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**Rural Nonfarm Employment and  
Incomes in the Himalayas**

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## Foreword

This paper deals with the different livelihood diversification strategies and the importance of non-farm income on the livelihood of rural households in Eastern Himalayas of India. Rural non-farm employment has not received the attention of the research community as it deserves. In recent years there has been an increasing interest in non-farm activities as a way out of the poverty which is prevalent in rural areas of North East and Eastern Himalayas. The research uses the data collected from the Lower Himalayas of Eastern India to explore the importance of rural non-farm activities on livelihood and establish the determinants of access to non-farm employment and income. This study provides scientific analyses yielding very interesting results with strong policy implications and is written in a high-quality style. Overall, this paper provides a valuable knowledge on rural nonfarm activities in a hitherto unexplored region.



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## Abstract

Nonfarm activities generate on average about 60 percent of rural households' incomes in the Himalayas. This paper analyzes the determinants of participation in nonfarm activities and of nonfarm incomes across rural households. A unique data set collected in the Himalayan region of India allows us to deal with the heterogeneity of rural nonfarm activities by using aggregations into categories that are useful both analytically and for policy purposes. We conduct an empirical inquiry that reveals that education plays a major role in accessing more remunerative nonfarm employment. Other household assets and characteristics such as land, social status, and geographical location also play a role.

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**Keywords:** Nonfarm employment; Rural households; Incomes; Education; India

**JEL classification:** O15; O18; Q12; R11

## 1. Introduction

Worldwide, rural households engage in a variety of nonfarm activities to generate income (Lanjouw and Lanjouw 2001; World Bank 2003). This has spurred an increasing interest in rural nonfarm employment, both among governments in developing countries and within various international agencies. Recent research indicates that the rural poor engage in nonfarm activities, both as a complement to their farm activities and as a substitute for their farm incomes. In some cases, nonfarm employment may be a coping strategy to deal with lack of access to sufficient land or with income shocks in agriculture. In other cases, rural households may find it profitable to reduce their farming activities and engage increasingly in nonfarm employment instead.

Amidst the mounting interest in nonfarm activities, this paper takes a comprehensive view of the variety of sources of income that rural households in the Himalayan region of India rely upon. The focus is on understanding the determinants of participation in nonfarm activities and of the levels of incomes derived from these activities by different categories of farm households.<sup>1</sup> In particular, the following research questions are of paramount interest to us: (a) What types of nonfarm activities do rural households engage in? (b) What determines the participation in more remunerative nonfarm employment? (c) What should be the main focus of strategies aiming at getting rural households out of poverty?

Several contributions set this paper apart from the others in the literature. First, we use a unique data set collected in the Himalayas. To the best of our knowledge, this is the first detailed survey conducted to examine the livelihoods of rural households in the region.<sup>2</sup> It is important to study rural nonfarm employment in the Himalayas since households living in remote and isolated villages are inclined to divide their time among a large number of distinct activities. Indeed, data from our survey show that nonfarm activities generate on average about 60 percent of rural households' incomes.

Second, we conduct an empirical inquiry that distinguishes between more than a few types of nonfarm employment, in particular between low-return and high-return nonfarm activities. By using several different classifications of economic activity, we provide a thorough and wide-ranging depiction of the labor allocation in a poor society. To deal with the great heterogeneity of rural nonfarm activities, we use aggregations into categories that are useful both analytically and for policy purposes. Our results by and large corroborate previous research but considerably refine our understanding of the factors that have an effect on labor allocation of rural households. We find strong evidence that education plays a major role in accessing more remunerative nonfarm employment. Other household assets and characteristics such as land, social status, and geographical location also play a role.

Third, our estimation approach also tests for effects of the caste system on rural nonfarm employment. This is important given the dearth of empirical evidence in the area.<sup>3</sup> The Indian government's job reservation policies in favor of applications from persons belonging to scheduled castes and scheduled tribes is an issue which arouses strong passions in the Indian

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<sup>1</sup> As in Dercon and Krishnan (1996) and Barrett et al. (2005), for instance, this study emphasizes the significance of factors other than household's behavior towards risk.

<sup>2</sup> The Himalayan region of India is ethnically, culturally, linguistically, socially, and historically distinct from the rest of India.

<sup>3</sup> The study by Kijima and Lanjouw (2005) is among the very few studies that explore explicitly the relationship between nonfarm employment and caste status.

public. This paper provides insight into participation in nonfarm activities and nonfarm incomes, taking into consideration the social status of rural households.

The remainder of this paper is organized as follows. Section 2 briefly discusses the empirical literature on rural nonfarm employment. Section 3 presents details about our data set, sampling procedure, and main variables. Section 4 portrays the importance of nonfarm incomes across categories of rural households. In Sections 5 and 6 we conduct an empirical inquiry of the determinants of participation in nonfarm activities and of incomes derived from these activities. Robustness checks are presented in Section 7. In Section 8 we present our concluding thoughts and reflect on policy implications.

## 2. Literature review

Much research on growth and development from the 1970s stressed the importance of farmers moving into other types of work in response to a divergence in returns to farm and nonfarm work. The potential contribution of small-scale industries in generating employment and income in rural areas has been widely recognized (Chuta and Liedholm 1982; Haggblade, Hazell, and Brown 1989; Liedholm, McPherson, and Chuta 1994).<sup>4</sup> Despite a common policy emphasis on rural industries in the 1960s through the early 1990s, recent literature has documented a shift towards trade, transport, and other services in the composition of rural nonfarm employment (Lanjouw and Lanjouw 2001; Reardon, Berdegue, and Escobar 2001).

There is a large literature looking at the determinants of rural income diversification. One of the central themes of the literature has been the effect of the household's level of education on nonfarm employment. In spite of the large and varied nature of the human capital literature for rural households, the primary focus until the 1980s was on the effect of education on the household's behavior on the farm.<sup>5</sup> Recently the focus has shifted to the issue of how education affects the nonfarm behavior of rural households. Schultz (1988) documents in a survey that farmers with more schooling often first supply family labor off the farm. Yang and An (2002) show that education improves the allocation of household resources between agricultural and non-agricultural activities. Jolliffe (2004) estimates returns to education in farm and off-farm work, and finds that they are much higher in the latter, thus affecting the allocation of labor in Ghanaian farm households. By and large, the empirical evidence is unanimous in finding positive effects of education on participation in nonfarm activities.

Household assets have also been extensively examined as a key determinant of participation in nonfarm activities. As Reardon, Delgado, and Matlon (1992) note, both theory and empirical evidence are ambiguous about the effects of household land and non-land assets on income diversification behavior. In particular, the empirical evidence on the direction of the impact of landholdings on nonfarm diversification is indefinite, positive in some settings and negative in others: a negative impact of land is reported for Nigeria and Sierra Leone (Liedholm and Kilby 1989), Thailand (Rief and Cochrane 1990), and Vietnam (van de Walle

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<sup>4</sup> An important implication of Chuta and Liedholm (1982) is that, despite the absence of favorable government policies and promotional efforts in Sierra Leone, small-scale industries play an important role in absorbing a large part of the pool of available manpower.

<sup>5</sup> A widely cited survey by Jamison and Lau (1982) summarizes the results of over 35 studies from Asia, Africa, and Latin America that measure returns to the education of farmers. All of these studies estimate whether education has a positive effect on farm output or profit, and most of them support the claim of Jamison and Lau that there are positive returns to the education of farmers.

and Cratty 2004); a positive impact is found for Burkina Faso by Reardon et al. (1992) and India (Lanjouw and Shariff 2002). Another factor correlated with participation in nonfarm activities is the size and structure of the household (Reardon 1997; Corral and Reardon 2001).

