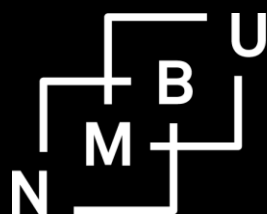# Are land-poor youth accessing rented land? Evidence from northern Ethiopia

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Norwegian University of Life Sciences
Centre for Land Tenure Studies

Centre for Land Tenure Studies Working Paper 7/19

Symposium paper: AAAE ACAE conference, Abuja, Nigeria, September 24, 2019

Are land-poor youth accessing rented land? Evidence from northern Ethiopia

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Abstract

Continued strong population growth in already densely populated rural areas in parts of Sub-Saharan Africa makes it harder for youth to choose agriculture as their main source of income. We investigate whether near landless youth still can access rented land as a complementary source of income. We utilize a unique data of rural youth that have been allocated rehabilitated communal land to form formalized business groups for joint business activity. They rely on complementary sources of income and land renting is one of these. Utilizing a sample of 3500 youth business group members from 360 youth business groups collected in 2016 and 2019 in five districts in Tigray region of Ethiopia, we find that 42% of the youth had access to rented land in 2016 and 47% in 2019. Average area rented was 0.66ha in 2016 and 0.74ha in 2019. Land renting is the most important source of income for 17 and 16% of the youth in 2016 and 2019 and the second most important source of income for 14 and 20% in 2016 and 2019, respectively. Access to rented land is constrained, however. Male youth who own oxen are much more likely to be able to rent in land.

Utilizing a trust game to elicit trust and trustworthiness of the youth, we also found a positive association between trustworthiness and access to rented land. Trust reduces transaction costs and more trustworthy youth have better access to rented land. The importance of trust is also illustrated by the dominance of kinship contracts and contracts with close neighbors reducing the costs of monitoring tenants.

The prohibition of land sales in Ethiopia limits the potential of the "agricultural ladder" to facilitate that youth can climb out of poverty through purchase of land. The youth group model may, however, help to overcome the barrier associated with very small and shrinking farm sizes and facilitate the development of larger and more professional land-based production units. Land renting is one of the rural livelihood diversification options that youth pursue and that help to sustain the youth business groups.

Key words: Land-poor rural youth; youth business group members; access to rented land; trust; income sources; Ethiopia.

JEL Codes: Q15.

1. Introduction

Youth unemployment is a growing challenge in developing countries (Awogbenle and Iwuamadi 2010). Unemployment rates are hard to estimate in developing countries where the majority of the population lives in rural area and agriculture is the dominant source of livelihood. There are indications that youth unemployment rates are three times as high as adult unemployment rates (Anyanwu 2014). Continued high population growth in Sub-Saharan Africa contributes to growing land scarcity and shrinking farm sizes while area expansion becomes increasingly difficult and a threat to remaining forest areas (Chamberlin et al. 2015; Tilman et al. 2011). Shrinking farm sizes and growing landlessness is associated with accelerating youth outmigration from rural areas (Bezu and Holden 2014). Yet, excessive youth rural-urban and international migration can lead to increasing youth unemployment, frustrations, and social and political instability (Blattman and Miguel 2010; Onah and Okwuosa 2016). Policy action is needed to provide new employment and livelihood opportunities for youth in rural as well as in urban areas (Ajofu 2013; Salami 2013).

Ethiopia has spearheaded a new approach to youth employment by allocating rehabilitated communal lands to unemployed, land-poor and landless youth (Holden and Tilahun 2018a). The youth organize themselves in business groups formalized as primary cooperatives based on cooperative law. They are allowed to establish a sustainable business on the allocated land. They elect a board, make their own bylaw, and prepare a business plan that has to be accepted by the local administration. They typically invest in activities such as forestry, apiculture, livestock rearing, horticulture and irrigation. It takes time for these joint activities to start to yield sizable incomes to be shared by group members. They therefore depend on complementary sources of income. Ethiopia has a well developed land rental market although land sales are prohibited (Holden et al. 2010; 2011). This may therefore be one important source of additional income although there are access constraints in the market (Holden et al. 2007; Gebru et al. 2019).

This paper investigates the potential of the land rental market to provide rented land as a complementary source of income to the youth who have joined these type of youth business groups. Our sample does not include youth that have chosen other livelihood strategies such as migration or higher education. However, we have returned migrants in the sample. We have also included questions on what the group members would have chosen as a livelihood strategy if the youth business group alternative were unavailable. It is of high policy interest whether the youth business group model contributes to reduced migration.

Research questions:

    a) To what extent are land-poor rural youth accessing rented land?
    b) Can the land rental market be an important complementary source of land and income and thereby stabilize and secure the livelihood of youth business group members?

c) What constraints do youth face in their attempts at accessing land through the land rental market and what are the conditions that enhance such access?
d) How important is land renting as a complementary source of income for near landless youth compared to others sources of such income?
e) What livelihood options would the youth business group members have chosen as their primary option if they were unable to join the business group and how likely are they to give up and drop out of the group?

We hypothesize that the land rental market potentially can be an important complementary source of income but that this depends on gender, farm endowments and social capital (trust and trustworthiness) of youth group members as these factors affect access to land through the land rental market. We use data from 1138 youth business group members in 119 youth business groups surveyed in 2016 and 2427 youth in 246 youth business groups surveyed in 2019 in Tigray Region in northern Ethiopia to test the hypotheses.

2. Theoretical model and hypotheses

We draw on the literature on land rental markets and contracts with emphasis on the allocation efficiency in these markets (Bliss and Stern 1982; Skoufias 1995; Holden et al. 2010). Such allocation efficiency may be constrained by transaction costs. There is no need for land markets if all other factor markets function perfectly (Singh et al. 1986; Holden et al. 2010). High transaction costs in non-land factor markets provide opportunities for efficiency gains in the land rental (tenancy) market. Non-linear (fixed and variable) transaction costs may cause non-participation or partial adjustment through the land rental market when non-land factor markets are imperfect. The immobility and spatial dispersion of land contribute to the only partially reducible transaction costs in land rental markets (Binswanger and Rosenzweig 1986). Tenure insecurity may be an important reason for allocative inefficiency as well as Marshallian inefficiency in some contexts, among others due to failed policy reforms (Otsuka 2007; Holden et al. 2013). Ethiopia introduced a tenure security-enhancing low-cost land registration and certification reform from 1998 and it has contributed to improved tenure security and more active land rental markets (Deininger et al. 2008; 2011; Holden et al. 2011).

