Research Square

Preprints are preliminary reports that have not undergone peer review.
They should not be considered conclusive, used to inform clinical practice,
or referenced by the media as validated information.

The Impact of Handcraft Participation on Rural Household Income in Gondar Zuria District Ethiopia

Fasil Tefera Shibesh
Injibara University
Tadsual Asfaw Dessie
tadsualasfaw30@gmail.com
Mekdela Amba University

Research Article

Keywords: Handicraft, Impact, Rural Income, Ethiopia

Posted Date: July 1st, 2026

DOI: https://doi.org/10.21203/rs.3.rs-9903615/v1

License: This work is licensed under a Creative Commons Attribution 4.0 International License.
Read Full License

Additional Declarations: No competing interests reported.

The Impact of Handcraft Participation on Rural Household Income in Gondar Zuria District Ethiopia

Fasil Tefera Shibesh[1], Tadsual Asfaw Dessie[2*]

1 Department of Rural Development and Agricultural Extension, Injibara University, Injibara, Ethiopia

2 Departments Rural Development and Agricultural Extension, Mekdela Amba University, Gimba, Ethiopia

***Corresponding author**: Tadsual Asfaw Dessie, Email: tadsualasfaw30@gmail.com

Abstract

Purpose: The main economy of developing countries is dependent on agriculture. However, their productivity is not able to feed their populations. Due to this, handcraft, covers the deficit from low agricultural productivity. While handicrafts have the potential to be a substantial income source, limited research exists on the impact of handicrafts on household income in the Gondar Zuria district. Therefore, this study intended to analyze the impacts of handicrafts on household income.

Design/methodology/approach: A cross-sectional research design was employed, utilizing primary data collected from 267 households through structured questionnaires using a multi-stage sampling technique. The study used descriptive and endogenous switching regression models.

Findings: The descriptive statistics revealed that 33.7% of sampled households participated in handicrafts, while 66.3% did not. The Endogenous Switching Regression model showed that handcraft participation significantly increased household income. Participants had a 31% income probability, and non-participants could potentially increase their income by 74% if they participated. The heterogeneity effect was -0.43, implying that the impact of handcraft is greater for non-participating individuals if they were to participate. The study confirmed that handicrafts have a positive impact on a household's income. The study suggests local governments should advise and support households to encourage handicraft participation, particularly among non-participants.

Keywords: Handicraft, Impact, Rural Income, Ethiopia**.**

Introduction

Background and Justifications of the Study

Agriculture remains the backbone of most developing economies, contributing significantly to national GDP and serving as the primary livelihood for rural households (FAO, 2021). Despite diverse agro-ecological conditions and mixed farming systems, many smallholder farmers continue to rely heavily on rain-fed agriculture, making them highly vulnerable to climate shocks, environmental degradation, low income and recurrent food insecurity (Shah and Patel, 2017; Ginindza and Mpandeli, 2021). Low productivity is further exacerbated by limited market access, inadequate education, weak rural infrastructure, and recurrent policy challenges (FAO, 2019). These constraints have intensified rural poverty, necessitating alternative livelihood pathways that can buffer households against agricultural risks.

Non-farm income diversification has emerged as a critical livelihood strategy across developing regions, contributing up to 42% of household income in Africa, 32% in Asia, and 40% in Latin America (Neglo *et al*., 2021). Rural non-farm activities, including self-employment, wage work, and microenterprise, play a substantial role in poverty reduction, income stabilization, and livelihood resilience (Duong *et al*., 2021; Ibrahim *et al*., 2019) .Among these, traditional handicrafts constitute an important and culturally embedded economic activity. Globally, countries such as India, Japan, China, and Indonesia have successfully leveraged handicrafts to enhance rural employment, preserve cultural heritage, and promote economic development (Ueki and Kamiesu, 2019; Dana *et al*., 2022; Dalal *et al*., 2024).Ethiopia similarly recognizes the sector's economic and cultural significance, integrating handicraft development into national economic strategies (Abreham, 2022; Kemal, 2020).

Ethiopia's handicraft sector encompasses weaving, pottery, blacksmithing, jewelry, basketry, woodwork, and other indigenous crafts that contribute both to cultural identity and household income (Temesgen *et al*., 2018; Wondirad *et al*. 2022; Bayisa *et al*., 2024).The Amhara Region is particularly known for its rich craft traditions, hosting more than 82,000 establishments engaged in textile and related crafts (Mekonnen et al., 2022; Worku, 2023). Gondar Zuria District, in particular, has strong potential for expanding weaving, pottery, and blacksmithing activities, which are vital for both cultural preservation and rural income generation (Tesfa and Xin, 2020).

Although several studies have explored handicrafts in Ethiopia, their emphasis has largely been on identifying challenges, understanding cultural significance, and examining general livelihood contributions (Wayessa, 2018; Wodajo, 2022; Dana *et al*., 2022;). Despite these contributions, several critical gaps remain unaddressed Datiko and Wondirad (2024). First, there is limited evidence on the determinants of household participation, an insufficient causal analysis of how handicraft production affects household income within specific local contexts, and a scarcity of region-specific studies in the Amhara Region (Damtie *et al*., 2022; Datiko and Wondirad, 2024). Addressing these gaps is crucial, as many rural households in Gondar Zuria District rely on handicraft production as a livelihood strategy. As a result, this study aimed to address the gaps mentioned above by determining and quantify the causal impact of handicraft activities on household income in Gondar Zuria District, Ethiopia.

2. Methods

2.1. The study area

This study was conducted in Gondar Zuria district, located in the Central Gondar Zone of the Amhara Region, Ethiopia. The district covers approximately 114,983 hectares and is administratively divided into 38 kebeles. It is bordered by Wogera district and West Belesa district to the north, Lay Armachiho district to the west, Dembia district and Lake Tana to the south, and Libo Kemkem district to the east. The total population is estimated at 290,460, of which about 85.2% reside in rural areas (CSA, 2017; GZWOA, 2025). The district is characterized by diverse agro-ecological conditions, predominantly Midland (76%), a mid-altitude temperate zone, with the remaining area classified as highland (24%). The topography is largely flat (65%), and elevation ranges from 1,800 to 2,700 meters above sea level. The climate features an average annual rainfall of 950–1,035 mm and temperatures ranging from 24°C to 33°C. Land use is dominated by cropland (63%), followed by grassland (14.8%) and forest cover (9.6%). Agriculture constitutes the primary livelihood, complemented by small-scale petty trading and handicraft production, including weaving, pottery, and blacksmithing, particularly in Enfranz and Maksegnit (GZWOA, 2025). Moreover, Figure 1 presents the locations map of Gondar Zuria District in Ethiopia.

