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Livelihood diversification and migration intentions among land-poor youth in Tigray, Northern Ethiopia: do they correlate with livestock assets, trust, and trustworthiness?

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Youth unemployment has been prevalent in Ethiopia. Over the past decades, efforts to rehabilitate degraded communal lands have been taking place in Ethiopia. This has created the opportunity to organize landless and land-poor youth and implement a policy of allocating rehabilitated lands for youth to engage in agriculture as a livelihood option. However, whether these rural youth will remain in agriculture or choose other livelihood options including migration, and how their trusting behaviors (trust and trustworthiness) and other factors influence their choices are worth investigating and are the aims of this study. This will help our understanding of what would incentivize the youth to enhance their livelihoods. We used data collected from samples of 1,138 youth group members in the 2016 survey and from 2,427 youth group members in the 2019 survey in five districts of the Tigray region of Northern Ethiopia. Our results from panel data multinomial logit and probit models show that the number of oxen, access to land in the land rental market, and income from youth group activity significantly correlated with youth group members' choices for livelihood options and planning for migrating out of the country. A higher number of oxen owned by the youth group members are associated with a higher likelihood that the youth choose agriculture as a livelihood. Youth group members with a larger number of oxen are also less likely to plan for migration. We also found that more trusting youth group members are more likely to choose off-farm employment relative to staying in agriculture than less trusting members. More trustworthy members are less likely to migrate and more likely to stay in agriculture because trustworthiness is associated with better access to land in the rental market. Thus, improving youth group members' access to land and their asset endowments such as oxen for increasing the productivity of youth group activity and hence income would incentivize youth group members to stay in agriculture and enhance youth group activity as a sustainable livelihood.

KEYWORDS

youth, livelihood, livestock, migration, trust, trustworthiness, Ethiopia

1. Introduction

Youth unemployment has been a major global concern over the last decade and major global events like the financial crisis of 2009, the recent COVID-19 pandemic, and conflicts in different parts of the world have triggered a sharp rise in youth unemployment. The global youth unemployment rate in 2022 was estimated to be 14.9%, it was 15.6% in the previous year, and unemployment among young people is more than three times more common than among adults [International Labour Organization (ILO), 2022]. The youth unemployment rate in Africa is 12.7 % and looks lower than the global average, but young people in Africa have had to face the consequences of the recent setbacks to the global economy. The COVID-19 pandemic put significant socio-economic pressure on the region, with the impacts of global and local lockdowns, value chain disruptions, and widespread economic downturns. Furthermore, recent environmental hazards and erupting conflicts in some parts of the region have taken a heavy toll on the economic prospects of many countries. Going forward, recent food price spikes and disruptions to energy markets are creating additional challenges for the region [International Labour Organization (ILO), 2022].

Ethiopia is the second most populous country in Africa with a total population of 120.28 million in 2021 of which 77.83 % live in rural areas (World Bank, 2023) with agriculture as the main livelihood. The country like other Sub-Saharan African countries has the youngest population in the world. Ethiopia's youth in the age group of 15–29 and children in the age group of 0–14 accounted for 29.9 % and 39.6% of the country's population in 2021, respectively (World Bank, 2023). Although the country has been able to register sustained and fast economic growth over the last one and half decades, the rate of growth in the youth population is higher than the economy's capacity to create employment opportunities. Recently, the youth is facing significant social-economic pressures due to several shocks such as the COVID-19 pandemic, a devastating armed conflict, drought, and soaring inflation. Unemployment, especially among the youth, in Ethiopia is pervasive, and in 2021, the unemployment rate among youth aged 15–29 was 11.8 % (or 7.4 % of male youth and 16.4 % of female youth) [Central Statistical Agency (CSA), 2021]. The youth unemployment rate is higher than the 8 % national unemployment rate among the economically active population aged 10 years and above reported in the 2021 labor force and migration survey of Ethiopia [Central Statistical Agency (CSA), 2021].

Most of the youth in Ethiopia live in rural areas with agriculture as their main livelihood. All land in Ethiopia is owned by the state, and there are restrictions on the land market and land cannot be sold. Rural residents have been guaranteed access to land through a law that grants them a right to obtain agricultural land for free with a user right. However, it has become increasingly more difficult to fulfill this right for the youth and the country is facing severe land scarcity in parts of the highlands where population densities have become very high and farm sizes have become very small. Land as a safety net is eroding, and landlessness is rising among the youth who are unable to stay on their parents' land (Bezu and Holden, 2014). This is true in the Tigray region of northern Ethiopia and

many other parts of the highlands of Ethiopia where most farmers cultivate less than one hectare of land.

In Ethiopia, there are restrictions on land markets, and selling and buying of land are illegal, but farmers can rent out lands for which they have use rights. In addition, there are almost no or very few large commercial farms that can provide farm-wage employment to land-poor rural youth (Bezu and Holden, 2014). In such conditions, access to farmland and oxen are important factors that determine whether a rural resident youth can depend on smallholder agricultural livelihood (Gebru et al., 2019; Gebrehiwot and Holden, 2020; Holden and Tilahun, 2021b). In Ethiopia's smallholder crop-livestock production system, oxen are used as traction power, while the market for such traction power functions poorly; therefore, oxen ownership is crucial for the ability to farm. In addition, addressing youth unemployment requires youth-inclusive policies that could generate livelihood options for the youth. Ethiopia has been investing in sustainable land management and rehabilitation of degraded lands since the 1990s through community-based land management and support from international donors through food for work and productive safety net programs. Tigray Region of northern Ethiopia received the Future Policy Gold Award 2017 from the World Future Council and the United Nations Convention to Combat Desertification (UNCCD) for its youth-inclusive land restoration policy (World Future Council, 2017). The region has been implementing a policy of allocating rehabilitated hillsides to landless and unemployed youth by forming youth business groups (Holden and Tilahun, 2018). The aim of the policy of allocating the rehabilitated land to organized youth groups was to let the youth engage in sustainable livelihood options such as beekeeping, livestock rearing/fattening, horticulture/irrigation, forestry, and, at the same time, sustainably managing the allocated land that was rehabilitated by communities (Holden and Tilahun, 2018). It is, therefore, worth assessing the choices of youth group members for diversifying their livelihood and their intention for migration and the factors that determine such choices.

In this study, we assess rural youth group members' planned livelihood choices in northern Ethiopia based on primary data collected in 2016 and 2019 and using panel data multinomial logit model. We assessed youth group member-level planned livelihood strategies and how they are correlated with member-level variables that include their characteristics, endowments, trusting behaviors, and parents' endowments because youth group members' choices may be largely driven by their parents' decisions and priorities (Bezu and Holden, 2014). District and group activity dummies were included to control unobserved heterogeneity.

What is novel in our study is that we assessed the correlation between trusting behaviors (trust and trustworthiness) of youth group members and their planned livelihood strategy and intention to migrate out of the country. Holden and Tilahun (2021b) found that more trustworthy youth group members were more able to rent land from other households and thereby establish themselves as farmers by also investing in oxen. Their study implies that being trustworthy positively correlates with youths' access to land in the rental market and engagement in agriculture as a livelihood. As far as our knowledge is concerned, no study investigated how trust and trustworthiness affect youths' choices for livelihood diversification,

including migration, and their decision for international migration. In this study, we investigate how the trusting behaviors of the youth affect their livelihood diversification decisions and their intentions for migrating out of the country. Based on [Holden and Tilahun \(2021a\)](#) who reported that group trust was important for group performance, we anticipate low internal trust and trustworthiness are an indication of poor group performance, which in turn is correlated with a higher probability of migration. In our analyses, we controlled selection bias due to the past migration history of the respondents and tested for the endogeneity of the oxen endowment of youth group members.

Section 2 reviews related literature and is followed by data and estimation strategy in Section 3. Section 4 presents the results, and we present the discussion and conclusion in Sections 5 and 6, respectively.

