Determinant factors of livelihood diversification: Evidence from Ethiopia

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Abstract: Ethiopia’s agricultural productivity is considered low despite the presence of various agricultural policies. These policies focus mainly on on-farm agricultural development to the neglect of rich opportunities for non-agricultural livelihood diversification activities. Livelihood diversification is a strategy that can boost farmers’ income and promote sustainable land management practices. This study investigates the factors that determine the probability that a farm household participates in non-agricultural income diversification activities in Ethiopia. It employed Logit econometric model to investigate the probability that a farm household participates in non-agricultural income diversification activities in the rural area, and the Seemingly Unrelated Regression (SUR) model to estimate a system of equations consisting of on-farm, off-farm and non-farm income generating activities of Ethiopia. Estimation showed that institutional factors such as secured perception of land ownership and becoming membership in cooperatives have significant influence on the probability of farm households’ participation in non-agricultural activities.
1. Introduction
Livelihood diversification refers to a key strategy taking place at different levels of the economy, which are usually, but not always directly linked (Start, 2001). It may be considered as a strategy for coping or risk management for farm households (Dercon, 2002; Ellis, 1998; Reardon, Delgado, & Matlon, 1992; Start & Johnson, 2004). Some also defined farm household diversification as income strategies of rural individuals or households in which they expand their number of activities, regardless of the location or sector (Loison & Loison, 2016; Saha & Bahal, 2012). It is mentioned that rural people construct their livelihoods via three main strategies: agricultural intensification, livelihood diversification, and migration (Barrett, Reardon, & Webb, 2001).

Livelihood diversification is classified in various ways by several scholars. Barrett, Bezuneh, and Aboud (2001) identified four distinct rural livelihood strategies contributing noticeably different returns and distributions. Some rural households depend exclusively on their own agricultural production for income, what they define the “full-time farmer” strategy. Others combine own production on-farm with wage labour on others’ farm, which they refer to as the “farmer and farm worker” strategy. The third strategy combine farm and non-farm returns. The fourth “mixed” strategy combines all three basic elements discussed so far: on-farm agricultural production, unskilled on-farm or off-farm wage employment, and non-farm returns from trades, commerce and skilled (often salaried) employment (Barrett, Bezuneh et al., 2001). Some scholars also grouped the components of rural livelihood diversification by sector (farm or non-farm), by function (wage employment or self-employment) or by location (on-farm or off-farm) (Loison & Loison, 2016; Saha & Bahal, 2012).

In situations of high-risk agriculture and poverty, poorer small-holders without the necessary assets may be pushed to seek alternative incomes by engaging in low-return and sometimes risky nonfarm activities (Barrett, Bezuneh et al., 2001). On the other hand, it is mainly among richer households or in regions with favourable agricultural conditions that livelihood diversification driven by motives to raise incomes or accumulate wealth prevails (Haggblade, Hazell, & Reardon, 2007; Loison & Loison, 2016; Makita, 2016). Diversification is therefore associated with both livelihood survival and distress under deteriorating conditions, as well as with livelihood enhancement under improving economic conditions (Niehof, 2004).

Farm households can diversify their return into on-farm, off-farm, and non-farm income components (Ellis, 1998). On-farm income is income gained from either through farming own-land or land acquired or accessed by cash or share tenancy, and income from livestock production. Off-farm income is income gained from labour wage working from other farms with-in agriculture sector. Non-farm income refers to income from non-agricultural sources like non-farm employment, urban-to-rural remittances, rental income, non-farm rural-wage, and international remittances to a farm household (Ellis, 2000).

2. Why farm households diversify?
Multiple motives prompt households and individuals to diversify assets, incomes, and activities. Diversification may be derived by limited risk bearing capacity in the presence of incomplete or weak financial systems that create strong incentives to select a portfolio of activities in order to stabilize income flows and consumption, by constraints in labour and land markets, and by climatic uncertainty (Kassie, 2016). It was found that for a vast majority of the rural population, livelihood diversification was distress driven (Saha & Bahal, 2012).
The main deriving factors for livelihood diversification include the heterogeneity of labour markets that come from the differences in household culture, location, gender, and technical skills (Davies & Hossain, 1997), the existence of risk (Bryceson, 1996), and seasonality (Ellis, 2000). Similarly, Reardon (1997) advocated the existence of livelihood diversification in developing countries due to the low credit access rate across the farm household; and cash to smooth consumption rather than to generate income for investment (Taylor & Wyatt, 1996). Some researchers mentioned deterioration of assets, disasters that are considered to be push factors; migration of the household members or the whole family itself (Bigsten, 1996); and population pressure (Malmberg & Tegenu, 2007) as determinants of livelihood diversification.

Simtowe, Asfaw, and Abate (2016) considered many literatures on justifications for farm income diversification and grouped into four broad categories: (i) self-insurance against risk, (ii) an ex-post coping strategy, (iii) inability to specialize due to incomplete input markets and (iv) consumption diversification where there are incomplete output markets. This is consistent with Kassie (2016), Reardon (1997), Bryceson (1999), Toulmin (2009) and Ellis (2000), who reports that most households avoid an extended period of dependency on only one or two sources of income as an ex-ante risk management strategy or as an ex-post risk-coping strategy. Some researchers have also argued that the lack of complete insurance and credit markets compels households to devote substantial resources to stabilizing the stream of income in order to protect themselves from the dire consequences of substantial income fluctuations (Abdulai & CroleRees, 2001; Bardhan, 1973). Reardon (1997) also mentioned various motivations for allocating labour to the non-farm sector including better relative returns, inadequate farm output, a need for non-farm cash sources to pay for farm inputs, and risky returns to farming. The reasons for livelihood diversification are varied, ranging from an attractive choice for accumulation purposes, enabled by asset and the diversity of those assets, to a distress induced insurance strategy brought on by crises (Barrett, Bezuneh et al., 2001; Martin & Lorenzen, 2016).

