# Rural Nonfarm Employment and Incomes
# in the Eastern Himalayas

Maja Micevska
University of Klagenfurt


and


Dil Bahadur Rahut
Center for Development Research, University of Bonn

Mailing address: Maja Micevska                                    May 2007
                 Department of Economics
                 Klagenfurt University
                 Universitaetsstrasse 65-57
                 A-9020 Klagenfurt
                 Austria



Email: maja.micevska@uni-klu.ac.at

# Rural Nonfarm Employment and Incomes
# in the Eastern Himalayas

Abstract

Nonfarm activities generate on average about 60 percent of rural households' incomes in the eastern Himalayan region of India. This paper analyzes the determinants of participation in nonfarm activities and of nonfarm incomes across rural households. We present and explore an analytical framework that yields different activity choices as optimal solutions to a simple utility maximization problem. A unique data set collected in the eastern Himalayas allows us to closely examine the implications of the analytical framework. 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.

## 1. Introduction

Worldwide, rural households are engaged 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 eastern 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.[1] In particular, the following research questions are of paramount interest to us: (a) Why do rural households engage in rural nonfarm employment? (b) What types of nonfarm employment opportunities are accessible to them? (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 present and explore a novel analytical framework that yields different activity choices as optimal solutions to a simple utility maximization problem. While many studies estimate rural nonfarm participation, most of them fail to develop a clear conceptual basis for the empirical analysis. Our analytical framework illustrates the role of the relative returns to farm

---

[1] 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.

and nonfarm activities as well as of the entry-constraints as determinants of the optimal pattern of activity choice.

Second, we use a unique data set collected in the eastern Himalayas to closely examine whether empirical observations are in accordance with the implications of the analytical framework. To the best of our knowledge, this is the first detailed survey conducted to examine the livelihoods of rural households in the region.[2] The choice of the Himalayas as a study region is appropriate because, given the mountainous and isolated terrain, households living in remote villages tend to divide their time among a large number of distinct activities. Indeed, data from our survey show that nonfarm activities generate on average more than 60 percent of rural households' incomes.

Third, we conduct an empirical inquiry that distinguishes between more than a few types of nonfarm employment, in particular between easy-entry, low-return activities and difficult-entry, high-return activities. By using several different classifications of economic activity, we provide a detailed and comprehensive picture of the labor allocation in a poor society. To deal with the extreme heterogeneity of rural nonfarm activities, we use aggregations into categories that are useful both analytically and for policy purposes. Our results largely confirm previous work but considerably refine our understanding of the factors influencing 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.

As a by-product, 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

---

[2] The eastern Himalayan region of India is ethnically, culturally, linguistically, socially, and historically distinct from the rest of India.

area.[3] 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 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. In Section 2 we present a simple analytical framework, which provides a conceptual basis for the empirical analysis. 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. An analytical framework

We first seek to shed light on household's activity choices by developing a simple analytical framework. The labor can be allocated to agricultural production, and to different nonfarm activities. For the sake of simplicity, we aggregate the nonfarm activities into a single group,[4] and analyze the choice between specializing in agriculture and activity diversification. We denote the labor allocated to agricultural production as $L_f$ and the labor allocated to nonfarm activities as $L_n$. The returns, say per week, to agricultural production and to nonfarm activities are denoted by $R_f$ and $R_n$, respectively. We assume that $R_n \geq R_f$ for the rural households to find it advantageous to engage in nonfarm employment.[5]

---

[3] The study by Kijima and Lanjouw (2005) is among the very few that explore explicitly the relationship between nonfarm employment and caste status.
[4] The model can be easily extended to include several nonfarm activities.
[5] One reader to an en earlier version raised the possibility that this assumption could be valid only with reference to a particular point in time due to the significant seasonality of most agricultural activity. While this possibility

Let the utility function of the household be

$$u = R_n L_n + R_f L_f - (S|L_n > 0) \tag{1}$$

where $S$ denotes an entry-constraint to the nonfarm employment which the household may encounter in case of activity diversification. This assumption reflects the perception and the empirical evidence that, in general, it is difficult for rural households to enter better remunerated types of nonfarm employment because of the need for special skills, the lack of capital for investment as well as limitations related to location (Dercon and Krishnan 1996; Collier and Gunning 1999). The costs of overcoming the entry-constraint, $S$, reduce the value of nonfarm earnings and the household's utility.

We normalize the household's labor endowment, $L = L_n + L_f$, as $N$, where $N$ is the number of adult household members. We thus rewrite the household's utility function as follows

$$u = R_n L_n + R_f (N - L_n) - (S|L_n > 0) \tag{2}$$

We further assume that

$$S = \delta L_n^\rho \tag{3}$$

should be kept in mind when analyzing our analytical framework, the purpose of the framework is to motivate the econometric analysis, which is based on annual data.

where $\rho > 1$. We model the entry-constraint, $S$, as a function of labor based on the assumption that overcoming a constraint is labor-intensive.[6] For instance, a household member might need to invest a significant amount of labor to attain the education level necessary to enter high-return nonfarm activities. Alternatively, some of the household members might engage in migration in order to accumulate savings that the household would use to overcome capital constraints to entrepreneurship.[7] When labor is allocated to overcoming a constraint, the household bears costs that reduce the household's utility. Since the cost of overcoming the entry-constraint may differ across households, $\delta$ is assumed to be a random variable with a probability distribution over the domain $\left[\underline{\delta}, \overline{\delta}\right]$.

We assume that the cost of overcoming the entry-constraint rises in the amount of labor allocated to that purpose and that it becomes increasingly difficult for the household to uphold this type of labor allocation as its amount increases (i.e., we assume that $\rho > 1$). This assumption merits some reflection. For example, as suggested by our empirical analysis in Section 5, a key constraint to participation in more remunerative nonfarm activities is education. When a family decides whether or not to enroll a child in school, the decision is influenced by its ability to cover education-related costs and by the opportunity cost of attending school.[8] Whereas elementary education is mandated in India, high school education is neither compulsory nor heavily subsidized. High school tuitions can be a substantial share of household income, and poor families may be unable to enroll children in school.[9] Thus,

---

[6] We do not try to model the underlying dynamics of capital accumulation. That type of modeling is provided in Dercon (1998).

[7] Studying and migration entail diversion of the student's or the migrant's time away from household production activities. Modeling the costs of overcoming a constraint in labor- or time-equivalent units is usual in the literature (see, for instance, Chiquiar and Hanson 2005; Stark et al. 2006).

