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Impact of Rural Out-Migration on Crop Productivity of Migrant-Sending Rural Households in Oromia Region of Ethiopia

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Abstract

This study quantified the impact of rural out-migration on crop productivity using the multinomial endogenous switching model as an analytical model in the Oromia region of Ethiopia. Cross-sectional data were gathered from a random sample of 384 rural households. The descriptive analysis revealed that the rate of rural-rural migration in Ethiopia decreased from 55.8 to 24.6% while the rate of rural-urban migration increased from 28.7 to 33.8 % between 1984 and 2021. The proportion of migrants in the total urban population increased from 17.2 to 49.2% in the Oromia region between 1999 and 2021. The regression results found that land size, use of irrigation, tropical livestock unit, dependency ratio, and education level of household head decrease the likelihood of participating in migration, whereas family size, number of plots, being female-headed households, and age of household head increase the probability of participating in migration. The participation in rural-urban and international migration increases the productivity of wheat producers by 341.28 and 707.21kilograms, respectively. Similarly, the participation in rural-urban and international migration increases the productivity of teff producers by 502.05 and 257.04 kilograms, respectively. This finding also supports the credit and risk hypotheses of the new economics labour migration theory. Enhancing access to finance or credit markets, agricultural land, and enhanced technology for youth in migrant-sending rural communities can leverage the gains from rural out-migration. Provision of pre-migration training, rural non-farm employment, awareness creation, promotion of safe migration, and better rural public services would capitalize the net benefit from out-migration.

Keywords

Migration, new economics labor migration, productivity, switching model, Oromia.

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Introduction

Migration is part and parcel of economic development and structural transformation in developing countries (World Bank, 2023). In structural transformation, people move from working only in rural agricultural sectors into urban non-agricultural sectors such as manufacturing and services. When migration flows from the low-productivity rural agricultural sector to more productive urban industrial sectors, it can benefit both migrants and the rural households they leave behind (ILO, 2022). Recently, migration patterns have shifted more prominently from lagging rural agricultural areas to leading urban centers and from developing to developed countries (FAO, 2021).

While the number of international migrants worldwide increased from 173 million in 2000 to 281 million in 2023, the total amount of global remittances rose from USD 128 billion to USD 860 billion over the same period (IOM, 2024; World Bank, 2024). Moreover, the share of international remittances flowing to developing countries grew from 57% in 2000 to approximately

81% in 2023 (World Bank, 2024). However, rural out-migration remains a development challenge in agrarian economies for at least three reasons: the composition, rate, and direction of migration. First, most rural out-migrants are young, better educated, more informed, and unmarried, resulting in a potential loss of human capital in rural agriculture. Second, the current rate of rural out-migration surpasses historical migration rates during the industrial revolution in now-developed countries (de Haas, 2011). Third, migration tends to move from rural areas, where job creation potential is relatively higher and underemployment is more common, to urban areas where job creation is limited and unemployment rates are higher (ILO, 2022).

Rural out-migration affects agricultural output and welfare in communities of origin by transferring labor and remittances between sending and receiving regions (Stark and Bloom, 1985). Two primary ways that migration impacts these economies are through remittances, which can increase farm investment and household welfare by reducing credit constraints, and labor loss, which can lower agricultural productivity by displacing young, educated, and skilled workers (Lucas, 1987; Lagakos et al., 2020). The opportunity cost of lost labor and the way remittances are used determine the overall effect. Remittances can help compensate for labor shortages if they are used productively; if not, migration may cause rural production to fall over time (Taylor and Wyatt, 1999; Zahonogo, 2011; United Nations, 2016).

Ethiopia is the 2nd most populous country in Africa and the 12th in the world (World Bank, 2021). Migration patterns in Ethiopia have varied across political regimes (Adugna, 2021). During the imperial era (1941–1974), both rural-urban and international migrations were limited. But, under the military regime (1974–1991), international migration increased while rural-urban migration was restricted by policy (Witten, 2007). Following the demise of the socialist government in 1991, both forms of migration have increased significantly. Between 2000 and 2023, the number of international Ethiopian migrants increased from approximately 611,000 to over 2.5 million, reflecting a growing diaspora (IOM, 2024). During the same period, remittance inflows to Ethiopia rose sharply from USD 53 million in 2000 to USD 539 million in 2023 (World Bank, 2024). Rural-urban migration also grew, with its share rising from 21.6% to 32.2%, while rural-rural migration declined from 35.5% to 23.4% between 1999 and 2021 (ESS, 2021). Oromia is the leading source of international migrants, whereas Amhara leads in rural-urban migration. Regarding destinations, 30.7% of Ethiopian migrants go to Saudi Arabia, followed by South Africa (12.4%) and the UAE (8.9%) (ESS, 2021). Ethiopians primarily migrate through three corridors: the eastern route to the Middle East, the northern route through Sudan to Europe, and the southern route to South Africa, where Ethiopia accounts for two-thirds of Horn of Africa migrants (Horwood, 2009; Massey et al., 1998; Abire and Sagar, 2016).

Despite the rising rate of rural out-migration in Ethiopia, particularly in the Oromia region, empirical studies examining its impact on crop productivity in migrant-sending areas remain limited. While some studies (Odozi et al., 2020; Mesfin et al., 2021) report a positive association between migration and crop productivity, others (Khanal et al., 2015; Imran et al., 2016; Adaku, 2019) find a negative association. However, few of these studies apply the New Economics of Labor Migration (NELM) framework or focus on specific staple crops in the Ethiopian context. Hence, this research addresses that gap by investigating the trends, determinants of rural out-migration, and quantifying its impact on the productivity of wheat and teff, two of Ethiopia's most important crops. Wheat is a key staple crop that is targeted by national self-sufficiency programs and agricultural modernization efforts, while teff is a culturally significant, indigenous crop with widespread consumption and high market value, particularly in Oromia. Understanding how migration affects the productivity of these crops is critical for evidence-based rural development and agricultural policy. The remainder of this paper is structured as follows. The second section contains a review of the relevant literature, the third section discusses the research methods, the fourth section presents the findings and a discussion, and the last section contains a conclusion of the study.

Literature review

Theoretical review

From the earliest individual-based explanations to more contemporary household-level tactics, migration ideas have evolved. Examples of classical models that have impacted the understanding of the causes of rural-to-urban migration include the push-pull framework (Lee, 1966), the dual-sector model (Lewis, 1954), the gravity model

(Ravenstein, 1885), and the human capital model (Harris and Todaro, 1970). These theories generally emphasize economic opportunities, labor productivity differences, and wage gaps as reasons influencing migration. However, many of their assumptions, such as the unlimited industrial absorption of rural labor, are less applicable in developing nations where low industrialization and high urban unemployment prevail.

While Lewis's (1954) dual-sector theory contended that excess rural labor moves to more productive urban industries, Ravenstein's (1885) gravity model emphasized the flow from rural agricultural areas to urban centers with higher economic opportunities. Lee's (1966) push-pull theory divided the reasons for migration into four categories: personal causes, intervening hurdles, pull factors (better jobs, education), and push factors (limited land, bad services). Harris and Todaro (1970) explained the coexistence of rural-urban migration and urban unemployment by framing migration as a function of predicted wage differentials. Although these viewpoints offer crucial background information, they are not very good at capturing the intricate socioeconomic tactics that influence migration choices in rural economies.