2. Literature review

[Ellis \(1998\)](#) defines rural livelihood diversification as a process by which rural residents construct a diverse portfolio of activities and social support capabilities in their struggle for survival and to improve their standards of living. According to this definition, a livelihood is more than just income and encompasses income as well as the social institutions (kin, family, compound, village, and so on), access to and benefits derived from public services (education, health, water supply, and transport), gender relations, and property rights required to support and sustain a given standard of living. [Ellis \(1998\)](#)'s definition of livelihood diversification contends with Amartya Sen's capability approach (CA) of measuring welfare. In Sen's CA, it is people's capabilities to function (or what people can be or do) that are the central focus of wellbeing analysis ([Sen, 1993](#)). In rural areas of Sub-Saharan Africa, livelihood diversification is mostly derived from rural residents' limited risk-bearing capacity in the prevalence of incomplete or almost non-existent financial and insurance markets coupled with imperfect labor and land markets and changing and uncertain climatic conditions ([Kassie, 2018](#)). Heterogeneity of labor markets due to differences in culture, location, gender, and technical skills ([Davies and Hossain, 1997](#)), the existence of risk ([Bryceson, 1996](#)), seasonality ([Ellis, 2008](#)), and low access to credit to smooth consumption ([Taylor and Wyatt, 1996](#)) are among the factors for rural livelihood diversification. Some argue that deterioration of assets, disasters, migration of a household member or members of the whole family ([Bigsten, 1996](#)), and population pressure ([Malmberg and Tegenu, 2007](#)) are other determinants of livelihood diversification.

The new economics of labor migration theory pioneered by [Stark \(1978, 1991\)](#) conceptualized migration as a collective decision by a household or family as a co-insurance strategy aimed at diversifying income through risk spreading. On the contrary, the neo-classical theory of migration, based on the classical assumption of an individual's rational decision for income maximization, considers migration choices as a reflection of rational cost-benefit analysis and thereby focuses on factors such as wage differentials between origin and destination ([Todaro, 1996](#); [Borjas, 2001](#); [De Haas, 2014](#)). Push-pull theories are a prototype version of neo-classical migration theories, and like

neo-classical theory, they see migration at the macro-level as a function of income and other opportunity gaps between origin and destination areas ([De Haas, 2014](#)). Rural livelihood diversification can be associated both with opportunity-led diversification under improving economic conditions (or prevalence of pull factors) and survival-led diversification under deteriorating conditions or prevalence of push factors ([Niehof, 2004](#)). It has been argued that it is mainly among richer rural residents or in regions with favorable agricultural conditions that livelihood diversification driven by motives to raise incomes or accumulate wealth prevails ([Loison, 2015](#); [Makita, 2016](#)). However, our view is that poor people also strive to raise their incomes, and this is not necessarily in conflict with having to focus on short-term survival, but their constraints may limit their ability to get out of a poverty trap.

Pull factors are positive, and these may attract farm households to pursue additional livelihood activities to improve their living standards. These factors provide incentives for farmers to expand their range of income activities outside farming by increasing the returns from non-farm activities. Such factors tend to dominate in less risky and more dynamic agricultural environments. In other words, opportunity-led livelihood diversification occurs when wealthier rural households engage in high-return non-farm activities, with accumulation objectives, to increase household income by maximizing returns from their assets ([Loison, 2015](#)). Income diversification is positively associated not only with wealth accumulation ([Barrett et al., 2001a](#)) but also with an increased ability to withstand exogenous shocks, at least in terms of partial consumption smoothing ([Block and Webb, 2001](#); [Dressler et al., 2016](#)).

It is often argued that livelihood diversification push factors force rural residents into a variety of low-return options, leading to more stable but lower-income-generating activities ([Lohmann and Liefner, 2009](#)). Rural residents are pushed into low-return non-farm activities or to survival-led diversification if they have low endowments of assets such as land, capital, livestock, and credit, making them less resistant to seasonal and other risk factors ([Barrett et al., 2001b](#)). In this context, diversification is considered an involuntary relapse of the process of specialization, brought on by crises such that the multiplication of activities is an adaptation necessary to ensure survival ([Cinner et al., 2010](#)). The most common push factors are related to different forms of risk, such as seasonality and climatic uncertainty ([Ellis, 2008](#); [Kassie, 2018](#)). Others include land constraints driven by population pressure and fragmented land holdings, missing or incomplete factor markets, and market access problems due to poor infrastructure and high transaction costs ([Barrett et al., 2001a](#); [Dercon, 2002](#)).

Rural residents in marginal environments are portrayed in the growing livelihood literature as experts in the craft of survival under conditions of adversity ([Ellis, 2008](#); [Toulmin, 2009](#)). Smallholder farmers use a variety of practices to adapt to climate variability and change. These practices include crop and livestock management, diversification of livelihood strategies, and land use management. [Holden and Tilahun \(2018\)](#) evaluated the early performance of land-poor youth in youth business groups, which were allocated rehabilitated land for establishing livelihood activities, against Elinor Ostrom's design principles for collective resource management and found a high degree of compliance with

the design principles. In the context of high youth unemployment and growing youth migration, Holden and Tilahun (2018) argue that the youth employment strategy of allocating rehabilitated communal lands to youth groups is a win-win strategy for proactively mobilizing the youth as a resource in the creation of sustainable livelihoods.

Holden and Tilahun (2021a) found that group trust was important for group performance in these youth business groups. They also found substantial variation in individual and group trust and trustworthiness. Trust and trustworthiness may be important for being successful in establishing a rural livelihood. It may, therefore, also be important for being able to invest in and build an individual livestock endowment. Holden and Tilahun (2021b) found that the more trustworthy youth group members, measured with the incentivized trust game, were more able to access land in the land rental market. Such success may reduce the likelihood that youth give up their rural livelihood and migrate to other places. However, there is no evidence on how the trusting behaviors of the youth affect their decision to choose other livelihood options, including migration and off-farm activities, and their intention for deciding to migrate out of the country. For example, we may ask whether more trusting youth are more daring and therefore more likely to migrate.

Based on the above brief review of the literature on rural livelihood diversification and following Bezu and Holden (2014) who investigated the livelihood choices of youth in southern Ethiopia, we conceptualize rural youth group members' livelihood choices [such as agriculture, and non-agricultural activities (such as migration, off-farm employment in nearby districts, or going for further education)] as a constrained optimization problem. The existing set of push and/or pull factors signal the relative return from the diverse livelihood options and where the amount of owned and otherwise accessed resources determine the capacity to engage in these livelihood options. In the case of choice of non-agricultural livelihood options relative to agriculture, the push factors include subject- and group-level resource poverty and might also be related to the performance of agriculture including the performance of youth group activities. This includes basic production potential, given available technologies, and agro-ecological characteristics as well as risk factors that may cause cyclical and transitory declines in agricultural income, chronic food insecurity, and fluctuation of income from agriculture and/or youth group activities (Reardon et al., 2007; Ellis, 2008; Bezu and Holden, 2014; Kassie, 2018). Incomplete and or missing factor markets such as missing or incomplete land, credit, insurance, and labor markets in rural areas are another source of push factors (Binswanger and Rosenzweig, 1986; Barrett et al., 2001a). In the absence of access to financial markets, individuals and households diversify their sources of income to self-insure themselves and provide working capital (Barrett et al., 2001b). Rural residents who do not own agricultural land in the face of missing land markets experience the ultimate push factor. However, farmers who have land to cultivate but face frequent weather shocks may be forced to diversify into the non-farm sector as *ex ante* risk management and/or *ex post* risk-coping mechanism (Bezu and Holden, 2014).

The pull factor arises if expected gains from non-agricultural livelihood options are assessed to be higher than gains from

agriculture. Higher returns to mobile factors of production such as labor and capital in non-agricultural livelihood options compared to agriculture make agriculture a less attractive livelihood option, but, in the presence of a strong and vibrant non-agricultural sector in rural areas, some rural residents may diversify into the non-agriculture sector while engaging in agriculture and achieve efficiency in labor and capital allocation while others may specialize in non-agricultural activities (Bezu and Holden, 2014). However, rural areas with strong push factors with few local non-agricultural livelihood options may experience high levels of outmigration, especially if they are not located within commuting distance to other sources of employment.

The push and pull factors represent the incentive that motivates rural residents to diversify their livelihood options. Whether and to what extent rural residents including the youth diversify their livelihoods depend on their individual, household, and community endowments, preferences (Bezu and Holden, 2014), and possibly their trusting behaviors. The estimation strategy of the next section provides further details on how trusting behaviors and endowments of youth group members are used as key variables of interest to model livelihood choices and the intention to migrate out of the country.

3. Materials and methods

3.1. Data

In February–March 2016, we conducted a census of 742 youth groups in five districts of Tigray (Holden and Tilahun, 2018). The groups were formed as primary cooperatives between 2011 and 2016 with an average of about 20, a minimum of 2, and a maximum of 193 members per group (Holden and Tilahun, 2018) based on a policy initiative to create new livelihoods for landless and unemployed youth. Youth groups are formalized as primary cooperatives under the Cooperative Law in Ethiopia. They self-organize and elect a board of five members and establish their group bylaw. The members in a group all come from the same community (*tabia*). Based on the census, we sampled 119 youth groups and then sampled randomly up to 12 members from each youth group among those available during the first-round survey in July to September 2016. In this first-round survey, a total of 1,138 members in the 119 youth groups took part in the survey and experiment. We followed up with an extended survey of 246 youth groups (2,427 members as sample respondents) in 2019. The main activities that the youth group members were engaged in include beekeeping, irrigation/horticulture, animal rearing, and forestry. Details on the distribution of the youth groups and youth group members by main activities are presented in Table 1 of Section 4. Nearly 60% of the respondents in the 2016 survey and close to 28% of the respondents in the 2019 survey reported that their families were at least quite severely affected by the 2015/16 drought and at least about 7% in the 2016 survey and close to 26% in the 2019 survey reported that the health of the heads of their parents was in either poor or very poor conditions.