[8] See Glewwe and Jacoby (1998) and Rosenzweig (2003), for the trade-off between the short-run benefits of wage employment to poor households who potentially face credit constraints and the long-run benefits associated with educational investment.

[9] Tilak (2002) argues that that there is nothing like "free" education in India. Household expenditures on education are sizeable. Households from lower socioeconomic backgrounds (scheduled castes/tribes and other low-income groups) spend considerable amounts on acquiring education.

households face increasing costs in acquiring higher education in terms of higher tuition, higher input costs (textbooks and other supplies), more competitive examinations, larger distances from home to school, and other costs associated with schooling.[10]

Upon inserting (3) into (2), we get that the household's utility is

$$u = R_n L_n + R_f (N - L_n) - \delta L_n^\rho \tag{4}$$

Note that a standard utility formulation depicts the conflict between the unpleasant allocation of labor aimed at overcoming a constraint and the consequent pleasure derived from a higher income (the last and first terms of the right-hand side of (4), respectively).

Assume that the optimal solution to (4) is interior. Upon solving for the first-order condition, we get that the optimal choice of $L_n$ is

$$L_n^* = \left( \frac{R_n - R_f}{\rho \delta} \right)^{\frac{1}{\rho - 1}} \tag{5}$$

Since $R_n - R_f \geq 0$, $L_n^* \geq 0$. If $R_n = R_f$, $L_n^* = 0$, in which case the household does not find it advantageous to engage in nonfarm activities and specializes in agricultural production. In this case, the household's utility is

$$u_f^* \equiv NR_f \tag{6}$$

---

[10] One concern is the possibility of non-convex cost of overcoming entry-constraints due to, for instance, economies of scale in children education. We recognize that it is not clear that the cost would be convex for educating two children versus one child up to primary education. While we believe that the assumption of convex cost of overcoming entry-constraints is realistic in the context of the Indian rural nonfarm sector, we are not aware of any empirical study that would support this assumption. These considerations could gainfully feature in our future research.

Activity diversification occurs if and only if $L_n$ takes an interior solution, i.e., if and only if

$$L_n^* = \left( \frac{R_n - R_f}{\rho \delta} \right)^{\frac{1}{\rho-1}} < 1 \tag{7}$$

or

$$\delta > \frac{R_n - R_f}{\rho} \equiv \delta^* \tag{8}$$

Thus nonfarm employment occurs if and only if $\delta > \delta^*$. Inserting (7) into (4) and rearranging yields

$$u_d^* \equiv (\rho - 1) \left( \frac{(R_n - R_f)^{\rho}}{\rho^{\rho} \delta} \right)^{\frac{1}{\rho-1}} + NR_f \tag{9}$$

On the other hand, if $\delta = \delta^*$ the household will choose to specialize in nonfarm employment rather than to diversify the activities. In this case, upon inserting $L_n = N$ into (4), we get that the household's utility is

$$u_n^* \equiv NR_n - \delta N^{\rho} \tag{10}$$

The analytical framework illustrates the role of $\delta^*$ as a determinant of the optimal pattern of activity choice under constraints. Since $\delta^*$ is a function of the returns to nonfarm activities relative to the returns to agricultural production as well as of the costs of

overcoming the entry-constraint, it follows that these two factors are the key determinants of labor allocation. We then have the following implications. Relatively high returns to labor in nonfarm employment (or relatively low returns to labor in agriculture) will drive households towards diversification. Yet, a household willing to diversify might not always have the capacity to do so. If the costs of overcoming the entry-constraints are too high, the household will specialize in agriculture even if a more diversified portfolio is wanted. Furthermore, the returns to labor in nonfarm activities might be so low that households are not willing to include them in their activity portfolios.

## 3. Data and variables

The data come from a survey conducted in the second half of 2004. The survey was based in the eastern Himalayan region of India, in the states of Sikkim and West Bengal.[11] 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[12] and rural Sikkim. Gram Panchayats were randomly selected in each block.[13] 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,

[11] 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).
[12] 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.
[13] Gram Panchayats are local government bodies in India. In Sikkim, Gram Panchayats were selected from all four districts (North, South, East, and West).

asset holdings, credit access, as well as other attributes of the households and of the household members. A one-year recall period was used and no effort was made to capture seasonality in income patterns.[14]

An implication from our analytical framework is that relative returns to labor in nonfarm employment are an important determinant of households' activity choices. It is therefore important to have data on the levels of nonfarm incomes from various sources. The Indian National Sample Survey Organization (NSS) has been carrying out all-India household surveys in quinquennial rounds.[15] 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.

To construct a measure of farm income, we begin with the value of all crops and animal products marketed in the last year. To this we add the implicit income earned from subsistence production imputed at local prices. From the total value of farm product, we then subtract expenditures on seed, fertilizer, livestock, maintenance of machinery, hired labor, rent paid to landlords, and the like. Nonfarm income is an aggregate measure of wage income and self-employment income. Income from wage work includes payment in kind and income from self-employment is net of business expenses.

---

[14] It should be mentioned that, as in most studies, recall errors are likely to have affected reported income.
[15] The sixth such survey was conducted in the 55th round (July 1999 - June 2000).

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 male and female adults separately because they might have different comparative advantages. The dependency ratio in the household is measured by the number of children younger than 15 years and of adults older than 65 years.

Level of education within the household is measured in different ways. 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.[16] 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 formulations.

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., skilled job or small business). Including this variable should reduce fears that observed correlation between education and nonfarm activities in fact captures family background. For instance, individuals whose parents were

---

[16] Children education is ignored because it is less likely to affect activity choices, but more likely to be influenced by them through income.

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.[17] 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.[18] 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.[19]

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 mountainous terrain, mileage is not a relevant measure for most of the region; travel time is a more accurate 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.[20] A dummy variable for residence in Sikkim also accounts for differences in the agricultural

---

[17] 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.
[18] For a detailed description of the social system and caste-based preferential policies in India, see Gallanter (1984) and Osborne (2001).
[19] As noted by Borooah et al. (2005), 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.
[20] Sikkim has had an impressive growth rate of 8.3 percent, which is the second highest in the country after Delhi.

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 about 60 percent of rural households' incomes (Table 1).[21] 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 more than 30 percent to total household income. The share of nonfarm wage income (45 percent) in total income by far exceeds the share of nonfarm self-employment income (14 percent). This result is consistent with findings reported by Reardon, Berdegué, and Escobar (2001) for Latin America, suggesting the need for more attention to wage employment, versus the traditional focus on self-employment.

[TABLE 1 HERE]

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

---

[21] 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).