By changing the unit of study from persons to households, the new economics of labor migration (NELM) provides a more comprehensive perspective (Stark and Bloom, 1985; Taylor, 1999). It makes the case that migration is a risk management tactic to get around market inefficiencies, especially in rural credit and insurance markets, rather than just a reaction to pay disparities. Families send migrants in order to secure remittances and diversify their sources of income, which may then be used to support consumption and investment in agriculture (Lucas and Stark, 1985). This viewpoint is more applicable to the realities of emerging agrarian economies since it takes into consideration both financial limitations and the agency of rural households in deciding to migrate.

The remittance channel, which can improve agricultural production and welfare by reducing liquidity constraints, and the lost labor channel, which can lower productivity and welfare by depleting the household's labor force, are the two opposing channels through which migration affects rural livelihoods. This is one of the main contributions of the NELM framework. The fact that migration has both positive and negative effects is highlighted by this dual effect. This study uses the NELM framework to analyse the effects of migration on crop productivity in the study area, since it is appropriate for examining both the advantages and disadvantages of migrationin rural settings.

Empirical review

Results from empirical studies on the connection between migration and agricultural productivity in rural areas that send migrants are wildly inconsistent. Rural–urban migration can improve agricultural production or welfare in origin areas, according to a number of studies, including de Brauw and Giles (2017) in China, in Ethiopia, and Chamberlin et al. (2020) in Zambia. These studies frequently attribute these gains to remittances that finance agricultural inputs or raise household living standards. Similar benefits are reported by Agza et al. (2023) in southern Ethiopia and Bassie et al. (2022) in Ethiopia, where migration was found to increase welfare and productivity. These results imply that migration may serve as a stimulant for rural development in specific circumstances, such as when remittance flows are put back into farming.

On the other hand, several studies document negative effects of migration, which are frequently connected to a lack of workers in rural areas. For example, studies conducted in Nigeria (Sennuga et al., 2023), Ghana (Kaur and Kaur, 2021), and the Philippines (Morales and Villaronte, 2022) show that migration dramatically lowers agricultural productivity by reducing household labor and increasing reliance on hired labor, which can raise production costs. Out-migration can reduce technical efficiency and production, according to broader multi-country data from Khanal et al. (2015), Imran et al. (2016), Goldsmith et al. (2017), Adaku (2019), and Sauer et al. (2013), as well as similar negative relationships in Vietnam. These findings demonstrate how the effects of migration vary greatly depending on the context, being influenced by factors such as remittance utilization, labor market conditions, and automation levels.

The relationship between migration and productivity is not consistently positive or negative, but rather fluctuates depending on the type of crop, household characteristics, and institutional setting, according to another study. Research conducted in Nigeria by Odozi et al. (2020) and Albania indicates that households with migrants can attain

greater technical efficiency or production, perhaps as a result of improved access to money and technology. But as Mesfin et al. (2021) in Ethiopia and Iheke et al. (2013) in Nigeria show, technical efficiency gains are not always accompanied by a decrease in the availability of on-farm labor. This heterogeneity implies that it might be deceptive to extrapolate generalizations from single-country research without taking into account variations in migratory trends, agricultural systems, and remittance usage.

Overall, there is disagreement in the empirical literature over whether migration increases or decreases agricultural output. This is partially because of methodological variations (such as propensity score matching, instrumental variables, and panel models)and contextual diversity (such as Asia, Africa, and Eastern Europe). The mechanisms by which migration influences agricultural outcomes, such as the trade-off between labor loss and remittance investment, are not well studied, nor are situations directly compared. There is also little evidence from the Oromia region of Ethiopia, where agricultural systems and migratory trends may be very different from those researched areas. The present study, which attempts to evaluate the effect of migration on agricultural output while taking local institutional and socioeconomic variables into consideration, is necessary because of this gap. By explicitly addressing these mechanisms, the study seeks to clarify the conditions under which migration can be beneficial or detrimental to rural agricultural systems.

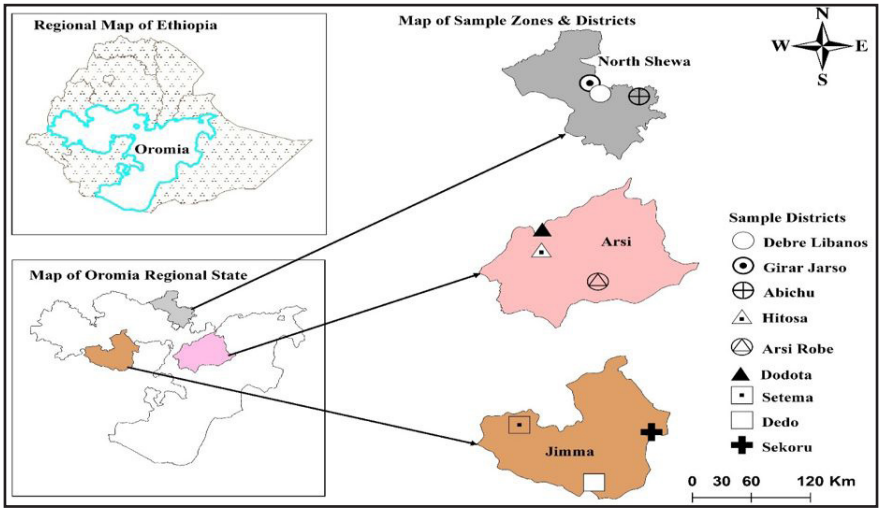
Materials and methods

The study area

This study was conducted in three selected zones of the Oromia regional state of Ethiopia in 2023. Oromia is the largest region in Ethiopia, both in terms of population size and land area. The region shares borders with all regions of Ethiopia except the Tigray region. The 2022 projected population of the region was 42,647,632 2022 (Regional Plan and Development Commission (RPDC), 2022), of which 35,453,080, or 83 percent of the population, live in rural areas. The total area of the region is 363,375 square kilometres. Administratively, the region is divided into 21 administrative zones, 23 town administrations, 294 rural districts/ woredas, and 29 towns. From the total of 21 zones[1] in Oromia National Regional State, three major rural-urban and international migrant sending zones, namely, Arsi, Jimma, and North Shawa, were covered by this research.

According to the latest population estimates, the total population of Jimma was 3,568,782; Arsi was 3,894,248, and the North Shewa zone was 2,100,331 (Ethiopian Statistical Service (ESS), 2022). Jimma zone has 20 woredas, while Arsi and North Shawa have 24 and 11 woredas, respectively. From each Zone, 3 woredas were selected for this study, namely: Setema, Sekoru,

[1] Zones in Oromia include Arsi, Bale, Bedele, Borena, East Haraghe, East Shewa, East Welega, Guji, West Guji, Horo Gudru Welega, Illubabor, Jimma, Kelem Welega, North Shewa, Southwest Shewa, West Arsi, West Hararghe, West Shewa, West Welega, Adama Special Zone, Jimma Special Zone and Oromia-Finfinnes Special Zone.



Source: Authors' preparation (2023)

Figure 1: Map of sample zones and districts of Oromia Regional State

and Dedo woredas from Jimma zone; Dodota, Arsi Robe, and Hitosa woredas from Arsi zone; and Girar-Jarso, Abichu, and Debre Libanos woredas from North Shewa zone were purposively selected for this study (see the Figure 1 above).