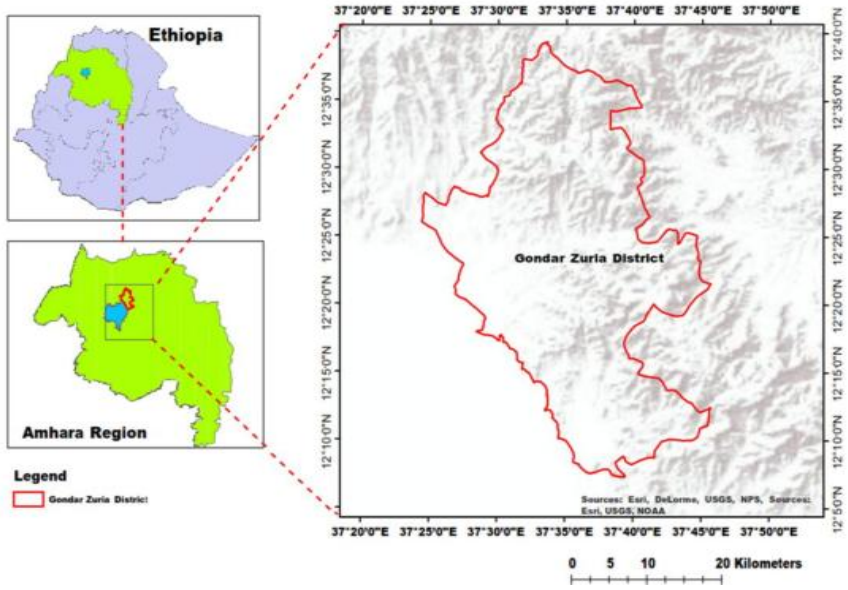


Figure 1: Map of Gondar Zuria District, Ethiopia, **Source**: GIS shape file of Ethiopian administrate map

2.2. Research Design and Sampling Procedure

This study employed a quantitative cross-sectional research design to examine the contribution of handcraft activities to rural household income in Gondar Zuria District. The design was considered appropriate because it allows the collection of data from a large number of households at a single point in time and facilitates comparison between households engaged in handcraft activities and those not involved.

A multistage sampling procedure was applied to select the study respondents. First, Gondar Zuria District was purposively selected due to the widespread presence of traditional handcraft activities and their importance to rural livelihoods. Second, three kebeles, Enfranz, Maksegnit One, and Maksegnit Two, were chosen based on their long-standing engagement in various handcraft enterprises, including weaving, pottery, blacksmithing, leatherwork, wickerwork, and woodcraft production (Nurhusien, 2017).

In the third stage, households within each selected kebele were categorized into two groups: handcraft participants and non-participants. A total sample of 267 household heads was then selected using systematic random sampling. The number of respondents drawn from each kebele was determined using probability proportional to size (PPS) to ensure adequate representation. To assess the economic effects of handcraft participation, only households with at least three

years of experience in handcraft activities were included in the participant group, thereby allowing sufficient time for livelihood impacts to be realized (White and Raitzer, 2017).

The sample size was determined using (Cochran, 1977), formula for estimating sample size in large populations:

$$n = \frac{z^2 pq}{e^2}$$

Where n is the required sample size, Z represents the standard normal value corresponding to a 95% confidence level (1.96), p is the estimated population proportion, q = 1 − p, and e is the acceptable margin of error. By assuming p = 0.30, q = 0.70, and a precision level of 6%, the calculated sample size was approximately 267 households.

The final sample allocation across the three kebeles was conducted proportionally according to the number of participant and non-participant households in each kebele. Thus, Table 1 presents the final sample size determination across each selected kebeles.

Table 1: Total number of sample household heads

Sample Kebeles	Total HH	Participants	Non participants	Sample from Ps	Sample from NPs	Total sample from each Kebeles
Enfranz	2494	864	1630	33	62	95
Maksegnit Kebele1	2186	720	1466	28	56	84
Maksegnit Kebele2	2294	756	1538	29	59	88
Total	6974	2340	4634	90	177	267

2.3. Data Source and Types

The study relied on both primary and secondary sources of information. Primary data were obtained directly from sampled households through a structured survey administered during fieldwork. The survey generated information on demographic characteristics, participation in handcraft activities, income sources, institutional support, and other variables relevant to the analysis. Secondary information was collected from reports, official records, district-level documents, and published literature related to rural handcraft activities and livelihood development. These sources provided contextual information regarding the extent of handcraft participation, historical development of the sector, and relevant socioeconomic conditions in the

study area. The use of secondary data helped complement and validate the information obtained through household surveys (Kothari, 2004).

2.4. Data Collection Methods and Instruments

A structured interview schedule was used as the principal instrument for collecting primary data (Aborisade, 2013). The questionnaire consisted mainly of closed-ended questions designed to obtain quantitative information on household characteristics, handcraft participation, income generation, and institutional factors influencing engagement in handcraft activities. To improve comprehension and ensure consistency during data collection, the questionnaire was translated into Amharic, the local language spoken in the study area. Prior to the main survey, the instrument was pretested on 20 households located outside the selected sample kebeles. Feedback obtained from the pilot exercise was used to refine the wording, sequencing, and clarity of the questions.

Five enumerators with prior survey experience and familiarity with the local context were recruited to conduct the interviews. Before field deployment, they received training on the objectives of the study, ethical considerations, interview techniques, and questionnaire administration procedures. Data collection was undertaken under the close supervision of the researcher to ensure data quality and consistency. In total, completed interviews were obtained from 267 sampled household heads.

2.5. Methods of Data Analysis

Both descriptive and econometric techniques were employed to analyze the data. Descriptive statistics, including means, frequencies, percentages, and standard deviations, were used to summarize and describe the demographic, socioeconomic, and institutional characteristics of the sampled households.

To examine differences between handcraft participants and non-participants, inferential statistical tests were applied. The chi-square test was used for categorical variables, while appropriate statistical measures were employed to compare continuous variables between the two groups.