Holden and Tilahun (2018) reported trust within a group as perceived by group leaders as one of the youth group performance

TABLE 1 Distribution of sample youth group members by main activity, districts, and survey year.

Youth group's main activity	Number of group members by <i>Woreda</i>					Total Members	Number of youth groups
	Raya Azebo	Degua Temben	Seharti Samire	Kilite Awlalo	Adwa		
Survey 2016							
Beekeeping	60	89	74	99	75	397	41
Irrigation/horticulture	93	37	30	36	76	272	28
Animal rearing	92	76	41	12	107	328	38
Forestry	12	47	0	0	82	141	12
N	257	249	145	147	340	1,138	119
Survey 2019							
Beekeeping	17	249	183	0	284	733	76
Irrigation/horticulture	140	142	120	0	94	496	47
Animal rearing	251	136	73	0	357	817	86
Forestry	74	46	9	0	252	381	37
N	482	573	385	0	987	2,427	246

indicators and found a strong correlation between such group trust and the degree of compliance with Ostrom's design principles for collective resource management. They suggested that group trust can be a good early performance indicator for business groups. We anticipate low internal trust and trustworthiness are an indication of poor group performance, which in turn is correlated with a higher probability of migration. Our definition of trust in this study is based on Fehr (2009) who defines trust as the behavior of an individual (trustor) who voluntarily places resources at the disposal of another party/individual (the trustee) without any legal commitment from the latter. The act of trust is associated with an expectation that the act will pay off in terms of the trustor's/investor's goals. If the trustee is trustworthy, the trustor is better off than if the trust was not placed, whereas if the trustee is not trustworthy the trustor is worse off than if the trust was not placed. If trust is a behavior involving trusting acts, then it is shaped by our beliefs about others' trustworthiness and our willingness to accept the risks involved in trusting acts (Fehr, 2009). Trust defined this way can be measured using the standard incentivized trust game (Berg et al., 1995). A potential drawback of behavioral trust measures taken from the trust game is that the investor may send money for purely altruistic reasons (Cox, 2004). These transfers might not be "trusting," although they place resources at the disposal of another party without any real commitment because the transfers are not associated with an expectation of a back transfer that renders the investor better off. Therefore, controlling for altruistic motives seems advisable because they might affect investors' behavior (Fehr, 2009). Holden and Tilahun (2021a), however, reported that altruistic preferences were associated with higher outgroup and ingroup trustworthiness and trust and hence are associated with stronger norms to reciprocate.

The surveys were combined with incentivized lab-in-the-field experiments (experiments that complement traditional randomized control trials in collecting data in the field to test

theoretical predictions and explore behavioral mechanisms) to elicit the trust and trustworthiness of the youth group members. Following the standard incentivized trust game (Berg et al., 1995), we derived measures of trust and trustworthiness. The incentivized trust game has become a common and recognized tool for the measurement of trust and trustworthiness (Fehr, 2009; Johnson and Mislin, 2011; Al'os-Ferrer and Farolfi, 2019; Holden and Tilahun, 2021b). We tripled the amount that a youth group member that plays the role of a trustor has invested before it is given to another random and anonymous member of the same youth group that plays the role of a trustee. The trustee decides freely how much of this amount to send back to the anonymous trustor. We used the strategy method to elicit returned amounts for varying received amounts and stated amounts to return were binding. Each member played both roles as trustor and trustee in the game. Trusting behavior was measured as the share of the endowment (Ethiopian Birr (ETB) 30) that was sent to the trustee whereas trustworthiness was measured as the share of a received amount (= tripled amount sent by the trustor) that was returned by the trustee in the game where all sampled members played both roles while anonymity was ensured. The survey also included questions about what livelihood options members would have chosen other than their current engagement as a youth group member, their intention to make international migration, and questions about the characteristics of individual members and their parents including their land and livestock endowments and income from youth group activities. For this study, we rely on the unbalanced panel data of both the 2016 and 2019 surveys.

3.2. Estimation strategy

Based on the random utility framework (Maddala, 1983) for limited dependent variables, the theoretical considerations on our

key variables of interest discussed in Section 2 as factors that could influence the choice of planned livelihood strategy of youth group members, and our dataset of repeated observations from youth group members in the surveys of 2016 and 2019, we can specify the utility that a youth group member derives from livelihood choice as follows:

$$U_{ijt} = \alpha_{1j}T_{it} + \alpha_{2j}TW_{it} + \alpha_{3j}OE_{it} + \alpha_{4j}GI_{it} + \alpha_{5j}T_{it}*GI_{it} + \alpha_j LA_{it} + \alpha_j C_{it} + v_{ij} + \varepsilon_{ijt} \quad (1)$$

where U_{ijt} is the utility of the i th youth group member with $i = 1, \dots, N$, from choosing intended livelihood strategy j with $j = 1, \dots, J$, where $J = 4$ (1 = agriculture, 2 = migration, 3 = off-farm employment, and 4 = further education), and t is the survey time and $t = 1, \dots, T_i$ with $T_i = 2$.

The right-hand side variables include measures of ingroup trust (T) and ingroup trustworthiness (TW), oxen endowment (OE), income from group activities (GI), row vector of land access variables (LA), and row vector of control variables (C). The control variables include youth group member-level variables (age, sex, marital status, birth rank, education, and perception about level of satisfaction on current livelihood), parent-level covariates (land per own child and livestock), covariate shocks (drought effect on the household), idiosyncratic shocks (health condition of the household head), and location and group activity fixed effects. The location variables are included to capture heterogeneity in agroecology, access to infrastructure, and other unobservable differences whereas the group activity variable is included to control the effect of the difference in current youth group activities that members are engaged in. The unobserved part consists of two error terms. The first, v_{ij} , refers to panel-level heterogeneity which may arise because livelihood strategy choices made by individual youth group members are not independent over time because of underlying individual preferences or characteristics that are unobservable to the researchers and remain unobserved in the data. The second error term, ε_{ijt} , captures heterogeneity at the observation (time) level.

In this model specification, taking agriculture as a base category of the four livelihood strategies specified above, we would like to test the following hypotheses:

H1: $\alpha_{1j} > 0$, for $j = 2$: Higher ingroup trust is likely to be associated with more likelihood of the youth choosing migration relative to staying in agriculture. In other words, more trusting youth group members might be more daring to migrate and hence less likely to choose agriculture as their planned livelihood option.

H2: $\alpha_{2j} < 0$, for $j = 2$: Higher ingroup trustworthiness is likely to be associated with less likelihood of the youth choosing migration relative to staying in agriculture. In other words, more trustworthy youth group members want to continue trustworthy to their fellow group members engaged in the same youth group and hence are more likely to choose agriculture as a planned livelihood option.

H3: $\alpha_{3j} < 0$, for $j = 2$: The larger endowment of oxen by a youth group member is likely to be associated with less likelihood of the youth choosing migration relative to staying

in agriculture. In other words, the larger the number of oxen that a youth group member owns, the more likely he/she will choose agriculture as a planned livelihood option.

H4: $\alpha_{4j} < 0$, for $j = 2$: Higher income from youth group activities is likely to be associated with less likelihood of the youth choosing migration relative to staying in agriculture. In other words, the higher the income from youth group activities, which is an indicator of better group performance, the more likely the youth group member will choose agriculture as his/her planned livelihood option.

Following [Holden and Tilahun \(2018\)](#), who reported trust within a group correlates with group performance measured in terms of the degree of compliance with Ostrom's design principles for collective resource management, it is worth investigating the effect of the interaction of ingroup trust and income from group activities, which is a group performance indicator, on the planned livelihood choice of youth group members and test the following hypothesis.

H5: $\alpha_{5j} > 0$, for $j = 2$: A positive coefficient of the interaction term of ingroup trust and income for the youth group implies that an increase in one of the variables, for example in ingroup trust, will increase the effect of the other variable, say income from youth group activity. In H4, we hypothesized that larger group income is associated with less likelihood of the youth choosing migration relative to staying in agriculture. Thus, higher ingroup trust enhances youth group income, which in turn reduces the likelihood of the youth choosing migration than staying in agriculture. However, if the coefficient for the interaction term is negative, it implies that the combined effect of the two predictors is less than the sum of the individual effects.

