Rural Nonfarm Employment, Income, and Inequality: Evidence from Bhutan

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Using the 2012 Bhutan Living Standard Survey, this paper finds that rural nonfarm activities comprise 60.7% of rural household income in Bhutan and this contribution increases with higher income and education levels. The poor and less educated participate less in the nonfarm sector. When they do, they are self-employed in petty nonfarm activities, which require little investment and little or no skills. Accounting for endogeneity and sample selection issues, we estimate the determinants of participation in nonfarm activities and nonfarm incomes. We find that a household's education and labor supply play an important role in accessing more remunerative nonfarm employment. Interestingly, we find that women play an important role in self-employment in nonfarm activities. Decomposition shows that nonfarm income has a disequalizing effect and farm income has an equalizing effect, indicating the need to increase the endowment of poor households to enable them to access the lucrative rural nonfarm sector. Further decomposition reveals that self-employment in petty nonfarm activities reduces inequality.

I. Introduction

Over the last 3 decades, Bhutan has achieved remarkable growth and development. Gross domestic product (GDP) at current prices has increased from Nu1,154 million ($17.5 million) in 1981/82 to Nu99,455 million ($1,507 million) in 2012/13. Real annual GDP growth averaged 8.4%, 6.7%, and 8.2% during 1981/82–1990/91, 1991/92–2000/01, and 2001/02–2012/13, respectively. Agriculture has traditionally been the main source of income for most of the population. However, as a result of the slow growth of the agriculture sector and a decline in the contribution of agriculture to GDP from 41.3% in 1980/81 to 27.8% in 2000/01, and further to 17% in 2012/13,

the Bhutanese economy has gone through massive structural changes. Average an-nual growth in the agriculture sector declined from 5.5% in 1981/82–1985/86 to 1.3% in 2006/07–2012/13. Thus, participation in nonfarm sectors is of paramount importance for growth, livelihoods, and poverty reduction. An important question is whether the rural labor market has moved in the direction of increased participation in the rural nonfarm sector. This study takes a comprehensive look at the sources of income that rural households in Bhutan rely upon.

This paper attempts to understand the determinants of participation in non-farm activities and of the levels of incomes derived from these activities in order to answer the following research questions: (i) What types of nonfarm activities do rural households engage in? Do they mainly engage in self-employment or work for wages? (ii) What determines participation in nonfarm employment? (iii) What is the impact of rural nonfarm activities on inequality? (iv) What should be the main focus of strategies aimed at supporting the growth of nonfarm activities in rural Bhutan?

Recent literature has shifted attention toward the heterogeneity of rural non-farm sectors (Barrett et al. 2005; Micevska and Rahut 2008; Rahut et al. 2014; Rahut and Micevska Scharf 2012a, 2012b). Thus, this paper differentiates between nonfarm self-employment and employment with respect to wages. Heterogeneity is further addressed by differentiating between self-employment in business and petty self-employment (e.g., handicrafts and pottery). By taking into account the heterogeneity of the nonfarm sector, we aim to refine our knowledge of factors that have an impact on the labor allocation of rural households.

The importance of education for participation in rural nonfarm sectors has been widely recognized, particularly high-return, nonfarm employment. However, the empirical evidence that accounts for endogeneity is scant. In examining the impact of education on the employment decisions of households, this paper adopts a different approach.

To identify the structural relationship between education and participation in the nonfarm sector, we estimate probit and Tobit models with endogenous education by using the education of the spouse and marriage at an early age as instruments for education. Furthermore, when estimating income from economic activities, we recognize the existence of both simultaneity and self-selection issues, and estimate sample selection models with endogenous education.

This paper decomposes inequality by income sources to examine the marginal effect of the income sources on inequality, taking into account the heterogeneity of rural nonfarm income.

The remainder of this article is organized as follows. Section II briefly dis-cusses the empirical literature on rural nonfarm employment. Section III presents the dataset and the variables employed in our analysis. Section IV describes the extent and nature of nonfarm employment in rural Bhutan. In Sections V and VI, we report the results of an empirical enquiry of the determinants of participation in

nonfarm activities and of income derived from these activities. Robustness checks are presented in Section VII and inequality decomposition in Section VIII. In the last section, we present our concluding thoughts and reflect on the policy implications.

II. Literature Review

Against the backdrop of widespread and deep-rooted poverty, rural–urban migration driven by poverty, and the inability of the agriculture sector to employ a growing population, there has been increasing interest among policy makers and researchers in rural nonfarm sectors in developing economies (Janvry and Sadoulet 2001; Lanjouw and Lanjouw 2001; Micevska and Rahut 2008; Reardon, Berdegué, and Escobar 2001; Haggblade, Hazell, and Reardon 2009), including with regard to improving welfare and decreasing poverty (Ruben 2001; Holden, Shiferaw, and Pender 2004).

Unlike traditional beliefs that rural households are mainly farm households, recent literature points out that rural households have several sources of income (Dercon and Krishnan 1996; Ellis 1998; Barrett, Reardon, and Webb 2001). Rural households diversify into nonfarm sectors for several reasons, including to cope with a shock in the agriculture sector (Alderman and Paxson 1992, Collier and Gunning 1999) and to maximize the return on assets (Rahut and Micevska Scharf 2012a).

Livelihood diversification studies in rural Africa confirm that poor households are less diversified despite the fact that they should be more risk-averse (Dercon and Krishnan 1996, Reardon 1997, Barrett et al. 2005), which makes it difficult to assess the role of risk as a factor in their participation in nonfarm activities. Therefore, the current paper focuses on the role of factors other than household risk aversion on participation in the rural nonfarm sector. Although a rural household would like to participate in rural nonfarm activities, not all households have the capacity to participate because of several impeding factors.

Education is one of the most important factors determining a household's ability to participate in nonfarm activities. Using case studies from 11 Latin American economies, Reardon, Berdegué, and Escobar (2001) concluded that education is the key factor determining participation and success in rural nonfarm employment. In the introduction to seven studies on income diversification in rural Africa, Barrett, Reardon, and Webb (2001) argue that educational attainment is one of the most important determinants of nonfarm earnings, especially in more remunerative employment. Interestingly, Micevska and Rahut (2008) found a differential role for education on participation in high-return and low-return nonfarm employment in the foothills of Sikkim and Darjeeling in India.

In Asia, there are several studies that have highlighted the association between education and participation in the rural nonfarm sectors. Fafchamps and Quisumbing (1999, 2003) argue that better-educated males in rural Pakistan earn higher nonfarm

incomes and are more likely to undertake nonfarm work. Yang and An (2002) show that education improves the allocation of household resources between agricultural and nonagricultural activities in rural parts of the People's Republic of China. Micevska and Rahut (2008) conducted an enquiry on participation in nonfarm activities in the Himalayas and showed that education plays a major role in accessing more remunerative nonfarm employment.

The effect of physical assets (land and nonland) on participation in nonfarm activities is ambiguous (Reardon, Delgado, and Matlon 1992). A negative impact of landholdings on participation in nonfarm employment has been reported in Thailand (Rief and Cochrane 1990) and Viet Nam (Van de Walle and Cratty 2004), while a positive impact was found in Burkina Faso (Reardon, Delgado, and Matlon 1992) and India (Lanjouw and Shariff 2004). In the current study, we have divided land into three categories—wetlands, drylands, and orchard—to assess if a differential role for land exists with respect to participation in rural nonfarm activities.

Larger households are more easily able to meet the demand for subsistence agriculture and supply their surplus labor for nonfarm activities. Several studies across the globe have confirmed the correlation of participation in nonfarm activities and the size and composition of the household (Reardon 1997, Fafchamps and Quisumbing 2003, Rahut and Micevska Scharf 2012b).

Literature on the role of gender has been mixed: while some studies find that males dominate the nonfarm sectors (see, for example, Fafchamps and Quisumbing 2003), other research observes that, in certain types of nonfarm activities, women are more heavily represented than men (Corral and Reardon 2001, Elbers and Lanjouw 2001). In Cambodia, female-headed households participate more in all types of nonfarm activities (Rahut and Micevska Scharf 2012b). Thus, the mixed findings on the role of gender vary across economies depending on social norms and the status of female members in the household and in society.

Although one can find several studies exploring participation in rural nonfarm activities in other Asian economies (see, for example, Fafchamps and Quisumbing 2003; Lanjouw and Shariff 2004; Micevska and Rahut 2008; Rahut et al. 2014; Rahut and Micevska Scharf 2012a, 2012b; Rief and Cochrane 1990; Van de Walle and Cratty 2004; Zhang, Huang, and Rozelle 2002), there is a lack of empirical research on nonfarm sectors in rural Bhutan.