Furthermore, econometric analysis was conducted to estimate the impact of participation in handcraft activities on rural household income while controlling for observable household characteristics. The combination of descriptive and econometric models provided a

comprehensive understanding of the factors influencing participation and the resulting livelihood outcomes.

2.5.1. Endogenous switching regression model analysis

This study applied the Endogenous Switching Regression (ESR) model to examine the impact of handicraft activities on household income. The ESR approach was selected because the treatment variable is binary and the model allows estimation of counterfactual outcomes while correcting for selection bias (White and Raitzer, 2017). The ESR framework estimates the impact of handicraft participation in two stages: modeling the determinants of participation, and estimating income outcomes conditional on participation status while correcting for selection bias.

Households decide whether to participate in handicraft activities based on expected benefits. Following Aakvik et al. (2000), Heckman et al. (2001), and Alene and Manyong (2007), the participation decision is modeled using a latent utility framework.

Let the unobserved net utility of participation be:

$$I_i^* = U_1 - U_0$$

Where U_1 represents the utility from participating in handicrafts and U_0 represents the utility from not participating. A household participates if the net utility is positive.

$$I_i^* = Z_i'\alpha + \varepsilon i$$

$$Ii = \begin{cases} 1 & if\ I_i^* > 0 \\ 0 & if\ I_i^* \leq 0 \end{cases}$$

Where: I_i^* = latent participation decision, I_i = observed participation status, Z_i = vector of household characteristics affecting participation, α = parameters to be estimated, and εi = random error term with mean zero and variance δ^2. Following Lokshin and Sajaia (2011), household income is modeled separately for participants and non-participants.

Regime 1: Participants $y_{1i} = \beta_1 X_{1i} + u_{1i} \quad if\ Ii = 1$

Regime 2: Non-participant $y_{2i} = \beta_2 X_{2i} + u_{2i} \quad if\ Ii = 0$

Where y_{1i}, y_{2i} = household income; X_{1i}, X_{2i} = explanatory variables; β_1, β_2 = parameter vectors; and u_{1i}, u_{2i} = are error terms. To identify the model, at least one instrumental variable affecting participation but not directly affecting income is required. In this study, working area is used as an instrumental variable.

The error terms of the selection and outcome equations are assumed to follow a trivariate normal distribution with mean zero:

$$(\varepsilon i, u_{1i}, u_{2i}) \sim N(0, \Omega)$$

Where the covariance matrix is: $\Omega = \begin{pmatrix} 1 & \rho_1 & \rho_0 \\ \rho_1 & \delta_1^2 & \rho_{10} \\ \rho_0 & \rho_{10} & \delta_2^2 \end{pmatrix}$.

The correlation coefficients ρ_1 and ρ_0 capture the relationship between participation decisions and income outcomes. Non-zero correlations indicate selection bias, justifying the ESR approach (Abdulai and Huffman, 2014).

Estimation of Treatment Effects: The ESR model allows estimation of both actual and counterfactual income outcomes. Based on the expected outcomes, conditional on participation of handcraft activity follow as:

1. Income of participants (observed): $(y_{1i}|\ I = 1,\ X)$
2. Income of non-participants (observed): $(y_{2i}\ |I\ =\ 0, X)$
3. Income of participants if they had not participated (counterfactual): $(y_{1i}|\ I\ =\ 0,\ X)$
4. Income of non-participants if they had participated (counterfactual): $(y_{2i}|I\ =\ 1,\ X)$

The average treatment effect on the treated (ATT) is computed as the difference between (1) and (3); $ATT\ =\ (y_{1i}|I\ =\ 1,\ X)\ -\ (y_{2i}\ |I\ =\ 1, X)$. This measures the income gain for households that actually participated in handicrafts.

The average treatment effect on the untreated (ATU) is given by the difference between (3) and (4) $ATU\ =\ (y_{1i}|I\ =\ 0,\ X)\ -\ (y_{2i}\ |I\ =\ 0, X)$. This estimates the potential income gain if non-participating households had participated. The difference between ATT and ATU measures whether participants or non-participants benefit more from participation:

$$TH = ATT - ATU$$

A negative value indicates that non-participants would benefit more from participation than current participants. Moreover, previous literatures supports the applications of ESR in impact evaluation include studies such as Ayuya (2019), Gregory and Coleman (2013), and Lokshin and Glinskaya (2009). In addition, Table 2 presents the explanatory variables used in this study along with their expected effects based on prior literature.

Table 2: Variables and their working hypothesis

Variables Acronyms	**Description of the variables**	**Type of variable**	**Unit of measurement**	**Expected Sign**	**Reference**
HHI	Household income as	Continuous	Total birr per year		

	an Outcome variable				
HCA	Handcraft participation	Dummy	1=participant,0 otherwise		
SEXHH	Sex of household	Dummy	0= Female, 1 = Male	+/-	Abdi (2020), Abate (2018)
EDUL	The educational level	Continuous	Grade of the households	+/-	W/ kidan and Tafesse (2023)
AGEHH	Age of household	Continuous	Measure in year	-/+	Nanda et al. (2019)
Martial	Marital status	Categorical	0=unmarrid,1=married,	+/-	Jabeen e t al., (2020)
ADUEQU	Household labor	Continuous	Adult equivalent	+/-	Abdurezak and Ahmed (2020), Igwe (2020)
DEPEND	Dependency ratio	Continuous	Dependency ratio	-/+	Asfaw et al., (2017), Wake et al., (2020)
LIVES	Livestock ownership	Continuous	TLU	+/-	Abdurezak and Ahmed, (2020), W/kidan and Tafesse, (2023)
LAND	Total Land size	Continues	hectare	+/-	Neglo et al. (2021)
CRACC	Credit access	Dummy	1=yes,0 otherwise	+/-	Yulisa and Permana (2022),Edota (2023)
ACCINFO	Access of market information	Dummy	Have access=1, 0=other	+/-	Ahmed et al. (2021) Kazungu (2023)
DSMAR	Distance market	Continuous	Measure in walking hour	+/-	Damena and Habte (2017)
TRAIN	Training access	Dummy	Have access=1, 0=other	+/-	Abate (2018), Gatdet (2021)
DSROAD	Road distance	Continuous	Measure in Kilometer	+/-	Dalal et al. (2024) Damena and Habte (2017)
NETWORK	Member of social network	Dummy	1,member,0=otherwise	+/-	Mohamed, (2019) Bayu,(2021)
WORKAR	Working area	Dummy	1,yes, 0= otherwise	+	Ferreira et al., (2019) Kazungu, (2023)

3. Result and discussions

3.1. Descriptive Statistics Results for Characteristics of Sample Respondents

3.1.1. Descriptive statistics results for dummy variables

The survey result indicates that out of 267 sample respondents, 33.7% (N = 90) were participants in handcraft activities and 66.3% (N = 177) were non-participants in handcraft activities. Table 3 presents the descriptive statistics for the dummy variables used in the analysis.