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 very important for all households.

[TABLE 2 HERE]

As expected, the share of income derived from farm activities is relatively more important for households with larger farms.[22] 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.[23] Households with lower educational levels obtain

---

[22] The landless households derive income from farm self-employment by engaging in sharecropping and by raising livestock.
[23] Enterprises requiring investment of at least 5,000 Rupees were classified as small.

relatively larger share of income from farm activities, participation in nonagricultural unskilled wage labor, and self-employment in micro enterprises.

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 nonfarm activities with less entry-constraints. Hence, it is important to explore further the determinants of access to different types of nonfarm employment.

## 5. Participation in nonfarm activities

We now analyze participation by rural households in nonfarm activities. According to the analytical framework discussed in Section 2 (equation 8), household's occupation choice is a function of the cost of overcoming the entry-constraint and of the returns to farm and nonfarm activities. Equation (8') summarizes this theoretical result in its testable form

$$\frac{\overline{\delta} - \delta^*}{\overline{\delta} - \underline{\delta}} = \frac{1}{\overline{\delta} - \underline{\delta}} \left[ \overline{\delta} - \left( \frac{R_n - R_f}{\rho \delta} \right)^{\frac{1}{\rho-1}} \right] \tag{8'}$$

It is important to note, however, that our empirical analysis does not aim at estimating the structural theoretical model.[24] Because the cost of overcoming the entry-constraint is not observable, we include factors that influence labor supply when markets are imperfect, such as: the asset position of the household, the household size and composition, and the locational characteristics of the community where the household is located (Table 3). Household assets

---

[24] Such estimation would require much more information. We would need to know the distribution of $\delta$, on which we have no information. In addition, although equation (8') implies a non-linear relationship, we assume linearity to make estimations simpler. If we had the necessary data, the Generalized Method of Moments (GMM) would be an appropriate method for the estimation of equation (8'). This would then allow us to test for possible misspecifications because of an incorrect structural form.

are classified as human capital, land, intergenerational effects (if parents of the household head were engaged in high-return nonfarm activities), and social status (if the households 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, literacy rates, and the supply of nonfarm jobs.


[TABLE 3 HERE]


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, while land assets and being a general-category household lower the probability of participation. 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.

An implication from our analytical framework is that relative returns to labor in nonfarm employment are an important determinant of households' activity choices. To explore this implication, we 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).[25] Easy-entry, low-return activities typically require no particular skills 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. Difficult-entry, high-return activities usually require certain

---

[25] Möllers and Buchenrieder (2005) use the term "demand-pull" to describe a situation in which those employed in agriculture take advantage of more remunerative nonfarm employment opportunities, and the term "distress-push" to describe a situation in which insufficient agricultural incomes and other factors push rural households into poorly paid nonfarm employment.

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 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 non-farm 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 opt out of 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.[26] This is true for both males and females, hence suggesting that women do not seem to play 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.

We proceed by reclassifying the nonfarm activities into wage employment (unskilled and skilled wage labor) and self employment (micro and small enterprises).[27] It is important to differentiate between these two distinct types of economic activity, since self-employment income includes returns to entrepreneurship and capital whereas wage income does not.

---

[26] 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.
[27] Micro enterprises involve little or no investment. Enterprises requiring investment of at least 5,000 Rupees were classified as small.

Columns 4 and 5 of Table 3 report that the mean education of males increases the probability of participation in both nonagricultural wage labor and nonagricultural self-employment activities. 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).

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.[28] 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 access to 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 41 years, and then increases. On the other hand, the likelihood of participation in small-business self-employment first rises with age, peaks at 41 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

---

[28] 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.

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.

Households with more children seem to be confined to self-employment in micro enterprises, while 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 pushed into unskilled, low-return wage employment. Regional location also matters as it affects the supply of opportunities. Compared to West Bengal, there is more participation in skilled wage labor 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 salaried and 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.[29]


[TABLE 4 HERE]


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

---

[29] 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.

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 overcome factor market constraints and 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.[30] 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 used as identifying restrictions.[31] The income equations in the second stage are estimated in logs.

[TABLE 5 HERE]

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 low-return activities, in particular from unskilled wage labor. This result is not surprising given that working as an unskilled laborer is often a strenuous activity for which returns to physical strength are high. Higher number of working-age males and females adds significantly to incomes from skilled wage labor and from small-business self-employment, hence suggesting that larger households can extract larger incomes from high-return nonfarm activities by diverting family labor from agriculture into the nonfarm sector.

The educational level of adults in the household affects income strategies. Education of both males and females increases earnings from high-return activities, especially from skilled wage labor. The strongest result concerns the effect of male education on nonfarm incomes: one additional year of education leads to 13 percent, 16 percent, and 18 percent

---

[30] 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 unskilled wage labor. A selection correction is thus appropriate.
[31] 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.

more income from nonfarm activities in general, high-return nonfarm activities, and skilled wage employment, respectively. [32] Interestingly, micro-business self-employment, as it is quite heterogeneous, provides opportunities for men with higher education to increase income. The coefficient on female education is also positive and highly-statistically significant: one year of schooling is estimated to raise nonfarm income by 7 percent. In the case of small business self-employment, an additional year of female education increases earnings by 15 percent.

Household with more members older than 65 years derive higher incomes from unskilled wage labor.[33] Geographical location affects specific sources of income, even after controlling for the differential asset positions of households. In Sikkim, incomes derived from skilled wage employment are higher, while incomes from micro-business self-employment are lower, indicating the importance of regional opportunities for nonfarm 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.[34]

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

---

[32] The estimated returns to education in the nonfarm sector are much higher than, for instance, estimates for rural Pakistan (Fafchamps and Quisumbing 1999).

[33] For the most part, this is because in poor households the older household members usually continue to work as unskilled laborers beyond the age of 65 years.

[34] The complete regression tables are available from the authors upon request.

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.


[TABLE 6 HERE]


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 of education on the probability of nonfarm employment as education levels improve. For those who went beyond primary education, gains are the greatest: they have a significantly higher likelihood of participating in remunerative nonagricultural employment. Education has a negative impact on participation in low-return activities, particularly at the highest educational levels (more than eleven years of schooling). Interestingly, the effect of education on participation in small-business employment is strongly positive, independent of the level of schooling.

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 small-business self-employment and does not significantly affect the probability of involvement in micro-business self-

employment. This suggests that access to credit could be important only for entry into small-business self-employment.[35]


## 8. Conclusions

Nonfarm activities play important role in the determination of rural households' incomes in the eastern 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 certainly 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).[36] 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.