Data sources and data collection instruments

This study primarily employed a quantitative-dominated mixed research design to generate a better understanding of the causes and impacts of rural out-migration on the economy of migrant-sending rural areas of the Oromia region. Structured questionnaire, key informant interview, and focus group discussion were used to gather primary data. Primary data on demographic characteristics, sources of rural out-migration, use of remittances, agricultural production, and welfare of rural sample households were gathered from 384 households between January 20 to February 20/2023, from nine sample districts in the Oromia region. Besides, secondary data on the trends of rural out-migration, major sources and destinations of rural-urban and international migrants were obtained from the Central Statistical Service. To support the results from the quantitative data, qualitative data on causes of migration, positive and negative effects of participation in rural out-migration were gathered using key informant interviews (KIIs) and focus group discussions (FGDs). Accordingly, 32 key informant interviews were conducted in this study. The participants in the key informant interview were selected purposively based on their expertise and professional contributions to the study from different offices, such as women and children, labour and social affairs, job creation, and the policy commission. Moreover, 8 focus group discussions were held, and 5-8 participants were included in each FGD. The participants in the FGDs also include elders, development agents, religious leaders, cultural leaders, youth and women group leaders, school principals, community representatives (local police), and return migrants.

Sampling procedures and sample size

A multistage sampling technique was employed to select sample households for this study. First, three sample zones, namely Jima, Arsi, and North Shewa, were selected for this study purposively from 20 zones[2] in the Oromia region. This is because the three zones are the primary sources of both rural-urban and international migrants in the Oromia region. Second, nine major migrant-sending sample woredas were chosen from the three sample zones. As a result, Setema, Dedo, and Sekoru woredas were selected from Jimma zone, while Dodota, Arsi Robe, and Hitosa woredas were chosen from Arsi zone. Likewise, Girar Jarso, Debre Libanos, and Abichu woredas were selected from the North Shewa zone. Third, two kebeles from each of the woredas in Jimma and Arsi Zones, while one kebele from each of the woredas in the North Shewa zone was selected. That means a total of 15 major migrant-sending sample *Kebeles*[3] were selected for this study. Fourth, the sample households were allocated among the three zones using Probability Proportional to Size (PPS). The samples were further allocated for migrant sending and non-migrant sending households, with 2/3 allocated for migrant-sending households from each woreda and kebele, while 1/3 was allocated for non-migrant sending households. The overall sample size is determined using Cochran's (1963) sample determination formula as follows (Equation 1):

$$\boldsymbol{n = \frac{Z^2 pqN}{e^2(N-1) + Z^2 pq}} \quad (1)$$

Where *e, p, q, n, N*, and *Z* are the measures of precision, the assumed level of variability in the population, one minus the level of variability in the population, the sample size of the study, the total population, and the value of the standard normal distribution, respectively. The total households (N) in the three sample zones, the degree of variability, and the level of precision in this study are 1249711, 0.5, and 0.05, respectively. Based on the above formula, a sample size of 384 is determined for this study. Hence, quantitative data were collected from 384 rural households on the causes and impact of rural out-migration in the region using a survey questionnaire in the year 2023. Participants in this study were divided into three groups, namely: households without migrants, households with international migrants, and households with rural-urban migrants. However, households with both international and rural-urban migrants were grouped under households with international migrants due to their few numbers (9).

[2] There are (21) zones in Oromia region and they include Arsi, Bale, Bedele, Borena, East Haraghe, East Shew, East Welega, Guji, West Guji, Horo Gudru Welega, Illubabor, Jimma, Kelem Welega, North Shewa, South West Shewa, West Arsi, West Hararghe, West Shewa, West Welega, Adama Special Zone, Jimma Special Zone and Oromia-Finfinnes Special Zone.

[3] The sample Kebeles include Asandabo and Habe Dangazela (Arsi Robe), Dirre Kiltu and Dodota Alem (Dodota), Jawi Chilalo and Sero Ankato (Hitosa), Seo Sidisa and Karti Wosorbi (Dedo), Yera Docha and Chafeta (Setema), Yabbu and Haro Kake (Sekoru), Ano Akabdo (Abichu), Wartu (Girar Jarso) and Wakene (Debre Libanos).

Method of data analysis

Both descriptive and inferential methods of data analysis were applied in this study. The descriptive methods include percentages, bar graphs, frequencies, means, standard deviations, and time series graphs. The inferential analyses, such as mean difference test, analysis of variance (ANOVA), and multinomial endogenous switching model, were employed to answer the research objectives. Since the problem of self-selection biases due to observed and unobserved factors is a common problem in migration analysis, this study employed a multinomial endogenous switching regression model to evaluate the impact of participation in rural-urban and international migration on the crop production of migrant-sending rural households in origin areas. The quantitative data were analysed using STATA 17 and SPSS 23 Statistical Software.

Model specification

To examine the impact of rural out-migration on crop productivity of migrant-sending rural households, wheat output per hectare and teff output per hectare were used as outcome variables. The treatment variable is rural out-migration, which is a nominal variable with three categories, namely, households without migrants (j = 0), with rural-urban migrants (j = 1), and international migrants (j = 2). But there is a problem of self-selection into migration due to both observed and unobserved factors. Put differently, participation in migration is not random, and households with similar characteristics may participate in rural-urban migration or international migration. To account for this selection problem, this study employed the multinomial endogenous switching model. The multinomial endogenous switching model was developed by Deb and Trivedi (2006) to control for endogeneity due to observed and unobserved factors. Based on the concept of expected utility maximization, rural households may participate in rural out-migration if the expected utility from rural out-migration is higher than the expected utility without participation. Following Deb and Trivedi (2006), the latent variable model, which describes the behaviour of rural households in choosing one alternative among the three alternatives to maximize its expected utility, is given by (Equation 2):

$$Y_{ij}^{*} = \beta_i Z_i + U_{ij} \quad (2)$$

Where Y_{ij}^{*} is the latent variable that measures the expected utility of the i^{th} household from choosing among the j^{th} alternative, i = 1,2,3…384, j = 0,1,2, Z_i is a vector of exogenous covariates, β_i is a vector of parameters to be estimated and U_{ij} is an error term. In the multinomial endogenous switching model, a household has j choices, and the latent outcome variable is given by (Equation 3):

$$Y_{ij} = \begin{cases} 1 \;\; iff \; Y_{i1}^{*} > \max_{k \neq 1}(Y_{i1}^{*}), & U_{i1} < 0 \\ . \quad . & . \\ . \quad . & . \\ . \quad . & . \\ M \;\; iff \; Y_{iM}^{*} > \max_{k \neq M}(Y_{i1}^{*}), & U_{iM} < 0 \end{cases} \quad (3)$$

where Y_{ij} is the observed value of the outcome variable for the i^{th} household choosing alternative j, U_{i1}, U_{i2} … U_{iM} are error terms of the outcome equation, i = 1,2,3…384, j = 0,1,2, and Y_{i1}^{*} is the latent variable. Given the assumption that U_{ij} is independently and identically distributed or the independence of the irrelevant alternatives (IIA) assumption, the selection model of migration leads to the following multinomial logit model, where the likelihood of choosing alternative j *(Equation 4)*:

$$P_{ij} = \Pr(U_{ij} < 0/Z_j) = \frac{e^{\beta_i Z_i}}{\sum_{k=1}^{M} e^{\beta_i Z_i}} \quad (4)$$

In the second stage, a multinomial endogenous switching regression model is used to quantify the impact of participation in rural out-migration on the crop productivity of migrant-sending rural households. Rural households without a migrant family member, j = 0 is the base category in this study. Hence, the output per hectare of wheat or teff (Q) for the i^{th} household is defined as m regime:

