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Factors shaping household expenditure in Gandaki Province: Evidence from Panel Data

Research Unit, Pokhara Office[1]

ABSTRACT

This study aims to investigate the determinants of household expenditure in Gandaki Province. Our analysis utilizes data from a three-year panel survey, the Nepal Household Risk and Vulnerability Survey 2016-2018, conducted by the World Bank, encompassing 554 households in seven districts within the Gandaki Province. The descriptive analysis reveals that about 45 percent of the households received remittances in Gandaki province, conspicuously higher than the national average of 38 percent. The average amount of remittances received by households in Gandaki is also perceptibly higher compared to national average. The econometric analysis suggests that years of schooling and the distance of household to vital infrastructures are influencing factors of household expenditure across all domains. Likewise, households headed by males spend more on food, alcohol, and home improvements. Higher self-employment rates in a community are associated with higher self-production, agriculture expenses and livestock purchase. In contrary, higher wage employments in a community tend to deter investment in agriculture and livestock. Evidently, households with more female members spend less on education. Finally, we observe that remittances tend to contribute to a rise in expenditures, particularly on durable goods and home improvements.

Keywords: Expenditure, Gandaki Province, Welfare, Remittances

JEL Codes: F24, I30, R20

[1] This study was conducted under the guidance of Director Mrs. Arya Joshi, by a team consisting of Deputy Director Mrs. Nabina Dhakal, Assistant Directors Mr. Bikram Budhathoki, and Mr. Rohan Byanjankar. Deputy Director Mrs. Nabina Dhakal contributed in review and writing, Assistant Director Bikram Budhathoki conducted detailed review of literature, and Assistant Director Rohan Byanjankar was responsible for data curation, formal analysis and writing. Corresponding author's email: rohanbjkr@nrb.org.np.

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I. INTRODUCTION

The spending patterns of households provide insights into how they utilize their resources and allocate them across various expenditure domains. This allocation encompasses essential areas such as food, clothing, energy, home improvements, durable goods, education, healthcare, agriculture, and livestock purchases, providing a comprehensive view of the household's economic behaviors. Prevailing literature has commonly utilized household expenditure as a proxy for household welfare (Amendola et al., 2016; Mishra et al., 2022). Expenditure on education and healthcare by households serves as a means of investing in human capital, contributing to the overall development and well-being of individuals. Likewise, spending on agriculture expenses and livestock purchases reflects the level of investment in agriculture and the expansion of agricultural activities. Additionally, food expenditure provides insight into the household's allocation of resources toward consumables, representing a fundamental aspect of their daily sustenance.

Existing literature has examined the determinants of household expenditure in various domains, including food (Kostakis, 2014; Stewart et al., 2003; Yimer, 2011), education (Bayar & Ilhan, 2016; McMahon, 1970; Tilak, 2002), healthcare (Han et al., 2013; Khaing et al., 2015; Su et al., 2006), and alcohol (Cheah, 2015; Yen & Jensen, 1996). The majority of the existing literature has integrated household characteristics and other area-level control variables within the scope of their respective studies. While there is variation in methodologies across the literature, the diverse approaches consistently lead to comparable conclusions. For instance, Yimer (2011) and Kostakis (2014) have similar findings in terms of determinants of food expenditure. Likewise, other literature on various domains also exhibits parallel findings. However, existing literature is confined to a specific expenditure domain, such as food, healthcare, and education. This underscores the need to holistically assess the determinants of household expenditure. Moreover, this study illustrates the factors affecting household expenditure at the province level of Nepal.

The data for our analysis comes from a three-year panel survey of Nepal Household Risk and Vulnerability Survey 2016 – 2018 collected by the World Bank. This survey incorporates 592 households residing in 7 districts (Gorkha, Lamjung, Tanahun, Syangja, Myagdi, Baglung, and Nawalparasi East) of Gandaki Province. Following Bell and Jones (2015), Wagle and Devkota (2018), and Wooldridge (2009), we utilize a random effect model to determine the factors affecting household expenditure. We also investigate the impact of remittances on household expenditure using propensity score matching following Mayor et al. (2020). We have established the delimitations of our study to precisely define its scope. While our dataset

enables analysis on a much larger scale, covering the entire country, our specific focus is on assessing the determinants of household expenditure in Gandaki Province. This choice serves as a deliberate limitation to ensure a more focused and in-depth examination within the specified administrative region.