Access to and participation in the land rental market as a complementary source of income and livelihood option depends on supply and demand characteristics in the tenancy market. We think that both demand and access depends on the potential tenant's ability to farm and their access to land from other sources than the land rental market. The ability to farm depends on non-land resources such as labor endowment, farming skills, capital endowments in form of oxen for ploughing, and equipment such as ploughs for cultivation. More of such capital is likely to be associated with higher expected returns from additional land. On the supply side in the land rental market, in a market where sharecropping is the dominant contract type, the ability to farm also matters for the landlord selecting tenants for her/his land to be rented out. Observable ability to farm may be inspected through the physical endowments of potential tenants. The same ability factors that are associated with higher demand for land and higher expected marginal returns from

additional land are therefore also proposed to increase the likelihood that potential tenants are accessing land in the rental market.

We study land renting in a context where gender has been shown to have a strong role in terms of a gender division of labor in agriculture. Land cultivation with the use of oxen is considered primarily a male task. This also implies that male youth are likely to have better chances of accessing land in the land rental market and are more likely to attempt to access such land. The reason for male dominance in land cultivation with oxen is likely related to the greater upper body strength of males as an underlying explanation for this strong cultural norm in the Ethiopian context (Holden et al. 2011; Bezabih et al. 2016).

Given the limited incentives in sharecropping contracts, landlords may also be cautious in their choice of tenants and prefer tenants they trust and/or easily observe or are more able to influence in the way they cultivate the rented land. Trust and trustworthiness are not variables that are easily observable by researchers but may still be taken into consideration by landlords in their choice of tenants based on their accumulated knowledge of alternative tenant candidates.

We only have information from one side of the market, that of tenants, in terms of their access to rented land. In addition, we have some information about the type of landlord they access the land from, whether the landlord is kinship-related, is a neighbor, comes from the same community or whether the land is accessed outside their own community.

We formulate the simple reduced form model with a dummy dependent variable for access to land, DR_{gi}, in the rental market by youth group member i in group g based on the above theoretical contextual considerations:

(1) $$DR_{gi} = \alpha_1 A_{gi} + \alpha_2 E_{gi} + \alpha_3 G_{gi} + \alpha_4 TW_{gi} + c_g + \varepsilon_{gi}$$

where A_{gi} is the land available for youth group member i in group g from other sources (own and spouse land). E_{gi} is the non-land endowment in form of oxen that are instrumental for land cultivation, G_{gi} is the gender variable, a dummy=1 for being male, TW_{gi} is a measure of trustworthiness (we return to how this is measured), and c_g represents a set of group or higher level controls, and ε_{gi} is an error term.

Non-linear transaction costs in the land rental market associated with access and limited information (search and negotiation costs, trust, monitoring and enforcement costs) imply that access in the past will enhance the likelihood of current access (Holden et al. 2007; Gebru et al. 2019). We therefore include lagged land rental market access ($DR_{gi,t-1}$) as a RHS variable. The lagged dependent variable also controls for endogeneity (unobservable member characteristics that are time-invariant) (Wooldridge 2010; Holden et al. 2010; Gebru et al. 2019).

We assess whether access to rented land is from relatives or non-relatives of the tenant households. We assume it may be harder to obtain land from non-relatives while relatives are more likely to provide land as a favor to their kin. We suggest therefore that the oxen endowment and

trustworthiness may be more important for accessing land from non-relatives. We estimate three models for that reason; one for overall access, one for access from relatives (DR_{gi}^{R}), and one for access from non-relatives (DR_{gi}^{NR}). We use linear panel data models with youth group fixed effects for this. The group FEs control for group and community unobservables such as group-specific trust-related characteristics such that it is only the individual within-group residual trustworthiness variation that we test whether it can affect land rental access, and particularly so for non-relative landlords. We include access to land from non-relatives in the model for access to rented land from relatives and vice versa. This is to test whether these sources of access serve as complements or substitutes. The same tenant may or may not access land from relatives as well as from non-relatives. With severe access problems in the market, it is more likely that the two types of access are complements than substitutes.

$$DR_{gi} = \alpha_1 A_{gi} + \alpha_2 E_{gi} + \alpha_3 G_{gi} + \alpha_4 TW_{gi} + \alpha_5 DR_{gi,t-1} + c_g + \varepsilon_{gi}$$

(2a, b, c)

$$DR_{gi}^{R} = \alpha_1^{R} A_{gi} + \alpha_2^{R} E_{gi} + \alpha_3^{R} G_{gi} + \alpha_4^{R} TW_{gi} + \alpha_5^{R} DR_{gi,t-1} + \alpha_6^{R} DR_{gi}^{NR} + c_g + \varepsilon_{gi}^{R}$$

$$DR_{gi}^{NR} = \alpha_1^{NR} A_{gi} + \alpha_2^{NR} E_{gi} + \alpha_3^{NR} G_{gi} + \alpha_4^{NR} TW_{gi} + \alpha_5^{NR} DR_{gi,t-1} + \alpha_6^{NR} DR_{gi}^{R} + c_g + \varepsilon_{gi}^{NR}$$

Based on the theoretical considerations we hypothesize (H1-H4):

H1: $\alpha_1 < 0$, as access to own land reduces the need and demand for rented land increases (Bliss and Stern 1982; Skoufias 1995; Holden et al. 2010). The better the land rental market works, the better rented land serves as a substitute for own land.

H2: $\alpha_2 > 0$; the rental market for ploughing services is poorly developed and the ownership of oxen therefore increases the expected marginal returns from rented land (Ghebru and Holden 2009). Landlords are more likely to be willing to rent land to tenants that have their own oxen.

H3: $\alpha_3 > 0$; the labor market is imperfect and male and female labor are not perfect substitutes. Males are more likely to be interested in renting in land and more likely to access land from landlords given the cultural norms in the Ethiopian society.

H4: $\alpha_4 > 0$; higher trustworthiness of the tenant (tenants with a good behavior and reputation) is likely to be associated with better access to rented land in the market, especially from non-kin landlords.

H5: $\alpha_5 > 0$; past access to land in the rental market enhances current access due to the non-linear transaction costs in the market related to search and negotiation costs, trust and reputation building, and social network building.

H6: $\alpha_6^{R}, \alpha_6^{NR} < 0$; access to rented land from relatives and non-relatives are substitutes..

Landlords may select tenants they trust and the trustworthiness of potential tenants may to some extent be public knowledge. If this is the case, landlords are more able to select trustworthy tenants in addition to selecting kinship-related tenants as kin relations may enhance trust and

trustworthiness. We used trust games to obtain measures of individual trustworthiness in our sample of youth. This allowed us to assess whether members that are more trustworthy were more likely to obtain rental contracts and especially contracts with non-kin landlords. Trustworthiness is endogenous and may depend on observable and, for researchers, unobservable individual and community characteristics. The lagged dependent variable should control for time-invariant unobservable individual characteristics and the group fixed effects controls for unobservable group and community characteristics.