Regime 0: $Q_{i0} = X_i\gamma_0 + \varepsilon_{i0}$, if $j = 0$ (5)

Regime 1: $Q_{i1} = X_i\gamma_1 + \varepsilon_{i1}$, if $j = 1$ (6)

Regime 2: $Q_{i2} = X_i\gamma_2 + \varepsilon_{i2}$, if $j = 2$ (7)

where Q_{ij} is the output per hectare of wheat or teff in kilograms of the i^{th} household in regime j, i = 1,2,3…384, j = 0,1,2, X_i is a vector of covariates, and ε_{ij} is the unobserved factor. Based on equations (5), (6), and (7), the selection bias-corrected outcome equations are given (Equations 8, 9, 10):

Regime 0:

$$Q_{i0} = X_i\beta_0 + \delta_0\left[\rho_0 m(P_{i0}) + \sum_j \rho_j\, m(P_{ij})\left(\frac{P_{ij}}{P_{ij}-1}\right)\right] + \\ + \varepsilon_{i0}\,,\ \ if\ \ j = 0 \quad (8)$$

Regime 1:

$$Q_{i1} = X_i\beta_1 + \delta_1\left[\rho_1 m(P_{i1}) + \sum_j \rho_j\, m(P_{ij})\left(\frac{P_{ij}}{P_{ij}-1}\right)\right] + \\ + \varepsilon_{i1}\ \ if\ \ j = 1 \quad (9)$$

Regime 2:

$$Q_{i2} = X_i\beta_2 + \delta_2\left[\rho_2 m(P_{i2}) + \sum_j \rho_j\, m(P_{ij})\left(\frac{P_{ij}}{P_{ij}-1}\right)\right] + \\ + \varepsilon_{i2}\ \ if\ \ j = 2 \quad (10)$$

where P_{ij} is the probability that the i^{th} rural household chooses the j^{th} alternative, ρ_j is the degree of correlation between the error term of the participation equation, U_{ij} and the error term of the outcome equation, ε_{ij} and $m(P_{ij})$ is the inverse transformation for the normal distribution function. The multinomial endogenous switching regression model is also used to estimate the counterfactual data to quantify the impact of rural out-migration on crop productivity of migrant-sending rural households. Following the work of Bourguignon et al. (2007) and assuming households without migrants, $j = 0$ as the base category, values of output per hectare of wheat or teff in kilograms for households with migrants are given by (Equation 11 and 12):

$$E(Q_{i1}/j = 1) = X_i\beta_1 + \\ + \delta_1\left[\rho_1 m(P_{i1}) + \sum_{k=1}^{M} \rho_k m(P_{ik})\left(\frac{P_{ik}}{P_{ik}-1}\right)\right] \quad (11)$$

$$E(Q_{i2}/j = 2) = X_i\beta_2 + \\ + \delta_2\left[\rho_2 m(P_{i2}) + \sum_{k=1}^{M} \rho_k m(P_{ik})\left(\frac{P_{ik}}{P_{ik}-1}\right)\right] \quad (12)$$

Moreover, once the actual mean values of output per hectare of wheat or teff in kilograms for rural households are determined using the above two equations, the mean values of output per hectare of wheat or teff in kilograms for households from the counterfactual data are given by (Equation 13 and 14):

$$(Q_{i0}/j = 1) = X_i\beta_0 + \\ + \delta_0\left[\rho_0 m(P_{i1}) + \rho_1 m(P_{i0})\left(\frac{P_{i1}}{P_{i1}-1}\right) + \rho_1 m(P_{i1})\left(\frac{P_{i3}}{P_{i3}-1}\right)\right] \quad (13)$$

$$(Q_{i0}/j = 2) = X_i\beta_0 + \\ + \delta_0\left[\rho_0 m(P_{i2}) + \rho_2 m(P_{i1})\left(\frac{P_{i1}}{P_{i1}-1}\right) + \rho_1 m(P_{i0})\left(\frac{P_{i3}}{P_{i3}-1}\right)\right] \quad (14)$$

Lastly, the conditional average treatment effects on treated (ATT) could be computed by subtracting Equations (13) and (14) from equations (11) and (12), respectively. The positive and significant values of ATT imply that participation in rural out-migration promotes crop productivity of migrant-sending rural households via the remittance channel.

Description of variables and hypotheses

In the first stage regression of the multinomial endogenous switching model, the dependent variable is rural out-migration, which is a nominal variable with three categories, namely, households without migrants (j = 0), households with rural-urban migrants (j = 1), and households with international migrants (j = 2). The occurrence of drought may induce rural out-migration by reducing the income of rural farm households. Studies conducted by Ma et al. (2019) and Abeje (2021) on determinants of rural-urban migration in northern Ethiopia found that the occurrence of drought is positively and significantly related to the propensity of rural out-migration, but the land size and rural-urban migration are negatively and significantly associated (Table 1).

Similarly, family size is considered a pushing factor for labour out-migration from rural areas. For instance, studies conducted by Alarima (2019) and Ma et al. (2019) on factors affecting rural-urban migration using cross-sectional data found that family size and years of schooling of household heads are positively and significantly related to the likelihood of rural out-migration. Besides, a study conducted by Kefelegn (2020) found that family size, years of schooling of household head, being female-headed households, and drought are positively and significantly related to rural out-migration. This study also hypothesizes that family size, education, being a female-headed household, and the occurrence of drought are positively associated with rural out-migration. Added to these, a study conducted by Tegegne and Penker (2016) also found that age, education

Variables	Description	Measurement	Sign
AGE	Age of household head	Continuous	+
EDUC	Education of the household head	Continuous	+
FS	Family size	Discrete	+
LS	Land size in hectares	Continuous	-
TLU	Tropical livestock unit	Continuous	-
Male	Sex of household head	Male = 1 & Female = 0	±
IRR	Use of irrigation	Users = 1 & non-users = 0	-
DPR	Dependency Ratio	Continuous	+
RM	Presence of Return Migrants	Presence = 1 & 0 otherwise	+
NFP	Non-Farm Participation	Participant = 1 &0 Otherwise	-
DR	Drought in the last five years	Occurrence = 1 & 0 otherwise	+
LR	Participation in land renting out	Renting = 1 & 0 otherwise	+
EXTN	Frequency of extension visits	Discrete	-
PSNP	Productive Safety Net Program	Users = 1 & 0 otherwise	±
Oromo	Dummy for Ethnicity of Household	Oromo = 1 & 0 otherwise	+
Arsi	Place a dummy for the zone	Arsi = 1 & 0 otherwise	+
Jimma	Place a dummy for the zone	Jimma = 1 & 0 otherwise	±
Muslim	Dummy for the religion of households	Muslim = 1 & 0 otherwise	+

Source: Authors' preparation (2023)

Table 1: Description, measurement, and expected signs.

level of household heads, and being female-headed households are positively and significantly related to the likelihood of rural-urban migration. However, Wondimagegnhu and Zeleke(2017) examined the determinants of rural-urban migration in Ethiopia and found a negative and significant association between tropical livestock units and rural-urban migration.

Further, a study conducted by Ajaero et al. (2018) on determinants of rural out-migration found that being male-headed households, family size, and age of household head are positively and significantly related to participation in migration. Similarly, Khatir and Rezaei-Moghaddam (2014) conducted a study on predictors of rural out-migration of youth in Iraq and indicated that family size, age of household head, being male-headed household, number of active male family members, and the occurrence of drought are positively and significantly related to the likelihood of rural out-migration while the land size and frequency of extension visits are negatively and significantly associated with rural out-migration.