The literature on the impact of nonfarm income on income inequality is divergent. Some researchers have found that nonfarm income increases inequality (Reardon and Taylor 1996; Canagarajah, Newman, and Bhattamishra 2001; Kung and Lee 2001), while others have found that it decreases inequality (Adams and He 1995, Janvry and Sadoulet 2001, Zhu and Luo 2006). Such contradictory results could be related to aggregation of different nonfarm activities with different returns to labor (Dercon and Krishnan 1996). Low-return, nonfarm employment has an inequality-decreasing effect and high-return, nonfarm employment has an increasing effect (Scharf and Rahut 2014).

In this paper, we take a detailed look at nonfarm activities in rural Bhutan using the most recent and nationally representative dataset collected by the National Statistical Bureau of Bhutan. The major contribution of this paper is fourfold. First, we estimate probit and Tobit models with endogenous education by using the education of the spouse and age of marriage as instruments for education. Furthermore, when estimating income from economic activities, we recognize the existence of both simultaneity and self-selection issues and estimate sample selection models with endogenous education. Second, while the study of rural nonfarm employment and income is very important for poverty reduction and improving the well-being of the rural population because of the rapid structural transformation of the Bhutanese economy in recent decades, there is no such study at present. Third, we estimate the role of peer effects on participation in nonfarm employment and the role of concentration in nonfarm income. Fourth, we estimate the effect of sources of income on income inequality.

III. Data and Variables

This study uses data from the 2012 Bhutan Living Standard Survey (BLSS 2012) (NSB and ADB 2012) to explore the determinants and impacts of nonfarm employment on income inequality in Bhutan. The data were collected by the National Statistics Bureau of Bhutan with funding from the Asian Development Bank. The BLSS 2012 followed the methodology of the World Bank's Living Standards Measurement Study. The selection of sample households was based on two mutually exclusive sampling frames for rural and urban areas. Since this paper focuses on rural nonfarm employment and its impact on inequality, the sampling methodology for rural households is described below.

The 2005 Population and Housing Census of Bhutan—conducted at the village level and updated after a more recent listing of activities such as those in the Bhutan Multiple Indicator Survey—was used to construct the sampling frame of primary sampling units for rural areas. Rural villages with fewer than 10 households were combined with adjacent villages; the total sample size for rural areas was 4,986. Primary sampling units were selected in proportion to size, and households in a selected primary sampling unit were drawn randomly so that the selection probability was constant within a group or stratum and selection probabilities across strata did not vary widely within the rural strata. The BLSS 2012 collected information from the selected households for the year preceding the interview through an integrated household questionnaire covering consumption, expenditure, assets, housing, education, health, fertility, and prices for different commodities.

The dependent variables of interest in this study are related to participation in nonfarm activities and the levels of income derived from these activities. To account for the heterogeneity of the nonfarm sector, we distinguish between two main types

of nonfarm activities: self-employment and wage employment. It is important to differentiate between these two types of economic activity because self-employment income includes returns to entrepreneurship, risk-taking, and capital, while wage income does not. It is also important to take into account the returns to labor in nonfarm employment. To do this, we use information from the survey to further classify self-employment in nonfarm activities into two types: business activities and other activities such as handicrafts and pottery. Self-employment in business provides relatively higher returns, while self-employment in handicrafts and pottery usually provides low returns and is physically demanding.

We use the following explanatory variables in the analysis life-cycle effects, which are captured by age and the age-squared of the household head; and the demand for farm labor by households, which is measured by farm size in acres. We have divided the land into three categories: wetlands, drylands, and orchard.

The supply of labor by households is captured by the household size (total members in the household). This study also uses the number of men and women of prime working age (15–65 years old) separately to capture the differentiated impact of gender on participation in nonfarm activities. We included the number of children under the age of 15 years and adults older than 65 years to measure the impact of dependency on the choice of livelihood. Level of education within the household is measured in different ways. First, we use years of education of the household head. Then, taking into account differences in education levels and the diversification of farm tasks by gender, we consider specifications of education that allow for different gender effects. In particular, we use the average education level of adult males and females and the highest level of schooling completed by adult males and females separately. In addition, to account for the nonlinearity of educational effects, we divide the household into several categories according to the highest level of education attained by the household head: no formal schooling, less than primary, completed primary, completed high school, and tertiary education. We regard the results of educational effects as robust when they are present in all specifications. An important limitation of household surveys, such as the BLSS 2012, is that they generate cross-sectional data that are usually not adequate to establish causal relationships between education and nonfarm employment since the optimal education decision depends on the expected labor market outcomes. In addition, education and nonfarm employment tend to be correlated with unobserved factors, such as intelligence and motivation. Fortunately, the BLSS 2012 provides information on instrumental variables that can be used to account for the endogeneity of education, such as age of first marriage of the household head and the education level of the spouse of the household head. The rationale for using marriage at an early age as an instrument is that it is correlated with educational choices but not correlated with current employment choices and earnings. Using the education level of the age of marriage as an instrument should reduce concerns that the correlation between education and nonfarm activities actually depicts family background.

Table 1.   **Contribution to Rural Household Incomes by Income Quintile** (%)

Sector of Employment	Income Quintile					Average
	1st	2nd	3rd	4th	5th	
Agriculture	**45.7**	**43.4**	**37.4**	**29.4**	**16.9**	**23.7**
Cropping	34.5	32.6	26.4	22.6	12.5	17.6
Livestock	11.2	10.8	10.9	6.8	4.5	6.1
Nonfarm	**32.1**	**36.7**	**48.5**	**57.7**	**67.0**	**60.7**
Wage	27.6	29.2	39.9	48.8	51.3	47.9
Business	2.0	3.5	5.3	6.3	14.0	10.7
Handicrafts	2.5	4.0	3.2	2.5	1.6	2.1
Remittances	12.2	11.1	6.0	3.2	1.5	3.0
Forestry	1.0	0.9	0.6	1.0	0.9	0.8
Others	8.9	7.9	7.6	8.7	13.8	11.7
Household income ($)	**154**	**534**	**1,054**	**1,867**	**5,781**	**1,871**

Source: Authors' calculations.

In order to account for accessibility to markets, we use a distance-to-market measure in terms of the time taken to reach the market. Interregional disparities are captured by classifying the households into 20 districts and Thimphu, which as the capital city of Bhutan is used as a base category. Although we include only rural households in the analysis, it is still important to control for regional differences as access to nonfarm sectors probably varies with geography. District dummy variables should capture differences in economic development and account for differences in agricultural potential, institutional arrangements, infrastructure, prices, and other unobserved region-specific characteristics as well.

One of the major contributions of this study is the endeavor to capture the role of peer effects on participation in nonfarm employment. The peer effect is measured by the number of household members excluding oneself pursuing rural nonfarm activities, wage employment in nonfarm activities, self-employment in business, and self-employment in handicrafts and pottery. This paper also captures the effects of the concentration of nonfarm activities in the village on the level of income from particular sources. The effects of the concentration of nonfarm activities contribute to higher incomes overall because of competition, and higher incomes from business as the competition attracts large numbers of customers to the village.

IV. Descriptive Statistics

Table 1 shows the contribution to total rural household income by income source across income quintiles. Nonfarm employment contributes 60.7% to rural household incomes across all income quintiles, while agriculture contributes only 23.7%. Within nonfarm income, wages contribute 47.9% to household income, business (self-employment) contributes 11.7%, and handicrafts and pottery contribute only 2.1%. This indicates that wage employment arising from industries

Table 2. **Contribution to Income by Level of Education of Household Head** (%)

Sector of Employment	Level of Education				
	No formal education	Less than primary school	Primary school completed	High school completed	University completed
Agriculture	**32.5**	**24.6**	**16.0**	**4.9**	**0.8**
Cropping	24.6	18.3	10.8	1.7	0.8
Livestock	7.9	6.3	5.2	3.2	0.0
Nonfarm	**50.8**	**51.4**	**70.0**	**79.4**	**96.8**
Wage	35.6	36.4	55.5	72.8	93.4
Business	12.4	13.3	12.8	6.0	2.7
Handicrafts	2.8	1.7	1.7	0.6	0.6
Remittances	4.2	2.0	0.9	1.4	1.0
Forestry	1.3	0.7	0.1	0.0	0.0
Others	11.2	21.3	13.0	14.3	1.3
Household income ($)	**1,467**	**2,167**	**2,443**	**4,173**	**5,192**

Source: Authors' calculations.

and infrastructure development plays an important role in rural livelihoods, and that only a small section of rural Bhutanese households are engaged in business (self-employment).

The share of agriculture in household income declines and the share of nonfarm income increases as income rises across quintiles, indicating the importance of nonfarm sectors to richer households. The share of agriculture in household income in the lowest (first) quintile is 45.7% and it falls to only 16.9% in the top (fifth) quintile. The contribution of nonfarm income to household income is 32.1% in the lowest quintile and 67% in the top quintile.

