.064)
Labor assets			
Number of children	0.003 (0.004)	0.004 (0.004)	−0.003 (0.007)
Number of adult males	0.004 (0.009)	0.091*** (0.008)	0.091*** (0.014)
Number of adult females	−0.017* (0.009)	−0.038*** (0.008)	−0.013 (0.014)
Access to facility			
Time taken to reach to primary school	0.000 (0.000)	0.000 (0.000)	−0.002* (0.001)
Time taken to reach health post	0.000 (0.000)	−0.000* (0.000)	−0.001*** (0.000)
Time taken to reach bus stop	−0.000*** (0.000)	0.000 (0.000)	0.000 (0.000)
Time taken to market center	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)
Time taken to cooperative bank	0.000 (0.000)	−0.000** (0.000)	0.000 (0.000)
Land assets			
Total land: bari	−0.021 (0.013)	−0.019** (0.009)	−0.019 (0.017)
Total land: khet	−0.203*** (0.030)	−0.047*** (0.012)	−0.030** (0.015)
Ethnicity group			
Bahun[a,e]	−0.121*** (0.026)	−0.071*** (0.024)	−0.021 (0.041)
Magar[a,e]	0.028 (0.031)	−0.042 (0.029)	−0.034 (0.054)
Tharu[a,e]	0.174*** (0.032)	−0.019 (0.031)	−0.063 (0.054)
Tamang[a,e]	0.024 (0.030)	0.006 (0.029)	−0.146** (0.060)
Newar[a,e]	−0.041 (0.036)	−0.023 (0.034)	0.255*** (0.054)
Kami Dami, and Sarki[a,e]	0.175*** (0.025)	0.087*** (0.025)	0.291*** (0.041)
Yadav[a,e]	0.093** (0.038)	−0.173*** (0.045)	−0.279*** (0.077)
Muslim[a,e]	0.151*** (0.038)	0.062* (0.038)	0.212*** (0.061)
Rai[a,e]	−0.013 (0.044)	−0.015 (0.042)	0.05 (0.063)
Gurung[a,e]	0.022 (0.047)	0.071* (0.043)	0.227*** (0.080)
Limbu[a,e]	0.207*** (0.043)	−0.096** (0.045)	−0.082 (0.076)
Other ethnic groups[a,e]	0.205*** (0.029)	0.041 (0.031)	0.137*** (0.052)

Table A2. Continued

	Hours in Wage In-Farm to Total Hours	Hours in Wage in Non-Farm to Total Hours	Hours in Self in Non-Farm to Total Hours
Time			
Year dummy 2004[a,f]	−0.090*** (0.016)	−0.006 (0.015)	0.035 (0.026)
Number of observations	5279	5279	5279
$F(45,5235)$	28.620	15.270	19.010
Prob > F	0.000	0.000	0.000
Log pseudolikelihood	−2490	−2688	−2556

Note: The coefficients represent the relative risk ratios in comparison to only in agriculture. Robust standard errors corrected in parentheses. [a]Dummy variables; [b]excluded category: female-headed household; [c]excluded category: no education; [d]Excluded category: mountain of Eastern Development Region; excluded category; [e]excluded category: Chhetri ethnic group; [f]year 1994/1996. ***, **, and * indicate significance at the 1 percent, 5 percent, and 10 percent levels, respectively.

adult male labor force in the degree of participation in the livelihood activities. The number of adult females is negative and significant for the wage in-farm and non-farm, which is an indication of the gender bias.

The probability of participation in wage in-farm decreases sharply and progressively with the increase in the level of education because the wage employment in-farm is less preferred by the educated, as the return is low and it has a low social status. The degree of participation in wage in non-farm increases exponentially with the increases in the level of education; the degree of participation in wage in non-farm is significant after completion of the primary level of education. Similarly, the strength of participation in self in non-farm increases with the increases in the level of education, except for the intermediate level (Year 10), which is insignificant.

Land assets, particularly the wetlands, are significant determinants of wage employment in-farm, non-farm, and self in non-farm. The interaction dummy of the development and the ecological dummy shows that location influences the choice of livelihood activities by influencing the supply sides.

The degree of participation in wage in-farm is lower for the Bahun ethnic group as compared to the Chhetri, while it is higher for the Kami-Damai-Sarki, Muslim, and Tamang groups. Compared to the Chhetri, the degree of participation in self in non-farm is lower for Tamang and Yadav, and it is higher for Newar, Muslim, Gurung, and the other ethnic groups.