In developing countries, farm households allocate their labour to off-farm income diversification activities for the following reasons: to reduce income risk by diversifying ex ante; to maintain food security (income and consumption) in the face of low farm productivity and income shocks such as drought, by diversifying ex post, in the face of insurance market failure; and to earn cash income to finance farm investments, in the face of credit market failure (Kassie, 2017). Agricultural product processing and input requirements, which is determined by the agricultural product mix, create derived demand for nonfarm labour. Forces outside agriculture mainly in the cities and in the mining sector also affect labour use in the rural nonfarm economy. Booms in the mining and oil sectors draw labour from rural areas. In Nigeria, for instance, “Dutch disease” analysis illustrated this with respect to the oil boom in the early 1980s (Oyejide, 1986; Reardon, 1997).

It is often stated that “distress-pushed” diversification factors that push farmers into a variety of low-return activities, leading to more stable but lower household income generating activities (Lohmann & Liefner, 2009; Reardon et al., 1998). In this light, diversification is seen as an involuntary reversion of the process of specialization, brought on by crises such that the multiplication of activities is an adaptation necessary to ensure survival (Cinner, McClanahan, & Wamukoto, 2010). On the other hand, progressive success and wealth, which in turn lead to increased access to resources, may lead to increased livelihood diversification as although they may have lower risk incentives than the poor, the non-poor may be more capable of financing this diversification if it is costly, have high entry barriers, and is initially risky (Reardon & Hopkins, 2006). From this point of view, diversification can be seen as a deliberate strategy adopted by proactive households with greater opportunities (Barrett, Bezuneh et al., 2001; Cinner et al., 2010; Martin & Lorenzen, 2016). These factors are negative factors that may force farm household to seek additional livelihood activities within or outside the farm. These factors tend to dominate in high-risk and low-potential agricultural environments, subject to drought, flooding and environmental degradation (Haggblade et al., 2007). The most common push factors are related to different forms of risk, such as seasonality and climatic uncertainty (Ellis, 2000). 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, Bezuneh et al., 2001; Dercon, 2002; Ellis, 1998; Reardon et al., 1992; Start & Johnson, 2004).

On the other hand, 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 nonfarm activities. Such factors tend to dominate in less risky and more dynamic agricultural environments (Haggblade et al., 2007). Alternatively, diversification resulting from a push or pull factors have been categorized by some scholars as either “survival-led” or “opportunity-led” respectively (Ellis, 2000; Hirzel & Le Lay, 2008; Reardon & Hopkins, 2006). Survival-led diversification, which is driven by push factors, mainly occurs when poorer rural households engage in low-return nonfarm activities by necessity to ensure survival, to reduce vulnerability or to avoid falling deeper into poverty. They are pushed into low-return nonfarm activities because they have low endowments of assets such as land, capital, livestock and credit, making them less resistant to seasonal and other risk factors (Barrett, Bezuneh et al., 2001; Ellis, 1998; Hirzel & Le Lay, 2008; Reardon & Taylor, 1996). Opportunity-led diversification is mainly driven by pull factors. It occurs when wealthier rural households engage in high-return nonfarm activities, with accumulation objectives, in order to increase household income by maximising returns from their assets (Loison & Loison, 2016). Income diversification has been shown to be positively associated not only with wealth accumulation (Barrett, Bezuneh et al., 2001; Bryceson, 1999), but also with an increased ability to withstand exogenous shocks, at least in terms of partial consumption smoothing (Block & Webb, 2001; de Janvry, Fafchamps, & Sadoulet, 1991; Dressler, de Koning, Montefrio, & Firn, 2016; Kinsey, Burger, & Gunning, 1998; Saha & Bahal, 2012).

The final explanation for diversification patterns is the existence of economies of scope in production. Economies of scope exist when the same inputs generate greater per-unit profits when spread across multiple outputs than when dedicated to any one output. The concept differs from that of economies of scale, in which per unit profits are increasing as the amount of all inputs to production grows. Economies of scope tend to favour specialization. Most empirical studies of African agriculture find no significant economies of scale beyond a very small farm size, attributable in large part to the absence of sophisticated water control or mechanization (Barrett, Bezuneh et al., 2001).

Ellis and Freeman (2004) mentioned some of the benefits of livelihood diversification in the process of improving livelihood and reducing poverty. They argued that farm households diversify their livelihood because of asset-based and insurance-based diversification theories. Asset-based diversification theories argue that the degree and level of diversity in a farm household’s income mix indicates the extent of diversity in the resources or assets it owns or has access to it. On the other hand, the insurance-based diversification theory argues that income failures and shocks dictate and push the farm household to diversify its activities. Ellis (2000) added that the reasons for livelihood diversification mainly emanates from necessity versus choice conditions.