Our findings reveal that households headed by males spend more on meat, alcohol, and home improvements while spending less on education compared to their female counterparts. Families with more female members spend more on clothing, food, and healthcare but less on education. Households that experienced shocks spend less on food and ceremonies and more on durable goods, home improvements, healthcare, and agricultural expenses. Similarly, distance to market and motor road have a negative effect on expenditure on food, meat, energy, clothes, durable goods, and healthcare. Households that favor public education spend more on agricultural costs and less on energy, durable goods, and ceremony. Education of household heads substantially affects overall household expenditure except for expenditure on alcohol and tobacco. Households owning low-plain land rely more on self-produce thereby curtailing food expenditure and expanding expenditure on agriculture expenses. Landholdings have a positive effect on self-production, home improvements, energy, and the acquisition of durable goods. Likewise, household indebtedness tends to increase expenditure on home improvements, healthcare, alcohol and tobacco, and agriculture expenses.

The latter section of this article proceeds as follows: Section II delves into the related literature, while Section III presents the data and methodology. Section IV outlines the results and discussion. Finally, Section VI concludes the study.

II. RELATED LITERATURE

Existing literature investigates the determinants of household expenditure from a holistic such as Mignouna et al. (2015), Varlamova and Larionova (2015), Yimer (2011) and Zwane et al. (2016) or a specialized perspective, such as Bayar and Ilhan (2016), Cohen et al. (2009), Han et al. (2013), Khaing et al. (2015), Kostakis (2014), McMahon (1970), Meng et al. (2012), Stewart et al. (2003), and Yen and Jensen (1996). Prior literature examines the determinants of household expenditure on health, such as Han et al. (2013), Khaing et al. (2015), and Su et al. (2006), education, such as Bayar and Ilhan (2016) and McMahon (1970), food, such as Kostakis (2014), Meng et al. (2012), Parappurathu et al. (2019), Stewart et al. (2003) and Yimer (2011), and alcohol, such as Cheah (2015) and Yen and Jensen (1996).

Previous literature examining the determinants of household food expenditure apprises that income and other demographic characteristics are the major factors influencing expenditure on

food. Yimer (2011) concludes that socio-demographic characteristics (household sizes, dependency ratios, education, employment status, gender) were significant in explaining both the decision to consume and the level of consumption. Likewise, the findings of Kostakis (2014) are in parallel to Yimer (2011) and find that income, gender, age, marital status, place of residence, and status of employment are the major determinants of food expenditure. Notably, poor households spend substantially less on food, including fruits and vegetables, than non-poor households (Steward et al., 2003).

Preceding literature on healthcare expenditure uncovers some prominent factors influencing healthcare expenditures, including education level (Varlamova & Larionova, 2015), distance to hospital (Das et al., 2015), and rural settings (Ghany & Sharpe, 1997), among others. Varlamova and Larionova (2015) suggest that the education level is a significant demographic factor that influences household health spending. Noteworthily, distance to the hospital from the household stands as one of the insuperable barriers to healthcare facilities thereby leading to lower healthcare expenditure (Das et al., 2015). Likewise, rural households with higher elderly members spend more on health and personal care compared to urban counterparts (Ghany & Sharpe, 1997).

Past literature on determinants of education expenditure delineates some pressing factors, which include household income (Bayar & Ilhan, 2016; Tilak, 2002), education of the household head (Tilak, 2002), gender of the household head (Khan & Khalid, 2012), among others. Tilak (2002) concluded that household income, the educational level of the head of the household, level of development of the village are important determinants of household expenditures on education. On the other hand, Khan and Khalid (2012) find that female-headed households are seen to have higher budget shares for education, housing, fuel and lighting, clothing and footwear, household effects, and lower average expenditures on food and drinks and transport and communications compared to their male-headed families. Income elasticity of education expenditure is higher for poorer households compared to the richer ones (Bayar & Ilhan, 2016) implying that for poorer households, the increase in income has a relatively stronger impact on their education spending.