H6: α_j for the LA < 0 , for $j = 2$: More access to land either through the land rental market, land redistribution, or inheritance from family is associated with less likelihood of the youth choosing migration relative to staying in agriculture. In other words, youth group members with more access to land are more likely to choose agriculture as his/her planned livelihood option.

For simplicity, we can rewrite equation 1 a multinomial logit model with a random-effects estimator ([Hartzel et al., 2001](#); [Grilli and Rampichini, 2007](#)) by condensing the RHS key observables and control variables into a row vector of variables, X, using the following equation:

$$U_{ijt} = \alpha_j X_{it} + v_{ij} + \varepsilon_{ijt} \quad (2)$$

Assuming a standard Gumbel distribution or type 1 extreme value distribution for the second error term, ε_{ijt} , and denoting the outcome variable as y_{it} will give rise to the multinomial logit model:

$$Pr(y_{it} = k | X_{it}, \alpha_j, v_{ij}) = \frac{\exp(X_{it}\alpha_k + v_{ik})}{\sum_{j=1}^J \exp(X_{it}\alpha_j + v_{ij})} \quad (3)$$

For model identification, equation 3 needs to be normalized to a base category, say in our case livelihood strategy 1 = agriculture, by setting both the elements in α_j and v_{ij} to zero for one category of the outcome variable, y_{it} . Given that $F(\cdot)$ is defined as a cumulative logistic distribution function and we let the base outcome be outcome 1 = agriculture, the likelihood that the i th individual chooses outcome k at time t is as follows:

$$\Pr(y_{it} = k | X_{it}, \alpha_j, v_{ij}) = F(y_{it} = k, X_{it}\alpha_j + v_{ij}) = \begin{cases} \frac{1}{1 + \sum_{j=2}^J \exp(X_{it}\alpha_j + v_{ij})} & \text{if } k = 1 \\ \frac{\exp(X_{it}\alpha_k + v_{ik})}{1 + \sum_{j=2}^J \exp(X_{it}\alpha_j + v_{ij})} & \text{if } k > 1 \end{cases} \quad (4)$$

We can estimate equation 4 using the *xtmlogit* command in STATA 17 using either fixed-effects or random-effects specifications. We used the *xtmlogit* command in STATA 17 to estimate equation 4 using both fixed-effects and random-effects estimators using agriculture as the base outcome and estimated the probabilities that a youth group member chooses migration, off-farm employment, and further education (Model 1). We fitted the observables, X_{it} , in the multinomial logit (MNL) model using the key variables of interest and control variables specified above in Equation 1.

Close to 40% of our sample had a history of migration and are returnees from temporary internal and international migration. We suspected this may cause selection bias. We constructed a dummy variable for members' migration history as a selection variable, and we ran panel data random-effects probit regression as a selection model with demographic characteristics of the respondents and constructed an Inverse Mills Ratio (IMR) for possible selection bias associated with groups with past migration history. We included the selection dummy and the IMR with livelihood multinomial choice as the dependent variable to test for the significance of selection bias (Model 2).

We also assumed the oxen endowment of the youth group member as an endogenous variable. For correcting endogeneity bias, we used the control function approach following [Petrin and Train \(2010\)](#), and we ran a random-effect generalized least square regression of oxen as a first-stage equation with all independent variables stated in model 2 and additional three variables that we considered are correlated with oxen endowment of the youth group member. These variables are time spent on work activities to help family, time spent on work for complementary income sources, and members' perception of the amount of work in youth group activities. Youth group members who allocate more time to complementary income-generating activities are more likely to generate more complementary income that could allow them to buy oxen, which will further enhance their access to land in the land rental market. Although youth group members who allocate more time to work on activities to help families are less likely to have a larger number of own oxen as in most cases labor contributions to family work have no monetary returns. In addition, those youth group members who perceive that the workload in youth group activities is too small have a larger number of oxen than those who perceive the workload in youth group activities is either average or too much. We anticipate that these instrumental variables satisfy

the exclusion restriction and affect the outcome variables only through their effect on the endogenous variable.

Using *xtivreg2*, we further tested the validity of these variables as instruments, and they satisfy the identification restrictions. The Sargan statistic for over-identification restriction is insignificant indicating that the instrumental variables used in the model were valid instruments and uncorrelated with the error term of the structural equation and that they were correctly excluded from the estimated equations. The Anderson Lagrange Multiplier statistics for the under-identification test were also significant (at $p < 10\%$) indicating that the models were correctly identified. We also tested the exogeneity of oxen owned by the youth group member using *xtivreg* and running the *dmexogxt* command in STATA 17. The null hypothesis of the test is that an ordinary least square (OLS) estimator of the same equation would yield consistent estimates. A rejection of the null indicates that endogenous regressors' effects on the estimates are meaningful. Our test results show that the Davidson-MacKinnon test of exogeneity test statistics is insignificant, and the p -value is 0.45 for the livelihood choice as a dependent variable. The same test for the equation of intention for international migration as the dependent result is also insignificant, and the p -value is 0.22. These show that the number of oxen is exogenous to both outcome variables. We have not reported the detailed results from the *xtivreg2* and *xtivreg* models and the *dmexogxt* exogeneity test, but these can be accessed upon request by the authors. Furthermore, we included the suspected endogenous variable (oxen endowment of the youth group member) and the error term from the first-stage equation with livelihood multinomial choice as the dependent variable (Model 3). If the coefficient for the error term is significant, it implies endogeneity of the oxen variable. We found that the coefficient for the error term is insignificant.

To assess youth group members' plans for international migration, we estimated a logit model of migration outcome using *xtprobit* in STATA 17 using the same variables as in the multinomial logit model above (Model 1). The dependent variable is a binary variable that takes the value one if the youth group member considers migrating out of the country and zero otherwise. Our main hypotheses in this migration model are that youth group members who are better endowed with their livestock (specifically, oxen) and land and/or expect to get land either from inheritance or land redistribution in their communities are less likely to consider migrating out of the country. We also hypothesize that (a) members in poorly performing groups are more tempted to leave their group and migrate; (b) poorly performing groups are also characterized by low internal trust and low trust ([Holden and Tilahun, 2018](#)) are therefore also correlated with a higher probability of migration due to poor performance of the group; and (c) individual and parent endowments are more important than group performance as individual livestock endowments are driven by parent endowments.

We included the selection dummy and the IMR with youth group members' intention for international migration as the dependent variable. We found a significant correlation between the self-selection dummy and the international migration choice variable indicating significant selection bias (Model 2). To check for the endogeneity of oxen to youth group member's intention for international migration, we ran the *xtprobit* model in STATA

17, which is an extended probit model that allows including a suspected endogenous variable as an ancillary equation and test for the correlation between errors from the main equation and the errors from the ancillary equation (Model 3). If any of these correlations are statistically significant, it implies the dependent variable in the auxiliary equation is endogenous.

4. Results

In this section, we will first describe the panel data of the distribution of sample youth groups and youth group members and provide a summary of the data on main variables that are used in modeling youth group members' livelihood choice and intention for international migration, whose results are presented in the following sub-sections.

4.1. Descriptive statistics

Table 1 shows the distribution of sample youth group members by main activity, districts, and survey years. In terms of the distribution of the samples by group main activity, beekeeping accounts for the largest number of samples in the 2016 survey whereas animal-rearing groups account for the largest number in the 2019 survey. In terms of the distribution by districts, 29.9% and 40.7% of samples in the 2016 and 2019 surveys were from the Adwa district, whereas the remaining close to 70% and 60% of the samples are from the other four districts.

Table 2 provides summary statistics of variables. Out of the total sample of youth group members, 16.5% responded in the 2016 survey that they would have chosen migration (would have migrated to urban areas to search for employment and/or migrated to another country) as their livelihood strategy if they did not join the youth group activity. In the follow-up 2019 survey, slightly a higher number (21.0%) responded to the same question that they would have chosen migration as their livelihood strategy if they did not join the youth group activity. The number of samples who would have chosen off-farm employment (would have looked for another employment opportunity in the neighborhood/*tabia*/nearby woreda center) and those who would have gone to school for further education as a livelihood strategy if they did not join the youth group decreased from 40.1 and 9.1% in 2016 to 26.7 and 3.5% in 2019, respectively. Our second outcome variable is the member's responses to the question "Do you consider migrating out of the country?" In the 2016 survey, 8.7% of the samples responded Yes to this question, whereas, in the follow-up survey of 2019, 6.6% of the respondents replied Yes to the same question.