Sex of the Household Head: Among participating households, 75.6% were male-headed and 24.4% were female-headed. In contrast, 92.0% of non-participating households were male-

headed, and 7.9% were female-headed. A chi-square test ($\chi^2 = 13.98$, $p < 0.01$) revealed a statistically significant difference at the 1% level, indicating that sex composition varies significantly between participants and non-participants.

Access to Market Information: Among participants, 70% had access to market information, compared to 40% of non-participants. Conversely, 30% of participants and 60% of non-participants lacked such access. The chi-square test ($\chi^2 = 21.32$, $p < 0.01$) confirmed a statistically significant difference, suggesting that households with better market information are more likely to participate in handicraft activities.

Marital Status: Most households were married, with 91.1% of participants and 94.3% of non-participant households being married, while 8.9% participants and 5.7% of non-participants were unmarried. The chi-square test ($\chi^2 = 1.09$, $p > 0.05$) showed no significant difference, indicating that marital status is not associated with participation in handicrafts.

Training Access on Handcrafts: Among participants, 91.1% had received training, while only 8.9% had not. The chi-square test ($\chi^2 = 16.67$, $p < 0.01$) showed a statistically significant relationship, highlighting that access to training strongly influences participation.

Credit Access: Among participants, 48.9% had access to credit compared to 55.4% of non-participants. Chi-square analysis ($\chi^2 = 1.01$, $p > 0.05$) showed no statistically significant association between credit access and participation.

Social Network Membership: Among participants, 74.4% were members of social networks, compared to 79.7% of non-participants. The chi-square test ($\chi^2 = 0.94$, $p > 0.05$) indicated no significant relationship between social network membership and participation.

Working Area: Among participants, 91.2% had access to a working area, while only 1.1% of non-participants had such access. Chi-square analysis ($\chi^2 = 224.02$, $p < 0.01$) indicated a statistically significant difference at the 1% level, showing that participants have better access to working areas.

Table 3: Descriptive statistics results for dummy variables

Variable	Handcraft participant

		Yes		No		Total			
		Freq	**%**	**Freq**	**%**	**Freq**	**%**	**χ2**	**p-value**
Sex	Male	68	75.6	163	92.1	231	86.5	13.98***	0.000
	Female	22	24.4	14	7.9	36	13.5		
Marital status	Unmarried	8	8.9	10	5.7	18	6.7	1.09	0.778
	Married	82	91.1	167	94.3	249	93.3		
Market information access	Yes	63	70.0	71	40.0	134	50.1	21.32***	
	No	27	30.0	106	60.0	133	49.9		
Training	Yes	9	91.1	6	3.6	15	5.6	16.67***	0.000
	No	81	8.9	171	96.4	252	94.4		
Credit	Yes	44	48.9	98	55.4	142	53.2	1.01	0.316
	No	46	51.1	79	44.6	125	46.8		
Social network	Yes	67	74.4	141	79.7	208	78	0.94	0.331
	No	23	25.6	36	20.3	59	22		
Working area	Yes	82	91.2	2	1.1	84	31.5	224.02***	0.000
	No	8	8.8	175	98.9	183	68.5		

Note: *** indicates at 1% significant level

Source: Authors computation from survey data, 2025

3.1.2. Descriptive statistics results for continuous variables

Table 4 presents the mean comparison results of continuous variables between handicraft participants and non-participants using a two-tailed t-test.

Age of household head: The mean age of participating household heads was 45.13 years, which is significantly lower than that of non-participants (50.83 years). The difference is statistically significant at the 1% level.

Education level: The mean years of schooling for participant households (2.43 years) was higher than that of non-participants (1.58 years), and the difference is statistically significant at the 5% level.

Adult equivalent ratio of HH: Table 4 shows that the mean adult equivalent ratio of participant households was 3.98, while for non-participants in handcraft households it was about 4.19. The overall mean and standard deviation of the adult equivalent ratio of household heads were found to be 4.13 and 1.35, respectively. The results of the two-tailed test showed that there is no

significant difference between handcraft participants and non-participants in deciding to participate in handcraft activities.

Livestock ownership: the average livestock ownership of sample households in TLU of participant 8.08 and non-participant 2.25, and indicated that there was no statistically significant mean difference between handcraft participants and non-participant. This result is consistent with (Asmare and Mekuriaw, 2017), the mean livestock ownership of sampled households (4.22 TLU) exceeded the national average of 3.4 TLU but fell short of the Central Gondar Zone's average of 5.92 TLU per household (Bachewe *et al.*, 2018).

Total land size: Regarding landholding size, non-participants owned slightly more land (0.91 ha) than participants (0.71 ha); however, the difference was not statistically significant. This result is similar with (Alemu *et al.*, 2017), Seyoum et al., 2020).

Market distance Based on the results, indicates the average market distance in minutes for participants 21.80 minute and non-participants 21.56 minute, however, there was no statistically significant mean difference between the market distance of handcraft participants and non-participant.