This paper is in the spirit of the literature that examines the individual, household, and geographic determinants of participation in nonfarm income generating activities and of incomes derived from these activities. The challenge thereby is to account for the great heterogeneity of the rural nonfarm employment, which results in widely varying productivity and profitability. The literature makes a useful distinction between low-return nonfarm work of last resort and high-return nonfarm activities (Ellis 1998; Lanjouw and Lanjouw 2001). Different researchers have followed different approaches in dealing with the categorization of nonfarm activities. Elbers and Lanjouw (2001) make a distinction between low- and high-productivity nonfarm wage employment based on whether earnings fall below or exceed the average earnings from agricultural labor. Ferreira and Lanjouw (2001) define high-return nonfarm activities as those with monthly returns above the poverty line. Our concern has been to group the nonfarm activities of rural households in the Himalayas into categories that are reasonably homogenous with respect to farmer's returns from participation in those activities. Then we proceed by classifying the nonfarm activities according to returns and in categories that differentiate between self-employment incomes and wage earnings.<sup>6</sup> As argued by Thomas and Strauss (1997), it is important to distinguish wages earned in the market and self-employment sectors, since wages may not be fully comparable across the sectors, since returns to human capital are likely to differ depending on the nature of the work, and since labor markets may be segmented.

### 3. Data and variables

The data come from a survey conducted in the second half of 2004. The survey was based in the Himalayan region of India, in the states of Sikkim and West Bengal.<sup>7</sup> The region is largely agrarian, based on traditional farming methods and terraced slopes. Because of the hilly terrain and lack of reliable transportation infrastructure, there are no large-scale industries.

As a first step, the region was divided into two main blocks: rural Darjeeling Gorkha Hill Council in the state of West Bengal<sup>8</sup> and rural Sikkim. Gram Panchayats were randomly selected in each block.<sup>9</sup> The selected Gram Panchayats were further divided into 4-6 villages and 5-8 households were randomly selected from each village. This sampling procedure yielded a sample of 520 households. The survey provided information on farm and nonfarm activities, income sources, income levels, demographic characteristics, employment status, asset holdings, as well as other attributes of the households and of the household members. A

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<sup>6</sup> This is different from recent works by Fafchamps and Quisumbing (1999), Yang and An (2002), and Jolliffe (2004), which use a mix of wages and self-employment income.

<sup>7</sup> The survey was carried out within a large-scale project designed to examine the livelihood of rural households. The project was financed by the German Corporation for Technical Cooperation (GTZ).

<sup>8</sup> We have taken into consideration only the highland areas of the Darjeeling Gorkha Hill Council. Villages involved in the production of Darjeeling tea were excluded from the analysis. A few politically unstable rural areas were also avoided.

<sup>9</sup> Gram Panchayats are local government bodies in India. In Sikkim, Gram Panchayats were selected from all four districts (North, South, East, and West).

one-year recall period was used and no effort was made to capture seasonality in income patterns.<sup>10</sup>

The Indian National Sample Survey Organization (NSS) has been carrying out all-India household surveys in quinquennial rounds. However, the NSS surveys capture just the participation in various activities and do not contain quantitative data on household incomes. These surveys are thus inapt for gauging the extent of dependence of the population on particular sources of income. Our survey focused on collecting reliable data on both the participation in nonfarm activities and the levels of incomes derived from these activities. This allows us to use several different classifications of economic activity as well as to provide a detailed and comprehensive picture of the labor allocation and incomes of rural households. Nevertheless, we complement our analysis by using the sixth NSS survey (conducted in the period July 1999 - June 2000). Selected estimates based on the NSS data are provided in the Appendix.

We begin by constructing a measure of farm income. To the value of crops and animal products marketed in the last year, we add the implicit income from subsistence production imputed at local prices. From the total value of farm production, we subtract the costs of seed, fertilizer, livestock, repairs of machinery, hired labor, and the like. We then proceed to construct measures of nonfarm income. Nonfarm wage income includes payments in kind. Nonfarm self-employment income is net of business costs, such as expenditures on raw materials, energy, hired labor, and equipment maintenance. We also treat the value of family labor as a cost.<sup>11</sup>

The demand for farm labor by households is measured by the farm size. We expect households who inherit a lot of land to be less likely to work off-farm. Previous studies on rural nonfarm employment have assumed exogeneity of land endowments since land markets in developing countries barely function and are generally quite thin. In the present study, to alleviate the endogeneity problem we consider just the inherited land. The supply of labor by households is captured by the number of men and women of prime-working age (15-65 years old). We include adult males and adult females separately because they might have different comparative advantages. Life-cycle effects are captured by age and age squared of the household head.

Level of education within the household is measured in different ways. In light of differences in education levels by gender and the diversification of farm tasks by gender, it is important to consider also specifications of education that allow for different effects of gender. We use the years of education of the household head, the average education of adult males and females, and the highest level of schooling completed by adult males and females.<sup>12</sup> In addition, to account for nonlinearity of educational effects we divide the households into several categories according to the highest level of education attained by adult members: uneducated, less than primary education (less than 5 years of education), completed primary (between 5 and 9 years), matriculation (between 10 and 11 years), completed high school (between 12 and 14 years), and tertiary education (15 or more years of education). We regard results about educational effects as robust when they are present in all specifications.

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<sup>10</sup> It should be mentioned that, as in most studies, recall errors are likely to have affected reported income.

<sup>11</sup> The resulting measures of income are sometimes referred to as restricted profit, or profit conditional on the cost of certain inputs.

<sup>12</sup> Children education is ignored because it is less likely to affect activity choices, but more likely to be influenced by them through income.



Intergenerational effects might play a role for participation in nonfarm employment. In our estimations, we consider whether a parent of the household head was engaged in a more remunerative nonfarm activity (i.e., in skilled wage job or small business). Including this variable should reduce concerns that correlation between education and nonfarm activities actually depicts family background. For instance, individuals whose parents were employed in high-return nonfarm activities probably received more exposure to the nonfarm sector or they might be better educated. Thus if family background is not controlled for, education variables may capture the effect of exposure to nonfarm activities, not that of education itself (Fafchamps and Quisumbing 1999).

Ethnicity may also play an important role in determining participation in nonfarm activities (de Janvry and Sadoulet 2001). Since the majority of the households are of Nepali ethnic origin and speak Nepali, we control for social status instead.<sup>13</sup> We divide the households into three groups. The first group consists of households that belong to scheduled tribes and scheduled castes (the lowest caste). These households have preferential treatment in public employment and reservation of seats in provincial and central legislatures.<sup>14</sup> The second group consists of households that belong to other backward classes and have certain preferential treatment in public employment, but to a lesser degree compared to the first group. The rest of the households are classified as a general category.<sup>15</sup>

In our empirical analysis, we control for locational characteristics. Ease of access to market is measured by the time required to reach the nearest market. Given the hilly terrain, mileage is not an appropriate measure for most of the region; travel time is a more exact measure in this case. Inter-regional disparities are captured by classifying the households into two categories according to the regional location: Sikkim and West Bengal. While both regions are largely agrarian, Sikkim has a more dynamic and diverse economy.<sup>16</sup> A dummy variable for residence in Sikkim also accounts for differences in the agricultural potential, institutional arrangements, infrastructure, prices, and other unobserved region-specific characteristics.

Finally, to investigate the role of external financing in nonfarm self-employment, we include in some estimations the following independent variables: a dummy variable indicating if the start-up investment included external financing and the share of the external financing in the start-up investment.

#### **4. The importance of nonfarm incomes**

Data from our survey show that nonfarm activities generate on average almost 60 percent of rural households' incomes (Table 1).<sup>17</sup> Nonfarm incomes are larger than agricultural incomes. Skilled wage employment is the most remunerative source of nonfarm income. The detailed sectoral breakdown suggests that, in terms of returns, services dominate nonfarm activity and contribute on average one-third to total household income. The share of nonfarm wage

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<sup>13</sup> Other languages spoken in the region include Bhutia, Dzongkha, Groma, Gurung, Lepcha, Limbu, Magar, Majhi, Majhwar, Newari, Rai, Sherpa, Sunuwar, Tamang, Thulung, Tibetan, and Yakha.

<sup>14</sup> For a detailed description of the social system and caste-based preferential policies in India, see Gallanter (1984) and Osborne (2001).

<sup>15</sup> As noted by Borooah, Dubey, and Iyer (2007), if one were to establish a hierarchy of communities in terms of the "desirability" of the economic status, scheduled castes/scheduled tribes would lie at the bottom, the general category Hindus would be at the top, and the other backward classes would be in the middle.

<sup>16</sup> Sikkim has had an impressive growth rate of 8.3 percent, which is the second highest in the country after Delhi.