The results from the trust game experiment indicate that the trust, which is the share of the endowment [Ethiopian Birr (ETB) 30] that was sent to the trustee, slightly increased from 40.6% in 2016 to 41.3% in 2019 and trustworthiness, which is the share of a received amount that was returned by the trustee to the trustor, increased from 29.4% in 2016 to 54.8% in 2019 (**Table 2**).

Regarding youth group members' endowments, the average livestock units owned by sample youth group members were 0.74 oxen in tropical livestock units (TLU) in the survey year 2016

and 0.91 TLU in 2019. The details for the remaining variables are presented in **Table 2**.

4.2. Livelihood choice

Table 3 shows the determinants that youth group members would have chosen migration, off-farm employment in nearby districts, and going to further education if they did not join as a member of the youth groups. Agriculture is the reference livelihood outcome in the reported models in **Table 3**. Model 1 shows the results from panel data random-effects multinomial logistic regression without controlling for selection bias associated with past migration history. Model 2 refers to panel data random-effects multinomial logistic regression with IMR and selection variable for controlling selection bias associated with past migration history, and Model 3 is the same as Model 2 but includes error term from a first-stage regression of suspected endogenous variable (oxen endowment of the youth group member) with livelihood multinomial choice as the dependent variable. If the coefficient for the error term is significant, it implies endogeneity of the oxen variable. Our results show that the history of migration and IMR are significantly correlated with migration as a livelihood choice than staying in agriculture, indicating significant selection bias. The IMR is also significantly correlated with off-farm employment as a livelihood choice than staying in agriculture, but the coefficient of the error term from the regression oxen as the first-stage equation is not significantly correlated with either migration, off-farm employment, or further education as livelihood options than staying in agriculture. Thus, our analyses of results for the livelihood choice model are based on Model 2 of **Table 3**, which controls for the selection bias.

The coefficient for the trust variable, which is the value of the share of the endowment (Ethiopian Birr (ETB) 30) that was sent to the trustee in the within-group trust game, is negative, but the correlation with migration as planned livelihood strategy relative to agriculture is not significant. Thus, we reject our hypothesis (H1). Rather we found that the variable trust is positive and significantly (at $p < 1\%$) correlated with off-farm employment as a planned livelihood strategy relative to agriculture (**Table 3**). This implies more trusting youth group members are more likely to choose off-farm employment relative to staying in agriculture than less trusting members. The variable trustworthiness, which is the value of the share of a received amount that was returned by the trustee to the trustor in the within-group trust game, is negative and significantly (at $p < 1\%$) correlated with youth group member's choice of migration as intended livelihood options relative to staying in agriculture (**Table 3**). This implies that we cannot reject our hypothesis (H2) that states an increase in the trustworthiness of youth group members decreases the likelihood of youth group members choosing migration relative to agriculture as a planned livelihood option. Marginal effects in **Table 4** also show that an increase in the trustworthiness variable is associated with an increase in the likelihood of a youth group member choosing agriculture as a livelihood whereas an increase in trusting behavior is associated with a decrease in the likelihood of a youth group member choosing agriculture as a livelihood.

TABLE 2 Description and summary statistics of key variables by survey year.

Variable description	2016				2019			
	N	Mean	Std. dev.	%	N	Mean	Std. dev.	%
Outcome variable								
Livelihood strategy	1,135			100.0	2,427			100.0
1 = Agriculture	187			16.5	510			21.0
2 = Migration	390			34.4	1,184			48.8
3 = Off-farm employment	103			9.1	84			3.5
4 = Further education	455			40.1	649			26.7
Consider migrating out of the country (1 = Yes, 0 = No)	1,138	0.09	0.28		2,427	0.07	0.25	
Youth group member-level variables								
Sex (1 = Female, 0 = Male)	1,138	0.32	0.46		2,427	0.31	0.46	
Birth rank (mean)	1,138	3.11	1.995		2,427	3.33	2.12	
Marital status	1,138			100.0	2,427			100.0
1 = Unmarried	369			34.8	600			24.7
2 = Married	687			60.4	1,726			71.1
3 = Separated	6			0.5	7			0.3
4 = Divorced	36			3.2	72			3.0
5 = Widowed	13			1.1	22			0.9
Age	1,138	29.07	9.80		2,427	32.05	9.24	
Trust (share sent in trust game)	1,138	0.41	0.22		2,427	0.41	0.27	
Trustworthiness (share returned in trust game)	1,138	0.29	0.19		2,342	0.55	0.26	
How satisfied are you with your current livelihood situation?	1,129			100.0	2,427			100.0
1 = Very satisfied	162			14.4	169			7.0
2 = Quite satisfied	374			33.1	826			34.0
3 = Acceptable situation	431			38.2	1,093			45.0
4 = Not satisfied	150			13.3	310			12.8
5 = Very unsatisfied (unbearable situation)	12			1.1	29			1.2
Education	1,138	5.38	3.96		2,427	4.78	3.94	
Oxen in Tropical Livestock Units (TLU)	1,138	0.73	0.95		2,427	0.91	0.95	
Expect to inherit land from parents	1,045			100.0	2,427			100.0
1 = Yes	313			30.0	590			24.3
0 = No	654			62.6	1,612			66.4
2 = Do not know	78			7.5	225			9.3
Applied to the <i>tabia</i> land administration to get land through land redistribution (1 = Yes 0 = No)	1,138	0.68	0.47		2,422	0.71	0.45	
Have got land from land redistribution in the <i>tabia</i> (1 = Yes 0 = No)	922	0.31	0.46		2,427	0.27	0.44	
Has access to any land in the land rental market (1 = Yes 0 = No)	1,138	0.42	0.49		2,427	0.46	0.50	
Income from the youth group work activity in ETB	1,138	647	2,866		2,427	1,589	9,630	
Parents/household level variables								
Parents land in ha per own child	1,128	0.15	0.22		2,427	0.14	0.18	
Livestock of parents in TLU	1,138	3.56	2.62		2,427	2.99	3.17	
How seriously was the household of your parents affected by the recent drought?	1,132			100.00	2,121			100.0

(Continued)

TABLE 2 (Continued)

Variable description	2016				2019			
	N	Mean	Std. dev.	%	N	Mean	Std. dev.	%
0 = Not at all	111			9.8	1,012			48.7
1 = Somewhat affected	345			30.5	513			24.2
2 = Quite severely affected	383			33.8	377			18.8
3 = Very severely affected	293			25.9	219			10.3
Health status of household head of parent of the youth group member	1,138			100.0	2,126			100.0
1 = Very good	381			33.5	225			10.6
2 = Good	667			58.6	1,349			63.5
3 = Poor	82			7.2	487			22.9
4 = Very poor	8			0.7	65			3.1

Some of the youth member-level endowment variables show a statistically significant correlation with some of the livelihood choices. The number of oxen owned by a youth group member and having access to land from land redistribution and access to land in the land rental market have negative and statistically significant correlations (mostly at $p < 1\%$) with the choice of migration, off-farm employment, and further education as planned livelihood strategies relative to staying in agriculture (Table 3). This indicates that an increase in the number of oxen owned by a youth group member decreases the likelihood of the youth group member either choosing migration, off-farm employment, or going for further education as a planned livelihood strategy relative to staying in agriculture. Thus, we cannot reject our hypothesis (H3) that a larger endowment of oxen by a youth group member is likely to be associated with less likelihood of the youth choosing migration relative to staying in agriculture. Similarly, having access to land from land redistribution or access to land in the land rental market decreases the likelihood of youth group members choosing migration, off-farm employment, or going for further education relative to staying in agriculture, respectively. Thus, we cannot reject our hypothesis (H6) that more access to land either through the land rental market, land redistribution, or inheritance from family, is associated with less likelihood of the youth choosing migration relative to staying in agriculture. The marginal effects in Table 4 also show that an increase in the number of oxen owned by a youth group member is associated with an increase in the likelihood of a youth group member choosing agriculture as a livelihood, which supports H3, and similarly, an increase in access to land from either land redistribution or the rental market is associated with an increase in the likelihood of a youth group member choosing agriculture as a livelihood and supports H6 (Table 4).