The outcome variable in the second-stage regression of multinomial endogenous switching regression is the output per hectare of wheat or teff in kilograms. The independent variables in the second stage regression include all independent variables in the first stage regression, less two instrumental variables such as religion and return migrants. Religion and the presence of return migrants served as exclusionary restriction variables in this study. Religion shapes cultural values, social norms, and access to migration networks, all of which either promote or impede migration patterns (Feliciano, 2018). Importantly, after controlling for other socioeconomic and agro-ecological factors, religion is unlikely to have a direct impact on agricultural output. Similarly, the presence of return migrants reduces the costs and uncertainties of migration by providing vital knowledge, financial resources, and logistical support (Gao et al., 2019; Martínez and Rubio, 2022). Return migrants may not directly affect agricultural productivity, but they do have an impact on the probability of migrating. A falsification test further confirmed the validity of the selected instruments in this study.

The treatment variable in the second-stage regression of the multinomial endogenous switching model is rural out-migration, which is a nominal variable with three categories, namely, households without migrants, with rural-urban migrants, and international migrants. Regarding the impact of participation in rural out-migration on the crop productivity of migrant-sending households, there are dichotomous results. While studies conducted by Odozi et al. (2020),

and Mesfin et al. (2021) found a positive and significant association between rural-urban migration and crop productivity, studies conducted by Bryan et al. (2014)Khanal et al. (2015), Imran et al. (2016), and Adaku (2019) found a negative and significant relationship.

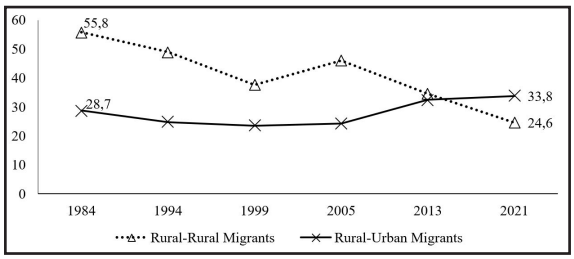
Results and discussion

This section presents both the descriptive and inferential results of data analysis. The descriptive results include the dynamics of rural-urban migration in the Oromia region and the characteristics of sample households in the study area. The inferential results include the independent samples t-test, which compares the means of two groups, and the econometric analysis on the drivers of rural out-migration, and the impact of rural-urban and international migration on crop productivity of migrant-sending households in rural areas of the Oromia region of Ethiopia.

Dynamics of rural-urban migration in Oromia region

The share of migrants from the total urban population was 27.2 percent in the Oromia region in 1999, and this figure increased to 49.2 percent in 2021, as indicated in Table 2. As shown in Table 2, the share of migrants from the total urban population of the Oromia region has been increasing over time, and is relatively higher compared to other regions such as the Amhara and SNNP regions. However, the share of migrants in the total rural population in Oromia regional state decreased between 1999 and 2021 from 15.5 to 12.5%. The implication is that both the urban and rural areas of Oromia are the major migrant receiving areas compared to Amhara and SNNP regional states.

The high share of migrants in the total urban population is primarily contributed to by the current high wave of rural-urban migration. Of all types of internal migration, rural-urban migration has recently become the most dominant type of internal migration in Ethiopia in general and the Oromia region in particular. As indicated in Figure 2, the rate of rural-rural migration decreased from 55.8 to 24.6 percent while the rate of rural-urban migration increased from 28.7 to 33.8 percent between 1984 and 2021. Furthermore, a study on rural outmigration highlights that ongoing land shortages and youth aspirations increasingly drive rural to urban movement, underlining why rural to urban migration is now the most significant internal migration stream. The implication is that rural-urban migration involves the transfer of labour from a place where job creation is easy, rural areas, to a place where job creation is difficult, urban areas. That means job creation in rural areas requires less capital compared to job creation in urban areas. Migration from rural to urban areas is crucial for structural change because it lowers the number of farmers while increasing employment in the urban industrial sector. However, rural-urban migration may result in high urban unemployment and a shortage of agricultural products if it is primarily driven by push factors, occurs before agricultural development, and is from the less productive agricultural sector to the least productive service sector.



Source: Authors' computation from different rounds of NLFs and population census

Figure 3: percentage of rural-rural and rural-urban migrants in Ethiopia over time.

Further, data on the total number of migrants in the Oromia region, as well as the reasons for migration, were gathered from Ethiopia's last four national labor force surveys. According to Table 3, the main reasons for out-migration in the Oromia region are a lack of jobs in rural

Year	Urban				Rural			
	1999	2005	2013	2021	1999	2005	2013	2021
Ethiopia	49.3	39.4	44.4	39.9	15.0	12.5	8.5	10.1
Oromia	**27.2**	**27.8**	**46.6**	**49.2**	**15.5**	**15.2**	**9.1**	**12.5**
Amhara	25.1	38.5	50.0	42.9	13.8	9.5	8.0	8.3
SNNP	20.6	30.6	42.1	31.6	13.6	10.4	7.9	11.8

Source: Authors 'Computation from ESS, 1999; 2005; 2013 and 2021, Labour Force Surveys

Table 2: Proportion of migrants in the total urban Pppulation of Oromia, Amhara and SNNP.

Years	1999	2005	2013	2021
Migrants in the Oromia Region	897,429	1,338,864	1,464,194	1,833,481
Reasons for Migration				
Search for Work	**15.4**	**8.8**	**26.3**	**29.4**
Job Transfer	4.5	4.2	5.5	7.8
Land Shortage	2.4	19.1	1.8	2.0
Education	8.8	10.3	7.9	9.9
Marriage Related Factors	**16.2**	**7.5**	**10.9**	**13.6**
Conflict & Drought	1.4	6.8	1.6	3.2
Join Family or Relatives	**37.6**	**35.4**	**29.2**	**29.4**
Health	0.5	1.3	2.1	1.1
Others	13.0	6.6	14.7	3.6

Source: Authors' Computed from the 1999, 2005, 2013, and 2021 NLFS

Table 3: Total migrants and the distribution of reasons for migration in Oromia region.

areas, the presence of family members or relatives in destination areas, and marriage-related factors. As shown in Table 3, the presence of a relative or family member in the destination area is the main pulling factor of migration in the study area, while a lack of job opportunities in the migrant-sending origin area is the main pushing factor of migration.

Still, as shown in Table 3, the percentage of migrants migrating due to marriage-related reasons has been increasing in the Oromia region. This descriptive result implies that creating viable farm and non-farm employment opportunities in origin areas will help to reduce the current wave of rural out-migration. Urban-biased development policies, on the other hand, would fuel rural out-migration and exacerbate the current high rate of urban unemployment. Therefore, the pull factors in destination areas and push factors in sending areas are the primary drivers of the movement of people from rural areas to urban areas in the Oromia region. A qualitative reviews show that marriage acts as an important pull factor for male migrants heading to urban areas, alongside economic incentives like job opportunities and higher expected income (Fassil and Mohammed, 2017). In Oromia and other rural parts of Ethiopia, limited employment options, including inadequate public sector jobs and constrained livelihoods, are identified as primary push factors, encouraging migration, while better access to jobs and services in urban areas serves as a pull factor (Tesfaye et al., 2023; Fente et al., 2023).