Preexisting literature on household alcohol spending traces demographic factors influencing alcohol spending, including age, income, gender, and education (Cheah, 2015; Yen & Jensen, 1996). Cheah (2015) reveals the likelihood of heavy alcohol drinking is positively associated with younger individuals, lower-income earners, males, the less-educated, non-singles, rural dwellers, and the employed. Surprisingly, elderly who completed a college degree spent significantly more on food away from home, and alcohol and tobacco (Ghany & Sharpe, 1997).

Likewise, income, region, and household demographics such as household composition, education, home ownership, and gender, age, and race of household head are among the significant determinants of household alcohol expenditure (Yen & Jensen, 1996).

Plethora of literature investigates the determinants of household spending on education, health, food, and alcohol. The literature exhibits variation in methodology, yet converges to similar conclusions. This study uncovers the major determinants of household expenditure in Gandaki Province. Our study delves into expenditure categorization that is rarely explored, including energy, self-production, agriculture expenses, and livestock purchases. Notably, this study is one of the first studies to investigate the determinants of household expenditure at the province-level of Nepal.

III. DATA AND METHODOLOGY

3.1 Data

The study uses three-year panel survey data from Nepal Household Risk and Vulnerability Survey 2016 to 2018. The survey has been conducted between May and September incorporating 6000 households residing in 50 districts spanning over 7 provinces of Nepal in each survey year (Walker et al., 2019). The survey includes 554 households residing in 7 districts (Gorkha, Lamjung, Tanahun, Syangja, Myagdi, Baglung, and Nawalparasi East) of Gandaki Province in each survey year. The survey covers rural and semi-urban households that might have precluded districts, including Kaski.

3.2 Methodology

The data availability enables us to deploy panel regression. Within panel regression, fixed effect, and random effect regressions are the popular techniques to estimate regression coefficients. The study follows the methodology proposed by Bell and Jones (2015) and Wooldridge (2009) and applied by Wagle and Devkota (2018). The ability of random effect to incorporate time-invariant factors motivates Bell and Jones (2015) to use random effect instead of fixed effect even though Hausman's test suggests in favor of applying fixed effects regression. Likewise, Wagle and Devkota (2018) also preferred applying random effect regression to fixed effect regression as fixed effect regression discards information that would be helpful to investigate the effect of time-invariant characteristics, such as ethnicity, gender, and geographical location.

$$Y_{it} = \beta_0 + \beta_1 S_{it} + \beta_2 H_{it} + \beta_3 Z_{it} + \lambda + \Gamma + \Lambda + \epsilon_{it} - - - (1)$$

Here, i and t subscripts denote i^{th} household at year t. Y_{it} refers to the expenditure of i^{th} household on different headings at year t. S_{it} represents individual characteristics of the household head, H_{it} encompasses household characteristics, and Z_{it} incorporates community characteristics. Likewise, $\lambda, \Gamma, and\ \Lambda$ are the caste fixed effects, year fixed effects, and district-level fixed effects. The exhaustive list of variables has been presented in Appendix

Likewise, we investigate how remittances reshape household expenditure using propensity score matching. Randomization is not possible in observed data, so a quasi-randomization technique has been applied. Propensity Score Matching (PSM) is a good strategy for impact evaluation as it creates an artificial control group by matching participants from the treatment group with participants from the control group who have similar propensity scores (Mayor et al., 2020; Rosenbaum, 2005; Setboonsarng & Parpiev, 2008). The PSM method eliminates selection bias and enables comparison of the factual and counterfactual to estimate the outcome of the program. Considering the possibility of bias estimate, time varying variables have been excluded when conducting propensity score matching.

The choice of a matching algorithm plays a crucial role in propensity score matching. Several matching algorithms are available such as nearest neighborhood, radius, kernel, etc. Nearest neighborhood matching or radius matching underestimates standard errors (Smith, 2000) and they suffer from the problem of non-smoothness in calculating standard errors with bootstrapping (Abadie & Imbens, 2006). To overcome these limitations, we applied Kernel matching; this matching method provides more weight to controls with small distances resulting in lower variance (Caliendo & Kopeinig, 2005; Jann, 2017). However, the choice of bandwidth parameter is important for the successful implementation of this method. The pair-matching algorithm proposed by Huber et al. (2013, 2015), cited in Jann (2017), for automatic bandwidth selection, has been applied to address this issue. Limited literature has exercised propensity score matching with a small sample size. However, Pirracchio et al. (2012) conclude that propensity score matching can yield unbiased estimations of treatment effect even in the case of small samples.