The income of members from youth group activity has a negative and statistically significant correlation with youth group members' choice of migration and off-farm employment (at $p < 1\%$) as well as with choosing further education (at $p < 5\%$) relative to agriculture, respectively (Table 3). This supports our hypothesis (H4) that higher income from youth group activities is likely to be associated with less likelihood of the youth choosing migration relative to staying in agriculture. The interaction of trust and income from youth group activity has a positive and statistically significant correlation with youth group member's

choice of migration, which supports our hypothesis (H5), and off-farm employment (at $p < 1\%$) as well as with choosing further education (at $p < 5\%$) relative to agriculture, respectively (Table 3). This implies an increase in average income from youth group activity decreases the likelihood of youth group members choosing migration, off-farm employment, or going for further education as planned livelihood options relative to agriculture. Moreover, the positive and significant interaction term implies the correlation of income with either choosing migration or off-farm-employment, or further education as a planned livelihood strategy is more negative and significant with increasing trusting behavior of the youth group member. This suggests that trust improves performance (here income from group activity), and income from youth group activity in turn negatively correlates with choosing either migration, off-farm employment, or going for further education as a planned livelihood strategy relative to staying in agriculture. This is consistent with Holden and Tilahun (2018) that reported a positive correlation between trust and group performance. Table 4 also shows that an increase in income from youth group activity is associated with an increase in the likelihood of youth group members staying in agriculture. The positive and significant interaction term also implies the correlation of trust with off-farm-employment as a planned livelihood strategy is more positive and significant with increasing income from youth group activity.

In the case of household/parent-level variables, parents' land per own child has a negative and significant (at $p < 1\%$) correlation with youth group members choosing migration and has a positive and significant correlation with choosing further education relative to agriculture (Table 3). We found no significant correlation between the recent past drought effects on parents to youth group members' livelihood choices. Location and youth group activity have some correlations with youth group members' livelihood choices (Tables 3, 4).

4.3. Determinants of youth's intention for international migration

Table 5 presents the results from a panel data logit model of out-of-country migration intention of youth group members.

TABLE 3 Multinomial models of determinants of livelihood choice by youth group members (Agriculture = base outcome).

Variables	Migration			Off-farm employment			Further education		
	Model 1	Model 2	Model 3	Model 1	Model 2	Model 3	Model 1	Model 2	Model 3
Migration history_Dummy		0.690a (0.206)	0.703b (0.284)		0.016 (15.290)	0.138 (0.880)		0.057 (0.156)	0.137b (2.170)
Trust	-0.001 (0.001)	-0.001 (0.001)	-0.001 (0.004)	0.003a (4.72E-04)	0.003a (0.001)	0.004c (0.002)	-0.003 (0.005)	-0.003 (0.006)	-0.006 (0.007)
Trustworthiness	-0.004a (4.12E-04)	-0.004a (4.03E-04)	-0.004 (0.011)	-0.003 (0.002)	-0.003 (0.002)	-0.003 (0.006)	-0.008c (0.004)	-0.008c (0.005)	-0.009 (0.010)
Income from youth group activity in ETB	-1.22E-04a (4.05E-05)	-1.22E-04a (4.04E-05)	-1.12E-04a (3.77E-05)	-4.39E-05b (1.82E-05)	-4.46E-05b (1.86E-05)	-2.51E-05a (7.66E-06)	1.95E-05b (9.04E-06)	1.93E-05b (8.61E-06)	-2.25E-05 (4.19E-05)
Trust*Income from youth group_Interaction	1.88E-06a (4.66E-07)	1.85E-06a (4.48E-07)	1.85E-06a (4.21E-07)	6.93E-07a (1.93E-07)	6.88E-07a (1.94E-07)	7.50E-07a (2.82E-07)	2.72E-07a (7.12E-08)	2.98E-07a (5.56E-08)	2.91E-07a (8.55E-09)
Access land in the land rental market	-1.177a (0.211)	-1.156a (0.231)	-0.613a (0.176)	-1.069a (0.220)	-1.062a (0.226)	0.356 (1.425)	-2.042a (0.144)	-2.051a (0.153)	-4.715c (2.636)
Have got land from land redistribution	-0.564a (0.062)	-0.568a (0.046)	-0.484a (0.035)	-0.798a (0.203)	-0.797a (0.195)	-0.633a (0.139)	-0.483a (0.096)	-0.486a (0.085)	-0.752c (0.387)
Applied to land redistribution	0.153 (0.198)	0.105 (0.229)	0.126 (0.433)	0.238 (0.179)	0.234 (0.173)	0.211 (0.249)	0.094 (0.319)	0.120 (0.319)	0.260 (0.407)
Expect to inherit land from parents	0.065 (0.075)	0.073 (0.074)	0.119 (0.281)	-0.154a (0.013)	-0.153a (0.011)	-0.051 (0.148)	0.171a (0.024)	0.157a (0.020)	-0.075 (0.283)
Oxen in TLU	-0.449a (0.113)	-0.446a (0.116)	-1.299a (0.153)	-0.366a (0.137)	-0.361a (0.139)	-2.462 (1.676)	-0.777b (0.325)	-0.767b (0.321)	3.113 (3.976)
Education	0.075a (0.003)	-0.059a (0.011)	-0.074a (0.021)	0.068a (0.010)	-0.026a (0.006)	-0.055 (0.053)	0.332a (0.044)	0.220 (0.146)	0.252 (0.188)
Parents land per own child	-0.736a (0.134)	-0.825a (0.135)	-0.485 (0.472)	-0.522 (0.536)	-0.544 (0.517)	0.108 (0.070)	1.334a (0.192)	1.287a (0.190)	0.090 (0.779)
Livestock of parents in TLU	0.041b (0.019)	0.044b (0.020)	0.050b (0.021)	0.019 (0.018)	0.020 (0.018)	0.033 (0.026)	0.010 (0.094)	0.014 (0.095)	-0.023 (0.119)
Effect of drought on the household of Parents	-0.038 (0.052)	-0.049 (0.049)	-0.054b (0.034)	0.025 (0.120)	0.025 (0.119)	0.006 (0.102)	0.126 (0.181)	0.128 (0.178)	0.175 (0.205)
Health status of household head of parent	-0.079 (0.166)	-0.091 (0.169)	-0.069 (0.259)	-0.084c (0.046)	-0.088b (0.044)	-0.114 (0.186)	0.117a (0.042)	0.124a (0.043)	0.107 (0.276)
Satisfaction with current livelihood	0.234b (0.118)	0.235c (0.129)	0.121 (0.103)	0.225 (0.209)	0.226 (0.211)	-0.033 (0.078)	0.022 (0.117)	0.017 (0.118)	0.439 (0.303)
Sex (Female =1 Male =0)	-0.753a (0.067)	3.211a (0.360)	3.373a (0.138)	-0.151 (0.175)	2.586a (0.611)	2.613c (1.572)	0.312 (0.255)	3.646 (2.521)	4.247 (5.671)
Birth rank	-0.015 (0.026)	-0.025 (0.024)	-0.012 (0.026)	-0.023a (0.004)	-0.027a (0.003)	-0.011 (0.010)	0.070c (0.040)	0.061 (0.042)	0.022 (0.016)

(Continued)

TABLE 3 (Continued)

Variables	Migration			Off-farm employment			Further education		
	Model 1	Model 2	Model 3	Model 1	Model 2	Model 3	Model 1	Model 2	Model 3
Marital status	−0.155a (0.053)	−0.451a (0.019)	−0.389b (0.173)	−0.160a (0.054)	−0.375a (0.094)	−0.210 (0.200)	−0.673 (0.511)	−0.955 (0.729)	−1.411 (1.277)
Age	−0.045a (0.003)	−0.056a (0.003)	−0.038c (0.020)	−0.040a (0.001)	−0.046a (0.001)	0.006 (0.044)	−0.172b (0.083)	−0.175b (0.082)	−0.275a (0.039)
Woreda (Baseline = Raya Azebo)	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Group main activity (baseline = animal rearing)	No	No	No	Yes	Yes	Yes	No	No	No
IMR from panel probit model (xtprobit) of migration history		−3.808a (0.528)	−3.932a (0.462)		−2.722a (0.469)	−2.748c (1.540)		−3.393 (3.034)	−4.251 (6.249)
Error term from random-effects GLS regression of Oxen in TLU as dependent			0.853 (0.106)			2.089 (1.789)			−3.822 (3.755)
_cons	1.742a (0.287)	5.829a (0.918)	5.934 (0.041)	2.036a (0.535)	5.009a (0.043)	4.766a (1.277)	1.431a (0.209)	5.108 (3.477)	6.645 (6.169)
N	2,869	2,869	2,743	2,869	2,869	2,743	2,869	2,869	2,743
No. of groups (year: 2016 and 2019)	2	2	2	2	2	2	2	2	2
Prob > chi2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Log pseudolikelihood	−2852.060	−2836.305	−2666.465	−2852.060	−2836.305	−2666.465	−2852.060	−2836.305	−2666.465

Levels of significance: c = $p < 0.10$, b = $p < 0.05$, and a = $p < 0.01$; values in parentheses are robust standard errors.