Inhabitants of marginal environments are portrayed in the burgeoning livelihoods literature as experts in the craft of survival under conditions of adversity (Davis, 2003; Ellis, 2000; 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 (Phillipo, Bushesha, & Mvena, 2015). The growth of non-farm income sources if accessible in remote rural areas might reduce the need for landless dwellers to carry out extractive practices in local environments for their survival. This has been called the “substitution of employment for the environment” and has received quite a lot of attention in the policy literature (Lipton, Sucher, Kaiser, & Dreyer, 1991). In addition, livelihood diversification is an effective way of solving the problems caused by poverty and environmental degradation. Therefore, livelihood diversification can be used as an efficient indicator to evaluate the success and sustainability of the rural community, which is, for instance, true in China (Liu & Liu, 2016).
Livelihood diversity helps to reduce households’ dependence on environmental resources, thereby helping environment restoration. Off-farm employment causes the outflow of the rural population and reduces regional population and environmental pressures, which is beneficial for maintaining rural development achievements. This is consistent with the results of the study on ecological restoration in the Wuyi Mountain Area of Fujian, China (Wang, Gao, Wang, & Li, 2016), as well as the studies on combating desertification in Asia, Africa and the rest of the world (Heshmati & Squires, 2013). The reduction in households’ engagement to the environment is mainly caused by less dependence on environmental resources after the improvement of livelihood diversity. As an external “pull” factor, the rapid development of China's overall economy effectively promotes the non-agricultural transfer of the rural labour force and improvement of household livelihoods, so as to indirectly facilitate the restoration of the ecological environment (Wang et al., 2016).

3. Farm livelihood diversification in sub-Saharan Africa

Non-farm income generating activities provide an important source of primary employment in the rural areas of most developing countries', and it is assumed that as farm size due to population pressure becomes smaller, the percentage of non-farm income becomes larger (Hilson, 2016). Non-farm activities have the potential to play a crucial role in reducing vulnerability to poverty by providing households with a form of insurance against the risks of farming and reducing reliance on natural resources (Cinner et al., 2010; Lohmann & Liefner, 2009; Martin & Lorenzen, 2016; Rigg, 2006; Simtowe et al., 2016).

Africa as a continent is identified by subsistence farmers, nonfarm income sources already account for as much as 40–45% of average household income (Hilson, 2016; Saha & Bahal, 2012). High population growth resulting from high fertility rates, shrinking farm sizes and growing landlessness in sub-Saharan Africa could have potentially negative impact on rural welfare and food security and by default pushing unskilled farm labour into mainly low-return nonfarm sectors (Haggblade et al., 2007; Heady & Jayne, 2014; Muyanga & Jayne, 2014). Secondly, urbanization in SSA is taking place without industrialization (Andersson Djurfeldt, 2015; Losch, Freguin-Gresh, & White, 2012), in contrast to green revolution Asia where urbanization and emerging industries gradually allowed rural people to leave agriculture and enter to nonfarm employment (Haggblade et al., 2007), and rewarded investments in education and migration (Jayne, Chamberlin, & Headey, 2014). In the absence of manufacturing industries and high-return service sectors to provide skilled nonfarm opportunities, prospects for increased employment and rising incomes in urban areas of SSA remain limited. This leaves smallholder farming as the primary option for gainful employment for SSA’s growing young labour force (Losch et al., 2012). However, rapid growth in nonfarm sectors fuelled by improvements in education and infrastructure can potentially alter this situation (Haggblade, Hazell, & Reardon, 2010). Thirdly, persistent low agricultural productivity coupled with chronic food insecurity and severe poverty characterises the smallholder rural economy in SSA (Loison & Loison, 2016; Reardon & Timmer, 2007).

A strand of literature attributes livelihood diversification in Africa to the failure of the structural adjustment programmes in the 1980s and the 1990s to improve economic conditions for agricultural production (Ellis & Freeman, 2004; Simtowe et al., 2016). Firstly, because of persistent low agricultural productivity and declining farm sizes coupled with rising population, SSA's structural and agricultural transformation appears to move very slowly. In addition, the transformation path clearly differs from the one taken by developed economies in Europe, America or Asia, where urbanization and industrialisation accompanied the rural transformations. Secondly, it is clear that rural farm and nonfarm livelihood diversification is of increasing importance for economic growth, poverty reduction, food security and creation of employment (Ajani & Chianu 2008; Barrett, Bezuneh et al., 2001; Loison & Loison, 2016). In addition, in the absence of complete credit or insurance markets, individuals are typically unable to smooth consumption in spite of a strong desire to do so. For many institutional, infrastructural, technological, and informational reasons, financial markets are routinely incomplete in rural Africa, so individuals must act outside of financial markets in order to reduce consumption variability driven by real income variability. When crops fail or livestock die, households must reallocate labour to non-farm diversification pursuits, whether formal
employment off-farm (e.g. wage labour), informal employment off-farm (e.g. hunting) or nonagricultural activities on-farm (e.g. weaving, brewing).