IV. RESULT AND DISCUSSION

4.1 Descriptive analysis

We begin our empirical analysis by presenting the descriptive statistics of both outcome and independent variables. We present the descriptive statistics for the full sample for Nepal and Gandaki province. We also incorporate the statistics of households receiving and non-receiving remittances in Gandaki province.

Table 1: Descriptive analysis

Variable	Full sample				Remittances received or not (Gandaki)			
	Nepal (1)	Gandaki (2)	Diff	Sig	Yes	No	Diff	Sig
	Mean/Prop	Mean/Prop	(1-2)		Mean/Prop	Mean/Prop	(Yes-No)	
Gender (1=Female)	0.24	0.26	(0.02)		0.37	0.17	0.20	***
Age of HH head	50.44	53.25	(2.81)	***	54.46	52.26	2.21	**
Years of education of HH head	3.87	4.26	(0.39)	***	3.98	4.48	(0.50)	*
HH size	4.81	4.40	0.41	***	4.39	4.41	(0.01)	
Number of females in HH	2.42	2.21	0.21	***	2.35	2.10	0.25	**
Members aged 5 to 25	1.95	1.51	0.44	***	1.49	1.53	(0.04)	
Members aged 26 to 59	1.74	1.62	0.12	***	1.38	1.81	(0.43)	***
Members aged above 59	1.13	1.27	(0.14)	***	1.51	1.08	0.44	***
Shocks (1=Yes)	0.22	0.37	(0.15)	***	0.38	0.36	0.02	
Value of lowland (in '000' Rs.)	1124.35	1249.00	(124.65)	***	972.03	1475.12	(503.09)	*
Value of upland (in '000' Rs.)	412.62	696.28	(283.66)	***	710.38	684.77	25.61	
Remittances (1=Received)	0.38	0.45	(0.07)	**			0.00	
Remittances in Rs (in '000' Rs.)	176.97	209.62	(32.65)	***	209.62		209.62	
Rural settings (1=Rural)	0.50	0.48	0.03		0.49	0.47	0.02	
Income in Rs. (in '000' Rs.)	149.48	137.77	11.70	***	89.46	177.22	(87.76)	***
Distance to market in km	5.45	6.95	(1.50)	***	6.65	7.19	(0.54)	
Distance to motor road in km	2.07	1.28	0.79	***	0.85	1.63	(0.78)	***
Attending private school	0.33	0.27	0.06		0.30	0.24	0.06	
Attending government school	0.98	0.84	0.15	***	0.73	0.93	(0.20)	**
Annual expenditures in Rs.			0.00				0.00	
Self-produce	41813.97	44444.98	(2631.01)	***	43991.79	44814.96	(823.17)	
Total food	73273.64	77032.58	(3758.94)	***	73853.42	79628.03	(5774.61)	
Basic food	49753.87	49579.11	174.75	***	48060.58	50818.83	(2758.25)	
Meat	15171.89	18735.02	(3563.13)	***	18325.30	19069.51	(744.21)	
Alcohol and Tobacco	4674.97	3902.25	772.72	***	2957.11	4673.86	(1716.75)	***
Energy	3487.02	4299.37	(812.35)	***	4330.10	4274.28	55.82	
Clothes and apparel	14486.30	16804.28	(2317.98)	***	17008.07	16637.90	370.17	
Home expenses	36711.78	45634.21	(8922.43)	***	46839.96	44649.84	2190.12	
Ceremony	26720.64	35423.24	(8702.60)	***	35474.40	35381.48	92.92	
Durables	5764.45	7721.54	(1957.09)	***	8726.02	6901.49	1824.53	
Healthcare	12041.88	10072.74	1969.14	***	10568.48	9668.02	900.46	
Education	14158.80	14606.11	(447.32)	***	14202.47	14935.64	(733.17)	
Agriculture expenses	13744.22	12377.75	1366.48	***	14291.89	10815.05	3476.84	*
Livestock purchase	3156.42	2431.14	725.29	***	2639.06	2261.39	377.66	

The descriptive statistics in Table 1 reveal that a non-negligible proportion of households are headed by females in Gandaki province. The average age of household heads in Gandaki province is 53 years, which is higher than that of the national average of about 51 years. Statistics on education, household size, number of female members, and number of members based on different age groups are akin to the national average. However, about 37 percent of households experienced shocks which is substantially higher than the national average of 22 percent.