---

[35] We are careful to avoid suggesting a clear casual 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.

[36] 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.

A key determinant of participation in more remunerative nonfarm activities is education. 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 skill 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 female education affect labor allocation in systematic fashion, which indicates that women do not play marginal role in the nonfarm sector. The relatively equal results regarding human capital across gender probably explain the relatively low gender gap in the education in the region.[37] A policy implication is that, using nonfarm employment as sole criterion, female education does not seem to be a wasted investment in the Eastern Himalayas. In addition, advanced education could make women more financially independent as less emphasis is put on unpaid work on the family farm.

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

---

[37] Data from the 55th round of the Indian NSS show that Sikkim and West Bengal have a lower-than-average gap between male and female literacy.

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. Clearly, focusing on the household determinants of access to nonfarm employment would not be sufficient. If nonfarm activities are to serve as a factor of a poverty reduction strategy in West Bengal, addressing the factors that can enhance the availability of nonfarm income opportunities for rural households should be a part of efforts at promoting regional development.

# References

Barrett, Christopher B., Mesfin B. Clark, Daniel C. Clay, and Thomas Reardon. 2005. "Heterogeneous Constraints, Incentives and Income Diversification Strategies in Rural Africa." *Quarterly Journal of International Agriculture* 44(1): 37-60.

Borooah, Vani K., Amaresh Dubey, and Sriya Iyer. 2005. "Has Job Reservation Been Effective? Caste, Religion, and Economic Status in India." Unpublished manuscript, University of Ulster, School of Economics and Politics.

Chiquiar, Daniel, and Gordon H. Hanson. 2005. "International Migration, Self-Selection, and the Distribution of Wages: Evidence from Mexico and the United States." *Journal of Political Economy* 113(21): 239-81.

Collier, Paul, and Jan W. Gunning. 1999. "Explaining African Economic Performance." *Journal of Economic Literature* 37(1): 64-111.

de Janvry, Alain, and Elisabeth Sadoulet. 2001. "Income Strategies among Rural Households in Mexico: The Role of Off-Farm Activities." *World Development* 29(3): 467-480.

Dercon, Stefan. 1998. "Wealth, Risk and Activity Choice: Cattle in Western Tanzania." *Journal of Development Economics* 55(1): 1-42.

Dercon, Stefan, and Pramila Krishnan. 1996. "Income Portfolios in Rural Ethiopia and Tanzania: Choices and Constraints." *The Journal of Development Studies* 32(6): 850-875.

Fafchamps, Marcel, and Agnes R. Quisumbing. 1999. "Human Capital, Productivity, and Labor Allocation in Rural Pakistan." *Journal of Human Resources* 34(2): 369-406.

_____. 2003. "Social Roles, Human Capital, and the Intrahousehold Division of Labor: Evidence from Pakistan." *Oxford Economic Papers* 55(1): 36-80.

Fafchamps, Marcel, and Forhad Shilpi. 2005. "Cities and Specialization: Evidence from South Asia." *Economic Journal* 115(503): 477-504.

Foster, Andrew D., and Mark R. Rosenzweig. (2004). "Agricultural Productivity Growth, Rural Economic Diversity, and Economic Reforms: India, 1970-2000." *Economic Development and Cultural Change* 52(3): 509-542.

Gallanter, Marc. 1984. *Competing Inequalities: Law and the Backward Classes of India.* Berkley, CA: University of California Press.

Glewwe, Paul, and Hanan Jacoby. 1998. "School Enrollment and Completion in Vietnam: An Investigation of Recent Trends." In *Household Welfare and Vietnam's Transition*, ed. David Dollar, Paul Glewwe, and Jennie Litvack. Washington, DC: The World Bank.

Lanjouw, Jean O., and Peter Lanjouw. 2001. "The Rural Non-Farm Sector: Issues and Evidence from Developing Countries." *Agricultural Economics* 26(1): 1-23.

Lanjouw, Peter. 2001. "Nonfarm Employment and Poverty in Rural El Salvador." *World Development* 29(3): 529-547.

Kijima, Yoko, and Peter Lanjouw. 2005. "Economic Diversification and Poverty in Rural India." *Indian Journal of Labour Economics* 48(2): 349-374.

Möllers, Judith, and Gertrud Buchenrieder. 2005. "Theoretical Concepts for the Analysis of Non-Farm Rural Employment." *Quarterly Journal of International Agriculture* 44(1): 19-36.

Osborne, Evan. 2001. "Culture, Development, and Government: Reservations in India." *Economic Development and Cultural Change* 49(3): 659-685.

Ravallion, Martin, and Gaurav Datt. 2002. "Why Has Economic Growth Been More Pro-Poor in Some States of India than Others?" *Journal of Development Economics* 68(2): 381-400.

Rosenzweig, Mark R. 2003. "Openness and Poverty Reduction in the Long and Short Run." Paper presented at the 2003 Conference on the Future of Globalization, Yale University, October 10-11.

Reardon, Thomas, Julio Berdegué, and Germán Escobar. 2001. "Rural Nonfarm Employment and Incomes in Latin America: Overview and Policy Implications." *World Development* 29(3): 395-409.

Stark, Oded, C. Simon Fan, Ewa Kępińska, and Maja Micevska. 2006. "Seasonal Migration." Unpublished manuscript, University of Klagenfurt, Department of Economics.

Tilak, Jandhyala B.G. 2002. "Household Expenditure on Elementary Education in Rural India: A Few Stylized Facts." *Indian Journal of Social Development* 2(2): 231-267.

World Bank. 2003. *Reaching the Rural Poor: A Renewed Strategy for Rural Development*. Washington, DC: The World Bank.