Rural households in sub-Saharan African countries usually have to cope with both poverty and income variability (Abdulai & Crole-Rees, 2001). There are two points to be considered here, the first being diminished farm productivity in sub-Saharan Africa. Second, in sub-Saharan Africa, under adjustment, support for agriculture has virtually disappeared, particular subsidies on crucial inputs such as fertilizers. These drivers have been divided along the spectrum of “necessity versus choice”: they make up a typology featuring, on the one extreme, “push factors”, and on the other extreme, “pull factors”. In sub-Saharan Africa, correspond to the two sets of drivers identified above—“pull factors” (“demand pull”) diversification and “push factors” (“distress push”) diversification, respectively have been parallelly identified (Hilson, 2016; Makita, 2016).

In Ethiopia, the complex interlinkages among poverty, population pressure, institutional failure and environmental degradation cause shrinkage of land holdings that led to farm fragmentation, landlessness and expansion of farming to steeper and marginal lands (Anley, Bogale, & Haile-Gabriel, 2007; Belay & Bewket, 2015). Woldehanna (2000) estimated that, in Ethiopia, non-agricultural income comprises 35% of gross farm households’ income. There are many empirical studies in Ethiopia which investigated determinant factors of livelihood diversification. The studies consider a variety of household characteristics such as age, gender, farm size, education and asset, along with other environmental characteristics such as credit access, distance to the nearby market and location (Beyene, 2008; Bezabih, Gebreegziabher, Gebremedhin, & Köhlin, 2010; Bezu & Barrett, 2010; Block & Webb, 2001; Demeke & Regassa, 1996; Gebre-Egziabher, Elkaim, Powell, & Parkinson, 2000; Lemi, 2006; MoLSA, 1997; Sisay, 2010; van den Berg & Kumbi, 2006; Woldehanna, 2000). These studies help us to understand factor determinants of livelihood diversification in Ethiopia by providing a lot of compelling and insightful results.

4. Method of the Study
In this study, 151 farm households were surveyed in East Gojjam Zone, which is located in Amhara National Regional State of Ethiopia. The zone was chosen randomly by employing multistage stratified sampling technique based on geographical location references. East Gojjam zone is one of the eleven administrative zones in the Amhara National Regional State. In the sample region, about 90% of the total labour force engaged in agriculture, mostly producing cereal crops, oil crops, pulses and horticulture. However, non-agricultural livelihood activity in the Region is very prevalent with a variety of livelihood activities including small trade, handcrafting and small-scale agro processing, generating second largest employment (BoFED-ANRS, 2015). Gozamin District, which is located in East Gojjam Zone, is selected. It has 15 rural villages of which Leqileqit, Weynmager and Addis-Gulit farm rural villages had been chosen, and the sample households had been selected proportionally from these three peasant villages (Figure 1).

This study employed the logit model to investigate the probability that a farm household participates in non-agricultural income diversification activities. Then, it applied the seemingly unrelated regression (SUR) model to a system of equations consisting of on-farm, off-farm and non-farm income equations. This is to acknowledge that income is the ultimate motives of diversification activities. Thus, the SUR model enables one to look into factor determinants of livelihood diversification from different perspectives, complementing the previous studies based on the binary choice models. The study sheds insights on farm household behaviour on livelihood diversification to provide some policy implications useful to alleviate poverty in rural Ethiopia.

5. Results and discussions
5.1. Description of data
Among the total farm households, 71.52% of them have participated in the off-farm and non-farm livelihood diversification activities. Male-headed farm households present 72.19% of the sample
The mean age of sample farm households is 44.36 years with 5.25 average family size. In terms of the farm households’ educational status, 68% of them had no formal education, and the remaining 20 and 11% of the sample households had attained their primary and secondary educational levels respectively. Table 1 presents descriptive statistics of the sampled farm households for livelihood diversification from the survey study.

On average, 35% of the households’ family members have been attending their school during the survey period. The average nearest market distance from their residence home is about 16.73 kilometres. The average land size of the sample household is 1.16 hectare, and on average each household had 2.4 numbers of labours between the ages of 15 to 65 years, inclusive; and 30,150 ETB livestock value using an estimated market price. During the survey crop season, the farm households had generated a mean income of 20,177 ETB; 1,235 ETB1 and 1,971 ETB from on-farm, off-farm and non-farm livelihood diversification activities respectively. The households’ average total income during the same season was 23,371 ETB.

5.2. Marginal estimation of livelihood diversification

In this section, we have investigated the determinant factors of livelihood diversification in Gozamin district, Ethiopia by applying the logit model to the survey data. Before estimation, we look into pairwise correlation coefficients between explanatory variables to check the possibility of multicollinearity problem. We found out no significant pairwise correlations, except between family size and the number of labour in the household. Therefore, we dropped out the family size from the regression analysis. In addition, the problem of heteroscedasticity is detected as expected from the cross-sectional data, so we reported heteroskedasticity robust standard errors. Table 2 presents coefficient estimates of the logit model for determinant factors of livelihood diversification in Ethiopia.

Regarding household characteristics that determine participation in livelihood diversification, an increase in household age decreases the probability of participation in livelihood diversification activities by the farm households. At the margin, a 1% increase in the age will result in the decline of the probability of livelihood diversification by 0.37% units. There are some possible explanations for
this result. First, it is related to the natural factors in that as the age of the farm household increases, the farmer will be getting older and could not be capable of diversifying as many livelihood activities as possible. Thus, old farmers are more likely to concentrate on on-farm agricultural activities for just the purpose of maintaining their subsistence consumption need. Second, rural population have been grown fast in Ethiopia with an annual rate of greater than 2.5%, which suggests that many young farmers are involved with the agriculture sector. With limited resources, new young farmers have to work with meagre rural resource endowment, which pushes them to diversify their livelihood activities to earn enough income for smoothing out yearly consumption. Third, the service and construction sectors in Ethiopia have recently been growing and expanding significantly faster than the industrial and agricultural sectors (MoFED, 2010). This provides a better opportunity for younger rural farmers to engage in the service and construction sectors than the older farmers who like to be paid better in other sectors as their productivity is much higher than the agricultural sector.