Similarly, about 45 percent of households in Gandaki province received remittances compared to a national average of 38 percent. In terms of annual expenditure, Gandaki province has higher expenditures for self-produce, food, basic food, meat, energy, clothes and apparel, home expenses, ceremony, durables, and education compared to the national average. The descriptive statistics in Table 3 reveal that a non-negligible proportion of households are headed by females in Gandaki province. The detailed results are presented in Table 3.

We further delve by categorizing the households of Gandaki Province as remittances receiving and not receiving. Female heads around 37 percent of remittances receiving households, while female heads approximately 17 percent of remittances not receiving households. Similarly, households receiving remittances have more female members than households not receiving remittances. As expected, remittances receiving households have substantially less household income than those not receiving households. Except for alcohol and agricultural expenses, the average expenditure is not significantly different between households receiving and not receiving remittances.

4.2 Econometric analysis

We conduct econometric analysis to investigate the determinants of household expenditure and to assess if remittances reshape household expenditure in Gandaki province. Table 2 presents the panel random effect regression result on the factors influencing household spending on various domains. Each column depicts the factors that determine each expenditure heading. We limit our explanation to key variables and results that are statistically significant. Additionally, we do not present district-level control variables to conserve the space. We shall interpret these coefficients as effects, not causal effects. The causal effects may be different from the naive effect, but estimation of the causal effect is beyond the scope of this study.

Households headed by males spend more on food, alcohol, and home expenses while spending less on education compared to female counterparts. Education of household heads substantially affects overall household expenditure except for expenditure on alcohol and tobacco, and firewood. The number of members of all age groups positively affect expenditure on food and education, whereas self-produce increases with an increase in working age population. Families with more female members spend more on self-production, food, clothing, healthcare and agriculture expenses but less on education. Clearly, households with a higher proportion of female members tend to allocate less spending towards education, suggesting a potential preference against investing in female education. Households that experienced shocks spend less on food and ceremonies and more on firewood, durable goods, home improvements, healthcare, and agricultural expenses.

Moreover, households owning low-plain land rely more on self-produce thereby curtailing food expenditure and expanding expenditure on agriculture expenses. Landholdings have a positive effect on self-production, home improvements, firewood, and agriculture expenses. Likewise, household indebtedness tends to increase expenditure on home improvements, healthcare, alcohol and tobacco, and livestock purchases. Likewise, remittance-receiving households spend less on education and more on clothing, home improvements, and ceremony. Aligned to our expectation, households with higher incomes spend more on meat, alcohol, healthcare and livestock. Notably, households that choose private education spend more on clothing, food, energy, health care, and alcohol and tobacco. Distance to market and motor roads substantially affect all the expenditure domains. Particularly, distance to market and motor road has a perceptible negative effect on expenditure on food, meat, energy, clothes, durable goods, and healthcare. This suggests that households residing distant from the market and motor roads sustain on self-production as expected. Likewise, households that favor public education spend more on food, clothes, and healthcare, but less on self-production. Notably, nature of employment within community has substantial effect on household behavior. Higher self-employment rates in a community are associated with higher self-production, agriculture expenses and livestock purchase. In contrary, higher wage employments in a community tend to deter investment in agriculture and livestock. This implies that households engaged in self-employment rely more on agriculture for their livelihood.