When it comes to intensity of land renting, we believe the same basic mechanisms are at work and pull in the same direction as in equation (1). Even those with access in the market may still be constrained. They may not have obtained as much land in the market as they had aimed for. One fundamental reason for this is that a land rental market dominated by sharecropping does not have a rental price that clears the market. This typically leads to rationing on the tenant side of the market. The model above therefore may be reformulated by replacing the probability of access with the area accessed in the market as follows;

$$(3) \qquad \overline{R_{gi}} = \beta_1 A_{gi} + \beta_2 E_{gi} + \beta_3 G_{gi} + \beta_4 TW_{gi} + \beta_5 DR_{gi}^R + \beta_6 DR_{gi,t-1} + c_g + \mu_{gi}$$

where $\overline{R_{gi}}$ is the rented area accessed by youth group member i in group g. With efficient allocation of land in the rental market, owned land and rented land should be perfect substitutes. Under such conditions, $\beta_1 = -1$. We hypothesize:

H7: $\beta_1 > -1$; we think that youth do not have smooth and easy access to land in the rental market due to significant transaction costs. These transaction costs are related to the immobility and spatial dispersion of land, the dominance of sharecropping and the need for landlords to monitor tenants.

We hypothesize that access to land in the rental market depends on the possession of non-land resources that are essential for farming, especially oxen for ploughing. This is essentially our hypotheses H2 and H3. These imply that $\beta_2 > 0, \beta_3 > 0$. These effects are caused by transaction costs in the market for non-land factor markets (such as for skills, traction power, capital), production risk and the inter-temporal nature of land renting and the associated dominance of sharecropping contracts, with screening and rationing of tenants. Tenants that are more trustworthy may earn a good reputation and are more likely to be trusted. Trustworthiness is therefore likely to be rewarded through accumulation of a good reputation. Our measure of trustworthiness with the trust game is a test for such an effect. Actual observed trustworthiness is important in communities where individuals know each other well and interact repeatedly over time in close neighborhoods and kinship networks. This may explain the dominance of land rental contracts between kin partners in Ethiopia (Holden et al. 2011) but trustworthiness may be even more important for accessing land from non-kin landlords. Our hypothesis H4 therefore also applies here; $\beta_4 > 0$, the trustworthiness variable should be associated with access to more land in the rental market.

3. Data and estimation strategy

3.1. Data

Based on a census of 742 youth business groups in five districts in Tigray Region in February-March 2016, we sampled 119 groups that were allocated land for establishing a sustainable land-based business option. We followed up with an extended survey of additional 246 groups in 2019. From each group we sampled randomly up to 12 group members among those available at the time of the survey in July-September 2016 and January-May 2019. The surveys were combined with incentivized lab-in-the-field experiments to elicit trust, trustworthiness and risk tolerance among group members. The survey included questions about the characteristics of individual members and their families and their complementary sources of income such as land rental income.

Measures of trust and trustworthiness were obtained using the standard incentivized trust game (Berg et al. 1995). The amount that the trustor has invested is tripled by the researchers before it is given to another random and anonymous member of the same youth group. This trustee decides freely how much of this amount to send back to the anonymous trustor. The strategy method was used to elicit returned amounts for varying received amounts. The stated amounts to return were binding. Trustworthiness behavior was measured as the share of a received endowment (30 ETB[1]) that was returned by the trustee in the game where all interviewed members played the roles as trustor and trustee while anonymity was ensured. The 30 ETB is close to the average amounts received from anonymous trustors.

3.2. Estimation strategy

One challenge with the models above is that trustworthiness is likely to be endogenous. Tentatively, landlords may have information about the trustworthiness of youth group members based on their past behavior or expressed attitudes. Trustworthiness of the youth group members, as revealed in the experiments, may or may not be correlated with landlords' perceptions of the trustworthiness of the youth group members. Our study is therefore a test of the reliability of the trust game as an instrument to measure trustworthiness as well as the extent to which such knowledge about the individual members is common knowledge within the communities among relatives and neighbors as most access to rented land is from kin and neighbors.

Within-group trust and trustworthiness are likely to depend on group characteristics, social relations within groups and their ability to perform well as groups. We use group fixed effects to control for such group characteristics, as we are interested primarily in the individual variation in trustworthiness and the degree to which such variation is local public knowledge that can affect access to land in the rental market.

As an additional control for endogeneity of trustworthiness, we include lagged access to rented land (lagged dependent variable) as a control for time-invariant unobservable individual characteristics. While actual individual trustworthiness may not change much over time, the reputation of trustworthy individuals may build up and lead to improved access to rented land over

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[1] ETB=Ethiopian Birr, 1 US$=21 ETB at the time of the survey. 30 ETB implies that the trustor invested 10 ETB out of an initial endowment of 30 ETB received. The amount was tripled by the researchers such that the anonymous trustee received 30 ETB and could freely decide how much to return to the anonymous trustor.

time. This is what we test after imposing these controls for endogeneity associated with unobservable group and time-invariant individual characteristics.

The parsimonious model in equation (1) is estimated as a linear panel data model with group fixed effects that control for group and community characteristics, including average group trustworthiness:

(4) $$DR_{gi} = \alpha_1 A_{gi} + \alpha_2 E_{gi} + \alpha_3 G_{gi} + \alpha_4 TW_{gi} + D_g + \varepsilon_{gi}$$

The model with lagged rental market access is estimated in the same way and so are the initial access models for rented land from relatives and from non-relatives. However, we also estimate bivariate probit models for access to land from relatives and non-relatives. We estimate two versions of these models, one seemingly unrelated regression (SUR) version, and one sequential version, based on the assumption that potential tenants first explore their access from relatives before they approach non-relatives for rented land access. These models are estimated with group fixed effects like the linear panel data models but without the lagged rented land variable, due to its high correlation with current rented land (such models fail to converge). The SUR version implies joint estimation of equations 4a and b below where the error correlation can be assessed. The sequential estimation implies that the first dependent variable is included on the RHS side in the second equation. We compare the unconditional marginal effects from the alternative specifications as well as the error correlations, and the conditional access to land from non-relatives, given access from relatives.