Previous studies show mixed results on the relationship between household age and farm income diversification. For example, Breman (1996) in India found a consistent result with this study in those younger households found to be more livelihood diversifier than old age counter parts. Kimhi and Lee (1996) reported that age of the farm household first increases and declines with the livelihood diversification, suggesting a nonlinear relationship. On the other hand, Barrett, Bezuneh et al. (2001), and Block and Webb (2001) argued that aged household heads have a larger family size and are likely to have extra and unemployed labour, helps them to allocate outside the agricultural sector.

Table 1. Descriptive statistics of sample farms for livelihood diversification in Ethiopia

| Variable     | Definition                                                                 | Mean  | S.D.  |
|--------------|-----------------------------------------------------------------------------|-------|-------|
| Div          | Dummy of livelihood diversifying, 1 if diversifying; 0 otherwise           | 0.72  | 0.45  |
| Hhsex        | Dummy of household head gender, 1 if male; 0 otherwise                      | 0.72  | 0.45  |
| Lnhhage      | Log of age of the farm household head                                      | 44.36 | 12.39 |
| Size         | Family size of the household                                              | 5.23  | 1.62  |
| Edu          | Dummy of education, 1 if no formal education                                | 0.68  | 0.47  |
| Elem_edu     | Dummy education, 1 if elementary education                                  | 0.20  | 0.40  |
| Secon_edu    | Dummy education, 1 if secondary education                                   | 0.11  | 0.32  |
| Stud_prop    | Proportion of students in the household                                     | 0.35  | 0.24  |
| Lnmrk_t_dist | Log of household home distance from the nearest market (km)                | 16.73 | 1.56  |
| Land_ha      | Land size owned by the household (in ha.)                                   | 1.16  | 0.45  |
| Labor        | Number of labor (between age of 15 and 65)                                 | 2.40  | 0.76  |
| Land_right   | Dummy, 1 if household feel secured for his land                            | 0.89  | 0.30  |
| Coop_mem     | Dummy, 1 if a household is a member of the cooperative                      | 0.64  | 0.47  |
| Credit_serv  | Dummy, 1 if a household has access to credit                               | 0.49  | 0.50  |
| Agri_exten   | Dummy, 1 if household participated in agri-extension                        | 0.72  | 0.44  |
| Lnlivestock  | Log of market value of livestock (in ETH currency 1$=18Birr)                | 30.150| 15.154|
| Ln wage      | Log of wage of labor (Annual wage)                                         | 4.663 | 1.398 |
| Vill_leqieq  | Location dummy, 1 if Leqiet                                                | 0.33  | 0.47  |
| Vill_weynma  | Location dummy, 1 if Weynmager                                              | 0.33  | 0.47  |
| Vill_addis   | Location dummy, 1 if Addis-gulit                                            | 0.33  | 0.47  |
| Lncropy      | Log of on-farm income                                                      | 20.177| 9.7989|
| Ln off-farmy | Log of off-farm income                                                     | 1.235 | 1.355 |
| Ln non-farmy | Log of non-farm income                                                     | 1.971 | 2.519 |
| Ln total     | Log of total income                                                        | 23.371| 11.191|

Source: Own survey data.
Location of the household is another determinant factor for livelihood diversification. As we move from Addis-Gulit (reference village in estimation) to Leqileqit and Weynmager peasant villages, the probability of participation in livelihood diversification found to decline, that is, households located in Leqileqit and Weynmager found to be less likely to engage in livelihood diversification activities compared to the farm merchandising who live in the reference village. The possible explanations may include; the reference village, Addis-Gulit, is nearer to the highway that stretches from Addis Ababa, the capital city of Ethiopia, to Bahir Dar, the administrative city of Amara National Regional State. This creates opportunities for farm households who live in Addis-Gulit to engage in a wide range of non-farm income diversification activities in trading and generating income by migrating to the other rural areas and towns. Resource endowment differences between the villages can also create variations in diversification incidences among villages. For example, Beyene (2008) in Ethiopia suggested that farm households who live in drought-affected areas participate in off-farm activities higher than households who live in relative food surplus areas.