Table 2 shows the relation between income sources and the level of education of the household head. With an increase in the level of education, the share of agriculture in household income decreases. The share of agricultural income is 32.5% for households whose heads do not have any formal education, 4.9% for households whose heads have completed high school, and 0.8% for households whose heads have completed university. The contribution of nonfarm activities to income rises with an increase in the level of education of the household head. The contribution of nonfarm activities to income is 50.8% for households whose heads do not have any formal education and 96.8% for households whose heads have completed university. This analysis reiterates the importance of education for employment in nonfarm activities, particularly wage employment.

V. Determinants of Participation in Nonfarm Activities

We estimated the determinants of participation in nonfarm activities using a probit model. Unlike many previous studies, we recognize that the level of education of the household head is endogenous to nonfarm participation because the optimal

education decision depends on expected labor market outcomes. We use instrumental variable probit regressions to remove the potential endogeneity problems in the first stage of the regression; the level of education of the household head is regressed on all exogenous variables and the following instruments: the education of the spouse of the household head and the age of first marriage. The null hypothesis of exogeneity is rejected in all regressions, except for self-employment in nonfarm activities (business). Thus, correcting for endogeneity bias is appropriate in most cases.

The result from the instrumental variable probit in Table 3 shows that education plays a fundamental and differential role in a household's participation in nonfarm activities. Higher levels of education enable households to participate in nonfarm wage employment, while education is negatively associated with participation in self-employment in petty nonfarm activities (e.g., handicrafts and pottery). Education is insignificant for participation in nonfarm self-employment, highlighting the fact that self-employment in nonfarm activities does not require prior education. A strong preference for wage employment among the more educated households arises from the fact that wage employment pays more and is less risky compared with self-employment.

For wage employment, we observe a U-shaped relation: with the increase in age, the probability of participation in wage employment decreases initially and increases later. Participation in nonfarm self-employment does not show any relation to age.

With regard to gender, we observe a negative effect of female headship on the probability of participation in wage employment and self-employment in petty nonfarm activities (handicrafts and pottery), but a positive effect on participation in self-employment in nonfarm business. This result suggests that female-headed households engage themselves in business in contributing to family incomes.

As expected, a larger labor supply in a household is associated with a higher probability of participation in nonfarm activities as a larger household has surplus labor and can more easily allocate workers to nonfarm employment. A similar result is observed for working-age males and females for participation in nonfarm activities. A working-age female has a positive effect on participation in self-employment in nonfarm business and petty nonfarm activities such as handicrafts and pottery, while a working-age male has a positive effect for participation in nonfarm wage employment. Women in Bhutan are enterprising and run small businesses such as shops and vegetable vending to support their families, while most of the men seek wage employment. This finding also reflects gender-differentiated economic roles in rural Bhutan.

Reconfirming the findings from previous studies, the results show that households with less land are more likely to work for wages off the farm; we find a negative effect for wetlands, drylands, and orchard on participation in wage employment in nonfarm activities. We also observed a negative association with orchard land and

Table 3. **Probit Estimations with Endogenous Regressors for Participation in Nonfarm Activities**

	Employment Nonfarm	Wage Employment Nonfarm	Self-Employment Nonfarm (Business)	Self-Employment Nonfarm (Petty)
Demographic characteristics				
Age of the household head	−0.0315***	−0.0445***	0.0153	−0.0251
	(0.0122)	(0.0118)	(0.0144)	(0.0161)
Age-squared of the	0.0002**	0.0003***	−0.0002	0.0001
household head	(0.0001)	(0.0001)	(0.0001)	(0.0002)
Female-headed	0.0039	−0.1043*	0.1554**	−0.2035***
household[a]	(0.0591)	(0.0567)	(0.0699)	(0.0799)
Labor assets and human capital				
Number of children under	0.0487***	0.0456***	0.0080	0.0104
15 years	(0.0168)	(0.0167)	(0.0217)	(0.0231)
Number of adult males	0.1162***	0.1290***	0.0370	−0.0532
> 15 and < 65 years	(0.0246)	(0.0245)	(0.0313)	(0.0368)
Number of adult females	0.0825***	0.0168	0.1089***	0.1187***
> 15 and < 65 years	(0.0256)	(0.0253)	(0.0326)	(0.0345)
Number of aged	0.0145	−0.0340	0.0655	−0.0617
> 65 years	(0.0438)	(0.0434)	(0.0555)	(0.0655)
Number of years of	0.1428***	0.1246***	0.0226	−0.0570***
schooling	(0.0199)	(0.0172)	(0.0193)	(0.0223)
Physical (land) assets				
Wetlands owned (acres)	−0.0034	−0.0178*	0.0092	0.0143
	(0.0096)	(0.0099)	(0.0132)	(0.0132)
Drylands owned (acres)	−0.0140*	−0.0139*	0.0043	−0.0088
	(0.0082)	(0.0082)	(0.0096)	(0.0112)
Orchard land owned	−0.0288**	−0.0378**	0.0322**	−0.1141**
(acres)	(0.0152)	(0.0161)	(0.0148)	(0.0470)
Access to market				
Time taken to reach	0.0001	0.0001	−0.0001	−0.0002
market (minutes)	(0.0001)	(0.0001)	(0.0001)	(0.0001)
Peer effect (concentration of activities)				
Percentage of household	0.0160***			
in nonfarm (excl. itself)	(0.0015)			
Percentage of household		0.0152***		
in wage nonfarm (excl.		(0.0015)		
itself)				
Percentage of household			0.0188***	
in business nonfarm			(0.0035)	
(excl. itself)				
Percentage of household				0.0300***
in petty nonfarm (excl.				(0.0026)
itself)				
Locational variable (district dummy)				
Bumthang[a,c]	−0.3488*	−0.4162**	−0.2248	0.1601
	(0.1982)	(0.1864)	(0.2100)	(0.2208)
Chhukha[a,c]	−0.0552	0.1228	0.0432	0.0673
	(0.1733)	(0.1551)	(0.1633)	(0.2084)

Continued.

Table 3.   *Continued.*

	Employment Nonfarm	Wage Employment Nonfarm	Self-Employment Nonfarm (Business)	Self-Employment Nonfarm (Petty)
Dagana[a,c]	−0.2389	−0.0828	−0.2689	−0.1974
	(0.1839)	(0.1686)	(0.1907)	(0.2424)
Gasa[a,c]	−0.5710*	−0.7698*	0.2161	−0.0436
	(0.3180)	(0.4405)	(0.3375)	(0.5249)
Haa[a,c]	−0.6059**	−0.3572	−0.6297**	−0.2556
	(0.2453)	(0.2377)	(0.3073)	(0.3560)
Lhuentse[a,c]	−0.2083	−0.1072	−0.7377***	0.1917
	(0.1821)	(0.1677)	(0.2616)	(0.2140)
Monggar[a,c]	0.0504	0.3330**	−0.3634**	−0.1316
	(0.1662)	(0.1482)	(0.1747)	(0.2071)
Paro[a,c]	−0.0884	0.1445	−0.1872	0.1150
	(0.1691)	(0.1518)	(0.1625)	(0.1976)
Pema Gatshel[a,c]	0.4426**	0.6025***	−0.4349**	0.2836
	(0.1832)	(0.1627)	(0.2035)	(0.2072)
Punakha[a,c]	−0.2533	0.0347	−0.3259*	−0.3670
	(0.1845)	(0.1669)	(0.1940)	(0.2914)
Samdrup Jongkhar[a,c]	−0.0680	0.0548	−0.0710	0.1837
	(0.1715)	(0.1530)	(0.1666)	(0.1997)
Samtse[a,c]	0.3283**	0.5730***	−0.3073*	−0.1263
	(0.1646)	(0.1498)	(0.1652)	(0.1970)
Sarpang[a,c]	−0.1029	0.1048	−0.2403	0.1218
	(0.1714)	(0.1536)	(0.1774)	(0.2014)
Trashigang[a,c]	−0.1330	0.1013	−0.5272***	0.1147
	(0.1632)	(0.1443)	(0.1832)	(0.1898)
Trashi Yangtse[a,c]	−0.1540	0.1721	−0.8053***	0.0314
	(0.1796)	(0.1635)	(0.2531)	(0.2216)
Trongsa[a,c]	−0.0749	0.2013	−0.3971*	−0.2009
	(0.1977)	(0.1792)	(0.2271)	(0.2803)
Tsirang[a,c]	−0.5761***	−0.4139**	−0.4505**	−0.1344
	(0.1912)	(0.1755)	(0.2011)	(0.2443)
Wangdue Phodrang[a,c]	−0.0843	0.2487	−0.5214***	−0.1912
	(0.1745)	(0.1550)	(0.1974)	(0.2373)
Zhemgang[a,c]	0.1491	0.3520**	−0.0910	0.1083
	(0.1927)	(0.1732)	(0.1879)	(0.2391)
Number of observations	4,169	4,169	4,169	4,169
Wald chi2(32)	873.1	921.01	180.79	336.17
Prob. > chi2	0.000	0.000	0.000	0.000
Log pseudolikelihood	−12508	−12612.4	−11501.7	−11322.9
Wald test of exogeneity	14.4***	9.95**	1.16	3.43*
Prob. > chi2	0.0001	0.0016	0.2813	0.064

Notes: Robust standard errors in parentheses. All regressions include a constant term. The number of observations in each regression is 4,169. *** = 1% level of significance, ** = 5% level of significance, * = 10% level of significance.
[a]dummy variables
[b]excluded category: male head
[c]excluded category: Thimphu district
[d]Instrumented variable using age of first marriage and education level of the spouse
Source: Authors' calculations.

participation in self-employment in petty nonfarm activities, while orchard land has a positive association with participation in self-employment in nonfarm business because households with an orchard generally earn large incomes and do not need to participate in petty nonfarm activities for their livelihood.