(5a,b) $$\begin{cases} DR_{gi}^R = \alpha_1^R A_{gi} + \alpha_2^R E_{gi} + \alpha_3^R G_{gi} + \alpha_4^R TW_{gi} + \alpha_5^R DR_{gi,t-1} + c_g + \varepsilon_{gi}^R \\ DR_{gi}^{NR} = \alpha_1^{NR} A_{gi} + \alpha_2^{NR} E_{gi} + \alpha_3^{NR} G_{gi} + \alpha_4^{NR} TW_{gi} + \alpha_6^{NR} DR_{gi}^R + (\alpha_7 DR_{gi}^R) + c_g + \varepsilon_{gi}^{NR} \end{cases}$$

We estimate the area rented with censored tobit models with group fixed effects. We assume that the same factors are at work and pull in the same direction for the probability of access and degree of access. The group FE controls for observable and unobservable group and community effects associated with land renting such as land availability from potential landlords, the general level of trust in the community and the specific group situation which may affect group members' search for complementary sources of income. As an additional control for unobservable time-invariant tenant characteristics we have included lagged access to rented land (models 5b and 5c) (Wooldridge 2010). This is similar to a model with lagged dependent variable that serves as a dynamic control for how lagged access affects current access. Finally, in model 5c we have added a dummy for accessing land from relatives. We rely on the dynamic control (lagged access variable) as a control for endogeneity of this variable.

$$\overline{R_{gi}} = \beta_1 A_{gi} + \beta_2 E_{gi} + \beta_3 G_{gi} + \beta_4 TW_{gi} + D_g + \mu_{gi}$$

(5a,b,c) $$\overline{R_{gi}} = \beta_1 A_{gi} + \beta_2 E_{gi} + \beta_3 G_{gi} + \beta_4 TW_{gi} + \beta_6 DR_{gi,t-1} + D_g + \mu_{gi}$$

$$\overline{R_{gi}} = \beta_1 A_{gi} + \beta_2 E_{gi} + \beta_3 G_{gi} + \beta_4 TW_{gi} + \beta_5 DR_{gi}^R + \beta_6 DR_{gi,t-1} + D_g + \mu_{gi}$$

The limited dependent variable characteristic of the models implies that the incidental parameter problem can bias the results from youth group fixed effects models. We tested alternative specifications with community and district fixed effects and found that the key results were very stable across these alternative specifications (the results are available from the authors upon request).

To investigate factors associated with the type of income source the youth have as their most important source of income, we used multinomial logit models. Only one specification of this model is included. It presents relative risk ratios and uses own farm as the baseline source of income.

4. Descriptive analysis

4.1. Land access by source

Close to 42% of the members surveyed in 2016 and 47% of the members surveyed in 2019 rented in land. Table 1 gives an overview of alternative sources of land based on the two years of data, decomposed by gender. This includes own inherited or allocated land through redistribution, land of spouse, and rented in land. The table includes dummy variables for access to the different sources of land as well as average areas accessed for all households, measured in the local measurement unit, *tsimdi*, which is approximately 0.25 ha.

Table 1. Land access from alternative sources, by gender

	2016 survey			2019 survey			2016	2019
	Females Means	Males Means	Pr(|T| >|t|)	Females Means	Males Means	Pr(|T| >|t|)	Gini-coef.	Gini-coef.
Number of observations	359	779		759	1668			
Own land access, dummy	0.24	0.25	0.506	0.27	0.32	0.034		
Own land area, *tsimdi*	0.32	0.35	0.544	0.29	0.47	0.000	0.46	0.55
Spouse own land, dummy	0.13	0.08	0.006	0.47	0.37	0.000		
Spouse own land area, *tsimdi*	0.18	0.12	0.017	0.52	0.45	0.058	0.39	0.42
Own or spouse land, dummy	0.32	0.30	0.491	0.61	0.56	0.017		
Sum of own and spouse land, *tsimdi*	0.50	0.46	0.480	0.81	0.92	0.056	0.46	0.48
Rented land access, dummy	0.29	0.48	0.000	0.39	0.51	0.000		
Rented land area, *tsimdi* (full sample)	0.65	1.32	0.000	0.83	1.64	0.000	0.41	0.43
Rented land area, *tsimdi* (those renting)	2.26	2.74	0.098	2.15	3.24	0.000		
Operational land access, dummy	0.48	0.59	0.001	0.72	0.70	0.244		
Operational land area, *tsimdi*	1.15	1.79	0.000	1.64	2.27	0.000	0.44	0.47

Source: 2016 and 2019 Baseline survey data.

Table 1 shows that male and female members are about equally likely to own some land and about 25% of them do so. Females are more likely to have a spouse that owns some land than males are, hence females have significantly more access to land than males have through their spouses. After combining own and spouse own land there is no significant gender difference in land access besides land renting. Males have significantly better access to land in the rental market than females in both years. Overall, males access more land through the rental market than through other sources while this is not the case for females. 48% of the females and 59% of the males had access to land from at least one of these sources of land in 2016 and this had increased to 72 and 70% for females and males in 2019. In terms of marital status, 60% of the surveyed members were married in 2016 (58% for females and 62% for males) against 71% in 2019 (73% for females and 70% for males).

This individual access to land comes in addition to the jointly allocated land for their youth groups. Table 1 also presents Gini-coefficients for the distribution of the different sources of individually accessed land among the youth group members. The Gini coefficients do not vary substantially across the different sources of land. Figure 1 shows the distribution of rented in area across the sample for the 2019 survey.
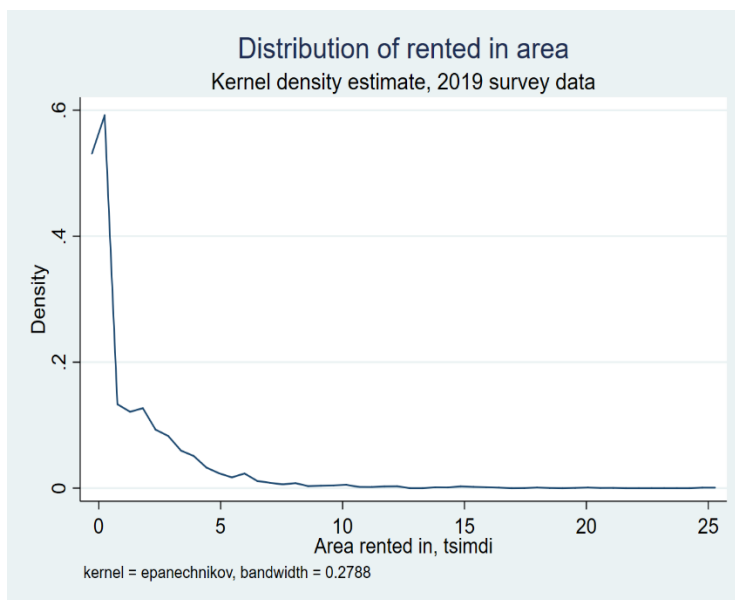
Figure 1. The distribution of area rented in

4.2. Land rental contract characteristics

Land rental contracts may be characterized based on the contract agreement details in form of sharing of inputs/input costs, output sharing, duration or renewal expectations of contracts, whether contracts are written or oral and have witnesses, and based on how closely related the contract parties are (social distance). These characteristics together say something about the functioning of the rental market, access constraints and transaction cost in the market and how varying levels of trust may affect who has access and to what types of contracts.