Table 2: Determinants of household expenditure: Panel regression

Variables	(1) Self-produce	(2) Food	(3) Basic food	(4) Meat	(5) Alcohol	(6) Energy	(7) Firewood	(8) Clothes	(9) Home expenses	(10) Ceremony	(11) Durables	(12) Health	(13) Education	(14) Agriculture	(15) Livestock
Gender of HH head (1=Male)	0.11	0.06*	-0.01	0.26	2.60***	-0.10	0.21	0.00	0.88***	-0.04	-0.20	0.20	-0.54***	-0.08	0.43
Age of HH head	8.48**	-0.44	-0.42	-6.12	15.03*	3.85	-1.56	1.33	8.26	0.54	13.86	-0.35	-4.15	12.38*	4.36
Age squared	-1.06**	0.08	0.08	0.69	-1.95*	-0.46	0.11	-0.16	-1.07	-0.03	-1.84	0.17	0.53	-1.60*	-0.56
Education of HH head	0.02	0.07***	0.07***	0.24**	-0.36***	0.30***	-0.37***	0.05***	0.06	0.09**	0.35***	0.13	0.13*	0.04	0.02
Number of females in HH	0.52**	0.14**	0.15***	0.10	-0.46	0.03	0.04	0.13***	-0.52	0.27	-0.10	0.64**	-0.95***	0.61*	-0.14
HH members aged below 5	0.21	0.16***	0.14***	-0.02	0.52	0.11	-0.42	0.09	0.05	0.00	-0.03	2.86***	0.47*	0.03	-0.26
HH members aged 5 to 25	0.32**	0.22***	0.26***	0.25	-0.01	0.04	0.20	0.29***	1.05***	0.43***	1.11***	-0.11	0.60***	-0.44	0.01
HH members aged 26 to 59	0.54***	0.23***	0.22***	0.58	0.35	0.07	0.30	0.34***	-0.51	0.16	0.78**	0.26	0.84***	0.26	0.18
HH members aged 59 plus	0.38**	0.08**	0.05	0.21	0.77***	0.11	0.39**	0.12**	-0.17	0.12	0.59**	0.04	0.28**	0.27	-0.08
Shocks (1=Yes)	0.10	-0.06*	-0.06*	-0.22	0.45	-0.01	0.52**	-0.13***	0.97***	-0.24*	0.64**	1.25***	-0.12	0.27	0.19
Value of lowland	0.09***	-0.01***	-0.02***	-0.01	-0.03	0.01	0.02*	0.00	-0.01	0.00	0.02	0.00	-0.01	0.13***	0.00
Value of upland	0.04***	0.00	0.00	0.02	0.03	0.00	0.03*	-0.01**	0.04*	0.01	0.03	0.02	-0.02	0.12***	0.02
Loan amount	0.00	0.00	0.00	0.00	0.06***	0.00	0.05***	-0.00**	0.06***	0.01**	-0.01	0.07***	0.01	0.02	0.07***
Remittances (1=Received)	0.08	0.00	0.01	0.01	-0.19	0.09	-0.01	0.06*	0.48***	0.13*	0.26	-0.13	-0.19*	0.13	-0.06
Rural (1=Yes)	0.02	0.02	0.03	0.02	-0.08	0.00	0.08	-0.02	0.48	0.02	-0.01	0.26	0.07	-0.65***	0.43**
Income	-0.01	0.01*	0.00	0.07**	0.06*	0.02*	0.01	0.00	0.03	0.00	0.03	0.04**	0.01	0.02	0.04**
Distance to market	0.24***	-0.08***	-0.06**	-0.54***	0.17	-0.29***	0.23	-0.05**	-0.04	-0.03	-0.19	-0.02	-0.03	0.23	-0.07
Distance to motor road	0.27*	-0.15***	-0.10*	-0.83***	0.25	-0.38***	-0.05	-0.05	0.57*	0.03	-0.61***	-0.27*	-0.12	-0.14	-0.11
Self-employment rates	0.49**	-0.10**	-0.14***	0.19	-0.38	-0.22	0.30	0.02	0.28	0.01	0.08	0.19	-0.27	1.05***	0.38**
Wage employment rates	-0.54**	0.13**	0.18***	-0.32	0.24	0.24	-0.52	-0.03	-0.44	-0.02	-0.03	-0.26	0.01	-1.56***	-0.71***
Private school	-0.37**	0.13***	0.10**	0.61	0.45	0.43***	-0.96***	0.17***	0.37	-0.11	-0.02	0.65**	7.61***	0.23	0.35
Government school	-0.09	0.01	0.03	-0.09	-0.22	-0.25**	0.18	0.02	-0.32	-0.32***	-0.74**	0.04	7.02***	0.48**	0.22
Constant	-30.85	7.27	4.7	-25.22	40.05	7.45	-22.16	-2.17	-142.69*	-75.18***	-25.64	118.86***	-24.42	-107.97*	63.97
Observations	1,662	1,662	1,662	1,662	1,662	1,662	1,662	1,662	1,662	1,662	1,662	1,662	1,662	1,662	1,662
Number of HHs	554	554	554	554	554	554	554	554	554	554	554	554	554	554	554