Distance to market does not seem to influence participation in nonfarm activities. Peer effects, as measured by the percentage of households in the village participating in nonfarm activities (excluding the household itself), shows a positive association with participation in all nonfarm activities. In communities and villages, a household's behavior and activities are heavily influenced by their neighbors; rural households adopt livelihood strategies and technologies based on what their neighbors are doing.

Spatial analysis shows that participation in wage employment in nonfarm activities is positive and significant in three districts—Pema Gatshel, Samtse, and Zhemgang—while it is either insignificant or negative for the rest when compared with the capital city, Thimpu. Pema Gatshel and Zhemgang are poor districts with degraded land. As a result, households in these districts explore nonfarm employment opportunities. Samtse is a vibrant district bordering the Indian state of West Bengal with lots of opportunities for trade because there is a concentration of industries like mining, juice factories, and cement factories. Households in Thimphu are more likely to participate in nonfarm self-employment because of the city's large population, higher incomes, and proximity to markets.

To gain further insight, we analyze the determinants of the intensity of participation. The intensity of participation in nonfarm activities is measured by the share of income from a particular activity in total household income. As the dependent variable is bound between 0 and 1, the equations are estimated as an instrumental variable Tobit. The findings in Table 4 reinforce those of Table 3.

Education has a differentiated impact on participation in nonfarm employment. The association between education and wage employment is positive and significant, while it is negative and significant with self-employment in petty nonfarm activities. Similarly a household's male labor supply (between 15 and 65 years old) is positive and significant for wage employment in nonfarm activities, and negative and significant for self-employment in petty nonfarm activities. The female labor supply is positive and significant for self-employment in nonfarm business and self-employment in petty nonfarm activities. The gender of the labor force available in the household influences participation in different activities differently. The number of children under 15 years old is positive for wage employment in nonfarm activities, indicating the existence of child labor. Female-headed households are less likely to participate in nonfarm wage employment and more likely to participate in nonfarm self-employment. Ownership of drylands is negatively associated with wage employment. The ownership of an orchard is negatively associated with wage employment and petty nonfarm self-employment, while it is positively associated

Table 4. **Tobit Estimations with Endogenous Regressors for Intensity of Participation in Nonfarm Activities**

	Employment Nonfarm	Wage Employment Nonfarm	Self-Employment Nonfarm (Business)	Self-Employment Nonfarm (Petty)
Demographic characteristics				
Age of the household head	−0.0166***	−0.0224***	0.0188	−0.0132
	(0.0042)	(0.0049)	(0.0156)	(0.0093)
Age-squared of the	0.0001***	0.0002***	−0.0002	0.0000
household head	(0.0000)	(0.0000)	(0.0001)	(0.0001)
Female-headed	−0.0220	−0.0626**	0.1640**	−0.0835*
household[a,b]	(0.0228)	(0.0264)	(0.0752)	(0.0472)
Labor assets and human capital				
Number of children under	0.0197***	0.0260***	0.0065	−0.0071
15 years	(0.0069)	(0.0078)	(0.0231)	(0.0137)
Number of adult males	0.0390***	0.0576***	0.0337	−0.0485**
> 15 and < 65 years	(0.0101)	(0.0115)	(0.0339)	(0.0221)
Number of adult females	0.0144	−0.0113	0.1027***	0.0713***
> 15 and < 65 years	(0.0105)	(0.0120)	(0.0344)	(0.0195)
Number of aged	−0.0078	−0.0284	0.0843	−0.0288
> 65 years	(0.0188)	(0.0214)	(0.0600)	(0.0382)
Number of years of	0.0491***	0.0586***	0.0183	−0.0350***
schooling	(0.0050)	(0.0059)	(0.0203)	(0.0131)
Physical (land) assets				
Wetlands owned (acres)	−0.0025	−0.0088	0.0109	0.0089
	(0.0046)	(0.0055)	(0.0143)	(0.0076)
Drylands owned (acres)	−0.0100***	−0.0106**	0.0018	−0.0041
	(0.0038)	(0.0044)	(0.0102)	(0.0066)
Orchard owned (acres)	−0.0238***	−0.0293***	0.0300**	−0.0743**
	(0.0073)	(0.0088)	(0.0148)	(0.0296)
Access to market				
Time to reach market	0.0000	0.0000	−0.0001	−0.0001
(minutes)	(0.0000)	(0.0000)	(0.0001)	(0.0001)
Peer effect or concentration of activities				
Percentage of household	0.0085***			
in nonfarm (excl. itself)	(0.0007)			
Percentage of household		0.0083***		
in wage nonfarm (excl.		(0.0007)		
itself)				
Percentage of household			0.0197***	
in business nonfarm			(0.0037)	
(excl. itself)				
Percentage of household				0.0171***
in petty nonfarm (excl.				(0.0013)
itself)				
Locational variable (districts dummy)				
Bumthang[a,c]	−0.1303*	−0.2206**	−0.2801	0.2158
	(0.0758)	(0.0994)	(0.2277)	(0.1386)
Chhukha[a,c]	−0.0824	−0.0679	−0.0387	0.0298
	(0.0578)	(0.0714)	(0.1700)	(0.1350)

Continued.

Table 4. *Continued.*

	Employment Nonfarm	Wage Employment Nonfarm	Self-Employment Nonfarm (Business)	Self-Employment Nonfarm (Petty)
Dagana[a,c]	−0.1547**	−0.1249	−0.3510*	−0.1068
	(0.0738)	(0.0875)	(0.2059)	(0.1592)
Gasa[a,c]	−0.2457	−0.4432*	0.2172	−0.0558
	(0.1599)	(0.2467)	(0.3587)	(0.3057)
Haa[a,c]	−0.2950**	−0.2508*	−0.7127**	−0.1847
	(0.1214)	(0.1398)	(0.3437)	(0.2157)
Lhuentse[a,c]	−0.0018	−0.0612	−0.8747***	0.2378*
	(0.0703)	(0.0876)	(0.2885)	(0.1359)
Monggar[a,c]	−0.0151	0.0845	−0.4412**	−0.0985
	(0.0546)	(0.0683)	(0.1883)	(0.1366)
Paro[a,c]	−0.0713	−0.0242	−0.2228	0.0529
	(0.0553)	(0.0687)	(0.1734)	(0.1305)
Pema Gatshel[a,c]	0.0175	0.1025	−0.5967***	0.1637
	(0.0565)	(0.0716)	(0.2178)	(0.1309)
Punakha[a,c]	−0.1374**	−0.0688	−0.4059**	−0.2234
	(0.0703)	(0.0818)	(0.2089)	(0.1872)
Samdrup Jongkhar[a,c]	−0.0865	−0.0382	−0.1378	0.0894
	(0.0577)	(0.0723)	(0.1765)	(0.1308)
Samtse[a,c]	−0.0232	0.0913	−0.4159**	−0.0848
	(0.0509)	(0.0666)	(0.1759)	(0.1316)
Sarpang[a,c]	−0.0395	0.0279	−0.2838	0.0402
	(0.0595)	(0.0735)	(0.1914)	(0.1289)
Trashigang[a,c]	−0.0204	0.0472	−0.6404***	0.1134
	(0.0566)	(0.0692)	(0.1976)	(0.1275)
Trashi Yangtse[a,c]	0.0108	0.1066	−0.9432***	0.0571
	(0.0668)	(0.0786)	(0.2816)	(0.1474)
Trongsa[a,c]	−0.0172	0.0782	−0.4576*	−0.1143
	(0.0676)	(0.0809)	(0.2497)	(0.1778)
Tsirang[a,c]	−0.2766***	−0.2917***	−0.5179**	−0.0758
	(0.0817)	(0.0936)	(0.2200)	(0.1589)
Wangdue Phodrang[a,c]	−0.0647	0.0301	−0.6315***	−0.0876
	(0.0668)	(0.0765)	(0.2148)	(0.1582)
Zhemgang[a,c]	0.1052*	0.1974**	−0.2333	0.1044
	(0.0637)	(0.0791)	(0.1937)	(0.1556)
Number of observations	4169	4169	4169	4169
Wald chi2(32)	1401.52	1497.03	208.59	374.99
Prob. > chi2	0.000	0.000	0.000	0.000
Log pseudolikelihood	−13584.4	−13561.1	−11672.2	−11271.5
Wald test of exogeneity	17.43	15	0.85	3.31
Prob. > chi2	0.000	0.0001	0.3559	0.0689

Notes: Robust standard errors in parentheses. All regressions include a constant term. The number of observations in each regression is 4,169. *** = 1% level of significance, ** = 5% level of significance, * = 10% level of significance.
[a]dummy variables
[b]excluded category: male head
[c]excluded category: Thimphu district
[d]Instrumented variable using age of first marriage and education level of the spouse
Source: Authors' calculations.

with self-employment in nonfarm business, indicating the differential impact of wealth on the choice of participation in rural nonfarm employment.