Educational level of the farm household head had a negative impact on the livelihood diversification decisions of farm households. Farm households who attended secondary and higher

| Variable       | Coefficients | Marginal effect (dy/dx) |
|----------------|--------------|-------------------------|
| Dependent      |              |                         |
| Livelihood diversification |              |                         |
| Explanatory variables |              |                         |
| Hhsex          | 0.5825 (0.4892) | 0.08615 (0.0768) |
| Lnhhage        | −2.7711** (1.2228) | −0.3759** (0.1541) |
| Vill_leqleq    | −2.5089* (1.4122) | −0.4267 (0.2482) |
| Vill_weynma    | −2.9063** (1.1947) | −0.5080** (0.1938) |
| Elem_educ      | 0.3743 (0.8468) | 0.0471 (0.0947) |
| Secon EDUC     | −2.0936** (0.7374) | −0.4180*** (0.1562) |
| Stud Prop      | −1.9091 (1.5320) | −0.2589 (0.1819) |
| Lnmrt_dist     | −22.8685*** (6.5343) | −3.1022*** (0.7624) |
| Land ha        | −0.2777 (0.7686) | −0.0376 (0.1068) |
| Labor          | −0.3071 (0.3717) | −0.0416 (0.0479) |
| Land right     | 2.1779** (0.8601) | 0.4451** (0.1854) |
| Coop mern      | 1.9734*** (0.6311) | 0.3254*** (0.1099) |
| Credit serv    | 0.3253 (0.5848) | 0.0441 (0.0767) |
| Agri exten     | 1.4062* (0.8411) | 0.2485 (0.1691) |
| Lnlivestock    | 0.1551 (0.4375) | 0.0210 (0.0592) |
| Ln wage        | 0.6613 (1.43509) | 0.0897 (0.1912) |
| _Cons          | 67.9569*** (22.6252) | – |

Number of obs = 147
Wald $\chi^2$ (16) = 28.89
Prob.$>\chi^2 = 0.0247$
Log pseudolikelihood = 51.164
Pseudo $R^2 = 0.4320$

Notes: Robust standard errors are in parentheses. For dummy variables, dy/dx denotes a change from 0 to 1. Addisgult is used as the reference village, and a household head having no formal education is used as the reference for educational level, so these two variables are eliminated from estimation.
Source: Computed from own survey data.
*Indicate coefficients are statistically significant at 10% significance level.
**Indicate coefficients are statistically significant at 5% significance level.
***Indicate coefficients are statistically significant at 1% significance level.
educational level had shown a lower probability of diversifying in livelihood activities compared to whom who do not have any formal educational backgrounds. Keeping other things constant, as one move from farm households who do not have formal education to farmers who attained secondary and higher educational level, the probability of livelihood diversification will decline by 41.8% units. The possible explanations may be farm households who attained secondary and higher educational level may engage in specializing in on-farm activities by employing better farm technologies and will increase their food crop productivity. Similarly, some studies suggested that education has a negative effect on diversification participation (Demeke & Regassa, 1996; MoLSA, 1997; Woldehanna, 2000) while other studies reported it has a positive effect (Gebre-Egziabher et al., 2000; Sisay, 2010). For instance, Beyene (2008) showed that education has no significant impact even though training skills has a positive impact. Author and Bryceson (2002) reported that better-educated farm households were found to participant less in livelihood diversification activities compared to the uneducated farm households in rural sub-Saharan Africa countries. On the other hand, Demeke and Regassa (1996) found that education has a positive impact as long as the farm household is located near the urban areas. Likewise, Kimhi and Lee (1996) and Barrett, Bezuneh et al. (2001) found contradict results in that educational level of the farm household has a positive impact on livelihood diversification. Ellis (1998) in his theoretical argument expressed that livelihood diversification activities requiring higher skilled labour attract more educated and ones that require lower skilled labour attract less uneducated household members and concluded there is a nonlinear relationship between the two variables.

The home-distance of farm households from the nearest market place found to have the greatest influence on the diversification. A one percent increase in the distance of farm households to the proxy market place, in this case, Debre Markos town, at the margin could lead to a decline in the probability of engaging in non-agricultural livelihood diversification activities by more than 3% units. The possible explanations include: first, during the slack crop production period farm households can engage in selling-out their labour to the nearest market to maximize their income and to smooth their annual consumption. Second, markets will promote the rural-urban linkages like vertical linkages, in which the farm household can supply the rural resources and products to the nearest market place where small-scale agro processing industries are located that use predominantly raw materials from rural areas. Backward-linkages may also be facilitated in that some farm households may have been involved in the merchandising processes of buying urban products for their rural villagers. Third, being close to the market places may lead to the development of the entrepreneurial skill of farm households that will motivate them to have involved in various livelihood diversification activities.

The institutional factors that determine farm households’ decision to engage in the livelihood diversification activities are related to the perception of land security and being membership in cooperatives. The probability of participation in livelihood diversification activities will increase by 44% units as farm households feel more secure about their land right. Land right is an important determinant factor because land in Ethiopia is considered as a public resource and the potential selling and buying of this resource are not permitted. Farmers have given the land use-right only. Likely justifications include: first, as farm households feel secure about their land ownership right, they will diversify agriculture to agroforestry practices like planting vegetables, coffee, and eucalyptus trees than just specializing in food crop production only in the study area. The second explanation is that as farm households feel secure about their land right, they may rent-out their land so that they may use the rent income to engage in more feasible livelihood diversification activities that may reward them a higher return than food crop production, such as trading activities and selling their own labour.

Finally, becoming membership in cooperatives increases the probability of participating in livelihood diversification activities. Ceteris paribus, at the margin, being the farm household become a member of cooperatives would likely to increase the probability of engaging in livelihood diversification activities by 32.5% units. First, households’ financial constraint will be minimized so that they
will have the opportunity to participate in off-farm and non-farm income generating activities, as they become members of the cooperatives including a member of informal institutions in the sample area like Equb. Second, farm households’ social capital and entrepreneur skill will be increased as they become a member of the cooperatives. Third, being the member of cooperatives could increase the bargaining power of farm households in selling and buying their products as well as in other related collective actions and decisions.