Table 4: Descriptive statistics results for continuous variables

Variable	Handcraft participation							
	Participant N=90		Non participant N=177		Total N=267		t-test	p-value
	Mean	SD	Mean	SD	Mean	SD		
Age	45.13	10.2	50.83	10.5	48.92	10.77	4.23	0.0000***
Education	2.43	2.99	1.58	2.57	1.87	2.75	-2.42	0.0164**
Adult equivalent	3.98	1.27	4.19	1.38	4.13	1.35	1.25	0.2098
Dependency ratio	0.63	0.56	0.54	0.30	0.57	0.41	1.72	0.0872
Livestock holding	8.08	60.78	2.25	0.68	4.22	35.28	-1.29	0.2021
Land	0.71	0.56	0.91	0.58	0.84	0	0.71	0.7054
Road distance	19.58	12.34	20.04	9.40	19.89	10.46	0.34	0.7339
Market distance	21.8	13.02	21.55	10.52	21.63	11.40	-0.17	0.8679

Note: **, *** indicates at 5% and 1% of significance level, respectively:

Source: Authors computation from survey data, 2025

3.2. Endogenous Switching Regression on Impacts of Handcraft on Households' Income

To assess the impact of handicraft participation on household income, a continuous outcome variable, an endogenous switching regression (ESR) model was applied following established procedures. (Lokshin and Sajaia, 2004). Prior to estimation, a falsification test was conducted to examine the validity of the instrumental variable (working area). The test employed a probit model for the selection equation and an ordinary least squares regression for the outcome equation. A valid instrument was defined as a variable significantly associated with handicraft participation but not directly related to household income. The availability of a working area satisfied this criterion and was therefore used as the instrumental variable in the ESR model. This approach is consistent with the definition of instrumental variables as factors that influence treatment assignment without directly affecting the outcome, thereby addressing endogeneity concerns (Swanson *et al*., 2018; Felton and Stewart, 2022).

The ESR results indicate that the model is well specified. The Wald test is statistically significant, confirming the overall goodness of fit, while the likelihood ratio test rejects the null hypothesis of independence between the selection and outcome equations, justifying the use of the ESR framework.

The estimated outcome equations reveal distinct determinants of household income for participants and non-participants. Among handicraft participants, household income is significantly influenced by the age of the household head, access to information, access to credit, and social networks. In contrast, for non-participants, household income is primarily determined by the age of the household head, marital status, household size, and landholding size.

Table 5: Endogenous switching regression results for selection and outcome variables

Variables	Determinants of handcraft participation			Determinants of household income					
				Handcraft Participant			Handcraft Non-participant		
	Marginal effect	Std. Err.	Z value	Coef.	Std. Err.	Z value	Coef.	Std. Err.	Z value
Sex	-0.769	0.79	-0.97	0.077	0.099	0.78	0.009	0.093	0.09
Age	-0.014	0.02	-0.74	0.011	0.005	2.43**	-0.029	0.016	-1.81*
Marital status	-0.822	0.42	-1.98**	-0.031	0.095	-0.33	0.076	0.079	0.99
Educational level	-0.061	0.07	-0.95	0.011	0.015	0.72	-0.009	0.009	-0.93
Adult equivalent	-0.069	0.18	-0.39	-0.032	0.030	-1.06	0.005	0.018	0.25
Dependency ratio	1.438	0.76	-.90	-0.066	0.065	-1.02	-0.100	0.073	-1.36
Total livestock	0.053	0.14	0.37	0.001	0.001	0.71	-0.006	0.017	-0.35
Total land size	0.011	0.12	0.09	0.002	0.0198	0.09	0.039	0.012	3.25***
Road distance	-0.006	0.02	-0.29	-0.003	0.005	-0.60	-0.004	0.004	-1.16
Market distance	0.016	0.02	1.08	-0.002	0.005	-0.46	-0.001	0.003	-0.34
Training access	0.125	0.08	1.58	0 .021	0.135	0.15	-0.038	0.012	-3.16***
Market information	1.490	0.36	4.09***	0.132	0.077	1.72*	-0.318	0.118	-2.70**
Credit access	-0.007	0.44	-0.02	0.145	0.082	1.77*	0.032	0.047	0.68
Social network	-0.379	0.26	-1.45	0.092	0.018	4.84***	-0.013	0.058	-0.23
Working area	2.178	0.38	5.78***						
/lns1	-1.133			0.74			-15.24***		
/lns2	-1.271			0.05			-23.95***		
/r1	-16.94			540.20			-0.03		
/r2	-16.46			432.40			-0.04		
Sigma_1	0.322			0.21			2.92***		
Sigma_2	0.281			0.18			1.88**		
rho_1	-1			11.53			-0.08		
rho_2	-1			22.83			0.04		
Number of obs	= 267				Log likelihood		= -510.7912		
Prob > chi2=0.0244					Wald chi2(14)		=50.54		
Log likelihood ratio test of indep. eqns.				chi2(1)	= 37.63		Prob > chi2= 0.0000		

*, **, *** represent significance at 1, 5%, and 10% probability levels, respectively

Source: Authors computation from survey data, 2025

The endogenous switching regression results in Table 5 identify distinct determinants of household income for handicraft participants and non-participants. The likelihood ratio test confirms dependence between the selection and outcome equations, supporting the appropriateness of the ESR model (Lokshin and Sajaia, 2004).

Age of household head (AGEHH): Age has a positive and statistically significant effect on income among handicraft participants ($p < 0.05$), but a negative effect among non-participants ($p < 0.10$). A one-year increase in age raises participants' income by approximately 1.1%, while reducing non-participants' income by 2.9%. This suggests that accumulated experience enhances productivity and decision-making in handicraft activities. The finding aligns with Tesgera et al. (2024), who report a positive relationship between age and non-farm income, but contrasts with with the findings of Adem and Tesafa (2020).

Total land size (LANDSZ): Landholding size significantly and positively influences income among non-participants ($p < 0.01$). A one-hectare increase in landholding raises income by 3.9%, indicating that households with larger farms rely more on crop and livestock production than on handicraft activities. This result is consistent with Gebru et al. (2018), and Gizachew (2020), who show that larger landholdings enhance farm-based income opportunities.

Training access about handcraft activity (TRAIN): Training access has a negative and statistically significant effect on income among non-participants ($p < 0.01$), reducing income by 3.8%. This may reflect ineffective training content, limited application of acquired knowledge, or opportunity costs associated with non-productive training participation. The result supports findings by Wordofa and Sassi (2017).

Access Market Information (ACCINFO): Market information significantly increases income for participants ($p < 0.10$) but reduces income for non-participants ($p < 0.05$). Access to market information raises participants' income by 13.2%, likely through improved pricing knowledge, input sourcing, and production planning. Conversely, non-participants may not benefit from such information due to limited engagement in handicraft markets. This finding is consistent with Leng et al. (2020) and Birara et al. (2018).