VI. Determinants of Nonfarm Income

Analysis of employment participation in rural nonfarm sectors merely tells us whether the household participates in nonfarm activities or not. Therefore, in this section, we endeavor to understand the determinants of household income from different nonfarm activities. We estimate the income equation using a sample selection model with an endogenous education variable because not all households derive income from nonfarm activities (Wooldridge 2002).

In addition to instrumenting education, we use two variables to identify restrictions at the first stage of the regressions: land (see, for example, Fafchamps and Quisumbing 1999) and the peer effect percentage of households in nonfarm activities in the village (excluding the household itself). In the second stage, we use the variable percentage of the household in nonfarm activities to measure the effect of the concentration of activities and competition on income. In the first stage, we estimate exactly the same probit model specified in Tables 3 and 4. The income equations in the second stage are estimated in logs and the results are presented in Table 5.

The result shows a U-shaped relationship between age and earnings from wage employment; initially, the wage income decreases with age and after a certain minimum it increases. A similar association is observed between age and earnings from self-employment in petty nonfarm activities. The earnings from self-employment in nonfarm business activities increase with an increase in age and decrease after a certain point.

Female-headed households earn 4.6 times less income from wage employment and 11.7 times more income from self-employment in nonfarm business activities than male-headed households, indicating that while rural women in Bhutan are disadvantaged in the nonfarm wage labor market, they are highly enterprising. The male labor force is positively associated with earnings from nonfarm wage employment and nonfarm self-employment, while it is negatively associated with income from self-employment in petty nonfarm activities. The female labor force is positively associated with income from self-employment in nonfarm business activities and petty nonfarm self-employment. The number of elderly is negatively associated with earnings from nonfarm wage employment and nonfarm petty self-employment, while it is positively associated with income from nonfarm self-employment in business activities.

Education is associated with higher nonfarm income and it is positively associated with income from nonfarm wage employment and nonfarm business self-employment, but negatively associated with earnings from self-employment in

Table 5. **Estimations of Income with Selection Correction (Instrumented)**

	Employment Nonfarm	Wage Employment Nonfarm	Self-Employment Nonfarm (Business)	Self-Employment Nonfarm (Petty)
Demographic variable				
Age of the household head	−1.1606***	−1.6140***	1.2119***	−0.4331***
	(0.1430)	(0.2062)	(0.2367)	(0.1148)
Age-squared of the	0.0075***	0.0120***	−0.0120***	0.0021***
household head	(0.0012)	(0.0017)	(0.0023)	(0.0008)
Female-headed	−0.9567	−4.6295***	11.6757***	−2.9680***
household[a]	(0.6797)	(0.7558)	(2.0610)	(0.7162)
Labor assets and human capital				
Number of children under	1.7330***	1.7169***	0.6376***	0.1714
15 years	(0.3211)	(0.3518)	(0.1801)	(0.1276)
Number of adult males	3.9046***	4.4419***	3.0341***	−0.9413***
> 15 and < 65 years	(0.5914)	(0.7376)	(0.5520)	(0.2466)
Number of adult females	2.7173***	0.4991	8.1342***	1.8833***
> 15 and < 65 years	(0.4811)	(0.3515)	(1.3341)	(0.3472)
Number of aged	0.0066	−1.7112***	5.1855***	−1.1120***
> 65 years	(0.5713)	(0.6058)	(0.9502)	(0.3569)
Number of years of	2.9304***	3.1795***	1.6609***	−0.9074***
schooling	(0.4852)	(0.5727)	(0.3752)	(0.2192)
Access to market				
Time taken to reach	0.0018**	0.0045***	−0.0073***	−0.0022***
market (minutes)	(0.0009)	(0.0011)	(0.0013)	(0.0006)
Peer effect or concentration of activities				
Percentage of household	0.7484***			
in nonfarm (excl. itself)	(0.0713)			
Percentage of household		0.7194***		
in wage nonfarm (excl. itself)		(0.0777)		
Percentage of household			1.6341***	
in business nonfarm (excl. itself)			(0.2096)	
Percentage of household				12.4375***
in petty nonfarm (excl. itself)				(2.9079)
Locational variable (districts dummy)				
Bumthang[a,c]	−6.7418***	−13.5002***	−12.6665***	3.1194***
	(2.6615)	(3.9235)	(2.8546)	(1.6235)
Chhukha[a,c]	0.4742	2.0964	5.2363***	0.5883
	(1.8837)	(2.1103)	(1.9656)	(1.0844)
Dagana[a,c]	−3.8438*	−3.5813	−15.4002***	−2.5840**
	(2.3319)	(2.3969)	(3.0265)	(1.2682)
Gasa[a,c]	−12.8063*	−24.7577***	12.2866***	1.0061
	(5.0553)	(6.2488)	(3.6310)	(2.2280)
Haa[a,c]	−17.6251***	−12.7077***	−41.1798***	−3.8812**
	(4.4332)	(3.9771)	(7.3171)	(1.5902)
Lhuentse[a,c]	−2.2886	−2.9452	−51.2314***	2.4872*
	(2.1815)	(2.3763)	(9.0037)	(1.4529)

Continued.

Table 5.   *Continued.*

	Employment Nonfarm	Wage Employment Nonfarm	Self-Employment Nonfarm (Business)	Self-Employment Nonfarm (Petty)
Monggar[a,c]	3.3297*	8.1063***	−23.5985***	−1.4747
	(1.8792)	(2.4801)	(4.2692)	(1.0713)
Paro[a,c]	2.0785	4.8010**	−10.5151***	1.7901*
	(1.8647)	(2.1246)	(2.4399)	(1.0630)
Pema Gatshel[a,c]	13.3984***	16.5214***	−28.3334***	2.9854**
	(2.7664)	(3.5923)	(5.0817)	(1.4243)
Punakha[a,c]	−1.6837	3.0310	−22.2391***	−3.3301**
	(2.3141)	(2.2936)	(4.1048)	(1.3525)
Samdrup Jongkhar[a,c]	0.5010	0.4339	−1.3711	1.5421
	(1.9049)	(2.0913)	(1.6602)	(1.1604)
Samtse[a,c]	8.0642***	11.5122***	−17.5173***	−2.0207*
	(2.2276)	(3.0499)	(3.4601)	(1.1078)
Sarpang[a,c]	1.0832	3.1474	−13.4581***	0.9509
	(1.9624)	(2.1874)	(2.7672)	(1.1810)
Trashigang[a,c]	0.2681	3.1103	−35.3584***	1.7142
	(1.8275)	(2.0622)	(6.2910)	(1.0916)
Trashi Yangtse[a,c]	−0.4078	4.4582*	−55.7196***	0.9732
	(2.1140)	(2.3810)	(9.8422)	(1.1371)
Trongsa[a,c]	0.4544	4.8869*	−26.4543***	−1.6109
	(2.2285)	(2.6014)	(4.9070)	(1.2339)
Tsirang[a,c]	−13.7553***	−13.2688***	−28.5624***	−1.5622
	(3.5508)	(3.7893)	(5.1348)	(1.1665)
Wangdue Phodrang[a,c]	3.0252	9.3401***	−35.4880***	−1.3016
	(2.0809)	(2.4785)	(6.2027)	(1.0865)
Zhemgang[a,c]	4.3406**	7.7591***	−4.6380**	0.8545
	(2.2197)	(2.7105)	(1.8695)	(1.2263)
Lambda	40.2918***	37.5874***	83.1318***	0.6803
	(7.9866)	(8.6131)	(14.5035)	(0.0656)
Number of observations	4169	4169	4169	4169
F(30, 4138)	72.62	79.02	12.61	16.61
Prob. > F	0.000	0.000	0.000	0.000
R-squared	0.280	0.288	0.195	0.197
Root MSE	17.563	18.077	11.271	10.374

Notes: Robust standard errors in parentheses. All regressions include a constant term. The dependent variable is annual income. In the first stage, the identifying restrictions are land assets (wetlands, drylands, and orchard). The number of observations in each regression is 4,169. *** = 1% level of significance, ** = 5% level of significance, * = 10% level of significance.
[a]dummy variables
[b]excluded category: male head
[c]excluded category: Thimphu district
[d]Instrumented variable using age of first marriage and education level of the spouse
Source: Authors' calculations.

petty nonfarm activities. This is not surprising as petty self-employment mostly comprises simple activities with low returns that require little or no skill.

