

ANALYZING HOUSEHOLD POVERTY AND REMITTANCE IN THE KOSHI PROVINCE OF NEPAL

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ABSTRACT

Remittances have contributed to reducing poverty in many countries in South Asia, including Nepal. This paper aims to analyze the determinants of poverty and the role of remittances in influencing poverty in Koshi Province of Nepal. The authors use cross-sectional data from the Nepal Living Standards Survey 2022, covering 1,416 households, and employ an instrumental variable, Heckman probit, and probit models for analyzing the determinants. It is shown that there is no endogeneity and no sample selection bias. The results indicate that gender, household size, income (excluding remittances), household assets, remittances, urban/rural status, and the household head's education level are significant factors influencing poverty. Urban households face greater poverty risk than rural ones, and remittances have contributed significantly to bringing households out of poverty. As remittance-receiving households are less efficiently mobilizing resources, this implies the implementation of policies for mobilizing such resources in the productive sector, including the agricultural sector.

Keywords: Household, Instrumental variable, Koshi province, Nepal, Poverty, Probit, Remittance

INTRODUCTION

Development strategies in developing countries are primarily focused on reducing poverty. Despite this, poverty is still a global issue that has huge impacts on people and the planet. Poverty affects all nations, though the degree of poverty differs across countries. World Bank (2024) mentioned that poverty reduction has slowed down to nearly stop, with 2020–30 set to be a missing decade. At present, 8.5 percent of the global population lives in extreme poverty (those living on less than \$2.15 per capita/day). At a poverty standard more relevant for upper-middle-income countries (\$6.85 per capita/day), 44 percent of the global population lives in poverty. About two-thirds of the world's extreme poor are living in Sub-Saharan Africa, while South Asia accounts for nearly one-fifth (World Bank, 2024).

Poverty is the outcome of economic, political, and social processes that are interrelated with each other and often reinforce each other in ways that aggravate the deprivation in which poor people live (World Bank, 2001). The initial literature measured poverty in terms of income or consumption expenditure (Sen, 1976; Townsend, 1954, 1971). In addition, the orthodox measure of poverty based on income or consumption, such as dollar-a-day and headcount ratio by the World Bank, is still prevalent and applicable globally (Ravallion et al., 2009). Sen conceptualized poverty not just as an inadequacy of income; it is the lack of essential human capabilities (Sen, 1992). He has underlined the significance of addressing social disparities and spending in education and healthcare to fight poverty and sustain economic development. Since 1976, poverty has been recognized as a multidimensional phenomenon, such as the absence of opportunities to change the situation, health and education, access to credit and productive resources, justice, and low voice in institutions (Sen, 1976).

The determinants of poverty have been quantitatively analyzed by various investigators. A study done by Lohano (2009) concentrated on poverty dynamics and their causes using

a panel survey, and found that the main cause of severe increase in poverty was tremors in agriculture. The agriculture sector is a source of living for many people in poor and least developed countries. Nepal also has a rural, agriculture-based economy, and poverty is more prominent in rural areas. A study on factors influencing poverty using data from DHS in Kenya showed that, in addition to other demographic variables, the household head's age positively correlates with the probability of being poor (Achia, 2010). Joshi et al. (2012) mentioned that dependency ratio, agricultural occupation, education of the household head, and landholding size were the main determinants of income poverty in Nepal. Gajurel et al. (2025) also examined the socio-economic dimension of poverty and found that poverty status was determined by family size, residential status, remittance, nonfarm or side/other business, landholdings and livestock, access to electricity, better health and road infrastructure, dwelling status, and preference for cooking fuel. Byanjankar and Sakha's (2021) findings revealed that households are less likely to fall into poverty when they have more assets. The fallow land and upland tend to increase poverty but have a very small impact, and an increase in the average distance of households from market, banks, and roads increases the probability of being under poverty. With educated heads, the probability of the household falling into poverty will be low. The probability of remittance-receiving households to fall into poverty is 2.3 percent lower than remittance non-receiving households. Research has also been carried out to estimate the impact of foreign remittances on poverty in Nepal. It was found that remittance-receiving households incline to expend more on consumption, health, and education in comparison to remittance non-receiving households (Thapa and Acharya, 2017). Raihan et.al. (2009) in Bangladesh and Bui et al. (2015) in Vietnam concluded that remittances have a positive and significant impact on households' food and housing-related spending, along with expenditures on education and health. Ang et al. (2009) have concluded that receiving remittances leads to a lower percentage of total household expenditure being allocated

to food consumption. Moreover, Philippines remittances show no substantial, measurable, or statistically significant effect on crucial investments such as health and education expenditures. However, it reveals that remittances help lift households out of poverty, which is consistent with previous findings.