We first inspect the variation in output sharing and input sharing contract conditions for the contracts that the youth group members in our sample have, see Table 2.

Table 2 shows that pure output sharing contracts totally dominate and constitute more than 90% of all contracts whereas 6% of the contracts are fixed rent contracts. A small share of the sharecropping contracts include a cash payment upfront at the time of contract agreement. The dominance of output sharing contracts implies that the youth share the production risks with their landlords and do not have to pay for the land till at harvest time when the output is shared.

Table 2. Contract types by output, input and payment characteristics

Contract type	2016 survey		2019 survey	
	Number of contracts	% of contracts	Number of contracts	% of contracts
Sharecropping (only sharing of output)	577	91.0	1 679	88.5
Sharecropping (output sharing) with cash	10	1.6	17	0.9
Output and input sharing	9	1.4	12	0.6
Cash rental contract	38	6.0	190	10.0
Total contracts	634	100.0	1 898	100.0

Source: 2016 and 2019 Baseline survey data.

Second, we inspect the types of landlord partners the youth have for their rented land, see Table 3.

Table 3. Who do the youth access rented land from?

Rent land from whom?	2016 survey		2019 survey	
	Landlord partner	% of contracts	Landlord partner	% of contracts
From relative	366	56.1	925	49.0
From neighbor	206	31.6	621	32.9
Other villagers in home *tabia*[1]	71	10.9	239	12.7
From villager in other *tabia*	9	1.4	94	5.0
Total	652	100.0	1879	99.5

Source: 2016 and 2019 Baseline survey data. [1]*Tabia*=community, the lowest administrative level. There were additional 10 contracts with government body in the 2019 data, not included here.

Table 3 shows that the youth primarily obtain land in the rental market from their relatives and neighbors. About 11% access land from others in their home community and very few access land outside their own community. This demonstrated the limited spatial integration in the land rental market. It may also indicate the importance of trust and personalized relations for land access. We inspect this further by looking at the nature of the contracts in terms of the degree to which they are written, have witnesses and are reported to the community administration, see Table 4.

Table 4 shows that 78% of the contracts in 2016 and 90% in 2019 are oral contracts without witnesses and this demonstrates a high degree of trust among the contract partners such as may be expected among relatives and neighbors. While the land laws state that all rental contracts should be written and reported to the local land administrations, we see that only 2.2% of the contracts

followed this regulation in 2016 and there is no increase in the percentage of formally registered contracts from 2016 to 2019.

Table 4. Contract agreement types

Contract agreement type	2016 survey		2019 survey	
	Contract agreement	% of contracts	Contract agreement	% of contracts
Oral contract without witnesses	496	77.6	1 690	90.2
Oral contract with witnesses	105	16.4	80	4.3
Written contract signed by both parties	24	3.8	79	4.2
Written contract signed and reported to *tabia* land administration	14	2.2	24	1.3
	639	100.0	1 873	100.0

Source: 2016 and 2019 Baseline survey data.

Table 5 presents data on the duration and/or renewal conditions of contracts.

Table 5. Contract duration and renewal types

Summary: Contract duration types	2016 survey		2019 survey	
	Contract length	% of contracts	Contract length	% of contracts
For one year/season	158	25.2	566	30.3
Open ended (can be renewed one year at the time)	439	70.1	1091	58.4
For a fixed number of years	29	4.6	210	11.2
Total	626	100.0	1867	100.0

Source: 2016 and 2019 Baseline survey data.

Table 5 shows that 70% of the contracts were open-ended in 2016 against 58% in 2019. This means they continue from year to year until one of the parties decides to end the contract. There are few with longer-term fixed contracts although we see an increase in such type of contracts (from five to 11%).

4.3. Relative importance of land renting as source of income

All youth group members were asked to rank their three main sources of income, see Table 6. Table 6 shows that own farm and support from the family are the most important sources of income followed by land renting. The youth group business activity has not yet become the main source of income for the majority of the youth group members. Trade and construction work employment are important non-farm sources of income.

Table 6. Youth income sources, by rank. Rank 1=most important.

	Income sources, August2015-July2016			Income sources in 2018		
	Rank 1, %	Rank 2, %	Rank 3, %	Rank 1, %	Rank 2, %	Rank 3, %
Youth group activity	7.0	27.6	16.8	2.9	8.7	12.8
Land renting/Sharecropping	16.8	14.0	3.5	16.0	20.4	8.6
Trade	9.6	7.4	3.4	6.6	5.6	3.7
Construction work	10.9	8.7	4.5	1.4	1.1	0.9
Support from family	20.9	10.3	3.5	17.7	5.7	1.5
Own farm	29.2	5.3	1.9	25.1	9.1	2.6
Daily laborer	-	-	-	16.9	17.0	9.4
Other, specify	5.7	5.7	3.0	4.5	4.0	3.2
Temporary land from family	-	-	-	8.9	12.4	7.8
No activity	0	20.9	63.5	0	16.0	49.5
Total	100	100	100	100.0	100.0	100.0
Sample size	1138	1138	1138	2427	2427	2427

Source: 2016 and 2019 Baseline survey data.

Table 7 gives an overview of expected main source of income five years into the future. We see that 61% in 2016 expected the youth group activity would be the main source of income five years later. Only 6% expected land renting to be the main source of income five years later than 2016. This indicates that land renting was perceived to be a temporary complementary source of income. Our new data from 2019 indicates that the expectations regarding the youth group activity has been modified as only 32% expect this youth group activity to be the main source of income in five years. At the same time, 13% expect land rental income to be the main source of income in five years. This indicates that they may have been too optimistic about the future benefits from the

Table 7. Expected main source of income five years into the future.

	2016 survey		2019 survey	
Source of income	Freq.	Percent	Freq.	Percent
Youth group activity	691	60.7	771	31.8
Land renting/Sharecropping	67	5.9	314	12.9
Trade	137	12.0	432	17.8
Construction work	20	1.8	55	2.3
Support from family	9	0.8	45	1.9
Qwn farm	189	16.6	604	24.9
Other, specify	11	1.0	128	5.3
Do not know/Very uncertain	6	0.5	78	3.2
Missing responses	8	0.7	0	0
Total	1,138	100	2427	100

Source: 2016 and 2019 Baseline survey data.

youth group activity in 2016 and these expectations have been modified. By 2019 more members have realized that they need to depend more on other complementary sources of income, including land renting.

Table 8 provides information about their stated livelihood choices if they did not join the youth business group in the 2019 survey. At least 21% stated that they would have migrated but some of the other options such as looking for other employment opportunity may also have implied migration. We also see that 24% would have tried to rent (more) land.

One may also wonder how likely it is that the youth group members will give up the youth group activity and look for other livelihood opportunities. The responses to that question in the 2019 survey are summarized in Table 9. We see that about 17% indicate that this is quite likely or very likely.