Characteristics of sample households in study area

The majority of the sample households (87%) are male-headed, and 65% of them are Muslims. Of the total sampled households (384), 40% (153) have no migrant, while 21% (82) and 39% (149) of the sample households have at least one rural-urban and international migrant, respectively. Besides, 22% of sample households are participants in off-farm activities in the Oromia region. But the national rate of participation in off-farm activities is 25% in Ethiopia. As can be seen from Table 4, about 10% of sample households are productive safety net users, while nearly 14% of sample households are irrigation users in the Oromia region.

Qualitative Variables	Categories	Frequency	Percent
Sex	Female	50	13.0
Migration	No Migrants	153	39.8
	Rural-Urban	82	21.4
	International	149	38.8
Sample Zones	Arsi	156	40.6
	Jimma	144	37.5
	North Shawa	84	21.9
Religion	Muslim	250	65.1
	Orthodox	125	32.6
	Others	9	2.3
Ethnicity	Oromo	370	96.4
	Amhara	11	2.9
	Others	3	0.8
Irrigation	Users	53	13.8
Productive Safety Net Program	Users	40	10.4
Credit	Users	38	9.9
Off-Farm Participation	Participants	84	21.9

Source: Authors' Computation, 2023

Table 4: frequency distribution of some qualitative variables of sample households.

The independent samples t-test was conducted to test the mean of continuous variables

by migration status, and the result is presented in Table 5. The average age of the household head is about 49 years, with average family size and years of schooling being 6.64 and 3.98, respectively. The average age of household heads with migrant household members is higher compared to the average age of household heads without migrants, and the mean difference is significant at 1% level. This could explain a relationship between the age of the household head and migration in the sense that older household heads could have a large family size, which, on the other hand, encourages migration because of resource sharing among members of the household. Likewise, the average family size of households with migrants is higher compared to households with no migrants in the study areas, and the mean difference is also significant at 1% level. This could be because households with large family sizes are more likely to participate in rural out-migration as predicted by the push and pull factors theory of migration. According to Lee (1966), large family size and limited access to agricultural assets are the main push factors. Previous research has demonstrated that, depending on the environment and compensating mechanisms, migration can both increase productivity (via remittances and hired labor) and decrease it (through home labor shortages) (Kokeb et al., 2021; Adino et al., 2022). Given that migration is endogenous and linked with plot and household factors, these mean differences should be interpreted as associations rather than causes. To assess causal influences, one must use techniques like instrumental variables, endogenous switching regression, or difference-in-differences when panel data is available to account for both observed and unobserved confounders.

As indicated in Table 5, the average land size per household in the study area is 1.88 hectares, which is relatively higher than the national average which is 1.15 hectares per household. The average tropical livestock unit (TLU) is 5.35 per household in the study area, while the average TLU for households with and without migrants is 5.36 and 5.34, respectively. The mean dependency ratio is 0.62 in the study area. High dependency ratio reduces household consumption per capita and makes households more vulnerable to shocks. As shown in Table 5, the mean dependency ratio of households without migrants is higher compared to households with migrant members. The implication is that the dependency ratio may tend to reduce participation in rural out-migration.

Econometric results

As specified in the methodology section, the multinomial endogenous switching model estimates two equations simultaneously: the participation equation and the outcome equation. The first stage regression uses the multinomial logistic model and is employed to examine the drivers of rural out-migration in the Oromia region. The dependent variable in the first stage regression is a nominal variable with three categories: non-migrant households ($J = 0$), rural-urban migrants ($J = 1$), and international migrants ($J = 2$). The base category is non-migrant households. The Wald test result is statistically significant at 1% implying that the survey data fit the model well.

As shown in Table 6, the coefficient of age square is favorably and significantly correlated with both rural-urban and international migration, but the estimated coefficient of household head

	Mean				Std. Error	t-value
	Grand Mean	With Migrants	Without Migrants	Mean Difference		
Age of Household Head	48.73	51.31	44.84	6.48	1.21	5.34***
Adult Equivalent	5.51	6.03	4.72	1.31	0.22	5.94***
Dependency Ratio	0.62	0.51	0.77	-0.26	0.07	-3.99***
Education	3.98	3.37	4.85	-1.48	0.40	-3.70***
Family Size	6.64	7.23	5.76	1.46	0.27	5.37***
Land Size	1.88	1.9	1.86	0.04	0.19	0.20
Tropical Livestock Unit	5.35	5.36	5.34	0.03	0.40	0.06
Asset per AE	8129.3	6048.01	11271.54	-5223.53	4130.07	-1.26
Productivity, wheat	1597.22	1725.27	1427.413	297.86	189.66	1.57
Productivity, teff	713.39	778.01	602.24	175.77	84.35	2.08**

Note: DPR and AE refer to dependency ratio and adult equivalent, respectively
Source: Authors' computation, 2023

Table 5: Mean difference test results for some continuous variables.

age is negatively correlated and significantly correlated with both. According to this non-linear relationship, the likelihood of having migrant household members rises with increasing age, but it is lower for younger household heads. Ajaero and Onokala (2013) in Nigeria and Wondimagegnhu and Zeleke (2017) in Ethiopia also noted this pattern, pointing out those middle-aged families with the networks and means to facilitate migration are more likely to migrate. In a similar vein, the head's years of education have a positive and statistically significant impact when it comes to rural-urban migration. This supports the findings of Tegegne and Penker (2016) and de Brauw et al. (2014), who show that higher education levels raise the likelihood of migration by improving access to information and urban employment opportunities and by influencing preferences for urban amenities and services that aren't available in rural areas. There are also notable differences in migration participation by the household head's gender. According to this study, migration is more likely to occur in rural households headed by women than by men. Tacoli and Mabala (2010) have observed similar findings, attributing this to women's restricted access to land, livestock, extension services, and non-farm revenue streams.

The irrigation dummy coefficient is negative and statistically significant at a 5 percent level of significance. This could be because the use of irrigation by rural households increases their farm income, builds resilience to poverty and vulnerability, and could reduce their likelihood of participating in rural out-migration. The study also revealed that family size increases the likelihood of participation in rural-out migration. A similar study is that of Wondimagegnhu and Zeleke (2017), who found that the probability of a household engaging in rural-out migration increases with family size. This suggests that a family with a large size may be forced to share resources like land and other agricultural assets, which may not be enough to make their living.