<sup>17</sup> Rural nonfarm income averages approximately 40 percent of rural incomes in Latin America, 45 percent in Africa, and 35 percent in Asia (Reardon et al. 2001).

income (47 percent) in total income by far exceeds the share of nonfarm self-employment income (10 percent). These results are consistent with findings reported by Reardon et al. (2001) for Latin America, suggesting the need for more attention to services and wage employment, versus the traditional focus on manufactures and self-employment.

**Table 1 : Composition of household income by sector and activity**

	Income			Share in total income (%)	Number of households (%)
	Mean (Rupees)	Median (Rupees)	Std. dev. (Rupees)		
<b>I. SECTORAL COMPOSITION</b>					
Agriculture	13,562	9,312	17,887	30.9	97.69
Manufacturing	10,463	7,457	7,770	2.3	9.81
Construction	14,621	8,816	21,515	11.6	34.42
Trade	20,826	9,939	31,899	5.7	13.65
Restaurants and hotels	27,014	12,775	14,087	0.8	1.35
Transport	25,712	16,014	19,029	2.3	6.73
Private services	26,515	19,180	21,288	8.3	13.46
Public services	74,800	72,000	46,820	25.5	14.62
Other	12,073	1,420	19,177	12.6	44.62
<b>II. FARM VS. NONFARM COMPOSITION</b>					
<b>Total farm income</b>	<b>13,562</b>	<b>9,312</b>	<b>17,887</b>	<b>30.18</b>	<b>97.69</b>
Farm self-employment	11,363	7,204	17,545	25.24	97.50
Agricultural wages	6,758	5,040	6,475	4.94	32.12
<b>Total nonfarm income</b>	<b>34,482</b>	<b>20,160</b>	<b>42,453</b>	<b>57.55</b>	<b>73.27</b>
<i>Nonagricultural wages</i>	<i>35,939</i>	<i>23,640</i>	<i>40,126</i>	<i>47.23</i>	<i>57.69</i>
Skilled labor	57,682	42,000	45,859	37.40	28.46
Unskilled labor	13,051	9,150	12,259	9.83	33.08
<i>Self-employment</i>	<i>18,123</i>	<i>6,624</i>	<i>36,497</i>	<i>10.32</i>	<i>25.19</i>
Small enterprise	28,279	10,390	47,117	8.67	13.46
Micro enterprise	5,378	3,240	5,799	1.65	13.65
<i>High-return activities</i>	<i>51,551</i>	<i>36,000</i>	<i>50,201</i>	<i>46.07</i>	<i>35.00</i>
<i>Low-return activities</i>	<i>12,135</i>	<i>8,400</i>	<i>11,913</i>	<i>11.48</i>	<i>37.50</i>
<b>Other income</b>	<b>12,074</b>	<b>1,420</b>	<b>19,177</b>	<b>12.27</b>	<b>44.62</b>
Remittances	19,378	18,000	21,163	5.69	12.88
Pensions	28,332	27,600	15,662	6.21	9.62
Other	586	245	999	0.38	28.27

*Notes: The mean, median, and standard deviation are calculated across households receiving income from the corresponding source. Micro enterprises involve little or no investment. Enterprises requiring investment of at least 5,000 Rupees were classified as small. Low-return activities include unskilled wage labor and micro-enterprise self-employment. High-return activities include skilled wage labor and small-enterprise self-employment.*

While farming is the main activity of the sample, about 73 percent of the households engage in nonfarm activities. Only 25 percent of the households engage in nonfarm self-employment, while 58 percent engage in nonfarm wage employment. It is worth noting that both nonfarm self-employment and nonfarm wage employment are quite heterogeneous. In nonfarm self-employment, retail dominates over brewing and manufacture. Nonfarm unskilled wage employment takes mainly the form of construction work, road labor, and other poorly-paid manual labor. Teaching, work for the government, and transportation are the main activities within the nonfarm skilled wage employment.

Table 2 shows the sources of income for households classified by farm size and by education of the household head. Nonagricultural incomes are larger than agricultural incomes across all categories of rural households, indicating that nonfarm activities are important for all households.

**Table 2 : Sources of household income by farm size and by education of the household head**

	Farm size in acres						Education in years					
	Landless	<0.5	0.5-1.5	1.5-2.5	2.5-3.5	>3.5	Uneducated	1-4	5-9	10-11	12-14	>14
Number of households (%)	17.7	27.1	27.7	12.3	6.9	8.3	36.4	16.2	33.2	9.0	3.9	1.5
Total income (Rupees)	33,535	34,671	42,636	56,482	53,414	73,889	31,705	37,806	45,673	74,949	68,147	114,900
Shares in total income (%)												
<b>Total farm income</b>	<b>21.3</b>	<b>25.5</b>	<b>28.7</b>	<b>28.7</b>	<b>36.4</b>	<b>46.8</b>	<b>39.0</b>	<b>34.8</b>	<b>28.9</b>	<b>26.3</b>	<b>12.9</b>	<b>8.3</b>
Farm self-employment	16.9	16.6	23.0	26.6	34.7	43.6	29.9	27.9	24.7	25.5	12.4	8.3
Agricultural wages	4.4	8.9	5.7	2.1	1.7	3.2	9.1	6.8	4.2	0.8	0.5	0.0
<b>Total nonfarm income</b>	<b>56.2</b>	<b>61.1</b>	<b>59.8</b>	<b>62.1</b>	<b>52.9</b>	<b>46.8</b>	<b>50.7</b>	<b>56.4</b>	<b>56.3</b>	<b>58.3</b>	<b>74.6</b>	<b>88.4</b>
<i>Nonagricultural wages</i>	<i>42.9</i>	<i>55.4</i>	<i>56.0</i>	<i>44.0</i>	<i>39.0</i>	<i>30.6</i>	<i>44.3</i>	<i>48.9</i>	<i>42.3</i>	<i>49.5</i>	<i>69.1</i>	<i>61.4</i>
Skilled labor	30.8	36.0	46.8	40.0	32.6	27.6	26.8	31.4	35.1	47.4	69.1	61.1
Unskilled labor	12.1	19.4	9.2	4.0	6.3	2.9	17.5	17.5	7.2	2.1	0.0	0.3
<i>Self-employment</i>	<i>13.3</i>	<i>5.7</i>	<i>3.7</i>	<i>18.1</i>	<i>14.0</i>	<i>16.2</i>	<i>6.4</i>	<i>7.5</i>	<i>14.0</i>	<i>8.8</i>	<i>5.4</i>	<i>27.0</i>
Small enterprise	2.0	2.5	1.6	0.8	2.5	0.4	4.0	5.8	12.6	7.3	4.5	27.0
Micro enterprise	11.3	3.1	2.1	17.3	11.4	15.8	1.7	1.4	1.5	1.0	0.0	1.7
<b>Other income</b>	<b>22.5</b>	<b>13.4</b>	<b>11.6</b>	<b>9.2</b>	<b>10.7</b>	<b>6.4</b>	<b>10.3</b>	<b>8.8</b>	<b>14.8</b>	<b>15.4</b>	<b>12.5</b>	<b>3.3</b>
Remittances	6.1	8.7	5.3	4.6	1.9	5.0	5.5	3.0	7.1	7.3	4.0	0.0
Pensions	16.0	4.4	5.9	4.3	8.1	1.1	4.1	5.4	7.5	8.0	7.7	3.0
Other	0.4	0.3	0.4	0.3	0.7	0.3	0.7	0.4	0.2	0.1	0.8	0.3

Notes: Micro enterprises involve little or no investment. Enterprises requiring investment of at least 5,000 Rupees were classified as small

As expected, the share of income derived from farm activities is relatively more important for households with larger farms.<sup>18</sup> Households with fewer land assets tend to have higher shares of total household income generated by nonfarm activities. Hence, the opportunity to participate in nonfarm activities seems essential for the land-poor, especially the opportunity to participate in nonagricultural wage labor. On the other hand, incomes derived from nonagricultural self-employment do not seem to differentially compensate for lack of access to land.

The role of education in accessing both nonfarm wage labor and nonfarm self-employment is quite clear. Households with a better educated household head derive larger shares of income from nonfarm activities, particularly from skilled wage labor and from self-employment in small enterprises.<sup>19</sup> Households with lower educational levels obtain relatively larger share of income from farm activities and from participation in nonagricultural unskilled wage labor.