Note: PSU level control variables incorporates self-employment rates and wage employment rates, district level control variables include poverty, life expectancy, and rainfall, and remaining control variables are caste dummy, ecological belt dummy, and year dummy. Standard errors clustered at PSU level. ***, **, *: 1%, 5%, and 10%

The results depicted in Table 2 may not be appropriate to interpret as causal effects. About half of the households in Gandaki province received remittances in 2018 which motivates us to investigate if remittances reshape household expenditures. Table 3 presents the causal effect of remittances on household expenditures using propensity score matching. Remittances tend to contribute to a rise in expenditures, particularly on durable goods and home improvements. The increased financial inflow from remittances appears to be channeled towards investments in long-lasting items and improvements to residential spaces, ultimately reflecting an improved and more comfortable lifestyle. Moreover, the findings align partly with Mishra et al. (2022).

Table 3: Causal effect of remittances on household expenditures

Outcome	**Self-produce**	**Food**	**Basic food**	**Meat**	**Alcohol**	**Energy**	**Clothes**
ATT	0.19	0.03	0.05	0.08	-0.16	0.06	0.06
Observations	1662	1662	1662	1662	1662	1662	1662
Outcome	**Home expenses**	**Ceremony**	**Durables**	**Health**	**Education**	**Agriculture**	**Livestock**
ATT	0.46**	0.14	0.38*	0.13	0.12	0.30	-0.03
Observations	1662	1662	1662	1662	1662	1662	1662

Note: control variables: gender of HH head, age of HH head, education of HH head, number of HH members aged 5 to 25, HH members aged 26 to 59, HH members aged 59 plus, shocks (1=yes), rural (1=yes), number of members attending private school, number of members attending government school, PSU level control variables incorporate self-employment rates and wage employment rates, district level control variables include poverty, life expectancy, and rainfall, and remaining control variables are caste dummy, ecological belt dummy, and year dummy. Standard errors clustered at PSU level. ***, **, *: 1%, 5%, and 10%.

4.3 Discussions to results

Household expenditures are one of the best proxies for household welfare. Expenditure on health and education is related to human capital investments, while spending on food relates to household well-being, including nutrition. Likewise, higher spending on alcohol and tobacco may eventually worsen well-being since these products may impede health. We also explore the determinants of agriculture expenses and livestock that provide insights on promoting investment in agriculture, including livestock.

Our results are congruous with prior literature. Existing literature, including Bayar and Ilhan (2016), Tilak (2002), Varlamova and Larionova (2015), Yimer (2011), illustrates education of

household head as the major factor influencing spending on food, education, and health. Our results regarding education level and spending on food, education, and health are parallel to Bayar and Ilhan (2016), Tilak (2002), Varlamova and Larionova (2015), and Yimer (2011). Notably, we observe a negative effect of the education level of household heads on spending on alcohol and tobacco, which perfectly aligns with Cheah (2015) and contradicts Yen and Jensen (1996). Credible arguments may support the negative relationship between education level and tobacco and alcohol consumption: (i) health consciousness rises with education level, potentially preventing households with higher levels of education from spending more on tobacco and alcohol and (ii) education creates societal consciousness and encourages socially responsible behavior that discourages people from using harmful consumables, such as alcohol and tobacco.