TABLE 4 Marginal effects of variables on the probability of choosing agriculture as a livelihood strategy.

Variables	Marginal effects (dy/dx)	
	Model 1	Model 2
Migration history_Dummy		-0.023a (0.005)
Trust	-6.65E-05b (3.09E-05)	-5.80E-05b (2.45E-05)
Trustworthiness	2.07E-04a (5.63E-05)	2.06E-04a (5.70E-05)
Income from youth group activity in ETB	4.04E-06a (1.42E-06)	4.00E-06a (1.36E-06)
Trust*Income from youth group_Interaction	-6.52E-08a (1.66E-08)	-6.36E-08a (1.59E-08)
Access land in the land rental market	0.069a (0.012)	0.068a (0.013)
Have got land from land redistribution	0.040a (0.009)	0.040a (0.008)
Applied to land redistribution	-0.011 (0.011)	-0.010 (0.012)
Expect to inherit land from parents	0.003 (0.002)	0.003c (0.001)
Oxen in TLU	0.025a (0.005)	0.025a (0.005)
Education	-0.005a (3.83E-04)	0.001c (0.001)
Parents land per own child	0.027c (0.016)	0.030c (0.016)
Livestock of parents in TLU	-0.002 (0.001)	-0.002 (0.001)
Effect of drought on the household of parents	-4.88E-04 (0.006)	-2.61E-04 (0.006)
Health status of household head of parent	0.004 (0.005)	0.004 (0.005)
Satisfaction with current livelihood	-0.012 (0.010)	-0.012 (0.010)
Sex (Female = 1 Male = 0)	0.020b (0.008)	-0.168a (0.003)
Birth rank	0.001a (2.77E-04)	0.001a (2.24E-04)
Marital status	0.011a (0.001)	0.026a (0.001)
Age	0.003a (3.87E-04)	0.003a (3.97E-04)
Woreda (Baseline = Raya Azebo)	Yes	Yes
Group main activity (baseline = animal rearing)	Yes	Yes
IMR from panel probit model (xtprobit) of migration history		0.185a (0.009)

Levels of significance: c = $p < 0.10$, b = $p < 0.05$, and a = $p < 0.01$; values in parentheses are robust standard errors.

Model 1 shows the results from panel data random-effects probit regression without controlling for selection bias associated with past migration history. Model 2 refers to panel data random-effects

probit regression with IMR and selection variable for controlling selection bias associated with past migration history, and Model 3 is panel data extended probit regression model used to check for the endogeneity of oxen to youth group member's intention for international migration. Our results show that the history of migration and IMR are significantly correlated with the dummy for youth group member's migration intention, indicating significant selection bias, but the correlations between errors from the main equation and the errors from the ancillary oxen endowment equation (in Model 3 of Table 5) are not significant. Thus, our analyses of results for the intention for the international migration model are based on Model 2 of Table 5, which controls for the selection bias. Gender, birth rank, and level of satisfaction of youth group members in current livelihood situation, livestock endowment, and land access variables are youth group member-level variables that are correlated with youth group members' intention for migrating out of the country.

We found no statistically significant correlation between trusting behaviors (both trust and trustworthiness) and youth group member's intention to migrate out of the country (Table 5). The number of oxen owned by a youth group member has a negative and statistically significant correlation with the youth group member's intention for migrating out of the country. This indicates that youth group members with a larger number of oxen are less likely to intend for out-of-country migration.

In the case of land access variables, having an expectation to inherit land from parents and having applied to land to tabia land administration for getting land through land redistribution have positive and statistically significant correlations with youth group members' intention of migrating out of the country, and access to land in the land rental market has a negative and statistically significant correlation with the intention to migrate out of the country (Table 5).

Among the household/parent-level variables, land per own child and livestock of parents have positive and statistically significant correlations with youth group members' intention for international migration. The likelihood of a youth group member to intend for international migration increases with increasing his/her parent's land per child and livestock endowments. The effect of past drought on parents has a positive and significant correlation with youth group member's intention for migrating out of the country. We found no significant correlation between location and youth group member's intention for immigrating out of the country regarding the group's main activity, and the coefficient for forestry as the main group activity has a positive and statistically significant correlation but only at <10%.

5. Discussion

The aim of the policy of allocating the rehabilitated land in northern Ethiopia to organized youth groups was to let the youth engage in sustainable livelihood options. The main objective of this study was to assess how the trusting behaviors of the youth and their endowments affect their livelihood diversification decisions. This study also examines determinants of youth group members' intention for international migration.

TABLE 5 Youth group members' out-of-country migration intention panel data models.

Dependent: plan for international migration (1 = Yes 0 = No) (main equation)	Model 1	Model 2	Model 3
Migration history_Dummy		0.514a (0.041)	0.448b (0.227)
Trust	-4.16E-04 (0.002)	-4.48E-04 (0.002)	-3.94E-04 (0.001)
Trustworthiness	-4.70E-04 (0.001)	-3.89E-04 (0.001)	-4.15E-04 (0.001)
Income from youth group activity in ETB	4.48E-06 (6.27E-06)	4.33E-06 (5.93E-06)	-2.41E-05a (9.02E-06)
Trust*Income from youth group_Interaction	-2.01E-07 (1.90E-07)	-2.07E-07 (1.95E-07)	-4.23E-08 (2.63E-08)
Access land in the land rental market	-0.144a (0.026)	-0.118a (0.023)	-0.112 (0.070)
Have got land from land redistribution	-0.130 (0.095)	-0.138 (0.088)	-0.13 1 (0.133)
Applied to land redistribution	0.194a (0.056)	0.152b (0.073)	0.132a (0.019)
Expect to inherit land from parents	0.104a (0.020)	0.107a (0.023)	0.087a (0.013)
Oxen in TLU	-0.121a (0.012)	-0.111a (0.004)	0.487 (0.762)
Education	0.020a (0.002)	-0.048b (0.019)	-0.029 (0.026)
Parents land per own child	0.243a (0.037)	2.04E-01a (3.08E-02)	0.082a (0.022)
Livestock of parents in TLU	0.019a (0.005)	0.020 (0.004)a	0.014a (0.010)
Effect of drought on household of parents	0.121b (0.048)	0.112b (0.051)	0.097a (0.008)
Health status of household head of parent	0.073 (0.058)	0.062 (0.049)	0.060a (0.002)
Satisfaction with current livelihood	0.053a (0.010)	0.054a (0.019)	0.045 (0.065)
Sex (female = 1 male = 0)	-0.266a (0.003)	1.781a (0.599)	1.322a (0.379)
Birth rank	-0.009a (1.59E-04)	-0.016a (0.001)	-0.015b (0.006)
Marital status	0.077a (0.008)	-0.067 (0.058)	-0.03 8 (0.090)
Age	-0.002 (0.007)	-0.008 (0.008)	-0.008b (0.003)
Woreda (baseline = Raya Azebo)	No	No	
Group main activity (baseline = animal rearing)	Yes	Yes	
IMR from panel probit model (xtprobit) of migration history		-1.907a (0.564)	-1.379a (0.365)
Constant	-2.155a (0.021)	-0.174 (0.643)	-0.755 (0.784)
Oxen in TLU (Auxiliary equation)			
Time spent on work activities to help a family in days per month			-0.009a (4.05E-04)
Time spent on complementary (other) income-generating activities in days per month			0.004 (0.005)

(Continued)

TABLE 5 (Continued)

Dependent: plan for international migration (1 = Yes 0 = No) (main equation)	Model 1	Model 2	Model 3
Amount of group work: 1 = Too much work activity 2 = Appropriate amount of work activity 3 = Too little labor investment			0.019a (0.006)
_cons			0.815a (0.045)
var (e. Oxen)			0.863 (0.019)
corr (e. Oxen; e. plan for international migration)			−0.558 (0.647)
var [plan for international migration (year)]			2.24E-14
var [Oxen (year)]			1.21E-14
corr [Oxen (year); plan for international migration (year)]			0.641
N	2,869	2,869	2,743
No. of groups (year: 2016 and 2019)	2	2	2
Prob > chi ²	0.0000	0.0000	0.0000
Log likelihood (Log pseudolikelihood)	−699.128	−679.296	−4345.230

Levels of significance: b = $p < 0.05$, and a = $p < 0.01$; values in parentheses are standard errors.