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) | | |
| **I. SECTORAL COMPOSITION** | | | | | |
| Agriculture | 13,562 | 9,312 | 17,887 | 29.03 | 97.69 |
| Manufacturing | 11,695 | 8,400 | 8,988 | 2.51 | 9.81 |
| Construction | 15,911 | 9,900 | 22,753 | 12.00 | 34.42 |
| Trade | 25,613 | 14,400 | 37,774 | 7.66 | 13.65 |
| Restaurants and hotels | 30,914 | 14,400 | 14,308 | 0.91 | 1.35 |
| Transport | 29,187 | 18,000 | 21,313 | 4.30 | 6.73 |
| Private services | 26,515 | 19,180 | 21,288 | 7.82 | 13.46 |
| Public services | 74,800 | 72,000 | 46,820 | 23.95 | 14.62 |
| Other | 12,073 | 1,420 | 19,177 | 11.80 | 44.62 |
| **II. FARM VS. NONFARM COMPOSITION** | | | | | |
| **Total farm income** | **13,562** | **9,312** | **17,887** | **29.03** | **97.69** |
| Farm self-employment | 11,363 | 7,204 | 17,545 | 24.28 | 97.50 |
| Agricultural wages | 6,758 | 5,040 | 6,475 | 4.76 | 32.12 |
| **Total nonfarm income** | **36,855** | **23,280** | **45,153** | **59.17** | **73.27** |
| *Nonagricultural wages* | *35,939* | *23,640* | *40,126* | *45.43* | *57.69* |
| Skilled labor | 57,682 | 42,000 | 45,859 | 35.97 | 28.46 |
| Unskilled labor | 13,051 | 9,150 | 12,259 | 9.46 | 33.08 |
| *Self-employment* | *24,886* | *12,000* | *44,795* | *13.74* | *25.19* |
| Small enterprise | 39,056 | 20,000 | 57,073 | 11.52 | 13.46 |
| Micro enterprise | 7,410 | 4,800 | 7,091 | 2.22 | 13.65 |
| *High-return activities* | *35,249* | *36,000* | *53,228* | *47.49* | *35.00* |
| *Low-return activities* | *12,828* | *9,050* | *12,085* | *11.68* | *37.50* |
| **Other income** | **12,074** | **1,420** | **19,177** | **11.80** | **44.62** |
| Remittances | 19,378 | 18,000 | 21,163 | 5.47 | 12.88 |
| Pensions | 28,332 | 27,600 | 15,662 | 5.97 | 9.62 |
| Other | 586 | 245 | 999 | 0.36 | 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.

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) | 35,429 | 36,022 | 43,570 | 59,866 | 56,056 | 77,499 | 32,830 | 39,570 | 47,733 | 77,692 | 70,552 | 124,133 |
| Shares in total income (%) | | | | | | | | | | | | |
| **Total farm income** | **20.1** | **24.5** | **28.1** | **27.1** | **34.7** | **44.7** | **37.7** | **33.2** | **27.6** | **25.4** | **12.5** | **7.7** |
|     Farm self-employment | 16.0 | 16.0 | 22.5 | 25.1 | 33.1 | 41.6 | 28.9 | 26.7 | 23.6 | 24.6 | 12.0 | 7.7 |
|     Agricultural wages | 4.1 | 8.6 | 5.6 | 2.0 | 1.6 | 3.0 | 8.8 | 6.5 | 4.0 | 0.7 | 0.5 | 0.0 |
| **Total nonfarm income** | **58.5** | **62.6** | **60.6** | **64.2** | **55.1** | **49.3** | **52.4** | **58.4** | **58.2** | **59.8** | **75.4** | **89.3** |
|     *Nonagricultural wages* | *41.1* | *53.6* | *54.8* | *41.5* | *37.1* | *30.4* | *43.1* | *48.0* | *40.7* | *47.7* | *66.8* | *56.8* |
|         Skilled labor | 29.7 | 34.9 | 45.8 | 37.7 | 31.1 | 27.6 | 26.2 | 31.3 | 33.8 | 45.8 | 66.8 | 56.6 |
|         Unskilled labor | 11.4 | 18.7 | 9.0 | 3.7 | 6.0 | 2.8 | 16.9 | 16.7 | 6.9 | 2.0 | 0.0 | 0.3 |
|     *Self-employment* | *17.4* | *9.0* | *5.8* | *22.8* | *18.0* | *18.9* | *9.3* | *10.4* | *17.6* | *12.1* | *8.7* | *32.5* |
|         Micro enterprise | 2.7 | 3.3 | 2.3 | 1.1 | 3.0 | 0.5 | 3.3 | 2.2 | 1.9 | 1.9 | 1.1 | 0.0 |
|         Small enterprise | 14.7 | 5.7 | 3.5 | 21.7 | 15.0 | 18.4 | 6.1 | 8.2 | 15.7 | 10.1 | 7.6 | 32.5 |
| **Other income** | **21.4** | **12.9** | **11.3** | **8.7** | **10.2** | **6.0** | **9.9** | **8.4** | **14.2** | **14.8** | **12.1** | **3.0** |
| Remittances | 5.8 | 8.4 | 5.1 | 4.3 | 1.9 | 4.8 | 5.3 | 2.9 | 6.8 | 7.0 | 3.9 | 0.0 |
| Pensions | 15.2 | 4.2 | 5.8 | 4.1 | 7.7 | 1.0 | 4.0 | 5.1 | 7.2 | 7.7 | 7.4 | 2.8 |
| Other | 0.4 | 0.3 | 0.4 | 0.3 | 0.6 | 0.2 | 0.6 | 0.4 | 0.2 | 0.1 | 0.8 | 0.2 |