In Nepal, the sixth five-year plan (1980-85) introduced the issue of poverty for the first time and aimed to increase production more quickly to reduce poverty. The seventh five-year plan (1985-1990) identified widespread poverty as the main problem of the Nepalese economy and concluded that increasing production is the only solution to the steady elimination of poverty in the country (NPC, 1985). Since then, the Government of Nepal (GON) has been implementing various poverty reduction strategies and programs. The GON has adopted the strategy of reducing poverty, which has been the top-prioritized agenda of the nation with the target for reduction since the Eighth Plan (1992-97). During the Ninth Plan (1997-2002), poverty reduced from 42 percent to 38 percent. The tenth plan (2002-2007) developed the Poverty Reduction Strategy Paper (NPC, 2003). This level of poverty reduced to 25 percent in 2010/11, 21 percent in 2016/17, and 20.3 percent in 2022/23 (NPC, 2024). In spite of the implementation of pro-poor programs and activities, the proportion of the poor has not been reduced as per the targets.

With the above background, the objective of this paper is to identify the factors influencing poverty in Koshi province of Nepal and assess the role of remittances by using Nepal Living Standards Survey (NLSS IV) data (National Statistics Office, 2024). The paper uses demographic, socio-economic variables, and remittance to identify and examine their effects on poverty.

METHODOLOGY

Data Sources

The sampling strategy of NLSS IV adopted a two-stage stratified sampling procedure. In the first stage, using the comprehensive list of census enumeration areas (EAs) as primary sampling units (PSUs), 800 EAs were selected from the 15

domains using probability proportional to size (PPS). An exhaustive household listing was prepared in the selected areas to update the list of households. After listing all households in a chosen EA, the list was arranged considering the household size (implicit stratification). A total of twelve households were randomly chosen from each EA using all households from the post-listing sampling frame as the secondary sampling units (SSUs), with an equal probability of selection. The EAs for Koshi province consisted of 118, with a sample size of 1416. Out of the total EAs, 64 EAs were for urban areas, while 54 were for rural areas.

Analytical Techniques

Using the NLSS IV data, a consumption aggregate was created by assigning monetary values (NPR) to essential household goods and services that are important to the welfare of the household. This approach adheres to international best practices and follows the methodologies outlined by Deaton and Zaidi (2002)

The poverty is estimated as follows:

$$Y_i = \alpha_1 + \beta_1 X_i + \mu_i \dots\dots\dots (1)$$

Y_i is the status of poverty, X_i is the vector of explanatory variables, including remittance.

If the households that received remittances were randomly selected from the whole population, this poverty function could be estimated using the Ordinary Least Square (OLS) technique. But, this may not essentially be the case. The households receiving remittances are not randomly selected and have some unobservable features that impact their decision to migrate and receive remittances; i.e., they are rather self-selected. In such a scenario, the OLS estimator fails to be both consistent and unbiased. Hence, an appropriate approach needs to be adopted, considering the selectivity bias issue.

The remittances and poverty might cause reverse causality problems, resulting in biased results (Adams and Page, 2005) and incorrect conclusions (Ang et al., 2009), Instrumental Variable (IV) estimation was employed in this study. It is

plausible that increasing remittances would lead to reduced poverty. On the other hand, it is also possible that the rise of poverty in a country causes people to work overseas, and they can eventually remit money and raise remittances inflow in the country. Hence, there could be an issue of endogeneity.