5.3. Farm income diversification estimation using SUR model

Table 3 below presents coefficient estimates of Seemingly Unrelated Regression (SUR) model for incomes of livelihood diversification. This study tested the null hypothesis that error terms for the three livelihood diversification equations are not related. The Breusch-Pagan test rejects the null hypothesis of independence of between on-farm, off-farm and non-farm residual series at the 1% level of significance. The test empirically confirms that it is appropriate to estimate the simultaneous equations of three income diversification activities using the SUR model. Unobserved variables that affect one of the livelihood diversification activities also affect the other activities in the same direction since the values of \( \rho \) (rho) in all the correlation matrix of residuals are positive.

Gender difference leads to an increase in participation of on-farm, off-farm and non-farm income diversification activities in the study area. That is, as we move from the female household heads to

| Regressors | Dependent variables | Incropy | Inoffarmy | Innnonfarmy |
|------------|---------------------|---------|-----------|-------------|
| Hhsex      |                     | 0.3712*** (0.1174) | 0.7180*** (0.2202) | 0.9695*** (0.2250) |
| Lnhhage    |                     | 0.0850 (2070) | -0.5622 (0.3957) | -0.1516 (0.6043) |
| Vill_leqleq|                     | -0.5104* (0.2771) | -0.4341 (0.54747) | 0.6800 (0.5593) |
| Vill_weynma|                     | -0.4550** (0.2111) | -0.3840 (0.3939) | -0.0218 (0.6024) |
| ElemEduc   |                     | 0.1121 (0.1206) | 0.0745 (0.2439) | 0.2239 (0.2492) |
| Secon Educ |                     | -0.1037 (0.1715) | -0.2841 (0.3343) | -0.3136 (0.3415) |
| Stud prop  |                     | -0.0472 (0.2239) | -0.9305** (0.4461) | -1.0264** (0.4558) |
| Lnmrk Dist |                     | -1.1765 (1.1135) | -4.588** (2.127) | -3.0306 (2.173) |
| Land_ha    |                     | 0.3036** (0.1080) | 0.2169 (0.2143) | 0.3553 (0.2190) |
| Land_right |                     | -0.0223 (0.2459) | -0.3333 (0.4957) | -0.0918 (0.5064) |
| Coop mem   |                     | 0.0664 (0.1419) | 0.9641*** (0.2809) | 0.4067 (0.2870) |
| Credit serv|                     | -0.0436 (0.1038) | -0.4272** (0.2036) | 0.0484 (0.2080) |
| Agri exten |                     | -0.0806 (0.1768) | -0.5715 (0.3535) | 0.3130 (0.3611) |
| LnTech     |                     | 0.2094** (0.0957) |                     |                     |
| Lnlivestock|                     | 0.0560 (0.1276) | 0.2923 (0.2250) | 0.5644** (0.2299) |
| LnWage     |                     | -0.2048 (0.3803) | -0.2570 (0.6062) | -1.0179 (0.6193) |
| Lnoxen     |                     | 0.3674 (0.3296) |                     |                     |
| Labor      |                     | -0.0547 (0.0837) | 0.0513 (0.1646) | 0.2047 (0.1682) |
| Cons       |                     | 10.4444*** (4.1240) | 0.0513*** (0.1646) | 17.2662** (8.3088) |

Breusch-Pagan test of independence: \( \chi^2 (3) = 38.503*** \)

Notes: Standard errors are in parentheses.
*Indicate coefficients are statistically significant at 10% significance level.
**Indicate coefficients are statistically significant at 5% significance level.
***Indicate coefficients are statistically significant at 1% significance level.
male household heads, income generated from on-farm, off-farm and non-farm activity found to be increased by 0.37, 0.72 and 0.97% respectively. This may be because in rural Ethiopia men usually used to control resources, so they have much higher access to participating in income diversification activities than female heads. Second, female household heads in the study area customarily have been engaging in preparing food, child caring and home management activities that are not valued in financial terms or income generating activities. Gender has mixed influences as shown in different empirical studies. In this regard, most studies reported that being male household head has significantly influenced income diversification (Bezabih et al., 2010; Demeke & Regassa, 1996; Larson, Savastano, Murray, & Palacios-López, 2015; van den Berg & Kumbi, 2006).

The proportion of family members who have been attending school during the survey season, either in the rural area where their family lives or in some other urban areas found to have a negative impact on non-farm and off-farm household income levels. As proportions of students increased by 1%, the income level of off-farm and non-farm diversification activities declined by 0.93 and 1.02% units respectively. These results are likely due to the fact that schooling withdraws rural labour force from livelihood diversification activities so farm income of the household will definitely be declined. Thus, the shortage of family labour may push the household to concentrate only on subsistence and on-farm agricultural activities. However, in the long run, investment in education may increase remittances, which will, in turn, increase the non-farm income of the household.

The distance of the home residence from the proximate market place indicated a negative effect on the farm household income, as the location of farm households’ home increased by 1%, the off-farm income of the household declined by more than 4% merchandising is because the market could demand farm household products and labour. This indicates that urbanization and access to market will facilitate the diversification process of farm households.