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

| | Nonfarm employ. | Nonfarm employment | | Nonfarm employment | | Nonfarm self-employment | | Nonfarm wage employment | |
|---|---|---|---|---|---|---|---|---|---|
| | | 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) |
| *Human capital and land assets* | | | | | | | | | |
| Age of household head | 0.015[*] | -0.016 | 0.021[*] | -0.004 | 0.019 | -0.016[***] | 0.013[**] | 0.004 | 0.008 |
| | (0.009) | (0.108) | (0.011) | (0.008) | (0.104) | (0.005) | (0.006) | (0.010) | (0.010) |
| Age of household head squared (x100) | -0.017[*] | 0.015[*] | -0.022[*] | 0.006 | -0.015 | 0.017[***] | -0.012[**] | -0.007 | -0.009 |
| | (0.009) | (0.011) | (0.012) | (0.008) | (0.011) | (0.005) | (0.005) | (0.010) | (0.010) |
| Household head is male[a] | 0.065 | 0.060 | -0.040 | -0.026 | 0.142[*] | 0.032 | -0.070 | 0.859 | 0.096 |
| | (0.077) | (0.079) | (0.087) | (0.072) | (0.083) | (0.042) | (0.060) | (0.069) | (0.062) |
| Number of working-age men | 0.037 | 0.027 | 0.060[**] | -0.019 | 0.042 | -0.017 | 0.001 | 0.031 | 0.064[***] |
| | (0.023) | (0.028) | (0.028) | (0.022) | (0.026) | (0.016) | (0.014) | (0.027) | (0.024) |
| Number of working-age women | 0.030 | -0.036 | 0.083[***] | 0.013 | 0.034 | 0.005 | 0.005 | -0.026 | 0.068[***] |
| | (0.026) | (0.030) | (0.030) | (0.023) | (0.028) | (0.017) | (0.014) | (0.028) | (0.025) |
| Mean education of working-age men | 0.013[**] | -0.023[***] | 0.047[***] | 0.012[**] | 0.016[**] | 0.006 | 0.009[**] | -0.031[***] | 0.042[***] |
| | (0.006) | (0.008) | (0.008) | (0.006) | (0.007) | (0.004) | (0.004) | (0.007) | (0.007) |
| Mean education of working-age women | 0.010 | -0.020[**] | 0.039[***] | 0.012[*] | -0.007 | -0.002 | 0.014[***] | -0.028[***] | 0.020[***] |
| | (0.007) | (0.008) | (0.008) | (0.007) | (0.008) | (0.005) | (0.004) | (0.008) | (0.008) |
| Land assets per adult | -0.029[**] | -0.055 | -0.015 | -0.019[*] | -0.032[*] | -0.042[**] | -0.001 | -0.036 | -0.018 |
| | (0.013) | (0.036) | (0.015) | (0.012) | (0.019) | (0.020) | (0.006) | (0.036) | (0.013) |
| *Other assets and characteristics* | | | | | | | | | |
| Number of adults older than 65 years | 0.073[*] | -0.022 | 0.046 | -0.014 | 0.052 | -0.022 | 0.005 | 0.067 | 0.04 |
| | (0.044) | (0.050) | (0.052) | (0.040) | (0.049) | (0.031) | (0.025) | (0.047) | (0.045) |
| Number of children younger than 15 years | 0.015 | 0.035[*] | 0.021 | 0.018 | 0.015 | 0.023[**] | 0.004 | 0.002 | 0.019 |
| | (0.016) | (0.019) | (0.018) | (0.015) | (0.018) | (0.011) | (0.010) | (0.017) | (0.016) |
| Parents were in high-return activities[a] | 0.077 | 0.011 | 0.077 | 0.183[***] | -0.077 | 0.069 | 0.105[**] | 0.009 | -0.059 |
| | (0.054) | (0.072) | (0.077) | (0.066) | (0.069) | (0.050) | (0.053) | (0.068) | (0.058) |
| Scheduled caste or tribe[a,b] | -0.076 | -0.141[**] | 0.046 | 0.163 | -0.089 | -0.174 | 0.039 | -0.136[**] | 0.009 |
| | (0.061) | (0.061) | (0.068) | (0.053) | (0.064) | (0.037) | (0.038) | (0.054) | (0.058) |
| General category[a,b] | -0.148[**] | -0.190[***] | -0.017 | -0.064 | -0.089 | -0.041 | -0.017 | -0.129[**] | 0.007 |
| | (0.060) | (0.059) | (0.068) | (0.052) | (0.063) | (0.039) | (0.033) | (0.052) | (0.060) |
| *Locational characteristics* | | | | | | | | | |
| Distance to market (x100) | -0.035 | 0.024 | -0.114 | 0.004 | 0.033 | 0.037 | -0.104[*] | 0.038 | 0.024 |
| | (0.062) | (0.075) | (0.079) | (0.059) | (0.073) | (0.039) | (0.055) | (0.069) | (0.071) |
| Residence in Sikkim[a,c] | 0.097 | -0.246 | 0.307[*] | -0.084 | 0.058 | -0.067 | 0.106 | -0.132 | 0.272[**] |
| | (0.124) | (0.150) | (0.162) | (0.127) | (0.152) | (0.082) | (0.111) | (0.140) | (0.121) |
| | | | | | | | | | |
| Log-likelihood | -263.4 | -281.5 | -257.9 | -268.5 | -319.2 | -179.1 | -171.5 | -243.2 | -243.2 |
| Pseudo *R*-squared | 0.115 | 0.203 | 0.260 | 0.085 | 0.100 | 0.123 | 0.165 | 0.263 | 0.263 |
| Wald chi-squared | 67.77 | 138.9 | 173.0 | 47.66 | 61.77 | 52.80 | 68.25 | 161.4 | 161.4 |
| Prob > chi-squared | 0.001 | 0.000 | 0.000 | 0.113 | 0.007 | 0.035 | 0.001 | 0.000 | 0.000 |

Robust standard errors adjusted for clustering by villages in parentheses. Village fixed effects included but not shown. All regressions include a constant. The number of observations in each regression is 520.
[a] dummy variables; [b] excluded category: other backward classes; [c] excluded category: residence in Darjeeling
[***], [**], and [*] indicate significance at the 1%, 5%, and 10% level.