The concentration of rural nonfarm activities is likely to have a strong positive influence on income from different sources of rural nonfarm activities because

of competition. Compared to Thimphu, income from wages in nonfarm activities are higher for those households in Monggar, Paro, Pema Gatshel, Samtse, Trashi Yangtse, Trongsa, Wangdue, and Zhemgang, while it is negative or insignificant for the rest. The earnings from self-employment in nonfarm business activities are lower for all the districts compared with Thimphu. Income from self-employment in petty nonfarm activities (handicrafts and pottery) is positive only for Pema Gatshel and Lhuentse, while it is either negative or insignificant for the rest.

VII. Robustness Check

In order to establish the robustness of the key results reported in the preceding section, we estimate a model with alternative specifications and present selected results in Tables 6, 7, and 8. Since the analysis in Section VI shows that the education level of the household head is a key determinant of participation in and income from nonfarm activities, we present estimates from alternative specifications in which education is measured as the level of education of the oldest member of the household, average level of schooling, and maximum level of schooling completed by an adult of the household. To account for the differences in the role of males and females separately, we also estimate the equation with the average level of schooling and the highest level of schooling completed by an adult male and adult female member of the household. The estimates are qualitatively similar to the corresponding estimates in Tables 3, 4, and 5: education has a positive impact on participation in nonfarm wage employment and nonfarm business self-employment, and a negative impact on self-employment in petty nonfarm activities.

To account for the nonlinearity of education, we divided the level of education into no formal education, less than primary, completed primary, completed high school, and completed university, and estimated the determinants of participation in and income derived from nonfarm employment. The result shows that the marginal effect is positive and progressively increasing for participation in and income derived from wage employment, while it is positive and significant for participation in self-employment in nonfarm business only for less than primary and completed primary, and it is negative for completed high school, and negative and significant for completed university. Participation in self-employment in petty nonfarm activities is insignificant for less than primary and completed primary, and it is negative and significant for completed high school and completed university.

We replaced the number of adult males and females with household size (total number of household members) and found a strong and positive relationship with participation in nonfarm employment. Wealth status, as measured by a dummy of households with a flush toilet, shows a positive association with participation in nonfarm self-employment.

The income from nonfarm wages and self-employment are positively associated with the level of education attained by the eldest member of the household and

Table 6.   **Robustness Check—Probit Estimation for Participation in Nonfarm Activities**

	Employment Nonfarm	Wage Employment Nonfarm	Self-Employment Nonfarm (Business)	Self-Employment Nonfarm (Petty)
Specification A				
Education of the eldest member of the household	0.0222*** (0.0026)	0.0286*** (0.0028)	−0.0010 (0.0013)	−0.0026** (0.0012)
Specification B				
Mean education of working-age member	0.0252*** (0.0027)	0.0246*** (0.0028)	0.0037*** (0.0013)	−0.0023** (0.0011)
Specification C				
Maximum education of working-age member	0.0131*** (0.0017)	0.0115*** (0.0018)	0.0033*** (0.0009)	0.0000 (0.0008)
Specification D				
Mean education of working-age men	0.0156*** (0.0023)	0.0164*** (0.0024)	0.0014 (0.0011)	0.0006 (0.0010)
Mean education of working-age women	0.0166*** (0.0031)	0.0144*** (0.0031)	0.0034*** (0.0013)	−0.0041*** (0.0013)
Specification E				
Maximum education of working-age men	0.0126*** (0.0019)	0.0124*** (0.0020)	0.0022** (0.0010)	0.0007 (0.0009)
Maximum education of working-age women	0.0091*** (0.0021)	0.0081*** (0.0022)	0.0021** (0.0010)	−0.0024*** (0.0009)
Specification F: Nonlinearity of education				
Less than primary[a,b]	0.0482 (0.0294)	0.0176 (0.0326)	0.0488*** (0.0199)	0.0076 (0.0143)
Completed primary[a,b]	0.1164*** (0.0282)	0.1113*** (0.0323)	0.0518*** (0.0212)	0.0125 (0.0149)
Completed high school[a,b]	0.2049*** (0.0276)	0.2599*** (0.0327)	−0.0003 (0.0207)	−0.0328** (0.0107)
Completed university[a,b]	0.2899*** (0.0219)	0.3867*** (0.0253)	−0.0444** (0.0163)	−0.0421*** (0.0103)
Specification G				
Toilet type—wealth status[a,c]	0.0418 (0.0694)	−0.0859 (0.0646)	0.3812*** (0.0824)	0.3114*** (0.0861)
Specification H				
Household size	0.0931*** (0.0159)	0.0671*** (0.0154)	0.0711*** (0.0192)	0.0246 (0.0209)

Notes: Each specification is estimated by a separate regression. The other regressors (not reported) are defined as in Table 3. Robust standard errors in parentheses. *** = 1% level of significance, ** = 5% level of significance, * = 10% level of significance.
[a] dummy variables
[b] excluded category: no formal schooling
[c] excluded category: nonflush toilet, open toilet
Source: Authors' calculations.

the maximum education of working-age members, confirming that the earnings from all categories of nonfarm activities increase with education. The mean of education of the working-age member is positively associated with income from wage employment, while it is negatively associated with income from self-employment in petty nonfarm activities. The mean and the maximum education of the working-age male

Table 7. **Robustness Check—Tobit Estimation for Intensity of Participation in Nonfarm Activities**

	Employment Nonfarm	Wage Employment Nonfarm	Self-Employment Nonfarm (Business)	Self-Employment Nonfarm (Petty)
Specification A				
Education of the eldest member of the household	0.0275*** (0.0021)	0.0362*** (0.0024)	−0.0114 (0.0096)	−0.0154*** (0.0056)
Specification B				
Mean education of working-age member	0.0349*** (0.0025)	0.0383*** (0.0029)	0.0256*** (0.0096)	−0.0109* (0.0058)
Specification C				
Maximum education of working-age member	0.0205*** (0.0018)	0.0206*** (0.0021)	0.0248*** (0.0066)	0.0004 (0.0038)
Specification D				
Mean education of working-age men	0.0211*** (0.0022)	0.0236*** (0.0026)	0.0096 (0.0085)	0.0026 (0.0050)
Mean education of working-age women	0.0206*** (0.0027)	0.0222*** (0.0032)	0.0235** (0.0101)	−0.0194*** (0.0066)
Specification E				
Maximum education of working-age men	0.0176*** (0.0020)	0.0184*** (0.0023)	0.0164** (0.0073)	0.0030 (0.0041)
Maximum education of working-age women	0.0135*** (0.0022)	0.0147*** (0.0025)	0.0143** (0.0074)	−0.0104** (0.0046)
Specification F				
Less than primary[a,b]	0.0478 (0.0342)	0.0102 (0.0394)	0.3045*** (0.1073)	0.0316 (0.0646)
Completed primary[a,b]	0.1834*** (0.0322)	0.1875*** (0.0379)	0.3056*** (0.1130)	0.0190 (0.0613)
Completed high school[a,b]	0.3378*** (0.0336)	0.4346*** (0.0407)	−0.0444 (0.1564)	−0.2427*** (0.0919)
Completed university[a,b]	0.4268*** (0.0309)	0.5645*** (0.0364)	−0.4996** (0.2306)	−0.3414*** (0.1256)
Specification G				
Toilet type—wealth status[a,c]	0.0731*** (0.0245)	−0.0057 (0.0288)	0.4054*** (0.0859)	0.1805*** (0.0516)
Specification H				
Household size	0.0245*** (0.0064)	0.0207*** (0.0073)	0.0685*** (0.0207)	0.0084 (0.0125)

Notes: Each specification is estimated by a separate regression. The other regressors (not reported) are defined as in Table 4. Robust standard errors in parentheses. *** = 1% level of significance, ** = 5% level of significance, * = 10% level of significance.
[a]dummy variables
[b]excluded category: no formal schooling
[c]excluded category: nonflush toilet, open toilet
Source: Authors' calculations.

member is positive and significant for income from nonfarm wage employment, nonfarm self-employment, and petty nonfarm self-employment, while the mean and the maximum education of the adult female member is positive and significant only for nonfarm wage employment. Specification with nonlinearity of education shows

Table 8.   **Robustness Check—Heckman Estimation for Determinants of Nonfarm Income**