On the other hand, farmland size has a significant and positive impact for on-farm agricultural income level. That is, as the land size of a farm household increased by 1%, income from on-farm activities will be increased by 0.30% unit at 5% level of significance. Total agricultural crop production increases as cropland size increased, at the given level of farm technology. In addition, the ranchers for livestock will increase and will lead to the increase in livestock production and on-farm income level, as the land size of a farm household increased. Finally, farm households are likely to rent-out extra farmland to other farmers who face a shortage of farmland, as they have larger farmland size, which further raises their income. However, the relation does not necessarily mean that there will be an increase in farm productivity, as there are counter arguments on land size versus efficiency relationship. It has been often argued that small-scale landholders are more efficient than larger farms.

Similarly, as households become membership in cooperatives leads to an increase in the off-farm income level by 0.96% units on average. Becoming membership in cooperatives will lead to the increase in social capital and entrepreneurship skill of the farm household that will motivate to the increase in livelihood diversification participation rates. On the other hand, access to credit service resulted in the decline in the off-farm income of the household by 0.43% units at 5% level of significance. This is likely because credit service in the short run can solve the subsistence budget constraints of the household, making it as a substitute for the off-farm income generating efforts. Credit service can also solve cash constraints of the household, making farm households shift from off-farm activity (like selling out his own labour) to the intensification of on-farm activities by purchasing and adopting better farm technologies. However, because this study employs only cross-sectional survey data, the results cannot fully estimate the effects of current credit on the future farm households’ income, which should include dynamic effects that can be estimated over given periods.

For improvements in farm household productivity and income, the role of farm technologies, like the use of fertilizer and improved seeds, plays an important role. As hypothesized, if agricultural
technology adoption of farm household increased by 1% unit, the on-farm production income found to be increased by 0.20% units. In the study area, the use of farm technology is found to be low, caused by the limited supply of farm technologies and the low purchasing power of farm households.

Current market value of livestock has a positive and significant impact on the non-farm income of the farm household. That is, as the value of livestock owned by the farm household increased by 1%, the non-farm income increased by 0.56% units. This is because livestock is considered as the principal store of an asset for the farm households in Ethiopia. The household may sell some of the livestock as its market value increases, using that revenue he can allocate this income to expand the non-farm livelihood diversification activities, like trading and participating in small-scale rural merchandising activities. In addition, in the study area, oxen and horse are used for agricultural production processes. Farm households that have many oxen and horses may rent them out and collect non-farm income.

6. Conclusion and implications

Ethiopian agriculture’s productivity is found to be low even though the country has implemented various agricultural policies. These policies formulated so far do not incorporate non-agricultural livelihood strategies under the policy framework as they have focused only on on-farm agricultural development and strategy. Therefore, agricultural development policies should incorporate livelihood diversification as there are significant opportunities. The logit model estimation shows that institutional factors such as secured land-right perception and cooperative membership have the significantly positive influence on the probability of participating in non-agricultural activity by farm household. On the other hand, age, education and distance to the proximate market indicated a significantly negative effect on farm household’s decision to participate in non-agricultural livelihood diversification activities. The SUR model estimation indicated that male-headed and membership in cooperatives affect off-farm income positively, while the distance to the market and access to credit service affect it negatively. Male-headed and livestock-raising affect non-farm income positively while the proportion of students in households’ affects it negatively.

As Ethiopian farmers harvest agricultural crops just once a year during the summer season of May to September, there exists idle rural labour force in the remaining non-farming seasons. Therefore, livelihood diversification practices of a farm household during the slack periods of agricultural activities will definitely boost the income, which enables farm households to buy new farm technologies that will in turn help to enhance agricultural productivity.

There should be comprehensive rural development policy that could empower farm households. Off-farm and non-farm rural livelihood diversification strategies need to be formulated under the rural development policies of Ethiopia. This off-farm and non-farm livelihood diversification strategy can complement the small-scale on-farm productivity improvement strategy of the country. The off-farm and non-farm rural development strategy will allow farm households to efficiently employ their labour hours throughout the year. This integrated rural livelihood—sustainable land management driving that can help maximize both the rural livelihood and the land management conditions of farm-households need to be formulated. Women-headed farm households participated in livelihood diversification activities less than male-headed farm households. It is recommended that the off-farm and non-farm rural development strategy need to mainstream gender equity so as to empower women-farmers to increase opportunity for their participation. Institutions like cooperatives, land rights and agricultural extension packages need to be incorporated in rural development strategies so as to improve the capacity of farm households to participate in livelihood diversification and sustainable land management practices.
Funding
The author received no direct funding for this research.

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Citation information
Cite this article as: Determinant factors of livelihood diversification: Evidence from Ethiopia, Geremew Worku Kassie, Sangho Kim & Francisco P. Fellizar, Cogent Social Sciences (2017), 3: 1369490.

Notes
1. ETB is an abbreviation of “Ethiopian Birr” that is the name for Ethiopia currency.
2. In previous studies, Sisay (2010) reported similar results for Ethiopia while Abdulai and Delgado (1999) reported contradicting results for Northern Ghana.
3. Equi is a traditional and informal saving mobilizing financial institution in Ethiopia, in which the member villagers collects money every week or month and using the lottery system (random probability method) the winner will be selected and will take the mobilized saving and the process continues till the last member takes the saving mobilized by the member mates. It helps to fill the failures in the financial market in rural Ethiopia.

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