We found that more trusting youth group members are more likely to choose off-farm employment relative to staying in agriculture than less trusting members (Table 3). Off-farm employment in the study area usually requires the youth to move to the nearby urban centers. Those who are more trusting of fellow youth group members may think that their fellow members will not evict them from membership in the youth group, for example, because of absence from youth group activity for search and/or engagement in off-farm employment in nearby urban centers. We also found that more trusting behavior is associated with a decrease in the likelihood of the youth staying in agriculture. On the contrary, we found that more trustworthy youth group members are less likely to choose migration than staying in agriculture. This result on livelihood diversification choice is consistent with our hypothesis that low internal trustworthiness correlates with a high probability of choosing migration as a livelihood option. Being more trustworthy is also associated with an increase in the likelihood of a youth group member choosing agriculture as a livelihood. This might be because being more trustworthy might be associated with more altruistic behavior and those who are more trustworthy may feel responsible to continue with their membership in the youth group, which they cannot do if they choose to migrate. Holden and Tilahun (2021a) reported that stronger norms to reciprocate, such as more ingroup trust and ingroup trustworthiness, are highly associated with altruistic and egalitarian preferences. Our results did not support our hypothesis (H1) that states more trusting youth groups are less likely to choose migration as a planned livelihood strategy relative to agriculture is not significant. We used ingroup trust in our study and did not consider the outgroup trust and trustworthiness behavior of our sample youth groups, which is a limitation that needs further research.

The number of oxen owned by the youth group member and access to land in the land rental market has a negative

and statistically significant correlation with the likelihood of youth group members choosing migration as well as off-farm employment as planned livelihood options than staying in agriculture. An increase in the number of oxen endowment of the youth group member is also associated with an increase in the likelihood of the youth choosing agriculture as a livelihood. Our result also shows that youth group members with a larger number of oxen are less likely to plan for migrating out of the country. As oxen are the main factor of production in smallholder farming in Ethiopia, a better personal endowment of oxen may encourage youth group members to engage in agriculture given that they have more access to land through, for example, the land rental market. Several studies on the land rental market in Ethiopia reported that oxen endowment of the land poor including the youth is a key factor in determining access to land in the land rental market (Gebru et al., 2019; Gebrehiwot and Holden, 2020; Holden and Tilahun, 2021b). In the context of high-risk agriculture and poverty, poor rural residents without the necessary assets such as land and livestock may be pushed to seek alternative livelihood activities by engaging in low-return and sometimes risky non-farm activities (Barrett et al., 2001a) including rural–urban migration (Bezu and Holden, 2014) as well as migration to other countries despite facing serious risks, including reported physical and sexual violence as well as abduction and required ransom payments to human traffickers, all the way of the illegal migration routes (Demissie, 2018).

We also found that an increase in the number of livestock owned by parents increases the likelihood of youth group members choosing further education relative to staying in agriculture. An increase in the number of livestock endowments of parents also decreases the likelihood of youth group members choosing migration relative to staying in agriculture. Like Bezu and Holden (2014), who reported a positive and significant association of farm size with the probability of youth choosing agriculture

as a livelihood, we found a significant positive association, though only at $p < 10\%$, for land size per own child with the likelihood of the youth group member choosing agriculture as a livelihood.

Access to land from land redistribution and access to land in the land rental market are important determinants of youth group members' choice of planned livelihood diversification. Both access to land in the land rental market, which is mostly in the form of sharecropping arrangement, and having access to land from land redistribution, which is mainly small plots of land for housing/homestead, have negative and statistically significant correlations with youth group member's choices of migration, off-farm employment, and further education than staying in agriculture. Our results from the marginal effects also confirm that the coefficients for both of these land access variables are positively and statistically significant indicating that youth group members' access to land either for farming through the land rental market or for constructing a house through land redistribution is positively associated with the likelihood of the youth to stay in agriculture.

Expectations to inherit land from parents and having applied to land to the *tabia* land administration for getting land through land redistribution have positive and statistically significant correlations with youth group members' intention of migrating out of the country, but access to land in the land rental market has a negative and statistically significant correlation with the intention to migrate out of the country. This might be because the land to the youth from land redistribution in the study area is mainly to provide small land for the youth to use as homestead and this land is not sufficient to establish an agricultural livelihood. Thus, those who got such land or expect to inherit from their parents may search for other livelihood options which include migration out of the country. On the contrary, access to land in the rental market is for undertaking farming activities and those with such access are more likely to prefer staying than planning for migrating out of the country. These results are consistent studies on land rental markets in Ethiopia that report access to farmland as an important factor that determines whether a rural resident youth can depend on smallholder agricultural livelihood (Gebbru et al., 2019; Gebrehiwot and Holden, 2020; Holden and Tilahun, 2021b).

Our study also indicates that annual income from youth group activity has a negative correlation with the likelihood of youth group members choosing migration, off-farm employment, and further education as planned livelihood options relative to staying in agriculture. We also found that the income from youth group activities has a statistically significant correlation with the likelihood of the youth staying in agriculture. This is a very good indication that improved performance of youth group activities, measured in terms of increased income from youth group activities, would incentivize youth group members to stay in agriculture and enhance their group activities as a sustainable livelihood option. Holden and Tilahun (2018) evaluated the early performance of 742 land-poor youth in youth business groups, from which our samples are drawn, against Elinor Ostrom's design principles for collective resource management and found a high degree of compliance with the design principles as early performance indicators.

In the context of smallholder agriculture in Ethiopia, land, labor, and oxen are important complementary factors of

production. Previous studies indicated that tenants' land access through the land rental market was positively affected by their endowments of labor and oxen (Gebbru et al., 2019; Gebrehiwot and Holden, 2020; Holden and Tilahun, 2021b). Our results also confirm that both access to land in the rental market and oxen endowment are important factors for youth to choose agriculture as a livelihood option. However, if markets for such factors are incomplete or missing, they become a source of push factors (Binswanger and Rosenzweig, 1986; Barrett et al., 2001a) and force the youth to migrate in search of livelihood options elsewhere.

6. Conclusion

Our results indicated that the trusting behaviors of the youth (trust and trustworthiness) significantly affect some of the livelihood diversification choices. More trusting youth group members are more likely to choose off-farm employment relative to staying in agriculture than less trusting members. Having a more trusting behavior is also associated with the decline in the likelihood of a youth group member choosing agriculture as a livelihood. More trustworthy youth group members are less likely to choose migration as a planned livelihood option relative to staying in agriculture. Being more trustworthy is also associated with an increase in the likelihood of a youth group member choosing agriculture as a livelihood. We found no correlations between the trusting behaviors of the youth (both trust and trustworthiness) and youth group members' intention for international migration.

Our study shows that personal endowment of oxen and access to land in the land rental market and access to land from land redistribution are important factors that positively influence the likelihood of the rural land-poor youth staying in agriculture. In addition, the oxen endowment of the youth and the land access variables have a significant negative correlation with youth group members' choices of migration as well as off-farm employment as livelihood options relative to staying in agriculture. Moreover, both oxen endowment and the land access variables have almost consistently negative and significant correlations with land-poor youth group members' intention for migrating out of the country. Thus, improving youth group members' access to land and their asset endowments such as oxen for increasing the productivity of youth group activity and hence income would incentivize youth group members to stay in agriculture and enhance youth group activity as a sustainable livelihood. Creating access to credit for the youth would be one policy intervention that would incentivize the youth. Rural credit services for the youth would enable the land-poor youth to buy and own oxen and other inputs and strengthen their youth group activities, which would intern enhance their access to land in the land rental market as well as their income from youth group activities, and hence incentivize them to make agriculture a sustainable livelihood option.

Our study is based on a reasonably large dataset collected from land-poor rural youth group members in the Tigray region of northern Ethiopia. It was conducted before the conflict in the region that devastated the lives and livelihoods of many people including the youth in the region and northern Ethiopia at large. Therefore, the findings of this study may not reflect

the current situation of youth group members in the study area. Devastating shocks like the civil war that occurred in the country will have important implications in changing peoples' behaviors and their coping strategies for re-establishing their livelihoods. Further research is required on the status of the youth group members, how their behaviors of trusting (including outgroup trust and trustworthiness, which our study did not address) and risk preferences have changed due to the civil war, and what coping strategies and interventions are needed for re-establishing their livelihoods.

Data availability statement

The raw data supporting the conclusions of this article will be made available by the authors, upon request and without undue reservation.

Ethics statement

Ethical approval was not provided for this study on human participants because the study was conducted with the consent of respondents and data has been analyzed anonymously. The participants provided their informed consent to participate in this study.

Author contributions

MT and SH contributed to the conception and design of the study and organized the database. MT performed the statistical analysis and wrote the first draft of the manuscript. All authors contributed to the manuscript revision and read and approved the submitted version.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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