In order to correct for sample selection bias, a two-step Heckman (1979) approach is utilized, leveraging information from households receiving remittances to improve the accuracy of the regression estimates. In the first stage, a probit regression model on the likelihood of remittance receipts is estimated against multiple variables (household and family characteristics, migration information, and family income). In addition, instrument variables (IVs) are incorporated in the model, such as ecological region and rural/urban residence. These IVs must be associated with the factors that determine whether a household member would migrate (the likelihood of receiving remittances), but not with the poverty status. IVs affect the probability of receiving remittances but do not directly influence poverty (in the absence of remittances).

To rectify the self-selection bias, the influence of remittances on poverty is estimated using the following function.

$$M_i = \alpha_i + \sum \beta_j X_{ij} + \sum v_j Z_{ij} + \dots \quad (2)$$

M_i is a binary variable that takes the value of 1 if a household gets remittances, 0 otherwise.

X_i is the vector of explanatory variables, and vector Z represents instrumental variables.

Based on the Dubin and McFadden (1984) method, if the error components of the choice model and the poverty model are correlated, the poverty equation can be corrected for selection bias by incorporating a specific correction term derived from the first-stage choice model estimation. Then, poverty equation (1) can be rewritten as follows:

$$Y_i = \alpha_i + \sum \beta_j X_{ij} + \sum \lambda_i + \varepsilon_i \quad (3)$$

Estimations of this equation will imply that selectivity in unobservable components is crucial for households receiving

remittances. In other words, if it is significant, then estimations would be biased without this selection term. The Wald test of exogeneity ($\text{corr} = 0$) with a hypothesis of “no endogeneity” is tested. Similarly, the Probit model with sample selection is run. The likelihood ratio (LR) test, when used to test for independence of equations in a Heckman model (where $\rho = 0$), assesses whether the selection equation and the outcome equation can be estimated separately without bias.

The “household poverty status” (poor/ non-poor) is taken as the dependent variable by assigning a value of 1 for poor and 0 for non-poor households. In this paper, households are classified as poor if their per capita expenditure is below NPR 72,908, and non-poor if it is above this threshold.

Due to the dichotomous nature of the response variable (poverty status), the probit model is adopted, which uses the cumulative logistic function to circumvent the unrestrained expectation problem found in the linear probability model for equations with dichotomous dummy response variables (Gujarati, 2015).

The probit model can be expressed as

$$\text{Prob}(Y_i = 1) = F\left(\frac{\beta_0 + \beta_1 X_{1i}}{\sigma}\right)$$

$$\text{Prob}(Y_i = 1) = F\left(\frac{\beta_0 + \beta_1 X_{1i}}{\sigma}\right) = \int_{-\infty}^{\frac{\beta_0 + \beta_1 X_{1i}}{\sigma}} \frac{1}{\sqrt{2\pi}} e^{-\frac{t^2}{2}} dt$$

(4)

F is the cumulative standard normal distribution function.

In the probit model, it is assumed that the error in the utility index model is normally distributed

$$\varepsilon_i \sim N(0, \sigma^2)$$

Analyzing Factors Influencing Poverty

The econometric form of the model to be used is expressed as follows:

$$\begin{aligned} \text{Poverty} = & \beta_0 + \beta_1 \text{Gender} + \beta_2 \text{Age} + \beta_3 \text{HHSIZE} + \beta_4 \text{ValAssets} + \\ & \beta_5 \text{Income} + \beta_6 \text{Upland} + \beta_7 \text{Education} + \beta_8 \text{Distance} + \\ & \beta_9 \text{MtnHilldum} + \beta_{10} \text{IndigDalitdum} + \beta_{11} \text{Remitdum} + \beta_{12} \\ & \text{Urbandum} + \varepsilon \end{aligned}$$

The variables are defined and their anticipated sign is presented in Table 1.