Multinomial Logistic Regression				Pseudo R square = 33.2		
Log Pseudolikelihood = -233.8592				Wald chi^2 (48) = 132.181		
Number of observations: 384				Prob > chi^2 = 0.000		
Independent Variables	Rural-Urban Migration			International Migration		
	Coefficient (Std. Error)	t-value	p-value	Coefficient (Std. Error)	t-value	p-value
Male	-1.273 (0.65)	-1.94	0.052	-1.607 (0.702)	-2.29	0.022
Age	-0.215 (0.128)	-1.69	0.092	-.323 (0.112)	-2.88	0.004
Age Square	0.003 (0.001)	2.24	0.025	0.003 (0.001)	3.15	0.002
Dependency Ratio	-0.785 (0.384)	-2.04	0.041	-1.522 (0.313)	-4.86	0.000
Education	0.26 (0.177)	1.46	0.143	.368 (0.134)	2.74	0.006
Education Square	-0.053 (0.019)	-2.76	0.006	-0.031 (0.012)	-2.59	0.010
Family Size	0.264 (0.099)	2.67	0.008	0.497 (0.089)	5.58	0.000
Oromo	0.209 (0.674)	0.31	0.757	1.432 (0.831)	1.72	0.085
Land Size	-0.381 (0.121)	-3.15	0.002	-0.363 (0.148)	-2.46	0.014
Extension Visits	0.009 (0.006)	1.54	0.122	0.003 (0.006)	0.44	0.657
NFP	-0.716 (1.064)	-0.67	0.501	0.789 (0.798)	0.99	0.323
TLU	-0.017 (0.054)	-0.31	0.760	-0.12 (0.058)	-2.07	0.039
Drought	-0.615 (0.403)	-1.52	0.128	0.166 (0.352)	0.47	0.638
PSNP	-1.381 (0.78)	-1.77	0.077	-1.063 (0.547)	-1.94	0.052
Arsi	-0.279 (0.58)	-0.48	0.633	2.77 (0.565)	4.91	0.000
Jimma	1.155 (0.453)	2.55	0.011	1.697(0.551)	3.08	0.002
Irrigation	-1.418 (0.62)	-2.30	0.022	-0.959 (0.558)	-1.72	0.086
Muslim	-0.807 (0.462)	-1.75	0.080	1.088 (0.481)	2.26	0.024
Return Migrants	0.182 (0.096)	1.90	0.057	0.20(0.093)	2.15	0.032
Land Renting	0.923 (0.526)	1.76	0.079	0.163 (0.449)	0.36	0.717
Constant	3.915 (3.447)	1.14	0.256	2.571 (2.939)	0.88	0.382

Note: Values in the parentheses are standard errors
Source: Own survey, 2023

Table 6: Estimation results of the drivers of rural out-migration in Oromia region.

As a result, members of the family engage in rural-urban or international migration. Therefore, a large family size is one pushing factors of rural-urban and international migration in Oromia.

The result in Table 6 also revealed that being followers of the Muslim religion reduces participation in rural-urban migration, while it increases participation in international migration. Putting it differently, followers of the Muslim religion are more likely to participate in international migration compared to followers of other religions. This indicates that religion is both a push and a pull factor in migration. More importantly, it shows that Muslim migrants are more likely to be pulled by Muslim countries in migrant-receiving destination areas (Ahsan, 2022). Agricultural assets like rural land size and number of tropical livestock units reduce household participation in migration in the study area. A similar finding was that of Wondimagegnhu and Zeleke (2017), who found number of tropical livestock units that the household owns reduces the probability of a household participating in rural-urban migration in Ethiopia. Abdullah (2022) has also found that land size negatively affects rural out-migration in Bangladesh. This suggests that better access to agricultural assets such as land, livestock, and capital in rural areas has the potential to reduce the rural out-migration in the Oromia region.

Besides, the presence of return migrants in a household is positively and statistically significantly associated with both rural–urban and international migration, ceteris paribus ($p < 0.05$). This finding is consistent with recent evidence indicating that returnees bring back financial capital, human capital, and social capital resources that reduce migration costs and enhance migration propensity. For example, return migrants return with accumulated savings, skills, and networks that finance and facilitate new migration opportunities (Bossavie et al. 2024) and promote entrepreneurship and urban engagement in their home communities (Yu et al., 2022). Comparing the variation across zones, sample households from Jimma and Arsi are more likely to participate in international migration compared to those from the North Shewa zone, as indicated in Table 6. The existence of dependents in a family (indicated by DPR) reduces participation in migration in the study area. That means families with unproductive members are less likely to participate in rural out-migration mainly because of the extra responsibility that the dependents pose to the family. This finding is in agreement with a study conducted by Zakir (2016) found a negative and significant relation between the dependency ratio and the rural-urban migration of households.

Likewise, participation in a productive safety net program also reduces participation in migration. This may be because participation in a productive safety net program might build the resilience of users to poverty and food insecurity and reduce their participation in rural out-migration. More so, the findings from the KIIs and FGDs showed that limited access to agricultural land, large family size, lack of employment, and credit constraints by rural youth are the major pushing factors of rural out-migration in the study area. They added that peer pressure, brokers, the presence of return migrants in the village, underage marriage, conflicts in the family, and divorce are also contributing to rural out-migration. Further, the participants in KIIs and FGDs also reported that rural youth are not interested in agricultural activities, and rural traditional life, and they are rather attracted by public services in urban areas.

The second stage regression of the multinomial endogenous switching model quantified the impact of participation in rural out-migration on output of wheat or teff per hectare in kilograms, and the results are presented in Table 7. As reported in Table 7, the actual mean output of wheat is 1,905 and 1,641 kilograms per hectare for households with rural-urban migrants and international migrants, respectively. But the counterfactual mean output of wheat is 1,564 and 934 kilograms per hectare for households with rural-urban migrants and international migrants, respectively. Accordingly, the conditional average treatment effects on treated (ATT) of wheat for households with rural-urban migrants and international migrants are 341 and 707 kilograms per hectare. This suggests that participation in international migration significantly increases wheat output per hectare in the study area, though the impact is also positive for rural-urban migration. This could be due to the fact that international migrants tend to send larger remittances, which enable households to invest more substantially in improved agricultural inputs, technology, and labor

Similarly, the actual mean output of teff is 996 and 820 kilograms per hectare for households with rural-urban migrants and international migrants, respectively. But the counterfactual mean output of teff is 494 and 563 kilograms per hectare for households with rural-urban migrants and international migrants, respectively.

Outcomes	Choices	Decision to Participate in Migration		Average Treatment Effect on Treated (ATT)
		Participation	Non-participation	
		Actual	Counterfactual	
Wheat Productivity	Rural-urban	1904.90	1563.62	341.28 (215.02)[c]
	International	1641.42	934.20	707.21 (107.29)[a]
Teff Productivity	Rural-urban	996.01	493.96	502.05 (84.92)[a]
	International	819.82	562.77	257.04 (45.68)[a]
Heterogeneity Effects		**BH_1**	**BH_0**	**TH**
Wheat Productivity	Rural-urban	-963.86 (305.83)[a]	166.99 (128.73)	-1130.86 (306.88)[a]
	International	-3.274 (141.93)	-462.41 (91.74)	459.13 (139.02)[a]
Teff Productivity	Rural-urban	839.19 (142.82)[a]	-96.20 (31.82)[a]	935.39 (144.92)[a]
	International	93.70 (62.14)[a]	-27.38 (28.56)[a]	121.09 (66.96)[c]
Falsification Test Result: F – statistics = 1.61			Probability > F = 0.206	

Standard errors are in parentheses. [a, b,] and [c] denote significance level at 1%, 5%, and 10%.
Source: Authors' Computation, 2023

Table 7: Estimation results of the impact of migration on productivity of wheat and teff.

Accordingly, the conditional average treatment effects on treated (ATT) of teff for households with rural-urban migrants and international migrants are 502 and 257 kilograms per hectare, and significant at the 1 percent level. Despite the fact that the estimated yield effects are significant, some values like for wheat are unusually high when compared to typical input related gains. These effects, therefore, should be interpreted cautiously and viewed as indicative rather than exact, reflecting both the empirical context and model assumptions.