We conclude this section by observing that there seem to be specific requirements to access the more remunerative nonfarm activities which the land-poor and the unskilled are not well placed to meet. That is, households poor in land and in education appear to be involved mainly in low-return nonfarm activities. Hence, it is important to explore further the determinants of participation in different types of nonfarm employment.

## **5. Participation in nonfarm activities**

Participation by rural households in nonfarm activities is a function of a vector of household characteristics and of the locational characteristics of the community where the household is located (Table 3). Household characteristics include: the household size and composition, human capital, land, intergenerational effects (if parents of the household head were engaged in high-return nonfarm activities), and social status (if the household is a member of a scheduled caste/scheduled tribe, other backward class, or if it belongs to the general category). Village fixed effects are included to control for systematic differences across villages due to market conditions, prices, literacy rates, and the supply of nonfarm jobs.

We start by estimating a probit model of participation in nonfarm employment. The estimates in the first column of Table 3 imply that the average education of working-age males is positively associated with participation in nonfarm activities. In contrast, households that belong to the general category and households inheriting a lot of land are less likely to engage in nonfarm activities. As discussed above, these results do not provide a detailed and comprehensive picture of the labor allocation of rural households because of aggregation of the different types of nonfarm activities in the dependent variable.

We next classify the nonfarm activities into two main types: easy-entry, low-return activities (unskilled wage labor and micro enterprise) and difficult-entry, high-return activities (skilled wage labor and small enterprise).<sup>20</sup> Low-return activities typically require no particular skills

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<sup>18</sup> The landless households derive income from farm self-employment by engaging in sharecropping and by raising livestock.

<sup>19</sup> Enterprises requiring investment of at least 5,000 Rupees were classified as small.

<sup>20</sup> The decision to combine self-employment income and wage earnings clearly comes at the cost of confounding two distinct types of economic activity. Nonetheless, both analytically and for policy purposes, the gains from aggregating these two income sources are important.

**Table 3 : Probit estimations of participation in nonfarm activities: marginal effects**

	Nonfarmemploy.	Nonfarm employment		Nonfarm employment		Nonfarm self-employment		Nonfarm wage employment	
	(1)	Low return	High return	Self-employ.	Wage employ.	Micro bus.	Small bus.	Unskilled labor	Skilled labor
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
<b>Household characteristics and assets</b>									
Age of household head	0.010 (0.008)	-0.018* (0.010)	0.018 (0.011)	-0.003 (0.008)	0.008 (0.100)	-0.015*** (0.005)	0.013** (0.006)	-0.001 (0.010)	0.008 (0.010)
Age of household head squared (x100)	-0.011 (0.008)	0.018* (0.010)	-0.018 (0.011)	0.005 (0.008)	-0.011 (0.010)	0.016*** (0.005)	-0.012** (0.005)	-0.001 (0.010)	-0.009 (0.010)
Household head is male <sup>a</sup>	0.076 (0.078)	0.073 (0.078)	0.045 (0.086)	-0.021 (0.070)	0.151* (0.081)	0.040 (0.041)	-0.068 (0.060)	0.092 (0.068)	0.098 (0.062)
Number of working-age men	0.031 (0.023)	0.024 (0.029)	0.055** (0.027)	-0.019 (0.022)	0.037 (0.027)	-0.016 (0.017)	0.001 (0.014)	0.026 (0.027)	0.061*** (0.023)
Number of working-age women	0.029 (0.026)	-0.037 (0.030)	0.081*** (0.030)	0.013 (0.024)	0.034 (0.029)	0.005 (0.017)	0.005 (0.014)	-0.025 (0.028)	0.068*** (0.025)
Mean education of working-age men	0.013** (0.006)	-0.022*** (0.008)	0.047*** (0.008)	0.012* (0.006)	0.016** (0.007)	0.005 (0.004)	0.009** (0.004)	-0.030*** (0.007)	0.042*** (0.007)
Mean education of working-age women	0.010 (0.007)	-0.021** (0.008)	0.038*** (0.008)	0.012* (0.007)	-0.007 (0.008)	-0.003 (0.005)	0.014*** (0.004)	-0.028*** (0.008)	0.019** (0.007)
Land assets per adult	-0.029** (0.013)	-0.058 (0.038)	-0.015 (0.015)	-0.019* (0.016)	-0.032 (0.020)	-0.046** (0.022)	-0.001 (0.006)	-0.036 (0.035)	-0.018 (0.013)
Parents were in high-return activities <sup>a</sup>	0.072 (0.054)	0.004 (0.072)	0.071 (0.076)	0.184*** (0.066)	-0.082 (0.070)	0.066 (0.050)	0.105** (0.052)	0.002 (0.068)	-0.059 (0.058)
Scheduled caste or tribe <sup>a,b</sup>	-0.069 (0.061)	-0.134** (0.061)	0.054 (0.068)	0.018 (0.054)	-0.083 (0.066)	-0.018 (0.037)	0.041 (0.038)	-0.135** (0.054)	0.014 (0.058)
General category <sup>a,b</sup>	-0.149** (0.060)	-0.191*** (0.059)	-0.017 (0.067)	-0.065 (0.051)	-0.090 (0.064)	-0.041 (0.037)	-0.017 (0.032)	-0.129** (0.053)	0.004 (0.061)
<b>Locational characteristics</b>									
Distance to market (x100)	-0.030 (0.061)	0.035 (0.074)	-0.107 (0.078)	0.001 (0.060)	0.039 (0.075)	0.045 (0.039)	-0.103* (0.054)	0.037 (0.068)	0.028 (0.071)
Residence in Sikkim <sup>a,c</sup>	0.092 (0.124)	-0.206 (0.138)	0.473*** (0.120)	0.098 (0.120)	0.092 (0.140)	-0.070 (0.082)	0.177* (0.105)	-0.157 (0.133)	0.156 (0.148)
Log-likelihood	-265.4	-283.5	-259.0	-269.2	-320.2	-181.4	-171.6	-244.2	-236.0
Pseudo R-squared	0.109	0.197	0.256	0.083	0.096	0.112	0.165	0.260	0.225
Wald chi-squared	64.37	134.2	165.6	48.60	68.03	47.09	66.84	160.8	138.2
Prob > chi-squared	0.001	0.000	0.000	0.063	0.001	0.067	0.001	0.000	0.000

Robust standard errors in parentheses. Village fixed effects included but not shown. The number of observations in each regression is 520.

<sup>a</sup> dummy variables; <sup>b</sup> excluded category: other backward classes; <sup>c</sup> excluded category: residence in Darjeeling

\*\*\*, \*\*, and \* indicate significance at the 1%, 5%, and 10% level.

and little or no investment. These mainly include: road and construction labor, cleaning services, weaving, brewing, road-side and weekly-market vendors, and firewood collection. High-return activities usually require certain skills and, in the case of small-enterprise self-employment, an investment higher than 5,000 Rupees. The main types of employment within this group are: teaching, civil service, police and health services, engineering, rice mills, groceries, cash crop trade, and transportation.

Results in columns 2 and 3 of Table 3 show that education plays a prominent and differential role across low-return and high-return nonfarm activities. Higher educational levels of both males and females enable participation in the more remunerative nonfarm employment opportunities. In contrast, for low-return nonfarm activities, education of both males and females has a negative effect on the participation decision. These results show that the better educated males and females stay away from the less remunerative nonfarm sector. Larger labor supply by the household is associated with higher probability of participation in the high-return nonfarm sector, as larger households benefit from returns to scale in household chores and can more easily let some members engage in nonfarm work.<sup>21</sup> This is true for both males and females, hence suggesting that women do not seem to play a marginal role in market-oriented activities. Households that are members of scheduled castes/tribes or that belong to the general category participate less in low-return activities compared to households that are members of other backward classes (the reference group for social status). This result suggests that the job reservation policy for the scheduled castes/tribes could have benefited households from these groups in the sense of allowing them to depend less on participation in the low-return nonfarm sector. Regional location also matters as it affects the supply of opportunities. Compared to West Bengal, there is more participation in high-return nonfarm activities in Sikkim. Thus, households located in the Darjeeling Gorkha Hill Council in the state of West Bengal, a region with a less dynamic economy and lower supply of nonfarm income opportunities, seem to be ill-placed for accessing lucrative nonfarm employment.