Table 1. Description of the variables and their expected sign

S.No.	Variable	Description	Expected sign
1	Poverty	It is a binary variable with a value of 1 for those households that are poor, 0 otherwise	-
2	Gender	It is a binary variable with a value of 1 for male headed household, 0 otherwise	Negative
3	Age	Household head's age in years	Positive/Negative
4	HHSIZE	Household size in terms of no. of family members in the household	Negative
5	Income	It is the annual household income excluding remittance (in NPR '000)	Negative
6	ValAssets	Value of Household Assets in NPR ('000)	Negative
7	Upland	Percentage of Land holding having upland	Positive
8	DistMarket	Distance of the Household to main market in Km	Positive
9	IndigDalitdum	It is a dichotomous variable for ethnicity with a value of 1 for Indigenous people and Dalits, 0 otherwise	Positive
10	MtnHilldum	It is a dummy for ecological region with a value of 1 for Mountain and Hill, 0 otherwise	Positive/negative
11	Remitdum	It is a dichotomous variable for Remittance (in cash) with a value of 1 for remittance-receiving households, 0 otherwise	Negative
12	Urbandum	It is a dichotomous variable with a value of 1 for urban households, 0 otherwise	Positive/negative
13	DistPavedroad	Distance to paved road in Km	Positive
14	AgeMigrant	Av. Age of Migrant in years	Positive/negative
15	EdnMigrant	Av. Education of migrants (no. of years of schooling)	Negative
16	Migrant15	No. of migrants above 15 years of age	Negative
17	Education	Education of HH Head in no. of years of schooling	Negative
	ε	Error term	

RESULT AND DISCUSSION

Descriptive Statistics

Poverty rate. The poverty headcount rate has declined in Nepal over a period of about 3 decades. The poverty rate was 41.8 percent in 1995/96, which dropped by half in 2022/23. Rural poverty, although still higher than the national average, has declined steadily. However, urban poverty substantially declined between 1995/96 and 2003/04, but started increasing afterwards (Figure 1).

The poverty rate in Koshi province is 17.19 percent, which is lower than the national average. The rural domain has a higher poverty rate and incidence of poverty than urban areas (Table 2). However, in terms of the distribution of the poor, the urban areas has a higher percentage of poor than rural areas.

Figure 1. Trend of Poverty in Nepal

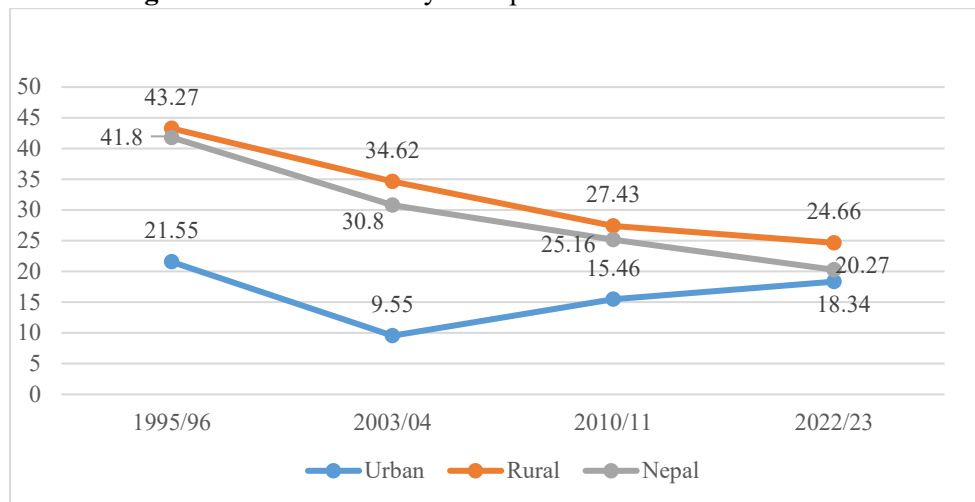


Table 2. Poverty across rural-urban domains in Koshi province

Domain	Poverty Incidence			Distribution of	
	Headcount rate	Poverty gap (x 100)	Poverty gap sq. (x 100)	the poor	the population
Urban	15.90	3.39	1.03	8.38	10.68
Rural	19.67	4.72	1.66	5.42	5.60

Source: National Statistics Office (2024).

Characteristics of the households. In this province, 60.8 percent of the total households are agricultural households, which is higher for rural areas (79.5 percent) than urban areas (51.2 percent). Table 3 summarizes the data for the entire sample, as well as for remittance-receiving and non-remittance-receiving families. It shows that there is a significant difference between the remittance receiving and non-receiving households with regard to household size, landholding, percentage of upland and irrigated area, household assets, and consumption expenditure. The remittance receivers have higher landholding size, irrigated and upland area, and value of household assets than non-receivers. The consumption expenditure, both food and non-food, is also higher for remittance receivers.