Credit Access (CREDITACC): Credit access positively and significantly affects income among participants ($p < 0.10$), increasing income by 14.5%. Access to financial resources enables households to purchase raw materials, invest in production, and expand market access. This result aligns with Girma (2022), Ayambila et al. (2017) and Neglo et al. (2021).

Social network (NETWORK): Membership in social networks significantly and positively affects income among participants ($p < 0.01$), increasing income by 9.2%. Social networks enhance information exchange, market access, and customer engagement, thereby improving income-generating opportunities. This finding is consistent with Abdullahi et al. (2015). Moreover, the ESR results demonstrate that participation in handicraft activities modifies the income effects of household characteristics and institutional factors. While farm resources drive income among non-participants, market access, financial capital, and social connectivity are key drivers of income among handicraft-participating households.

3.2.1. Treatment Effects of Handicraft Participation on Household Income

To estimate the causal impact of handicraft participation on household income while accounting for both observed and unobserved heterogeneity, treatment effects were derived from the endogenous switching regression (ESR) model using counterfactual outcome estimates (Lokshin and Sajaia, 2004). The Average Treatment Effect on the Treated (ATT) measures the difference between observed income of participating households and the income they would have obtained had they not participated. Conversely, the Average Treatment Effect on the Untreated (ATU) estimates the expected income gain for non-participating households if they had participated in handicraft activities.

The results presented in Table 6 show that the observed expected household income of handicraft participants is 12.56, compared to 11.65 for non-participants. The counterfactual analysis indicates that participants would have earned 12.25 had they not participated. The difference between the observed and counterfactual outcomes yields an ATT of 0.31, indicating that participation increases household income by approximately 2.53%. This demonstrates that engagement in handicraft activities contributes positively to household income.

For non-participants, the estimated counterfactual income under participation exceeds their observed income by 0.74, representing an income gain of 6.53%. This suggests that households currently not engaged in handicraft production could experience even greater income improvements if they participated. The transitional heterogeneity effect further indicates that the potential income gain from participation is larger for non-participant households than for current participants. As a result, the findings confirmed that handicraft participation has a positive and economically meaningful impact on household income. The results imply that expanding

participation in handicraft activities could serve as an effective strategy for enhancing rural household livelihoods. These findings are consistent with previous empirical studies, including (Adem and Tesafa, 2020; Abisuga and Muchie, 2021; Wondirad et al., 2022) which report that handicraft activities significantly improve household income.

Table 6: Expected outcome, treatment and heterogeneity effect

Outcome variable		Prediction		Treatment effect	T -value
		HC participant	HC non-participant		
Households income	HC Participant	12.56 (a)	12.25 (c)	ATT=0.31	9.6***
	HC non-participant	12.39(d)	11.65(b)	ATU=0.74	8.6***
	Heterogeneity effect	0.17	0.60	TH=-0.43	6.49***

*** represent significant at 1%.

Source: Authors computation from survey data, 2025

Conclusion and Recommendation

Conclusion

This study applied descriptive statistics and endogenous switching regression model to assess the impacts of handcraft activity on household's income in case of Gondar zuria district, Ethiopia. The Endogenous switching regression model results revealed that handcraft activity had a positive effect on household income for currently participant in handcraft by 2.53%, and it increase household income by 6.53% if non participants would have participate in handcraft activity. Moreover non participant households would have participated in handcraft activity, would get higher income compared currently participants. Therefore, we conclude that, handcraft participant and non-participant household should be encouraged and involved in handcraft activity to increase their income of the households.

Recommendation

The empirical results demonstrate that participation in handicraft activities significantly improves household income, while non-participating households also show substantial potential income gains if they engage in the sector. Based on these findings, the following policy and

programmatic recommendations are proposed to strengthen the income-generating capacity of rural households through handicraft development.

- ✓ Structured mentorship programs should be established to enable experienced and older artisans to transfer technical skills, production knowledge, and market practices to younger or less experienced households. This will enhance productivity, preserve traditional knowledge, and sustain profitability in handicraft production.
- ✓ Targeted and affordable credit schemes should be expanded to support handicraft producers in acquiring raw materials, adopting improved production techniques, and accessing wider markets. Financial inclusion mechanisms tailored to small-scale artisans can significantly enhance income-generating capacity.
- ✓ Timely and reliable dissemination of market information, including prices, demand trends, and input availability, should be institutionalized. Improved information access enables producers to make informed production and marketing decisions, thereby increasing returns from handicraft activities.
- ✓ The formation and strengthening of handicraft cooperatives and producer groups should be actively supported. Collective organization enhances market access, improves bargaining power, facilitates knowledge exchange, and increases product visibility.
- ✓ Training (non-participants): overhaul existing handcraft training to be action-oriented and skill-based, ensuring trained individuals convert knowledge into actual economic activity and avoid wasting time.
- ✓ Existing handicraft training initiatives should be redesigned to emphasize practical, skill-based, and market-oriented learning. Training programs must focus on translating knowledge into productive engagement and income-generating activities.
- ✓ For households with larger landholdings, handicraft production should be promoted as a complementary livelihood strategy, particularly during off-season periods. Integrated income diversification programs can enhance resilience without substituting primary agricultural activities.
- ✓ Largely, the findings confirm that handicraft participation constitutes an effective pathway for improving rural household income. Local governments and development stakeholders should strengthen institutional support for existing participants while promoting broader participation among non-engaged households. As land constraints

intensify, handicraft activities offer a viable and sustainable alternative for livelihood diversification and rural income enhancement.

Declarations

Consent to Participate

The study protocol was reviewed and approved by the Research Ethics Committee of the Department of Rural Development and Agricultural Extension, College of Agriculture, Food, Environment, and Climate Sciences, Injibara University (Ref. No. INU/CAFECS/RDAE/48/2025, April 2025). All procedures involving human participants were conducted in accordance with the ethical standards of the institutional research committee and the principles of the Declaration of Helsinki.

Prior to data collection, the objectives, procedures, potential benefits, and voluntary nature of participation were clearly explained to all respondents. Written or verbal informed consent was obtained from all participants before their inclusion in the study. Participants were assured of the confidentiality and anonymity of the information provided and were informed of their right to withdraw from the study at any stage without any consequences.

Consent to Publish: NOT APPLICABLE

Data availability: Data will be made available on request.