We proceed by reclassifying the nonfarm activities into wage employment (unskilled and skilled wage labor) and self-employment (micro and small enterprises).<sup>22</sup> It is important to differentiate between these two distinct types of economic activity, since self-employment income includes returns to entrepreneurship, risk taking, and capital whereas wage income does not. Columns 4 and 5 of Table 3 report that male education increases the probability of participation in nonagricultural wage labor, as better educated men add to the impetus to find work outside the family farm. Intergenerational effects are important for participation in self-employment, suggesting that the occupational effect on the propensity to engage in self-employment carries over across generations (Fafchamps and Quisumbing 2003).

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<sup>21</sup> Dercon and Krishnan (1996) also find that a higher income-earning capacity, in terms of more male labor, allows households to take up high-return activities.

<sup>22</sup> Micro enterprises involve little or no investment. Enterprises requiring investment of at least 5,000 Rupees were classified as small. Of course, it is possible that over time some firms could grow from micro businesses to small-scale enterprises (and some firms could exit). On the other hand, Liedholm et al. (1994) show that for rural small enterprises in Africa, growth is the exception rather than the rule. Being a cross-section, our data do not permit us to investigate dynamic issues. We made a modest effort to account for possible dynamics of enterprises by applying an alternative classification criterion based on the current net income instead of the initial investment. Results (not shown) were qualitatively unaffected, which indicates that dynamics of rural enterprises might not be substantial in the Himalayan region.

Table 3A in the Appendix presents (analogously to Table 3) estimates of participation in wage employment and in self-employment using the NSS data. The results reinforce our previous conclusions and illustrate the significance of additional variables. A particularly strong effect on participation in wage employment is found for female education and for the male head dummy. Membership of scheduled castes/tribes also increases the likelihood of nonfarm wage employment as a result of job reservation policies. Households belonging to the general category and located in Sikkim are better positioned to take on both self-employment and wage labor off the farm.

To extend the analysis even further, we present estimates of participation in the four nonfarm activities: micro enterprise, small enterprise, unskilled wage labor, and skilled wage labor (columns 6-9 of Table 3). Clearly, education is a key factor in determining participation in nonfarm activities, particularly participation in the more remunerative activities.<sup>23</sup> Results show that education has no differential role across genders in accessing different types of nonfarm employment. Households with higher average education of both males and females participate more in self-employment in small enterprises and in remunerative wage employment that requires certain skills. In contrast, these households participate less in unskilled wage labor. Education has no role to play in self-employment in micro enterprises, possibly because the products of these enterprises are for local consumption and use traditional technologies.

A distinctly opposite age pattern can be observed in participation in micro-business and small business self-employment. In the case of micro-business self-employment, the likelihood of participation decreases with age, dips at 48 years, and then increases. On the other hand, the likelihood of participation in small-business self-employment first rises with age, peaks at 55 years, and then declines. Household labor supply tends to raise participation in skilled wage labor. Land assets reduce the probability of participation in micro-business self-employment. A possible explanation for this finding is the higher marginal productivity of farm labor compared to the marginal productivity of labor in micro enterprises. Intergenerational effects are important for self-employment only in small enterprises. Households that are members of scheduled castes/tribes or that belong to the general category are less likely to participate in unskilled wage employment. This again suggests that members of other backward classes, being deprived of preferential treatment in employment under the job reservation policy, are compelled to rely relatively more on unskilled, low-return wage employment.

To get further insights, we analyze the determinants of the *intensity* of participation (Table 4), defined as the share of income from a particular nonfarm activity in the total household income. Since the dependent variable is bounded between 0 and 1, the equations are estimated as Tobits.<sup>24</sup>

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<sup>23</sup> A possible criticism of our estimates is the simultaneity between education and participation in nonfarm employment. To alleviate the endogeneity problem, we take into consideration only the education of working-age males and females, and exclude the household members who are currently undergoing education. We conducted a test of weak exogeneity of education and found evidence supportive of the exogeneity assumption.

<sup>24</sup> We also performed two alternative estimations: (i) we first transformed the bounded dependent variable into an (positive) unbounded variable and then applied the OLS estimator; and (ii) we applied the Censored Least Absolute Deviations (CLAD) estimator. The results of the two alternative estimation methods have similar qualitative implications as the Tobit estimates.

**Table 4 : Tobit estimations of the intensity of participation in nonfarm activities:**  
marginal effects

	Nonfarmemploy.	Nonfarm employment		Nonfarm employment	Nonfarm self-employment		Nonfarm wage employment		
	(1)	Low return	High return	Self-employ.	Wage employ.	Micro bus.	Small bus.	Unskilled labor	Skilled labor
<i>Household characteristics and assets</i>									
Age of household head	0.011 (0.008)	-0.019* (0.010)	0.031** (0.014)	0.001 (0.014)	0.012 (0.011)	-0.032** (0.013)	0.049** (0.025)	-0.003 (0.013)	0.022 (0.018)
Age of household head squared (x100)	-0.014* (0.008)	0.018* (0.011)	-0.033** (0.014)	0.002 (0.014)	-0.017 (0.011)	0.034*** (0.013)	-0.045* (0.024)	-0.001 (0.013)	-0.027 (0.018)
Household head is male <sup>a</sup>	0.148** (0.070)	0.184* (0.094)	0.054 (0.117)	-0.030 (0.115)	0.217** (0.093)	0.127 (0.122)	-0.253 (0.168)	0.193* (0.111)	0.231 (0.164)
Number of working-age men	0.036 (0.022)	-0.009 (0.029)	0.071* (0.037)	-0.021 (0.038)	0.053* (0.029)	-0.041 (0.036)	0.020 (0.057)	0.022 (0.033)	0.094** (0.048)
Number of working-age women	0.023 (0.024)	-0.046 (0.031)	0.110*** (0.041)	0.009 (0.040)	0.033 (0.031)	-0.009 (0.039)	0.024 (0.064)	-0.035 (0.035)	0.129** (0.053)
Mean education of working-age men	0.024*** (0.006)	-0.026*** (0.008)	0.068*** (0.011)	0.022** (0.010)	0.024*** (0.008)	0.014 (0.010)	0.031* (0.016)	-0.045*** (0.010)	0.087*** (0.014)
Mean education of working-age women	0.011 (0.007)	-0.032*** (0.009)	0.050*** (0.011)	0.022* (0.011)	-0.002 (0.009)	-0.009 (0.011)	0.056*** (0.018)	-0.038*** (0.011)	0.037** (0.015)
Land assets per adult	-0.050*** (0.017)	-0.117*** (0.036)	-0.022 (0.026)	-0.037 (0.028)	-0.054** (0.025)	-0.141** (0.068)	-0.004 (0.036)	-0.092** (0.040)	-0.037 (0.036)
Parents were in high-return activities <sup>a</sup>	0.023 (0.058)	-0.006 (0.075)	0.077 (0.095)	0.238** (0.092)	-0.088 (0.076)	0.106 (0.087)	0.304** (0.141)	-0.022 (0.087)	-0.078 (0.127)
Scheduled caste or tribe <sup>a,b</sup>	0.011 (0.054)	-0.061 (0.067)	0.077 (0.095)	0.070 (0.091)	-0.049 (0.070)	0.000 (0.084)	0.149 (0.145)	-0.110 (0.077)	0.049 (0.125)
General category <sup>a,b</sup>	-0.087 (0.054)	-0.176** (0.068)	-0.005 (0.094)	-0.074 (0.093)	-0.085 (0.069)	-0.065 (0.086)	-0.095 (0.153)	-0.160** (0.076)	0.002 (0.122)
<i>Locational characteristics</i>									
Distance to market (x100)	-0.064 (0.060)	0.012 (0.072)	-0.146 (0.114)	-0.064 (0.101)	0.003 (0.078)	0.087 (0.088)	-0.409** (0.203)	0.005 (0.084)	0.035 (0.144)
Residence in Sikkim <sup>a,c</sup>	0.140 (0.140)	-0.405** (0.175)	0.621** (0.250)	0.003 (0.216)	0.108 (0.181)	-0.130 (0.185)	0.799** (0.381)	-0.335* (0.203)	0.849*** (0.300)
Log-likelihood	-339.3	-289.0	-341.8	-258.5	-396.5	-149.0	-178.3	-259.3	-308.4
Pseudo R-squared	0.130	0.217	0.210	0.095	0.094	0.139	0.162	0.248	0.189
Wald chi-squared	101.5	159.9	181.5	54.45	82.59	48.19	69.08	170.8	144.0
Prob > chi-squared	0.000	0.000	0.000	0.025	0.000	0.068	0.001	0.000	0.000

Robust standard errors in parentheses. Village fixed effects included but not shown. The number of observations in each regression is 520.