This suggests that the substitution of labor and capital between the rural agricultural sector and urban non-agricultural sectors promotes the productivity of wheat and teff producers in the Oromia region. This could be because the transfer of capital in the form of remittances from urban areas to capital-constrained rural areas will enhance agricultural production by lessening the credit constraints and the risk aversion level of households. This finding supports the credit and risk hypotheses of the new economics labor migration theory, which claims that migration increases agricultural investment and productivity by reducing the risk aversion level and the credit constraints of migrant-sending rural households. Furthermore, since households with limited land size, tropical livestock unit, fragmented land size, and large family size participated in rural out-migration in the study area, as evidenced from the descriptive results, participation in rural out-migration may not necessarily lead to a reduction in agricultural production via the lost labor effect. Moreover, about half of the migrants in the study area are female migrants, and the opportunity costs of female migrants to agricultural production are lower compared to male migrants since male family members are more likely to participate in agricultural activities. Yet, migration may increase output per hectare of remittance-receiving rural households through the remittance channel if rural households spend remittances from migrants on the purchase of agricultural inputs and livestock. This result, therefore, implies that migration promotes crop productivity through the remittance channel by lessening the liquidity constraint and increasing agricultural investment in the region.

Generally, remittances give families access to financial resources that can improve total production capacity, reduce liquidity constraints, and encourage investments in agricultural inputs. These advantages could, however, come at the price of young, talented people leaving the rural areas, which would leave less productive labor available for use in the origin areas. According to this labor-remittance trade-off, remittances can boost productivity by providing financial capital, but these benefits may be somewhat countered by the concurrent loss of human capital, especially in labor-intensive farming systems where having physically fit workers on hand is essential.

In sum, while the human capital theory of migration considers the expected wage differential between rural areas and urban areas as the primary cause of rural out-migration, the new economics labor migration theory insists that rural out-migration is mainly caused by the inefficiency in capital and insurance markets in rural areas. Besides, the new economic labor migration theory also assumes that migration affects the welfare and production of migrant-sending areas via two channels: the lost labor channel and the remittance

channel. Hence, rural outmigration is a two-handed transaction, and it gives with one hand and takes with the other hand. The impact of migration on welfare and production of migrant-sending households, therefore, depends on the relative strength of the remittance effect and the lost labor effect. However, in this study, remittances from migrants have been shown to increase agricultural investments, food expenditure, non-food expenditure, and kilocalories per adult equivalent per day of migrant-sending households in Oromia regional state. This result, therefore, supports the new economics labor migration theory, which assumes that participation in migration increases the welfare of migrant-sending households.

The impact of rural out-migration on agricultural output in rural areas that send migrants has been the subject of several prior studies, with mixed results. On the one hand, Khanal et al. (2015), Abdi (2021), Imran et al. (2016), Goldsmith et al. (2017), and Adaku (2019) report a negative and considerable impact, which they frequently attribute to a lack of labor and a decrease in household capacity to oversee farm operations. Conversely, Odozi et al. (2020), Mesfin et al. (2021) and Yu et al. (2024) indicate a positive and significant effect, indicating that migrant workers' remittances can improve productivity, allow the adoption of new technologies, and increase access to agricultural inputs. Likewise Bassie et al. (2022), using cross-sectional data from China, conclude that participation in migration can promote crop productivity, underscoring that migration's impact on agriculture varies by context, resource availability, and the way remittances are utilised.

The base heterogeneity for participants (BH_1), the base heterogeneity for non-participants (BH_0) and the transitional heterogeneity (TH) effects are computed, and the results are presented in Table 7. The base heterogeneity for participants (BH_1) is the difference between the output per hectare of participants minus the output per hectare of non-participants if they had participated. But the base heterogeneity for non-participants (BH_0) is the difference between the output per hectare of participants if they had not participated minus the output per hectare of non-participants. Hence, a positive value of TH suggests that the productivity-enhancing impact of migration is higher for participants compared to non-participants, whereas the negative value of TH implies that the productivity-enhancing impact of migration is higher for non-participants had they participated in migration compared to participants. This study utilized religion and dependency ratio as exclusion restriction variables. The validity of these instruments was evaluated using a falsification test, the results of which confirmed their appropriateness for the analysis. Once migration choices are taken into consideration, religion has little direct impact on household productivity; however it may influence migration decisions by influencing social networks, cultural norms, and migration preferences. Similarly, return migrants capture exposure to migration networks and information flows that enable out-migration, but apart from their impact on migration behavior, they have no direct impact on production levels.

Conclusion

Rural out-migration involves the flow of labor from the rural agricultural sector to the urban non-agricultural sectors and the transfer of cash in the form of remittances from urban receiving areas to rural sending areas. Migration does not occur in a vacuum; it affects agricultural practices in regions that transfer migrants via labor-loss and remittance channels. However, empirical evidence on the impact of rural out-migration on agricultural production in Ethiopia remains limited. By using cross-sectional survey data from 384 households and applying the New Economics of Labour Migration (NELM) theory along with a multinomial endogenous switching model, this study helps close this gap by investigating the factors that influence rural out-migration and its impact on productivity among wheat and teff producers in the Oromia region.

According to the descriptive findings, the percentage of migrants in Oromia's total urban population increased significantly from 27.2% in 1999 to 49.2% in 2021. This suggests that people migrate from rural areas with comparatively better job creation and lower unemployment to urban areas with high unemployment and few jobs. This trend is consistent with the human capital theory of migration, which holds that improved access to public amenities like clean water, power, transportation, healthcare, and education attracts migrants in addition to job opportunities.

The econometric findings show that while larger family sizes, female-headed households, and older household heads increase the likelihood of migration, land size, irrigation use, livestock

holdings, dependency ratio, participation in productive safety net programs, and education level decrease that likelihood. More crucially, the study shows that the productivity of wheat and teff producers is greatly increased by both international and rural-urban migration. In particular, teff yields rose by 502.05 kg/ha and 257.04 kg/ha, respectively, and wheat yields rose by 341.28 kg/ha and 707.21 kg/ha, respectively, as a result of rural–urban and international migration. These results provide support for the NELM theory's credit and risk assumptions, which contend that by reducing risk aversion and loosening credit constraints, migration might boost agricultural investment.

From a policy standpoint, the findings imply that, as long as remittances are efficiently directed toward profitable agricultural ventures, the benefits of rural out-migration on agricultural output may exceed any possible labor shortages. This emphasizes how crucial it is to have laws that make it easier to use remittances for technology adoption and agricultural inputs. Enhancing land access and tenure security, increasing the availability of cheap finance, upgrading irrigation systems, offering pre-migration financial literacy and agribusiness training, and more are examples of practical initiatives. Furthermore, enhancing rural public services and establishing supplementary off-farm job prospects can guarantee that migration choices are advantageous and strategic rather than solely motivated by misery. In sum, these results have wider implications for rural development plans in Ethiopia and other comparable situations. Rather than perceiving rural out-migration only as a loss of labour, it should be acknowledged as a potential engine of agricultural transformation if supported by enabling institutions, targeted policies, and mechanisms that enhance the productive use of remittances.

This study does, however, have some limitations. First, because it is based on cross-sectional data, dynamic impacts over time are not captured. Second, results are not as comparable or generalizable across nations due to the diversity of socioeconomic and agro-ecological environments. Third, without accounting for factors like labor, seed variety, market accessibility, or input quality, productivity is expressed in kilos per hectare. Panel or longitudinal data should be used in future studies to better understand the temporal dynamics of migration's impacts on agriculture. In order to offer a more profound understanding of the ways in which migration impacts agricultural practices, labor allocation choices, and remittance utilization, researchers may also utilize a qualitative method.

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