Declaration of competing interest: The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Funding: This research has not received any fund.

References

Aakvik, A., Heckman, J. J., and Vytlacil, E. J. (2000). Treatment Effects for Discrete Outcomes when Responses to Treatment Vary Among Observationally Identical Persons: An Application to Norwegian. In: National Bureau of Economic Research Cambridge, Mass., USA.

Abate, K. (2018). *Growth Determinants of Small Scale Handicraft Manufacturing Enterprise's: The Case of Addis Ababa, Ethiopia.* St. Mary's University,

Abdi, M. (2020). *Determinants of participation in non-farm income generating activities of drought prone smallholder farmers the case of dire dawa.* Haramaya university,

Abdulai, A., and Huffman, W. (2014). The adoption and impact of soil and water conservation technology: An endogenous switching regression application. *Land economics, 90*(1), 26-43.

Abdullahi, F. G., Ghani, N. A., and Dalhatu, S. (2015). Rural women's economic contribution towards community development in rural communities of Kano State, Nigeria. *Mediterranean Journal of Social Sciences, 6*(6), 250-259.

Abdurezak, F., and Ahmed, A. (2020). Impact of non-farm activities on wellbeing of rural household, the case of Kersa District, Eastern Hararghe Zone, Ethiopia. *Humanities and Social Sciences, 8*, 182.

Abisuga-Oyekunle, O. A., and Muchie, M. (2021). Handicraft small enterprises as an instrument for rural economic growth and poverty eradication. *Problems and Perspectives in Management, 18*(4), 25.

Abreham, H. (2022). *Traditional handcrafts, creativity art and their relationship with tourism marketing.* ST. MARY'S UNIVERSITY,

Adem, M., and Tesafa, F. (2020). Intensity of income diversification among small-holder farmers in Asayita Woreda, Afar Region, Ethiopia. *Cogent Economics & Finance, 8*(1), 1759394.

Ahmed, Z., Hussain, A. B., Alam, R., and Singha, A. K. (2021). Perils and prospects of Manipuri handloom industries in Bangladesh: An ethnic community development perspective. *GeoJournal*, 1-16.

Alene, A. D., and Manyong, V. M. (2007). Gains from high-yielding varieties with and without complementary technologies: The case of improved cowpea in Northern Nigeria. *Journal of Agricultural and Food Economics, 2*(1), 1-14.

Asfaw, A., Simane, B., Hassen, A., and Bantider, A. (2017). Determinants of non-farm livelihood diversification: evidence from rainfed-dependent smallholder farmers in northcentral Ethiopia (Woleka sub-basin). *Development Studies Research, 4*(1), 22-36.

Ayambila, S., Osei-Akoto, I., and Ayamga, M. (2017). Determinants of non-farm micro and small enterprise participation in rural Ghana. *British Journal of Economics, Management & Trade, 17*(4), 1-12.

Bayisa, D., Abdiyo, K., and Debu, D. (2024). Socioeconomic Impacts of the Artisan Implements on the Peasants Living Conditions, the Oromo of Southwestern Ethiopia, Jimma: A Historical Perspective. *Journal of Asian and African Studies*, 00219096231225948.

Bayu, E.K. and Gondar, E., 2021. Determinants variables for women's participation in non-agricultural livelihood diversification strategies in Ethiopia: A logistic regression model analysis. *Journal of Poverty, Investment and Development*, 58(1), pp.34-57.

Birara, D. A., Abate, T. M., and Mekie, T. M. (2018). Factors affecting market outlet choice of wheat producers in North Gondar Zone, Ethiopia. *Agriculture & Food Security, 7*, 1-8.

Cochran, W. G. (1977). *Sampling techniques*: john wiley and sons.

CSA. (2017). *(Central Statistical Authority)Summary and statistical report of the 2017 population and housing census*.

Dalal, A., Bhattacharya, S., and Chattopadhyay, S. (2024). Hurdles to handicraft marketing for artisan entrepreneurs in an emerging economy. *Journal of Small Business and Enterprise Development, 31*(1), 74-94.

Damena, A., and Habte, D. (2017). Effect of non-farm income on rural household livelihood: A case study of Moyale District Oromia Regional State, Ethiopia. *American Scientific Research Journal for Engineering, Technology, and Sciences, 33*(1), 10-36.

Damtie, Y. A., Berlie, A. B., and Gessese, G. M. (2022). Rural livelihoods diversification in Ethiopia: evidence of households around Lake Tana. *Cogent Social Sciences, 8*(1), 2154545.

Dana, L.-P., Ramadani, V., Palalic, R., and Salamzadeh, A. (2022). *Artisan and handicraft entrepreneurs*: Springer.

Datiko, D. B., and Wondirad, A. (2024). pro-poor impacts of tourism handcrafts in Ethiopia: a value chain approach. *Tourism Culture & Communication*.

Duong, P. B., Thanh, P. T., and Ancev, T. (2021). Impacts of off-farm employment on welfare, food security and poverty: Evidence from rural Vietnam. *International Journal of Social Welfare, 30*(1), 84-96.

FAO. (2019). FAO and the situation of food security and nutrition in the world. *Journal of nutritional science and vitaminology, 65*(Supplement), S4-S8.

FAO. (2021). Food and agriculture organization of the United Nations—FAO. In The Europa directory of international organizations 2021 (pp. 297-305).

Felton, C., and Stewart, B. M. (2022). Handle with care: a sociologist's guide to causal inference with instrumental variables. *Sociological Methods & Research*, 00491241241235900.

Ferreira, J., Sousa, B. M., and Gonçalves, F. (2019). Encouraging the subsistence artisan entrepreneurship in handicraft and creative contexts. *Journal of Enterprising Communities: People and Places in the Global Economy, 13*(1/2), 64-83.

Gatdet, C. (2021). Determinants of Subsistence Farmers Participation to Non-Farm Activities in Itang Special District, Gambella Region, Ethiopia. *International Journal of Multidisciplinary Research and Explorer (IJMRE) May-2021*.

Gebru, G. W., Ichoku, H. E., and Phil-Eze, P. O. (2018). Determinants of livelihood diversification strategies in Eastern Tigray Region of Ethiopia. *Agriculture & Food Security, 7*, 1-9.

Ginindza, S. N., and Mpandeli, N. S. (2021). The role of small-scale farmers in ensuring food security in Africa. *Food Secur. Afr, 10*.