<sup>a</sup> dummy variables; <sup>b</sup> excluded category: other backward classes; <sup>c</sup> excluded category: residence in Darjeeling

\*\*\*, \*\*, and \* indicate significance at the 1%, 5%, and 10% level.



The findings in Table 4 reinforce those of Table 3. The most remunerative employment opportunities are captured by those with the higher educational levels. The beneficial effect of education accrues to both males and females. Land assets decrease the intensity of participation in unskilled wage labor and in micro-business self-employment, as labor is reallocated to the farm. Taken together, our results indicate that the key determinants of the intensity of participation in nonfarm employment are education and inherited wealth (land): these regressors account for most of the variation in the intensity of participation as more educated households are likely to farm less, while those with more inherited wealth tend to farm more. As in Fafchamps and Shilpi (2005), proximity to markets is associated with higher intensity of participation in small-business self-employment. This result suggests that households with better access to market are in a better position to develop private initiatives that make running small enterprises more attractive by taking advantage of returns to scale. Social status and geographical location display similar effects as in the participation equations.

We thus conclude that household assets, household characteristics, and locational characteristics all play a role in explaining participation in nonfarm activities. Key among the determinants of participation in nonagricultural employment are education (with higher rewards to higher levels of education), household labor supply (positively for high-return activities), land assets (negatively), intergenerational effects (positively for self-employment), social status (negatively for other backward classes), and regional location (with deficits in opportunities for households in West Bengal).

## 6. Determinants of nonfarm income

To understand why some households are better able to derive income from specific nonfarm activities than others, we now turn to an analysis of the determinants of household income by source (Table 5). Since not all households derive income from nonfarm activities, the income equations are estimated using the two-step Heckman selection model.<sup>25</sup> Following Fafchamps and Quisumbing (1999), family background variables – inherited land and a dummy variable indicating if parents of the household head were engaged in high-return nonfarm activities – are the identifying restrictions that are used to estimate household participation in nonfarm activities and are excluded from the income equations. Additionally, as in Yang (1997) and Jolliffe (2004), we use the number of adult family workers as an identifying instrument.<sup>26</sup> The income equations in the second stage are estimated in logs. While in columns 1-3 of Table 5 self-employment income and wage income are combined for illustrative purposes, in the other columns the two categories of earnings are kept distinct.<sup>27</sup> We thus estimate two sets of regressions: in the regressions on self-employment earnings, the unit of observation is the household; in the regressions on wage income, the unit of observation is the household head.

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<sup>25</sup> The absence of correlation between the errors in the selection and income regressions is rejected for all regressions except for low-return nonfarm activities and micro-business self-employment. A selection correction is thus appropriate in most cases.

<sup>26</sup> While this choice of exclusion restrictions is not based on an economic theory of household behavior, specification testing indicates that the variables are both well correlated with household participation in nonfarm activities and properly excluded from the income functions. We also experimented with a longer list of identifying restrictions. For instance, instead of village dummies in the first-step estimations we included the psychical characteristics of the village: the log of the arable land area, the log of the distance to the nearest river, its mean elevation, and rainfall. Results were insensitive to the choice of identifying restrictions.

<sup>27</sup> As already mentioned, it is important to differentiate between self-employment income and wage income. Self-employment earnings include returns to entrepreneurship and capital, while wage earnings do not.

In the regressions on wage income we use wages instead of earnings, since earnings incorporate labour supply decisions (Strauss and Thomas 1995).<sup>28</sup>

**Table 5 : Estimations of (log) nonfarm income with selection correction: marginal effects**

	Nonfarmemploy.	Nonfarm employment		Nonfarm employment		Nonfarm self-employment		Nonfarm wage employment	
	(1)	Low return (2)	High return (3)	Self-employ. (4)	Wage employ. (5)	Micro bus. (6)	Small bus. (7)	Unskilled labor (8)	Skilled labor (9)
<i>Household i.e. individual characteristic</i>									
Age of household head	0.288*** (0.015)	0.297*** (0.033)	0.274*** (0.023)	0.212*** (0.075)	0.166*** (0.026)	0.134 (0.142)	0.228*** (0.049)	0.086** (0.037)	0.148*** (0.015)
Age of household head squared (x100)	-0.274*** (0.019)	- (0.035)	- (0.026)	-0.186** (0.079)	- (0.031)	-0.109 (0.146)	- (0.052)	-0.097*** (0.037)	- (0.018)
Household head is male <sup>a</sup>	1.213*** (0.290)	1.630*** (0.490)	0.757** (0.332)	0.069 (0.649)	1.097** (0.477)	0.621 (1.093)	0.239 (0.634)	2.231** (0.877)	0.231 (0.230)
Mean education of working-age men	0.141*** (0.023)	0.040 (0.086)	0.150*** (0.034)	0.137*** (0.041)		0.156* (0.088)	0.049 (0.051)		
Mean education of working-age women	0.073*** (0.022)	-0.035 (0.068)	0.104*** (0.029)	0.161 (0.101)		0.090 (0.141)	0.155** (0.064)		
Education of household head					0.044*** (0.011)			-0.019 (0.017)	0.067*** (0.015)
Scheduled caste or tribe <sup>a,b</sup>	0.168 (0.177)	0.156 (0.452)	0.172 (0.243)	0.632 (0.575)	0.066 (0.112)	0.822 (0.914)	0.359 (0.585)	-0.247** (0.108)	0.012 (0.148)
General category <sup>a,b</sup>	-0.076 (0.196)	-0.339 (0.587)	-0.055 (0.266)	0.253 (0.479)	0.049 (0.168)	0.232 (0.7545)	0.005 (0.560)	-0.254 (0.163)	-0.154 (0.124)
<i>Locational characteristics</i>									
Distance to market (x100)	0.016 (0.186)	0.091 (0.259)	-0.071 (0.312)	-1.010 (0.756)	-0.251 (0.183)	-0.447 (0.638)	-1.012* (0.620)	-0.022 (0.067)	-0.108 (0.223)
Residence in Sikkim <sup>a,c</sup>	0.474*** (0.148)	-0.185 (0.726)	0.800*** (0.231)	0.049 (0.397)	0.262** (0.117)	-0.072 (0.526)	-0.113 (0.409)	-0.216** (0.106)	0.419*** (0.145)
Lambda	0.834 (0.230)	0.282 (1.658)	0.923 (0.292)	1.318 (1.183)	0.369 (0.066)	1.463 (2.044)	1.635 (0.701)	0.475 (0.144)	0.130 (0.105)
Log-likelihood	-920.4	-654.2	-605.4	-595.5	-616.4	-371.4	-304.1	-315.2	-295.9
Wald chi-squared	7371	1772	4530	453.4	15881	109.0	211.5	2387	2589
Prob > chi-squared	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Robust standard errors in parentheses. Village fixed effects included but not shown. In columns 1-4, 6, and 7, the unit of observation is the household; in the first stage, the probabilities of participation in nonfarm activities are estimated at the household level as in Table 3. In columns 5, 8, and 9, the unit of observation is the household head; in the first stage, the probabilities of participation in nonfarm activities are estimated for the household head; the identifying restrictions are the inherited land and parental occupation.

<sup>a</sup> dummy variables; <sup>b</sup> excluded category: other backward classes; <sup>c</sup> excluded category: residence in Darjeeling  
\*\*\*, \*\*, and \* indicate significance at the 1%, 5%, and 10% level.