Mean income differences. The mean income difference of non-remittance recipients and remittance recipients' households is given in Table 4. For households that do not receive any remittance, the income amount will be the same in both scenarios, which is NPR 145,031. However, when we include the remittance income, the annual average income per capita is NPR 408,106 for the remittance-receiving households. But for the same group, when we do not consider the remittance income, the average income falls to NPRs 105,502, a reduction of 74%. This shows that the recipient families are greatly dependent on remittance income.

The household income is compared between non-remittance receivers and remittance receivers under two scenarios (first row). It reveals that there is a significant income gap. Accounting for remittance income shows that receivers have a

mean per capita income that is 181.4 percent higher than those who do not receive such transfers. However, once remittance income is excluded, the overall income of non-receiving households surpasses that of remittance-receiving households. When excluding remittance income, the mean annual per capita income is 27.3 percent higher for non-recipients compared to recipient households (second row).

Table 3. Characteristics of remittance receivers and non-remittance receivers

Description/ Characteristics	All Sample		Remittance Receiving HHs		Non-remittance Receiving HHs		Mean difference
	Mean	SD	Mean	SD	Mean	SD	
No. of HHs	1416		561		855		
Household head's age	46.7	14.4	47.1	14.9	46.4	14.1	0.76 ^{ns} (0.97)
Household size	3.8	1.7	3.6	1.7	4.0	1.7	0.40 ^{***} (4.99)
Years of Schooling of HH Head	1.4	2.9	1.6	3.0	1.3	2.9	0.29 ^{ns} (1.82)
Landholding (ha)	0.41	0.71	0.48	0.76	0.36	0.68	0.12 ^{***} (3.04)
Percent upland	28.7	42.3	32.1	43.3	26.5	41.4	5.6 ^{***} (2.46)
Percent irrigated	21.4	37.3	25.1	40.8	19.4	36.2	5.7 ^{***} (2.54)
Distance to Main Market (km)	7.2	9.4	7.3	9.4	7.1	9.5	0.2 ^{ns} (0.24)
Distance to Paved Road (Km)	5.9	12.4	6.1	12.6	5.7	12.3	0.40 ^{ns} (0.60)
HH Asset Value ('000 NPR)	152.3	247.0	169.1	266.7	141.3	232.7	27.8 ^{**} (2.08)
HH Income (excluding Remittance, '000 NPR)	129.4	537.1	105.5	511.5	145.0	553.0	39.5 ^{ns} (1.35)
Remit in Cash ('000 NPR)	119.9	365.5	302.6	531.2	0	0	NA
Share of Remittance in total Gross Income of the HH (%)	31.9	42.9	80.4	27.3	0	0	NA
Food Expenditure (NPR '000)	65.25	36.83	70.27	42.45	61.95	32.22	8.32 ^{***} (4.18)
Non-food Expenditure (NPR '000)	76.81	66.77	87.54	74.02	69.76	60.58	17.78 ^{***} (4.93)

Note: Figures in parentheses indicate the t-statistic. ^{***}, ^{**}, and ^{ns} indicate significant at 1 percent, 5 percent, and non-significant, respectively.

Table 4. Difference between the income (per capita) of remittance receiving and non- remittance receiving households

Description	Non-remittance Recipient HHs	Remittance Recipient HHs	Percent change (No remittances vs. remittance recipient)
Mean annual per capita income (NPR) (including remittances)	145,031	408,106	-181.4
Mean annual per capita income (NPR) (excluding remittances)	145,031	105,502	27.3
No. of HHs	855	561	N/A

Result Of Different Models

The results obtained from the use of different models are given in Table 5. Initially, an instrumental variable probit model (IVprobit) was used to correct the issue of endogeneity and the sample selection problem. The urban-rural dummy and ecological dummy variables are used as IVs for remittance-receiving households. The Wald test statistic is not significant, showing no endogeneity. The dummy for remittance-receiving households is not endogenous to poverty. In addition, the Heckman probit (heckprobit) model is employed to test for selection bias. The LR statistic is not significant, suggesting that the outcome equation and selection equation are independent, meaning there's no significant sample selection bias. Hence, a probit model has been used.