Table 8. Livelihood choices if not joining the youth business group

| | First choice | | Second choice | |
	Freq.	Percent	Freq.	Percent
Migrated to urban area to search for employment	474	19.5	347	16.2
Rented/ Sharecropped in (more) land	589	24.3	381	17.7
Migrated out of the country	36	1.5	14	0.7
Gone to school to get more education	84	3.5	13	0.6
Looked for other employment opportunity	370	15.3	237	11.0
Own farm	595	24.5	143	6.7
Other, specify	279	11.5	102	4.8
No more			1190	42.4
Total	2,427	100.0	2,427	100.0

Source: 2019 Baseline survey data.

Table 9. How likely is it that you will give up the youth group activity and look for another source of livelihood?

	Freq.	Percent
Very unlikely	757	31.2
Quite unlikely	1,247	51.4
Quite likely	350	14.4
Very likely	73	3.0
Total	2,427	100.0

Source: 2019 Baseline survey data.

4.4. Socio-economic characteristics

Additional socio-economic characteristics of the youth and their family/parent households were obtained through survey interviews and lab-in-the-field experiments. The lab-in-the-field experiments were used to obtain measures of trust, trustworthiness and risk tolerance. Summary statistics for the socio-economic variables for male and female youth group members are presented

in Table 8. The data are grouped by gender due to our hypothesis that the land rental market primarily is a complementary source of income for males and the table demonstrates some important systematic differences between males and females that may contribute to the "gender" differences in land rental market access.

Table 10 shows that there are significant gender differences in farm endowments such as oxen and ploughs which are instrumental for land cultivation. This is likely to affect land access in the rental market. Parent households of males have on average larger farm sizes than the parent households of females. There are also significant gender differences in trust and actual trustworthiness but not in stated trustworthiness. Males are significantly more risk tolerant.

Table 10. Socio-economic characteristics, by gender

	2016 survey			2019 survey		
	Females Means	Males Means	Pr(|T|>|t|)	Females Means	Males Means	Pr(|T|>|t|)
Number of oxen	0.54	0.82	0.0000	0.79	0.96	0.0000
Number of ploughs	0.49	0.73	0.0000	0.90	1.06	0.0001
Farm size of parents, *tsimdi*	1.95	2.46	0.0002	2.56	3.15	0.0000
Trust, share invested	0.36	0.43	0.0000	0.36	0.44	0.0000
Trustworthiness, share returned	0.27	0.30	0.0072	0.29	0.33	0.0001
Birth rank	3.09	3.11	0.8600	3.21	3.42	0.0333

Source: 2016 and 2019 Baseline survey data.

5. Results and discussion

5.1. Access to land in the rental market

The results from alternative instrumental variable probit models are presented in Table 9, which presents marginal effects. We assess what the results indicate for our first four hypotheses. Hypothesis H1 states that access to own or other sources of land reduce the need and demand for rented land. We see from Table 9 that the coefficients on own and spouse land as well as on parents' farm size are negative. The coefficients are only significant in the models with *tabia* fixed effects for own and spouse land but highly significant in all specifications for parents' farm size. We therefore cannot reject this hypothesis. It will be more interesting to discuss the size of these coefficients in the area rented models.

Hypothesis H2 states that oxen increases the expected marginal returns from rented land and these are observable endowments that make landlords more willing to rent out their land. We see that the coefficients on oxen are highly significant and positive in all model specifications, giving strong support to this hypothesis. Overall, oxen raise the likelihood of accessing land in the rental market by 21 percentage points. Oxen are obviously crucial for access to land in the rental market.

Hypothesis H3 states that males are more likely to access land from landlords, given the cultural norms in the Ethiopian society. Table 11 shows that the coefficient on the male gender dummy is significant and positive in all specifications and males are 8 percentage points more likely to access land in the rental market than female youth group members.

Table 11. Parsimonious models: Overall land access versus access from relatives and from non-relatives

	Rented land access	Rented land from relatives	Rented land from non-relatives
Trustworthiness	0.106*	0.0499	0.0996*
	(0.0453)	(0.046)	(0.0413)
Male, dummy	0.0765***	0.0381*	0.0648***
	(0.0199)	(0.0191)	(0.0179)
Own land	0.00757	0.0122	-0.0054
	(0.0078)	(0.0087)	(0.0071)
Oxen	0.212***	0.147***	0.144***
	(0.014)	(0.0118)	(0.0114)
Constant	0.182***	0.111***	0.0481*
	(0.0223)	(0.0222)	(0.021)
N	2427	2427	2427
R-sq., within	0.161	0.086	0.091
R-sq., between	0.513	0.416	0.305
R-sq., overall	0.243	0.144	0.133
F-value	72.04	47.65	45.48
Prob>F	0.0000	0.0000	0.0000

Source: 2019 Baseline survey data. Models with youth group FE. Standard errors are corrected for clustering at youth group level. Significance levels: * $p<0.05$, ** $p<0.01$, *** $p<0.001$.

Hypothesis H4 states that higher trust between the tenant and the landlord reduces transaction costs and therefore increases the likelihood that a rental contract materializes. Table 11 shows that more trustworthy tenants are significantly (at 5 % level) more likely to access land in the rental market. It is, however, only access to land from non-relatives that is significantly associated with trustworthiness, which we measured trustworthiness with the trust game (share of the amount returned as trustee). A 10% increase in the share returned increases the likelihood that the tenant accesses land from non-relatives by one percentage point.

Hypothesis H5 that non-linear transaction costs in the land rental market associated with access and limited information (search and negotiation costs, trust, monitoring and enforcement costs) implies that access in the past will enhance the likelihood of current access has strong support in the models in Table 12. Table 12 shows that a change in access to land in the rental market is enhanced by the trustworthiness and oxen endowment of tenants.

Finally, hypothesis H6 that access to rented land from relatives and from non-relatives are substitutes also have strong support in the models in Table 12.

Table 12. Land rental models with dynamic control for endogeneity

	Rented land access	Rented land from relatives	Rented land from non-relatives
Lagged land access	0.959***	0.885***	0.846***
	(0.008)	(0.014)	(0.018)
Trustworthiness	0.0242*	0.036	0.0595*
	(0.011)	(0.028)	(0.029)
Male, dummy	-0.004	0.004	0.018
	(0.006)	(0.011)	(0.013)
Own land	-0.004	-0.002	-0.008
	(0.002)	(0.006)	(0.006)
Oxen	0.00733*	0.0468***	0.0571***
	(0.004)	(0.008)	(0.008)
Land from non-relative		-0.619***	
		(0.022)	
Land from relative			-0.640***
			(0.022)
Constant	-0.003	-0.0297*	-0.0439**
	(0.006)	(0.013)	(0.015)
N	2427	2427	2427
R-sq., within	0.934	0.647	0.587
R-sq., between	0.972	0.826	0.800
R-sq., overall	0.944	0.684	0.631
F-value	4862.4	846.6	490.8
Prob>F	0.0000	0.0000	0.0000

Source: 2019 Baseline survey data. Models with youth group FE. Standard errors are corrected for clustering at youth group level. Significance levels: * $p<0.05$, ** $p<0.01$, *** $p<0.001$.