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

| | Nonfarm employ. | Nonfarm employment | | Nonfarm employment | | Nonfarm self-employment | | Nonfarm wage employment | |
|---|---|---|---|---|---|---|---|---|---|
| | | 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) |
| *Human capital and land assets* | | | | | | | | | |
| Age of household head | 0.015[*] | -0.022[**] | 0.034[**] | -0.002 | 0.014 | -0.033[**] | 0.051[*] | 0.001 | 0.022 |
| | (0.009) | (0.011) | (0.015) | (0.016) | (0.011) | (0.013) | (0.028) | (0.013) | (0.019) |
| Age of household head squared (x100) | -0.017[*] | 0.021[*] | -0.036[**] | 0.006 | -0.019[*] | 0.037[***] | -0.047[*] | -0.004 | -0.027 |
| | (0.009) | (0.011) | (0.015) | (0.016) | (0.011) | (0.014) | (0.028) | (0.014) | (0.019) |
| Household head is male[a] | 0.065 | 0.156[*] | 0.037 | -0.055 | 0.196[**] | 0.119 | -0.280 | 0.173 | 0.221 |
| | (0.077) | (0.092) | (0.117) | (0.121) | (0.090) | (0.121) | (0.180) | (0.111) | (0.158) |
| Number of working-age men | 0.037 | 0.001 | 0.066[*] | -0.045 | 0.056[**] | -0.091[**] | 0.008 | 0.026 | 0.097[**] |
| | (0.023) | (0.028) | (0.037) | (0.040) | (0.028) | (0.041) | (0.061) | (0.034) | (0.046) |
| Number of working-age women | 0.030 | -0.042 | 0.108[***] | 0.011 | 0.033 | -0.018 | 0.025 | -0.033 | 0.122[**] |
| | (0.026) | (0.030) | (0.040) | (0.043) | (0.030) | (0.039) | (0.069) | (0.035) | (0.051) |
| Mean education of working-age men | 0.013[**] | -0.027[***] | 0.067[***] | 0.023[**] | 0.022[***] | 0.014 | 0.033[*] | -0.045[***] | 0.082[***] |
| | (0.006) | (0.008) | (0.011) | (0.011) | (0.008) | (0.010) | (0.017) | (0.010) | (0.014) |
| Mean education of working-age women | 0.010 | -0.029[***] | 0.050[***] | 0.025[**] | -0.001 | -0.010 | 0.061[***] | -0.038[***] | 0.036[**] |
| | (0.007) | (0.009) | (0.011) | (0.012) | (0.009) | (0.011) | (0.020) | (0.011) | (0.014) |
| Land assets per adult | -0.029[**] | -0.109[***] | -0.025 | -0.040 | -0.051[**] | -0.137[**] | -0.008 | -0.089[**] | -0.036 |
| | (0.013) | (0.035) | (0.025) | (0.030) | (0.024) | (0.068) | (0.039) | (0.040) | (0.035) |
| *Other assets and characteristics* | | | | | | | | | |
| Number of adults older than 65 years | 0.073[*] | -0.001 | 0.040 | -0.036 | 0.029 | -0.071 | 0.013 | 0.047 | 0.005 |
| | (0.044) | (0.053) | (0.068) | (0.075) | (0.052) | (0.070) | (0.118) | (0.062) | (0.087) |
| Number of children younger than 15 years | 0.015 | 0.028 | 0.020 | 0.026 | 0.020 | 0.021 | 0.017 | 0.011 | 0.017 |
| | (0.016) | (0.018) | (0.026) | (0.027) | (0.019) | (0.024) | (0.045) | (0.021) | (0.033) |
| Parents were in high-return activities[a] | 0.077 | -0.007 | 0.090 | 0.254[***] | -0.079 | 0.118 | 0.332[**] | -0.198 | -0.068 |
| | (0.054) | (0.073) | (0.094) | (0.096) | (0.073) | (0.086) | (0.151) | (0.087) | (0.122) |
| Scheduled caste or tribe[a,b] | -0.076 | -0.071 | 0.111 | 0.073 | -0.058 | 0.028 | 0.187 | -0.116 | 0.038 |
| | (0.061) | (0.066) | (0.094) | (0.096) | (0.068) | (0.083) | (0.158) | (0.076) | (0.120) |
| General category[a,b] | - 0.148[**] | -0.176[***] | 0.004 | -0.070 | -0.084 | -0.074 | -0.041 | -0.167[**] | -0.002 |
| | (0.060) | (0.066) | (0.094) | (0.097) | (0.067) | (0.085) | (0.165) | (0.076) | (0.118) |
| *Locational characteristics* | | | | | | | | | |
| Distance to market (x100) | -0.072 | 0.013 | -0.160 | -0.052 | 0.020 | 0.066 | -0.043[**] | -0.002 | 0.013 |
| | (0.060) | (0.071) | (0.113) | (0.106) | (0.075) | (0.088) | (0.022) | (0.084) | (0.138) |
| Residence in Sikkim[a,c] | 0.307[**] | -0.245 | 0.700[***] | 0.235 | 0.209 | -0.298 | 0.751[**] | -0.250 | 0.731[***] |
| | (0.122) | (0.155) | (0.207) | (0.207) | (0.152) | (0.222) | (0.381) | (0.182) | (0.250) |
| | | | | | | | | | |
| Log-likelihood | -338.0 | -288.3 | -341.2 | -271.8 | -385.0 | -144.3 | -183.9 | -258.4 | -301.4 |
| Pseudo *R*-squared | 0.129 | 0.212 | 0.210 | 0.085 | 0.097 | 0.156 | 0.156 | 0.247 | 0.190 |
| Wald chi-squared | 100.2 | 155.0 | 181.6 | 50.39 | 82.90 | 53.45 | 67.74 | 169.4 | 141.7 |
| Prob > chi-squared | 0.000 | 0.000 | 0.000 | 0.070 | 0.000 | 0.031 | 0.002 | 0.000 | 0.000 |

Robust standard errors in parentheses. Village fixed effects included but not shown. All regressions include a constant. The number of observations in each regression is 520.
[a] dummy variables; [b] excluded category: other backward classes; [c] excluded category: residence in Darjeeling
[***], [**], and [*] indicate significance at the 1%, 5%, and 10% level.