	Employment Nonfarm	Wage Employment Nonfarm	Self-Employment Nonfarm (Business)	Self-Employment Nonfarm (Petty)
Specification A				
Education of the eldest member of the household	0.0744*** (0.0113)	0.0603*** (0.0140)	0.0420* (0.0249)	0.0565** (0.0260)
Specification B				
Mean education of working-age member	0.0697*** (0.0078)	0.0622*** (0.0073)	0.0236*** (0.0091)	−0.0236** (0.0099)
Specification C				
Maximum education of working-age member	0.0782*** (0.0079)	0.0718*** (0.0086)	0.0365 (0.0240)	0.0354*** (0.0139)
Specification D				
Mean education of working-age men	0.0735*** (0.0086)	0.0648*** (0.0102)	0.0361* (0.0205)	0.0527*** (0.0167)
Mean education of working-age women	0.0498*** (0.0101)	0.0465*** (0.0114)	−0.0263 (0.0301)	0.0281 (0.0363)
Specification E				
Maximum education of working-age men	0.0651*** (0.0075)	0.0557*** (0.0086)	0.0404** (0.0199)	0.0391*** (0.0151)
Maximum education of working-age women	0.0358*** (0.0073)	0.0332*** (0.0083)	−0.0261 (0.0208)	0.0162 (0.0238)
Specification F				
Less than primary[a,b]	0.2292** (0.1035)	0.2013* (0.1143)	−0.0730 (0.3606)	0.0300 (0.2403)
Completed primary[a,b]	0.4338*** (0.1114)	0.4327*** (0.1207)	−0.0125 (0.3462)	−0.0291 (0.2279)
Completed high school[a,b]	0.9774*** (0.1487)	0.8644*** (0.1752)	0.3063 (0.3420)	0.7232* (0.4351)
Completed university[a,b]	1.3130*** (0.1870)	1.1052*** (0.2242)	1.4394* (0.7557)	1.2497** (0.6179)
Specification G				
Toilet type—wealth status[a,c]	2.1793*** (0.6998)	−2.6828** (1.0971)	30.0143*** (3.4089)	5.0317*** (1.1648)
Specification H				
Household size	3.0591*** (0.4442)	2.2537*** (0.4040)	5.6890*** (0.9288)	0.2865** (0.1139)

Notes: Each specification is estimated by a separate regression. The other regressors (not reported) are defined as in Table 5. Robust standard errors in parentheses. *** = 1% level of significance, ** = 5% level of significance, * = 10% level of significance.
[a]dummy variables
[b]excluded category: no formal schooling
[c]excluded category: nonflush toilet, open toilet
Source: Authors' calculations.

that the earnings from wage employment progressively increase with the increase in the level of education. In the case of income from nonfarm self-employment, it is positive and significant only after the completion of university, while it is significant and positive after the completion of high school for self-employment in petty nonfarm activities.

Table 9. **Rural Inequality Decomposition by Income Source**

Source	Income (Nu)	Contribution to Income (%)	Contribution to Gini (%)	Elasticity
Agriculture	17,552	17.6%	12.3	−5.3***
Livestock	6,099	6.1%	4.3	−1.8***
Wage nonfarm	47,856	47.9%	51.4	3.5***
Self-employment nonfarm	10,740	10.7%	14.1	3.4***
Handicrafts	2,105	2.1%	1.5	−0.6***
Remittances	3,047	3.0%	1.0	−2.0***
Forestry	848	0.8%	0.9	0.1**
Others	11,696	11.7%	14.4	2.7***
Total income	99,943	100.0%	59.4	

Nu = Ngultrum.
Notes: $1 = Nu66.14 on 31 August 2015. Contribution refers to the contribution of each income component to the overall Gini coefficient. Elasticity refers to the elasticity of the overall Gini coefficient to small changes in income components.
Source: Authors' calculations.

We replaced the number of adult males and females with the household size (total number of household members) and found a strong and positive relation with income from nonfarm employment. Wealth status, as measured by the dummy of households with flush toilets and without flush toilets, shows a positive association of wealth and income from nonfarm self-employment.

VIII. Nonfarm Income and Inequality

We decomposed income inequality by income components to determine the contribution of a particular income source to total income inequality based on the methodology proposed by Lerman and Yitzhaki (1985). Table 9 shows the income from each source, the contribution of each component to the overall Gini coefficient, and the elasticity of the overall Gini coefficient to small changes in income components. We divided the total income into three major components: farm income; nonfarm income; and income from other sources such as transfers, remittances, pension receipts, and other sources of unearned income. The contribution of nonfarm income to overall income inequality of about 67% is quite high, compared with only about a 17% contribution from farm income. The elasticity of 0.63 indicates that an increase in nonfarm income increases overall inequality, as opposed to an increase in farm income, which decreases the overall Gini coefficient. However, on further disaggregation of rural nonfarm income sources, we find that not all nonfarm sources of income are associated with higher income inequality. An increase in income from self-employment in handicrafts and pottery actually decreases overall inequality. Thus, even if self-employment in handicrafts and pottery activities offer very low remuneration levels and therefore no realistic prospects

for upward income mobility, such income sources are obviously important from a social welfare perspective. For poorer subgroups of the population, these nonfarm incomes may offer the only means to some level of economic security. On the other hand, income from wage labor in nonfarm and self-employment in nonfarm business activities contributes significantly to overall inequality. This suggests that entry barriers impede the less educated and poor from accessing nonfarm wages and nonfarm business self-employment, thereby causing nonfarm sectors to have distributionally regressive effects on incomes.

IX. Conclusions and Recommendations

Bhutan has gone through a remarkable structural transformation during the last 3 decades that has resulted in an increase in the contribution of the secondary and tertiary sectors to GDP, and to the declining role of agriculture in the economy. Against the backdrop of these structural changes, it is important to explore if the rural labor market has moved in the direction of increased participation in rural nonfarm sectors.

Rural nonfarm sectors have been widely recognized as an important source of income in the drive for growth and poverty reduction in developing economies. This paper has endeavored to examine the importance of rural nonfarm employment and income in Bhutan, and the determinants of participation in income generation activities in rural nonfarm sectors.

Rural nonfarm sectors contribute 60.7% of total rural household income in Bhutan, while the agriculture sector contributes only 23.7%. Among nonfarm activities, nonfarm wage employment is the most important, contributing 47.9% of total rural household income. The analysis shows that the importance of the agriculture sector declines sharply across income quintiles, while the contribution of nonfarm sectors increases, indicating the importance of nonfarm income for richer households. Likewise, we find that the contribution of the agriculture sector decreases with an increase in the education level of the household head, while the contribution of nonfarm sectors increases exponentially with the increase in the level of education. The poor and the less educated participate less in rural nonfarm sectors than richer households. As in most previous studies, we find that education is a key determinant of participation in rural nonfarm sectors and the subsequent income generated.

The probit and Tobit model estimation with endogenous regression confirms the importance and differential role of education for participation in rural nonfarm sectors. In addition, the instrumented selection estimation reinforces the level of education on the return from different types of nonfarm activities. To check the robustness of the result, the model was estimated with different specifications for education, which yielded similar results.

The results confirm that Bhutanese women play an important role in the family and in society; female-headed households, the number of adult females in the household, and female education systematically influence the labor allocation and income from nonfarm sectors. In fact, women are engaged in self-employment in nonfarm activities and contribute to family incomes. In addition, the results show that ownership of an orchard positively influences participation in nonfarm business self-employment. We find that wealth status is key to assessing nonfarm business self-employment.

The policy implications from the analysis are obvious and important: First, raising education levels should be a high priority for improving access to rural nonfarm sectors and reducing poverty. Second, there are significant direct and indirect costs of education that create a critical barrier to access for the rural poor; therefore, providing free education alone is not enough. Third, it is questionable whether the Bhutanese education sector equips rural youth with the skills necessary for successful participation in modern nonfarm sectors. The Bhutanese government policy of compulsory and free education, and equal opportunities to access formal and nonformal education, is a step in the right direction. But while education is free and compulsory, households are expected to pay for the cost of dress and other miscellaneous expenses. In addition to the direct costs, there exists an opportunity cost for sending children to school, which is particularly high for poor families as their children contribute to the livelihood of the family by fetching water and firewood, helping on the farm, selling vegetables, and completing other tasks. During vacation, children from poor Bhutanese families tend to work in the construction sector and as potters on horticulture farms to generate cash income to support their education. Therefore, education policy should provide extra support and incentives to children from low-income families.

Returns on investment in education accrue only after a certain level of education is attained; hence, households will invest in education if families can continue to send their children to school beyond high school (Rahut and Micevska Scharf 2012a). In Bhutan, the number of seats available for students significantly decreases after secondary and higher secondary school, making it challenging to get a place for higher secondary, technical, and tertiary education. (See Appendix 1 for more details.) Children of those families who are not able to be placed in government schools and colleges are forced to look for seats in private schools in Bhutan and in India, which is beyond the capacity of poor Bhutanese households. Such a situation creates disincentives for the Bhutanese to send their children to school. The other pressing issue in Bhutan is increasing unemployment among educated Bhutanese, which also creates disincentives for investment in education.