To assess this potential correlated access we estimated two types of bivariate probit models for the two sources of access, one with a SUR formulation and one sequential, assuming that potential tenants first try to obtain land from relatives before they search for land from non-relatives. Table 13 presents the model results.

Table 13 confirms the significance of trustworthiness as important for access to land from non-relatives. Being male also enhances access to rented land from non-relatives more than from relatives. Oxen are important in both cases. Those with access to land from relatives are 25 percentage points less likely to access land from non-relatives. This is likely due to less effort by the tenants to obtain such land.

Table 13. Bivariate probit models for access to land from relatives and non-relatives

	SUR model		Sequential model	
	Land from relatives	Land from non-relatives	Land from relatives	Land from non-relatives
Trustworthiness	0.049	0.097*	0.051	0.101**
	0.045	0.041	0.044	0.039
Male, dummy	0.038*	0.060***	0.034	0.066***
	0.019	0.019	0.020	0.017
Own land	0.010	-0.004	0.012	0.000
	0.007	0.006	0.008	0.006
Oxen	0.135***	0.120***	0.136***	0.151***
	0.011	0.010	0.010	0.010
Land from relative				-0.254***
				0.048
athrho	-0.242***		0.633*	
	0.055		0.285	
rho	-0.237		0.560	

Source: 2019 Baseline survey data. *Note:* Models with youth group FE. The table presents unconditional marginal effects. Standard errors are corrected for clustering at youth group level. Significance levels: * $p<0.05$, ** $p<0.01$, *** $p<0.001$. SUR-model: Wald test of rho=0: chi2(1) = 19.304, Prob > chi2 = 0.0000. Sequential model: Wald test of rho=0: chi2(1) = 4.916, Prob > chi2 = 0.0266.

5.2.   Area rented models

Table 14 presents tobit models with group fixed effects for total area rented in by tenants. Lagged access to rented land is included as a control for endogeneity associated with unobservable time-invariant tenant characteristics in models Tob2 and Tob3. This variable is highly significant and indicates that access to rented land in the past is associated with larger current rented in areas. We should be cautious about the interpretation of the coefficients on this variable. However, it should help to control and remove endogeneity bias in the parameters for the other key variables. We see that its inclusion causes substantial changes in the parameter estimates for these other key variables as demonstrated by comparing the results in model Tob1 with models Tob2 and Tob3. We see that males access 0.7 *tsimdi* additional rented land compared to females (supports hypothesis H3, significant at 0.1% level). One extra ox increases access to rented land by 0.9 *tsimdi* (supporting hypothesis H2, significant at 0.1% level), trustworthiness enhances how much land is rented in (supports hypothesis H4, significant at 5% level). One *tsimdi* extra own land reduces access to rented land by 0.2 *tsimdi,* demonstrating substantial transaction costs in the adjustment of operational land area through the rental market (supporting hypothesis H7). In a smoothly functioning market where rented land easily is substituted for owned land we expect that the coefficients on own land and possibly parents' land, if the youth cooperate with their parents in their farming activity, should be close to -1 (Bliss and Stern 1982; Holden et al. 2010).

Model Tob3 also adds a dummy for accessing land from relatives. We see that such access is associated 0.4 *tsimdi* additional land (significant at 1% level).

Table 14. Tobit models for area rented in

	Tob1	Tob2	Tob3
Trustworthiness	1.249**	0.968*	0.964*
	(0.456)	(0.398)	(0.394)
Male, dummy	0.978***	0.692***	0.702***
	(0.184)	(0.201)	(0.202)
Own land	-0.086	-0.191**	-0.196**
	(0.069)	(0.061)	(0.060)
Oxen	2.000***	0.927***	0.913***
	(0.163)	(0.143)	(0.143)
Lagged rent in dummy		22.55***	21.93***
		(0.872)	(0.881)
Rent from relatives, dummy			0.403**
			(0.148)
Group FE	Yes	Yes	Yes
Constant	-3.087***	-20.93***	-20.43***
	(0.392)	(1.049)	(1.050)
var(e.rent~)	8.687***	4.075***	4.057***
	(1.045)	(0.542)	(0.544)
N	2427	2427	2427

Source: 2019 Baseline survey data. *Note:* Standard errors are corrected for clustering at youth group level. Significance levels: * $p<0.05$, ** $p<0.01$, *** $p<0.001$.

5.3. Main income source models

We assessed factors associated with the main income source of the youth group members utilizing the Rank 1 responses in Table 6 and using multinomial models. The most common source, own farm, is the base category that the other alternatives are compared with. The results are presented in Table 15. We did not have any particular hypotheses we wanted to test here. We therefore just summarize the key results. The table presents relative risk ratios.

We see that males are more likely than females to have all the alternative income sources as the main source of income compared with own farm. Older individuals are less likely than younger individuals to have all the alternative income sources as main income source, compared to own farm. Members that are more educated are more likely to have the youth group activity, trade, construction work and other income sources as the main income source. Married members are less likely to have the youth group activity, trade, family support and other income as main source of income. More own (and spouse) land enhances the probability that own farm is the main source of income compared to all other activities. Members with more oxen are more likely to have land renting as the main source of income. The youth group activity is more likely to be the main source of income in Raya Azebo district than in the other three districts and the same is the case for land renting. The youth group activity is also more likely to be the main source of income for irrigation groups than for the other types of groups.

5.4.   Discussion

We can now discuss the regression findings in relation to some of the contract and partner information that we presented in the descriptive analysis. Table 2 shows that sharecropping contracts dominated the land rental market, as only 6% of the contracts were fixed-rent contracts. Sharecropping implies that the tenant characteristics and efforts affect the outcomes of the contracts for the landlords who therefore need to worry about the performance of their tenants. Trust therefore plays a more important role in sharecropping than in fixed rent contracts, and screening and monitoring costs may be reduced by renting land to kin partners and neighbors and selecting tenants that are known to be more trustworthy. Actual trustworthiness of potential tenants appears be public knowledge in the communities our data come from and the trust games appear to have been able to reveal such actual trustworthiness.