<sup>28</sup> Ideally, as argued by Strauss and Thomas, we would also use wages instead of earnings in the regressions on self-employment income. However, wages from self-employment are very difficult to calculate since many of the self-employed are operating family businesses, which employ unpaid family labor. While we do subtract the value of family labor from self-employment income, it is not clear how net income should be allocated among family workers.

Incomes from different nonfarm activities increase with age, but at a decreasing rate indicating what to expect as a life cycle matures. When the household head is a man, the household derives significantly more income from both high-return and low-return activities, and in particular from unskilled wage labor. This result is not surprising given that working as an unskilled laborer is often a gruelling activity with high returns to physical strength.

Not surprisingly, the educational level of adults in the household affects income levels. Education of both males and females increases significantly earnings from high-return activities: one additional year of male education leads to 16 percent more income from high-return nonfarm activities, while one additional year of female education brings 11 percent more income.<sup>29</sup> In the case of small-business self-employment, an additional year of female education increases earnings by 17 percent. Interestingly, micro-business self-employment, as it is quite heterogeneous, provides opportunities for men with higher education to increase income. Looking at the regressions on wage income, we can conclude that the education of the household head increases income from skilled wage labor and has no effect on unskilled wages.

Social status matters as household heads who are members of scheduled castes/tribes, and as such probably benefit from job reservation policies, extract smaller incomes from unskilled wage employment. Geographical location affects levels of income, even after controlling for the differential asset positions of households. In Sikkim, incomes derived from high-return nonfarm activities and particularly from skilled wage employment are higher, while incomes from unskilled wage employment are lower, indicating the importance of regional opportunities for nonfarm wage employment.

## 7. Robustness checks

In this section, we report estimates from alternative specifications designed to probe the robustness of the main results reported in the preceding sections. For space considerations, we present only selected estimates.<sup>30</sup>

An implication from our empirical analysis is that education is a key determinant of success in participation in the more remunerative nonfarm activities. To check the robustness of this result, in the top panel of Table 6 we present an alternative specification in which education is measured as the highest level of schooling completed by an adult male and an adult female member of the household. The estimates are qualitatively similar to the corresponding estimates in Table 3: schooling has a positive impact on participation in the nonfarm sector and especially on participation in the high-return nonfarm employment.

In the middle panel of Table 6 we present a specification where the probability of participation in nonfarm employment is not linear in years of schooling. Compared to households with no education, those which members have completed some education participate more in the nonfarm sector. As in Lanjouw (2001), there is a strengthening effect

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<sup>29</sup> The estimated returns to education in the nonfarm sector are much higher than, for instance, estimates for rural Pakistan (Fafchamps and Quisumbing 1999).

<sup>30</sup> The complete regression tables are available from the authors upon request.

**Table 6 : Robustness checks: marginal effects of probit estimations**

	Nonfarmemploy.	Nonfarm employment		Nonfarm employment		Nonfarm self-employment		Nonfarm wage employment	
	(1)	Low return (2)	High return (3)	Self-employ. (4)	Wage employ. (5)	Micro bus. (6)	Small bus. (7)	Unskilled labor (8)	Skilled labor (9)
<i>Specification including the highest level of schooling attained</i>									
Maximum education of working-age men	0.013** (0.006)	-0.027*** (0.007)	0.049*** (0.007)	0.010* (0.006)	0.013* (0.007)	0.001 (0.004)	0.009*** (0.004)	-0.032*** (0.007)	0.040*** (0.006)
Maximum education of working-age women	0.011* (0.006)	-0.017** (0.007)	0.033*** (0.008)	0.011* (0.006)	-0.003 (0.007)	-0.001 (0.004)	0.011*** (0.004)	-0.022*** (0.007)	0.019*** (0.007)
<i>Specification including nonlinearity of educational effects</i>									
Less than primary (< 5 years of education) <sup>a,b</sup>	0.168** (0.054)	0.057 (0.106)	0.413*** (0.127)	0.011 (0.099)	0.277*** (0.074)	-0.014 (0.056)	0.987*** (0.013)	0.116 (0.101)	0.389*** (0.142)
Primary (5-9 years of education) <sup>a,b</sup>	0.137** (0.067)	-0.128 (0.085)	0.505*** (0.105)	0.148* (0.083)	0.090 (0.084)	0.031 (0.055)	0.901*** (0.076)	-0.118 (0.073)	0.372*** (0.102)
Matriculation (10-11 years of education) <sup>a,b</sup>	0.160** (0.058)	-0.203** (0.084)	0.660*** (0.073)	0.255** (0.113)	0.137 (0.091)	0.046 (0.072)	0.995*** (0.005)	-0.179* (0.066)	0.620*** (0.106)
Secondary (12-14 years of education) <sup>a,b</sup>	0.159** (0.059)	-0.396*** (0.045)	0.692*** (0.045)	0.137 (0.125)	0.176* (0.096)	-0.066 (0.049)	0.987*** (0.007)	-0.317*** (0.032)	0.718*** (0.073)
Tertiary (>14 years of education) <sup>a,b</sup>	0.261*** (0.032)	-0.342*** (0.059)	0.736*** (0.030)	0.249** (0.129)	0.340*** (0.064)	-0.031 (0.055)	0.988*** (0.006)	-0.297*** (0.036)	0.802*** (0.039)
<i>Specifications including external financing variables</i>									
External financing available <sup>a</sup>						0.134 (0.108)	0.706*** (0.125)		
Share of external financing						0.163** (0.082)	0.373*** (0.098)		

Robust standard errors in parentheses. The number of observations in each regression is 520. Each specification is estimated by a separate regression. The other regressors (not reported) are defined as in Table 3.

<sup>a</sup> dummy variable; <sup>b</sup> excluded category: uneducated

\*\*\*, \*\*, and \* indicate significance at the 1%, 5%, and 10% level.

of education on the probability of nonfarm employment as education levels improve. Even those who completed a few years of education have a significantly higher likelihood of participating in remunerative nonagricultural employment, suggesting that small gains in education could lead to significantly better employment prospects. Education has a negative impact on participation in low-return activities, particularly at the highest educational levels (more than nine years of schooling). Interestingly, the effect of education on participation in small-business employment is strongly positive, independent of the level of schooling.

Table 6A in the Appendix replicates the above analysis, differentiating between nonfarm wage employment and nonfarm self-employment and using the NSS data. We find a particularly strong effect of education (measured as the highest level of schooling completed) on participation in wage labor off the farm. For those who completed and went beyond primary education (at least five years of schooling) gains are the greatest: they have a significantly higher likelihood of participating in nonfarm wage employment.

We conclude this section by reporting estimates of the effect of availability of external financing on the probability of participation in nonagricultural self-employment. Results in the bottom panel of Table 6 show that the availability of external financing for start-up investment (measured both as a dummy variable and as a share in the start-up investment) raises the probability of participation in self-employment and especially the probability of involvement in small-business self-employment. This suggests that access to credit is correlated with entry into small-business self-employment.<sup>31</sup>

## 8. Conclusions

Nonfarm activities play an important role in the determination of rural households' incomes in the Himalayas. On average, nonfarm income accounts for about 60 percent of total household income. Services dominate the rural nonfarm activities, and the shares of nonfarm wage income exceed the shares of nonfarm self-employment income across all categories of rural households. This suggests the need for more attention to the service sector and to wage employment, versus the traditional focus on rural manufactures and self-employment. While the majority of households do diversify their activities, access to high-return nonfarm activities might be limited in terms of special skills or access to assets. Indeed, the evidence presented in this paper clearly points to the fact that those with low education and with little access to land are mainly involved in low-return nonfarm activities.

Investment in agricultural productivity growth is important for poverty reduction in rural areas. Nevertheless, the growth of the rural nonfarm sector could be an important complement to investments in agricultural productivity. Empirical evidence shows that the growth of the nonfarm sector in India is particularly pro-poor (Ravallion and Datt 2002; Foster and Rosenzweig 2004).<sup>32</sup> Our analysis suggests that a particularly important challenge is to increase the access of the poor to nonfarm activities that yield high and stable incomes, and thus present a potential basis for upward income mobility. While data constraints

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<sup>31</sup> We are careful to avoid suggesting a clear causal relationship between the availability of external financing and the entry into small-business self-employment. Since our measures of the availability of external financing are arguably endogenous, we are not in the position to establish the causal relationship rigorously.