Although a major focus of this paper is on demand-side analysis of nonfarm employment, a small part of the analysis investigates the supply side, which is crucial for the transformation of the economy from reliance on the primary sector to the secondary and tertiary sectors. In the probit, Tobit, and Heckman models,

we included a variable—peer effect, supply, and concentration of activities—as a proxy to analyze the supply side of nonfarm employment. Results from all three models confirm the importance of the supply of nonfarm sectors for participation in rural nonfarm employment. Therefore, government policies should focus on creating industries and enterprise to generate nonfarm employment opportunities. Given that Bhutan and India share a long and porous border (699 kilometers), as well as a preferential trade agreement, and Bhutan has an abundant supply of energy, the country is in a position to create industries and enterprises to supply employment opportunities that can absorb young Bhutanese in productive nonfarm activities. Such development of industries and enterprises can also lead to the growth of small household businesses to meet the demand for goods and services from large industries and enterprises. (See Appendix 2 for more details.) As Bhutan is increasingly viewed as a sought-after tourist destination, government policies should invest in promoting rural tourism.

The investment of resources by the government to encourage the private sector to invest in agriculture, manufacturing, and tourism in rural areas would trigger the growth of productive employment in other sectors of the rural nonfarm economy. Policies should not only encourage private investment in rural sectors, but also foster a business environment that is conducive to the growth of private sector enterprises in rural areas. Sufficient incentives are necessary to encourage manufacturing in rural areas; incentives can be in the form of providing suitable infrastructure, cheap electricity, or a tax holiday. Rural industrialization must adopt a cluster-based approach, where large and medium-sized firms utilize local resources and are linked with small businesses.

Rural manufacturing also requires investment in skill formation and entrepreneurship development. Unlike the agriculture sector, in Bhutan, rural nonfarm sectors suffer from the lack of a single institution that supports the development of the rural nonfarm economy. Single window integrated service centers to promote rural nonfarm sectors are a perquisite for the development of the rural nonfarm economy. The Government of Bhutan should also provide social security benefits to participants in unorganized sectors such as agriculture. Rural households would also indirectly benefit from linkages between the nonfarm and farm sectors.

Results from the decomposition of inequality by income source show that income from agriculture, livestock, handicrafts, and remittances has an equalizing effect, while income from wage and self-employment in nonfarm activities has a disequalizing effect. Only a small proportion of the population is able to access nonfarm wage and self-employment opportunities. Lucrative nonfarm employment requires a higher level of education, financial capital, and skills; hence, households with a low level of endowments of financial and human capital are only left with the option to engage in the agriculture sector for livelihood. Policies augmenting the endowment of poor households' resources would enable them to participate in lucrative sectors, thereby reducing the disequalizing effect of nonfarm sectors.

Increasing the supply of nonfarm employment opportunities and creating an enabling environment for small businesses would absorb the surplus labor in the farm sector and ultimately lead to equilibrium with respect to returns to labor in the farm and nonfarm sectors. However, the results also confirm the importance of the supply of nonfarm employment opportunities, which depends on forces that extend beyond the rural sector, including growth and broader macroeconomic policies.

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*ADB recognizes "China" as the People's Republic of China.

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Appendix 1. Overview of Education in Bhutan in 2014

Bhutan has made significant progress in the education sector since it initiated its first 5-year plan in 1960. The number of students, teachers, and schools has increased significantly during last 3 decades (Table A.1).

In 2014, Bhutan has 332 public primary schools (up to grade 6) and 12 private primary schools; 87 public lower secondary schools (up to grade 8) and 1 private lower secondary school; 63 public middle secondary schools (up to grade 10) and 2 private middle secondary schools; 37 public higher secondary schools (up to grade 12) and 17 private higher secondary schools; and 13 tertiary institutes, including 1 private college. In addition, there are 107 extended classrooms and 210 early childhood care and development centers.[1] The data shows that the number of seats available for students decreases with an increase in the level of education, thereby pushing many students to either travel to India for education or drop out. For poor households, continuing education in a private school or traveling to India is almost impossible.

A similar situation is observed with the number of teachers. In 2014, there were 8,572 teachers, including 2,533 in primary schools, 1,939 in lower secondary schools, 2,148 in middle secondary schools, 1,790 in higher secondary schools, 150 in extended classrooms, and 12 in the Muenselling Institute.[2]

For the 2014 academic year, total school enrollment was 172,393, including 46,780 students in primary schools, 43,513 in lower secondary schools, 44,207 in middle secondary schools, 34,982 in higher secondary schools, 2,885 in extended classrooms, and 26 in Muenselling Institute. Total enrollment at the tertiary level was 11,089 students. Under the technical training programs, there are 1,405 trainees pursuing various technical and vocational courses in eight Ministry of Labour and Human Resources technical training institutes and one private training institute.[3]

The effects of the decline in the number of schools with an increase in the level of education are reflected in the enrollment rate (Table A.2). In 2014, the gross enrollment ratio was 113% at the primary level, 96% at the secondary level, 58% at

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[1]Government of Bhutan, Department of Education. 2014. *Annual Education Statistics 2014.* http://www .education.gov.bt/documents/10180/12664/Annual+Education+Statistics+2014.pdf/f3779fb8–2cae-400c-833a -ab7140633b99?version = 1.0

[2]Ibid.

[3]Ibid.

Table A.1.   **Students, Teachers, and Schools in Bhutan**

	Students		Teachers		Schools		
	1988	2014	1988	2014	1988	2014	
						Govt.	Private
Primary school	42,446	46,780	1,513	2,533	150	332	12
Lower secondary school[a]	11,835	43,513	447	1,939	21	87	1
Middle secondary school[b]	4,515	44,207	248	2,148	9	63	2
Higher secondary school[c]		34,982		1,790		37	17
Total	**58,796**	**169,482**	**2,208**	**8,410**	**180**	**519**	**32**

Notes: Does not include extended classroom and Muenselling Institute.
[a]Previously known as junior high school
[b]Previously known as high school
[c]Previously known as junior college
Source: Government of Bhutan, National Statistics Bureau. *Statistical Year Book of Bhutan 1995* and *2014*. www.nsb.gov.bt

Table A.2.   **Gross Enrollment Ratios**

Key Education Indicator	Male	Female	Total
Gross enrollment ratio—Primary[a]	113%	113%	113%
Gross enrollment ratio—Basic[b]	108%	105%	107%
Gross enrollment ratio—Secondary[c]	101%	92%	96%
Gross enrollment ratio—Higher Secondary[d]	58%	59%	58%
Gross enrollment ratio—Tertiary within Bhutan[e]	27%	21%	24%
Gross enrollment ratio—Tertiary within Bhutan and outside Bhutan[f]	35%	29%	32%

Notes: [a]Grade 1–6; [b]Grade preprimary–10; [c]Grade 7–10; [d]Grade 11–12; [e]University in Bhutan (beyond Grade 12); [f]University in Bhutan and outside (beyond Grade 12).
Source: Government of Bhutan, Department of Education. 2014. *Annual Education Statistics 2014.* http://www.education.gov.bt/documents/10180/12664/Annual+Education+Statistics+2014.pdf/f3779fb8-2cae-400c-833a-ab7140633b99?version=1.0

the higher secondary level, and 24% at the tertiary level (Bhutan only). The gross enrollment rate at the tertiary level of Bhutanese students in both Bhutan and India was 32%.

The Government of Bhutan announced a loan program for students to pursue tertiary education in India and Bhutan. In 2015, 99 students were selected to receive a loan to pursue tertiary education in Bhutan and 11 students were selected for a loan to pursue tertiary education in India.

Appendix 2. Macroeconomic Policy for Rural Nonfarm Employment

Results from the analysis in this paper strongly suggest the importance of increasing the supply of nonfarm employment and of providing rural households with skills and knowledge through education. Neither increasing the level of education nor the supply of nonfarm employment opportunities can happen automatically; it depends on factors outside of the rural sector, including aggregate demand and supply, and broader macroeconomic policies.

Development policies focusing on education can help in augmenting the endowment of rural households and enable them to seek employment opportunities in nonfarm sectors that require higher levels of education and skills. The supply of education and skills development alone will not lead to livelihood diversification into lucrative nonfarm sector opportunities and increases in income and welfare. Therefore, augmenting the supply of rural nonfarm employment opportunities through a comprehensive and inclusive set of macroeconomic policies is crucial for rural industrialization and for expanding the scope of rural nonfarm-based livelihood. The rural nonfarm sector development policy should focus on providing rural infrastructure and incentives to attract investment in rural areas, like tax holidays and the provision of electricity at affordable prices, and on expanding the links between rural areas and urban centers within Bhutan, and with India.