In the probit model, gender, household size, household income (excluding remittances), value of household assets, remittances, urban area dummy, and education level of the household head are significant variables.

Education is an important variable contributing to reducing poverty. When household heads are educated, there is a lower probability that a household will fall into poverty. With a 1 unit increase in the number of years of schooling of the household

head, the likelihood of falling into poverty declines by 0.2 units. The marginal effect coefficient shows that the likelihood of households falling into poverty decreases by 0.4 units with a one-unit increase in household assets, and by 0.1 units with a ten-unit increase in household income. The households in urban areas are more vulnerable to poverty in comparison to those living in rural areas. The households receiving remittances are less exposed to poverty in comparison to remittance non-receiving households. The likelihood of being vulnerable to poverty for remittance-receiving households is 1 unit lower than for remittance non-receiving households. With males being the head of the household, the probability of falling into poverty will be higher by 0.8 units compared to female-headed households. With one unit increase in household size, the probability of falling into poverty will increase by 1.2 units.

Table 5. Results of different models

Variables	IVProbit Dependent var: poverty	Heckprobit Outcome var: poverty	Selection: Remitdum	Probit on OLS Marginal effects
Gender	-0.342*	-0.440**	-0.102	-0.008*
HHsize	-0.838	0.365***	0.021	0.012***
Age	-0.006**	-0.005	-0.009*	-0.000
Income	-0.0001	-0.082*	0.000	-0.0001***
ValAssets	-0.001	-0.014***	0.000	-0.0004***
Upland	0.114	-0.167	0.283	0.005
DistMarket	-0.009*	0.012	0.011	0.0003
DistPavedroad	-0.007	0.006	-0.007	0.000
IndigDalitdum	-0.026	0.095	-0.018	0.004
MtnHilldum	IV	-0.023	-0.487**	-0.005
Remitdum	-3.173***	-	-	-0.010**
Urbandum	IV	0.743***	0.080	0.012**
AgeMigrant	-0.002	-	0.002	-
EdnMigrant	0.023*	-	0.045***	-
Migrant15	0.120**	-	0.224**	-
Education	-0.003	-0.095**	0.008	-0.002**
Constant	2.668***	-1.637	1.293***	-
Tests	Wald Chi ² 1.24 (prob = 0.265)	LR test of indep. eqns. (rho = 0): chi ² (1) = 0.03 (prob = 0.853)		Pseudo R ² =0.288 LR Chi ² (13)=341.92***

CONCLUSION

Most development strategies in developing countries aim to reduce poverty, yet it remains a significant global issue, affecting all nations differently. In Nepal, poverty alleviation has been prioritized in government plans since 1980, but progress has not met targets. This paper investigates the determinants of poverty in Koshi province of Nepal using data from the Nepal Living Standards Survey IV with a sample size of 1416 households. Different models, such as the instrumental variable probit model (IVprobit), were used initially to correct the issue of endogeneity and the sample selection problem. The Heckman probit (heckprobit) model was also employed to test for selection bias. The results of these models indicated no endogeneity and selection bias. Hence, the probit model is employed.

In Koshi province, the poverty level is 17.19 percent, which is more concentrated in rural areas in comparison to urban areas. About 61 percent of households in this province are agricultural households. Migration is happening among higher landholding size, irrigated and upland areas, and the value of household assets in comparison to households having a lower value of these parameters. The remittances has contributed significantly to bringing households out of poverty, but such households are less efficiently mobilizing domestic resources at their disposal in comparison to non-remittance receiving households. Higher levels of household assets, education, and smaller family size contribute to poverty reduction; however, education level carries higher power.

The identification of poverty concentration and focusing on education is an important policy tool to reduce poverty. The public policy framework that promotes the mobilization of resources owned by remittance-receiving households in favor of non-remittance-receiving households will contribute to overall poverty reduction and reduce vulnerability against future shocks in the remittance regime.

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