<sup>32</sup> Ravallion and Datt (2002) emphasize that the nonfarm growth was more pro-poor in states with initially higher literacy, higher farm productivity, higher rural living standards, lower landlessness, and lower infant mortality.

preclude making strong statements about causality, the analysis points to a number of areas to which further attention may be directed when addressing the design of policies.

A key determinant of participation in more remunerative nonfarm activities is education. The evidence presented here suggests that even relatively small gains in educational outcomes may yield considerably improved employment prospects in the nonfarm sector. Hence, education is an important advantage to alleviate poverty if nonfarm activities are to compensate for asset disadvantages. Getting rural households out of poverty requires investments in rural education, as well as efforts to increase access of the rural youth to schooling and to prepare them to access well-remunerated nonagricultural employment. This is particularly important if the expanding nonfarm sector increasingly favors employment that requires skills and education. Of course, raising the capacity of the poor to participate in the better-paid nonfarm activities via education will be effective only if the overall business environment is favorable and if the job creation is on the rise.

The number of adult females in the household and the female education affect labor allocation in systematic manner, which indicates that women do not play a trivial role in the nonfarm sector. The relatively equal results regarding human capital across gender could possibly elucidate the relatively low gender gap in the education in the region.<sup>33</sup> A policy implication is that, using nonfarm employment as a single criterion, female education does not seem to be a futile investment in the Himalayas. In addition, educated women who participate in the nonfarm sector are more likely to be financially independent.

Households that belong to scheduled castes/tribes or that belong to the general category are less likely to participate in unskilled wage labor compared to households that are members of other backward classes. This suggests that households that belong to other backward classes find themselves in unfavorable conditions relative to other households when it comes to accessing high-skilled wage employment. Job reservation has been seen as the most important of the public concessions towards scheduled castes/tribes in India and there is demand to extend reservation to persons who belong to other backward classes. Our results suggest that if the job reservation policy is to be extended beyond the scheduled castes/tribes, then households from the other backward classes may have a strong case.

Finally, regional location affects specific sources of income. In the highlands of West Bengal, participation in and incomes derived from nonfarm employment are lower than in Sikkim. The common geographical effects are probably capturing variations in institutional constraints, market development and infrastructure bottlenecks, though further research is needed to understand these effects. In any case, focusing on the household determinants of access to nonfarm employment might not be sufficient. If nonfarm activities are to serve as a factor of a poverty reduction strategy in West Bengal, addressing the regional factors that can enhance the availability of nonfarm income opportunities for rural households should be a part of efforts at promoting regional development.

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<sup>33</sup> Data from the 55<sup>th</sup> round of the Indian NSS show that Sikkim and West Bengal have a lower-than-average gap between male and female literacy.

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## Appendix

The estimates presented bellow come from regressions using household survey data collected by the Indian National Sample Survey Organization (NSS). While the NSS surveys capture just the participation in various activities and do not contain quantitative data on household incomes, it could be illuminating to check whether our results still hold when using the NSS data instead of our survey data. The data come from the sixth NSS survey that was conducted in the 55<sup>th</sup> round (July 1999 - June 2000). We use the NSS data on rural households in Sikkim (1056 households) and in Darjeeling Gorkha Hill Council in the state of West Bengal (96 households).

The NSS data allow us to re-estimate some of the regression results shown in Tables 3 and 6. For several reasons, however, the results are not directly comparable. First, while the robust standard errors are adjusted for clustering by villages, we do not include village fixed effects in Tables 3A and 6A.<sup>34</sup> Second, we could not control for all the variables originally included in the regressions. As data on inherited land are not available, we include the total land per adult household member instead. Information on parental occupation and distance to market is also not available. Finally, it was not possible to distinguish between all the different categories of nonfarm activities (e.g. between low-return activities and high-return activities) that were included in Tables 3 and 6.

**Table 3A. Probit estimations of participation in nonfarm activities: marginal effects**

	Nonfarm employment	Nonfarm employment	
	(1)	Self- employment (2)	Wage employment (3)
<i>Household characteristics and assets</i>			
Age of household head (x100)	0.107 (0.153)	0.027 (0.088)	0.033 (0.136)
Age of household head squared (x100)	-0.004** (0.001)	0.000 (0.001)	-0.005*** (0.001)
Household head is male <sup>a</sup>	0.143** (0.061)	0.012 (0.038)	0.123** (0.053)
Number of working-age men	0.033 (0.024)	0.044*** (0.013)	0.010 (0.021)
Number of working-age women	0.010 (0.022)	0.022 (0.013)	0.011 (0.023)
Mean education of working-age men	0.070*** (0.012)	0.005 (0.005)	0.062*** (0.010)
Mean education of working-age women	0.118*** (0.019)	0.001 (0.009)	0.110*** (0.019)
Land assets per adult (x100)	-0.069*** (0.022)	-0.045* (0.024)	-0.021 (0.014)

<sup>34</sup> We experienced difficulties estimating the probit model due to the presence of a large number of village fixed effects. Many observations were dropped due to collinearity. Nevertheless, the results when using village fixed effects were qualitatively similar.

	Nonfarm employment	Nonfarm employment	
		Self- employment	Wage employment
Scheduled caste or tribe <sup>a,b</sup>	0.025 (0.045)	-0.028 (0.028)	0.089 <sup>**</sup> (0.042)
General category <sup>a,b</sup>	0.126 <sup>***</sup> (0.041)	0.062 <sup>**</sup> (0.028)	0.101 <sup>***</sup> (0.039)
<i>Locational characteristics</i>			
Residence in Sikkim <sup>a,c</sup>	0.340 <sup>***</sup> (0.059)	0.104 <sup>**</sup> (0.029)	0.237 <sup>***</sup> (0.048)
Log-likelihood	-640.3	-479.9	-605.5
Pseudo R-squared	0.196	0.067	0.190
Wald chi-squared	153.2	41.86	169.7
Prob > chi-squared	0.000	0.000	0.000

*Robust standard errors adjusted for clustering by villages in parentheses. All regressions include a constant. The number of observations in each regression is 1152.*

<sup>a</sup> dummy variables; <sup>b</sup> excluded category: other backward classes; <sup>c</sup> excluded category: residence in Darjeeling

\*\*\*, \*\*, and \* indicate significance at the 1%, 5%, and 10% level.

**Table 6A. Robustness checks: marginal effects of probit estimations**

	Nonfarm employment (1)	Nonfarm employment	
		Self- employment (2)	Wage employment (3)
<i>Specification including the highest level of schooling attained</i>			
Maximum education of working-age men	0.070 <sup>***</sup> (0.012)	0.005 (0.005)	0.062 <sup>***</sup> (0.010)
Maximum education of working-age women	0.118 <sup>***</sup> (0.019)	0.001 (0.009)	0.110 <sup>***</sup> (0.019)
<i>Specification including nonlinearity of educational effects</i>			
Less than primary (< 5 years of education) <sup>a,b</sup>	0.073 (0.064)	0.068 (0.054)	-0.006 (0.067)
Primary (5-9 years of education) <sup>a,b</sup>	0.226 <sup>***</sup> (0.065)	0.018 (0.054)	0.247 <sup>***</sup> (0.056)
Matriculation (10-11 years of education) <sup>a,b</sup>	0.496 <sup>***</sup> (0.051)	0.049 (0.056)	0.544 <sup>***</sup> (0.054)
Secondary (12-14 years of education) <sup>a,b</sup>	0.534 <sup>***</sup> (0.041)	0.108 (0.085)	0.608 <sup>***</sup> (0.051)
Tertiary (>14 years of education) <sup>a,b</sup>	0.562 <sup>***</sup> (0.035)	0.024 (0.069)	0.698 <sup>***</sup> (0.029)

*Robust standard errors adjusted for clustering by villages in parentheses. The number of observations in each regression is 1152. Each specification is estimated by a separate regression. The other regressors (not reported) are defined as in Table 3a.*

<sup>a</sup> dummy variable; <sup>b</sup> excluded category: uneducated

\*\*\* indicate significance at the 1%, level.

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