Table 5. 'Heckit' estimations of (log) nonfarm income: marginal effects

| | Nonfarm employ. | Nonfarm employment | | Nonfarm employment | | Nonfarm self-employment | | Nonfarm wage employment | |
|---|---|---|---|---|---|---|---|---|---|
| | | 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) |
| *Human capital and land assets* | | | | | | | | | |
| Age of household head | 0.269*** | 0.307*** | 0.253*** | 0.242*** | 0.259*** | 0.141*** | 0.230*** | 0.313*** | 0.228*** |
| | (0.016) | (0.023) | (0.022) | (0.034) | (0.020) | (0.041) | (0.049) | (0.028) | (0.036) |
| Age of household head squared (x100) | -0.265*** | -0.299*** | -0.246*** | -0.230*** | -0.260*** | -0.083* | -0.224*** | -0.326*** | -0.231*** |
| | (0.020) | (0.027) | (0.025) | (0.038) | (0.024) | (0.047) | (0.054) | (0.030) | (0.036) |
| Household head is male[a] | 1.008*** | 1.324*** | 0.453 | 0.381 | 1.021*** | 1.097 | 0.404 | 1.453*** | 0.382 |
| | (0.274) | (0.368) | (0.298) | (0.407) | (0.336) | (0.712) | (0.463) | (0.543) | (0.399) |
| Number of working-age men | 0.238*** | 0.017 | 0.255*** | 0.103 | 0.310*** | -0.292 | 0.328** | 0.182 | 0.249*** |
| | (0.066) | (0.113) | (0.068) | (0.130) | (0.072) | (0.237) | (0.127) | (0.131) | (0.090) |
| Number of working-age women | 0.266*** | 0.224** | 0.249*** | 0.152 | 0.252*** | -0.077 | 0.369** | 0.293** | 0.218* |
| | (0.068) | (0.110) | (0.093) | (0.136) | (0.076) | (0.220) | (0.181) | (0.117) | (0.113) |
| Mean education of working-age men | 0.134*** | 0.098* | 0.161*** | 0.156*** | 0.127*** | 0.139** | 0.051 | -0.041 | 0.181*** |
| | (0.021) | (0.056) | (0.032) | (0.036) | (0.026) | (0.066) | (0.037) | (0.102) | (0.043) |
| Mean education of working-age women | 0.069*** | -0.017 | 0.109*** | 0.097** | 0.057** | -0.064 | 0.147** | -0.041 | 0.087*** |
| | (0.020) | (0.039) | (0.025) | (0.047) | (0.025) | (0.070) | (0.060) | (0.089) | (0.032) |
| *Other assets and characteristics* | | | | | | | | | |
| Number of adults older than 65 years | 0.231 | 0.301 | 0.217 | 0.230 | 0.285** | -0.342 | 0.296 | 0.395** | 0.259 |
| | (0.145) | (0.210) | (0.177) | (0.320) | (0.144) | (0.418) | (0.395) | (0.198) | (0.188) |
| Number of children younger than 15 years | 0.093* | 0.001 | 0.070 | 0.049 | 0.062 | 0.225 | -0.009 | -0.017 | 0.049 |
| | (0.051) | (0.075) | (0.066) | (0.097) | (0.056) | (0.145) | (0.110) | (0.070) | (0.080) |
| Scheduled caste or tribe[a,b] | 0.190 | 0.403 | 0.229 | 0.183 | 0.141 | 0.070 | 0.555 | 0.283 | 0.129 |
| | (0.155) | (0.283) | (0.223) | (0.299) | (0.177) | (0.479) | (0.445) | (0.471) | (0.260) |
| General category[a,b] | -0.004 | -0.017 | 0.035 | -0.036 | -0.140 | -0.587 | 0.210 | -0.356 | -0.056 |
| | (0.181) | (0.396) | (0.249) | (0.346) | (0.209) | (0.545) | (0.447) | (0.459) | (0.287) |
| *Locational characteristics* | | | | | | | | | |
| Distance to market (x100) | -0.026 | 0.057 | -0.123 | -0.352 | -0.036 | 0.401 | -0.693 | 0.005 | -0.168 |
| | (0.158) | (0.202) | (0.231) | (0.337) | (0.179) | (0.486) | (0.579) | (0.203) | (0.362) |
| Residence in Sikkim[a,c] | 0.476*** | 0.280 | 0.850*** | -0.270 | 0.639*** | -1.135*** | 0.099 | -0.172 | 1.119*** |
| | (0.135) | (0.423) | (0.191) | (0.272) | (0.155) | (0.423) | (0.322) | (0.735) | (0.261) |
| Lambda | 0.694 | -0.698 | 1.076 | 1.126 | 1.022 | 2.330 | 1.197 | 0.232 | 1.345 |
| | (0.230) | (0.801) | (0.192) | (0.482) | (0.278) | (0.204) | (0.606) | (1.202) | (0.369) |
| Log-likelihood | -871.9 | -634.4 | -561.8 | -484.1 | -783.7 | -271.7 | -277.6 | -514.1 | -445.9 |
| Wald chi-squared | 9790 | 2385 | 7573 | 617.9 | 3547 | 638.0 | 531.4 | 2482 | 3034 |
| 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. In the first stage, the probabilities of participation in nonfarm activities are estimated as in Table 3.
[a] dummy variables; [b] excluded category: other backward classes; [c] excluded category: residence in Darjeeling
***, **, and * indicate significance at the 1%, 5%, and 10% level.
***, **, and * indicate significance at the 1%, 5%, and 10% level.

Table 6. Robustness checks: marginal effects of probit estimations

| | Nonfarm employ. | Nonfarm employment | | Nonfarm employment | | Nonfarm self-employment | | Nonfarm wage employment | |
|---|---|---|---|---|---|---|---|---|---|
| | | 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) |
| *Specification including the highest level of schooling attained* | | | | | | | | | |
| Maximum education of working-age men | 0.013** | -0.027*** | 0.049*** | 0.010* | 0.013* | 0.002 | 0.009*** | -0.032*** | 0.041*** |
| | (0.006) | (0.007) | (0.007) | (0.006) | (0.007) | (0.004) | (0.004) | (0.007) | (0.006) |
| Maximum education of working-age women | 0.011* | -0.016** | 0.034*** | 0.014* | -0.002 | 0.007 | 0.011*** | -0.023*** | 0.019*** |
| | (0.006) | (0.007) | (0.008) | (0.006) | (0.007) | (0.004) | (0.004) | (0.007) | (0.007) |
| *Specification including nonlinearity of educational effects* | | | | | | | | | |
| Less than primary (< 5 years of education)[a,b] | 0.165** | 0.058 | 0.422*** | 0.016 | 0.276*** | -0.009 | 0.987*** | 0.113 | 0.410*** |
| | (0.054) | (0.106) | (0.127) | (0.097) | (0.073) | (0.057) | (0.014) | (0.101) | (0.141) |
| Primary (5-9 years of education)[a,b] | 0.139** | -0.121 | 0.520*** | 0.161** | 0.093 | 0.044 | 0.901*** | -0.120 | 0.390*** |
| | (0.067) | (0.086) | (0.104) | (0.082) | (0.085) | (0.054) | (0.080) | (0.073) | (0.102) |
| Matriculation (10-11 years of education)[a,b] | 0.165** | -0.189* | 0.676*** | 0.280*** | 0.146 | 0.073 | 0.995*** | -0.180** | 0.650*** |
| | (0.058) | (0.087) | (0.069) | (0.111) | (0.092) | (0.078) | (0.005) | (0.066) | (0.102) |
| Secondary (12-14 years of education)[a,b] | 0.163** | -0.389*** | 0.702*** | 0.163 | 0.184* | -0.053 | 0.987*** | -0.319*** | 0.739*** |
| | (0.058) | (0.048) | (0.042) | (0.125) | (0.093) | (0.054) | (0.007) | (0.032) | (0.067) |
| Tertiary (>14 years of education)[a,b] | 0.260*** | -0.340*** | 0.740*** | 0.268** | 0.341*** | -0.018 | 0.988*** | -0.299*** | 0.810*** |
| | (0.031) | (0.060) | (0.029) | (0.128) | (0.062) | (0.059) | (0.006) | (0.035) | (0.036) |
| *Specifications including external financing variables* | | | | | | | | | |
| External financing available[a] | | | | | | 0.122 | 0.706*** | | |
| | | | | | | (0.103) | (0.125) | | |
| Share of external financing | | | | | | 0.145* | 0.373*** | | |
| | | | | | | (0.082) | (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.
[a] dummy variable; [b] excluded category: uneducated
***, **, and * indicate significance at the 1%, 5%, and 10% level.