Girma, Y. (2022). Credit access and agricultural technology adoption nexus in Ethiopia: A systematic review and meta-analysis. *Journal of Agriculture and Food Research, 10*, 100362.

Gizachew, F. (2020). Determinants of Non-Farm Employment and Farm Production of Small Holder Farmers in Huambo District of Wolaita Zone, Ethiopia.

GZWOA. (2025). Gondar Zuria Woreda Office of Agriculture Information.

Heckman, J., Tobias, J. L., and Vytlacil, E. (2001). Four parameters of interest in the evaluation of social programs. *Southern Economic Journal, 68*(2), 210-223.

Ibrahim, S., Akerele, D., Oyawole, F., Uthman, O., and Aminu, R. (2019). Effect of non-farm income on poverty status of farm households in Ogun State, Nigeria. *Nigerian Journal of Agriculture, Food and Environment, 15*(2), 40-49.

Igwe, P. A. (2020). Determinants of household income and employment choices in the rural agripreneurship economy. *Studies in Agricultural Economics, 122*(2), 96-103.

Jabeen, S., Haq, S., Jameel, A., Hussain, A., Asif, M., Hwang, J., and Jabeen, A. (2020). Impacts of rural women's traditional economic activities on household economy: Changing economic contributions through empowered women in rural Pakistan. *Sustainability, 12*(7), 2731.

Kazungu, I. (2023). Business Development Services and Participation of Rural-Based Micro Enterprises in Export Markets: Exploring the Heterogeneity of the Tanzanian Handcrafts Industry. *SAGE Open, 13*(4), 21582440231210471.

Kemal, M. N. (2020). Challenges and Opportunities of Handicraft Production Among Afar Women: The Case of Aysaita District.

Kothari, C. R. (2004). *Research methodology: Methods and techniques*. New Age International.

Leng, C., Ma, W., Tang, J., and Zhu, Z. (2020). ICT adoption and income diversification among rural households in China. *Applied Economics, 52*(33), 3614-3628.

Lokshin, M., and Sajaia, Z. (2004). Maximum likelihood estimation of endogenous switching regression models. *The Stata Journal, 4*(3), 282-289.

Mekonnen, H., Bires, Z., and Berhanu, K. (2022). Practices and challenges of cultural heritage conservation in historical and religious heritage sites: evidence from North Shoa Zone, Amhara Region, Ethiopia. *Heritage Science, 10*(1), 172.

Mohamed, F. (2019). *Access to microfinance services and women empowerment in awoday district, east hararghe zone, oromia region, ethiopia.* Haramaya University,

Nanda, R., Peshin, R., Singh, A. K., Sharma, L. K., and Bagal, Y. S. (2019). Factors affecting non-farm diversification among farm households in Jammu and Kashmir. *Agricultural Economics Research Review, 32*(1), 125-132.

Neglo, K. A. W., Gebrekidan, T., and Lyu, K. (2021). Determinants of participation in non-farm activities and its effect on household income: An empirical study in Ethiopia. *Journal of Development and Agricultural Economics, 13*(1), 72-92.

Nurhusien, M. (2017). *A survey of historical heritages in gondar zuria woreda.* University of Gondar,

Seyoum, F., Haji, J., Geberamedhin, B., and Jaleta, M. (2020). Determinants of Farm Households' Vulnerability to the Impact of Land Degradation in the Central Omo-Gibe Basin, Ethiopia.

Shah, A., and Patel, R. (2017). Problems and challenges faced by handicraft artisans. *Voice of Research, 6*(1), 57-61.

Temesgen, A. G., Tursucular, O., Eren, R., and Ulcay, Y. (2018). The art of hand weaving textiles and crafting on socio-cultural values in Ethiopian. *International Journal of Advanced Multidisciplinary Research, 5*(12), 59-67.

Tesfa, R., Maayii, and Xin, Z. (2020). Assessment of tourism industry in Gondar City, Ethiopia. *GeoJournal*, 1-13.

Tesgera, W. D., Beyene, A. B., and Wakjira, T. K. (2024). Does non-farm employment increase rural households' consumption in western Ethiopia? Empirical evidence from the horo guduru wollega zone. *Heliyon, 10*(7).

Ueki, Y., and Kamiesu, Y. (2019). Opportunities and challenges of developing complementary relationships between traditional craft industries in Japan and Lao PDR: Lessons from Japanese policies and business experiences. *Ishida (ed.)*.

W/kidan, A., and Tafesse, A. (2023). Determinants of Smallholder Farmers' Income Diversification in Sodo Zuria District, Southern Ethiopia. *Advances in Agriculture, 2023*(1), 6038569.

Wake, A. A., Tolera, T., and Chalchisa, T. (2020). Determinates of farmers participation decision on craft in Lume district, east Showa zone, Oromia national regional state, Ethiopia. *Int J Fish Aquat Stud, 8*(4), 343-350.

Wayessa, B. S. (2018). The technical style of Wallaga pottery making: An ethnoarchaeological study of Oromo potters in southwest highland Ethiopia. . *African Archaeological Review, 10*(1), 34-55.

White, H., and Raitzer, D. A. (2017). *Impact evaluation of development interventions: A practical guide*: Asian Development Bank.

Wodajo, M. R. (2022). Manufacturing procedures and techniques of indigenous pottery technology: an ethno-archaeological investigation on west guji zone of bule hora district, southern ethiopia.

Wondirad, A., Bogale, D., and Li, Y. (2022). Practices and challenges of developing handcrafts as a core tourism product in Chencha and Konso, southern Ethiopia. *International Journal of Cultural Policy, 28*(3), 306-326.

Wordofa, M. G., and Sassi, M. (2017). Impact of farmers' training centres on household income: Evidence from propensity score matching in Eastern Ethiopia. *Social Sciences, 7*(1), 4.

Worku, T., Getahun. (2023). Heritage resources as a driver of cultural tourism development in Ethiopia: A review. *Cogent Arts & Humanities, 10*(1), 2158623.

Yulisa, P. A., and Permana, D. (2022). Analysis Effect of Omni Channel on The Msme's Performance in Craft Industry through Customer Experience and Customer Relationship Management. *International Humanities and Applied Sciences Journal (IHASJ), 3*(3), 19-27.