Moreover, we conclude that spending on energy also increases with education level of the household head. This indicates that educated household heads prefer smoke-free, environmental and health friendly energy alternative, such as LPG gas and electricity, to firewood. Conspicuously, we observe that households owning plain lands rely on self-production implying less expenditure on the purchase of food items. This argument is cushioned by higher agriculture expenses for households owning plain lands. Furthermore, we observe that household with higher number of females spend less on education, suggesting that households do not prioritize education for female. Traditional beliefs and the perception of females as members who leave their parents' house after marriage might discourage households from investing in the education of females.

Finally, we observe that remittances have a tendency to boost expenditure in categories such as home improvements and durable goods. Households often send their members for foreign employment with the aim of enhancing their living standards, providing a plausible explanation for the positive impact of remittances on these specific expenditure domains. Moreover, relative income hypothesis may offer a better understanding of this phenomenon, as households are influenced by a demonstration effect that motivates them to align their lifestyle with that of other elite households in the community. In addition, for Nepalese households, a home is not just a place to live, but also a symbol of status. Therefore, they are keen to spend money on improving and renovating their homes.

V. CONCLUSION

The analysis of determinants of household expenditure in Gandaki province yields insightful findings. We observe substantial differences in expenditure between male and female household heads. Moreover, years of schooling and the distance of households to vital infrastructures emerge as the influencing factors of household expenditure across all domains. This underscores the need for policymakers to concentrate efforts on improving the accessibility and availability of high-quality education. Furthermore, policymakers should prioritize initiatives aimed at enhancing the accessibility and availability of essential infrastructures, such as well-maintained roads and easy accessibility to the market. We observe less priority on female education, which necessitates initiatives to promote gender equality in education, create awareness about the long-term benefits of female education, and provide financial support or incentives to encourage households to prioritize and invest in the education of female members. We perceive that remittances tend to contribute to a rise in expenditures, particularly on durable goods and home improvements. This underscores the importance of implementing policies that encourage the diversification of remittance utilization towards more productive activities.

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APPENDIX

Appendix 1

Table A1: Description of variables

SN	Variable	Nature
1.	Gender of household head	Dummy (1=Male)
2.	Age of household head	Log transformation
3.	Age squared	Log transformation
4.	Years of education of household head	Log transformation
5.	Number of female members	Log transformation
6.	Number of members aged below 5	Log transformation
7.	Number of members aged 5 to 25	Log transformation
8.	Number of members aged 26 to 59	Log transformation
9.	Number of members aged above 59	Log transformation
10.	Shocks*	Dummy (1=Exposed to shocks)
11.	Lowland*	Log transformation
12.	Upland*	Log transformation
13.	Income*	Log transformation
14.	Loan groups	Dummy (1=Formal, 2=Informal, 3 = No loan)
15.	Remittances	Dummy (1=Received)
16.	Distance to market in km	Log transformation
17.	Distance to motor road in km	Log transformation
18.	Rural settings	Log transformation
19.	Ethnicity	Dummy
20.	Self-employment rates in PSU	Log transformation
21.	Wage employment rates in PSU	Log transformation
22.	Distance to urban center in km	Log transformation
23.	District: Rainfall in mm	Log transformation
24.	District: Poverty	Log transformation
25.	District: Life expectancy	Log transformation
Household expenditures		
26.	Self-produce	Log transformation
27.	Food	Log transformation
28.	Basic-food	Log transformation
29.	Meat	Log transformation

SN	Variable	Nature
30.	Alcohol and tobacco	Log transformation
31.	Energy	Log transformation
32.	Firewood	Log transformation
33.	Clothes and apparel	Log transformation
34.	Home improvements	Log transformation
35.	Ceremony	Log transformation
36.	Durable goods	Log transformation
37.	Health	Log transformation
38.	Education	Log transformation
39.	Agriculture expenses	Log transformation
40.	Livestock purchase	Log transformation

*Note: * These variables have been discussed in the subsequent portion.*

We allude briefly to some of the variables listed in Table A1. Shocks is a dummy variable that takes value 1 if the household has suffered from a natural disaster or loss of a family member or loss of agricultural output or riot or disease or injury of a family member, 0 otherwise. Lowland and upland represent the monetary value of landholdings of a household. Lowland refers to the plain land while upland denotes land in hills or rocky terrain. Income of a household constitutes wage income, rent from land and equipment, and revenue from financial assets, but excludes remittances.