Table 3 shows that 56% in 2016 and 49% in 2019 of the contracts were with kin landlords and another 32% and 33% of the contracts were with neighbors in 2016 and 2019 respectively. Relatives may be more trusted and neighbors are more easily observable, and this reduces information asymmetries and monitoring costs. Table 4 shows that 78% of the rental contracts were oral and without witnesses in 2016 and this had increased to 90% in 2019, a very clear indication of trust among the contract parties. Only 6% of the contracts were written and only 1-2% reported to the local administrations although such reporting is a requirement according to the land laws and regulations in the country. This may be due to local perceptions that such reporting is unnecessary for sharecropping contracts with local persons you trust. It indicates also a high level of trust in the youth that have received such contracts but this rationed access and trust applies mainly to a subsample of business youth group members; mostly male youth with oxen and ploughs that are kin or neighbors that can easily be monitored. This demonstrates a very limited spatial integration in this market and that land renting as a complementary source of income for youth primarily works for youth staying close to home. Although females appear to have poorer access to land themselves, their access through their husbands is better and the fact that the percentage of the females that are married had increased from 2016 to 2019 contributes to improved land access for females as well.

The dominance of one year and open-ended contracts provides a flexibility for landlords to pull out if tenants do not perform well, and this could potentially also represent a "treat of eviction" as renewal may depend on performance (Kassie and Holden 2007). However, we did not collect data to investigate this further. For the youth this may imply tenure insecurity in the rental market. However, this will also depend on the mutual trust among the contract partners.

6. Conclusions

We have investigated the potential of the land rental market to serve as a complementary source of income for land-poor rural youth in northern Ethiopia. Our study is of land-poor youth that are formal members of youth business groups that recently were allocated some joint land for joint business establishment.   We found that access to rented land was common among these group members with 42% having access to rented land in 2016 and 47% having such access in 2019. Converting from the local area unit *tsimdi* to hectares we found that those with access on average accessed 0.66 ha of rented land in 2016 and 0.74 ha in 2019. Land renting was the most important

source of income for 17 and 16% in 2016 and 2019 and the second most important source of income for 14 and 20% of the respondents in 2016 and 2019 respectively. It was mostly male youth, who own oxen, that were able to rent land. Being trustworthy, measured using the trust game, also enhanced access to land in the rental market and particularly accessing land from non-relatives. Female youth group members appeared generally disadvantaged in their access to complementary sources of income.

The relatively high degree of access to the rental market does not imply that the market operates efficiently, however. Access is constrained by non-linear transaction costs as evidenced by the low coefficients on own land in the regressions and access being highly dependent on gender and oxen ownership and kinship ties as well as lagged access. The data indicates that access may improve over time, however, for those who prove that they are reliable tenants.

Asking about expectations five years into the future, we found that the expectations that the youth group activity would be the main source of income had been reduced from 61 to 32% of the respective samples in 2016 and 2019. The share that expected land renting to become the main source of income had increased from 6 to 13%. We may therefore conclude that land renting to a larger extent was perceived as a temporary solution in 2016 than in 2019.

The fact that land cannot be purchased or sold in Ethiopia limits the potential for the "agricultural ladder" to be a pathway out of poverty for the poor through first renting and then purchasing land. However, we see that land access through inheritance, administrative redistributions and marriage also have improved access and jointly with rented land and the jointly held land through the youth business groups is appears that the large majority of these very land-poor youth are able to establish sustainable land-based livelihoods. However, they will continue to be vulnerable to climate shocks and would benefit from more public support to help them stabilize their livelihoods.

Table 16. Multinomial logit models for main source of income of youth group members, 2019 data

	Youth group activity	Land renting	Trade	Construction work	Family support	Daily laborer	Borrowed land	Other income
Male, dummy	6.599***	4.514***	3.258***	2.600**	2.817***	3.430***	3.100***	2.078**
	(2.295)	(0.868)	(0.818)	(0.955)	(0.615)	(0.653)	(0.683)	(0.471)
Age, years	0.861***	0.884***	0.879***	0.939**	0.744***	0.869***	0.862***	0.914***
	(0.024)	(0.010)	(0.013)	(0.022)	(0.017)	(0.012)	(0.012)	(0.015)
Education, years	1.077*	1.0099	1.085**	1.120*	1.054	1.001	0.992	1.118***
	(0.040)	(0.025)	(0.031)	(0.053)	(0.030)	(0.023)	(0.026)	(0.037)
Married, dummy	0.107***	0.675	0.290***	1.200	0.061***	0.597	0.724	0.293***
	(0.038)	(0.215)	(0.100)	(0.764)	(0.020)	(0.167)	(0.263)	(0.097)
Own & spouse land	0.588**	0.451***	0.524***	0.568***	0.241***	0.419***	0.878**	0.648***
	(0.102)	(0.038)	(0.055)	(0.082)	(0.082)	(0.046)	(0.044)	(0.061)
Oxen	1.144	1.562***	0.636*	0.393***	0.633**	0.553***	0.999	0.885
	(0.207)	(0.146)	(0.118)	(0.099)	(0.108)	(0.061)	(0.119)	(0.129)
District: Raya Azebo=base								
Degua Tembien	0.143***	0.212***	0.361**	1.377	0.231***	0.618	0.184***	0.299***
	(0.080)	(0.051)	(0.129)	(0.797)	(0.077)	(0.188)	(0.063)	(0.100)
Seharti Samre	0.267*	0.302***	0.969	1.146	0.527	1.665	0.614	0.635
	(0.158)	(0.090)	(0.341)	(0.860)	(0.185)	(0.546)	(0.198)	(0.237)
Adwa	0.191**	0.427**	0.485*	2.787	1.115	4.217***	1.476	0.812
	(0.104)	(0.112)	(0.178)	(1.639)	(0.330)	(1.199)	(0.439)	(0.238)
Main activity: Irrigation=base								
Livestock	0.188***	0.914	1.315	1.050	1.290	1.235	0.956	1.538
	(0.477)	(0.206)	(0.382)	(0.536)	(0.344)	(0.306)	(0.240)	(0.489)
Perennials	0.420	1.034	0.397*	0.600	1.094	1.490	1.245	1.944
	(0.242)	(0.339)	(0.176)	(0.436)	(0.376)	(0.450)	(0.447)	(0.715)
Beekeeping	0.074***	0.571*	0.405**	0.430	0.882	0.674	0.766	0.751
	(0.037)	(0.141)	(0.131)	(0.253)	(0.265)	(0.176)	(0.213)	(0.250)
Constant	392.85***	111.4***	152.0***	0.568	52762.2.9***	134.97***	84.73***	15.12***
	(400.817)	(59.615)	(104.428)	(0.698)	(39364.460)	(83.499)	(46.738)	(11.335)

Source: 2019 Baseline survey data. *Note*: The baseline activity for comparison is income from own farm. The table presents relative risk ratios with cluster robust standard errors. Significance levels: * p<0.05, ** p<0.01, *** p<0.001.

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