Determinants of Smallholder Farmers' Participation in Certified Coffee Value Chain: Evidence from Members of Coffee Cooperatives in Dale District, Sidamo, Southern Ethiopia

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Abstract

The objective of this study was to identify determinants of smallholder farmers' level of participation in certified coffee value chain. The study used household survey from 155 sample smallholder coffee farmers. The econometric model (Truncated regression model) analysis identified that smallholder farmers' level of participation (measured by the amount of coffee supplied as certified coffee) is positively affected by sex of the household head (in favor of male), proportion of land allocated for coffee, trust in cooperative management, annual coffee production & agricultural cash income, while age, education level, and distance from the coffee marketing centers have a negative influence. On the other hand, the effect of utilizing of credits and the farmers' perception on the benefits of participation was found to be statistically insignificant. Addressing the infrastructure problems and promoting improved agronomic practices to boost better quality coffee in rural villages can have a positive effect to increase national certified coffee supply. Along with these strengthening the management of coffee farmers' cooperatives to emplace transparent systems should be critically addressed.
Keywords: Coffee certification, smallholder farmers, cooperatives, Ethiopia

1. Introduction

Coffee has a great social, cultural and livelihoods importance for the majority of Ethiopian population and to the national economy. The country produces more than 30% of the total coffee production in Sub-Saharan Africa and it also consumes nearly 50% of the total production blended with complex socio-cultural settings. In 2012/13 fiscal year it generated 24.2% of the total export revenue (NBE, 2014). Moreover, about 25 % of the total population is dependent on production, processing, distribution and export of coffee (Mekonen, 2009).

Due to these reasons, the coffee sub sector has enjoyed higher attention under the current agricultural commercialization strategy. The production of high value crops like coffee is one of the distinctive features of the new strategic direction being pursued by the Government of Ethiopia and many development partners. This is also part of the multi-faceted efforts geared towards transforming the country's age old subsistence agricultural farming system into commercial oriented and export led production (MoFED, 2010).

Though several efforts have been exerted to exploit the most possible reward from the coffee production and export, still several complex challenges are observed cracking the road to higher benefit share. Among the key challenges facing the whole coffee sub sector in Ethiopia, the volatile nature of global coffee price is critical one. This has been a real source of vulnerability for smallholder producers. Countries like Ethiopia have a very low market share, often below 5% in the international coffee trade. Due to this, Ethiopian smallholder coffee farmers receive only a fraction of the retail price and continued to engage in subsistence farming.

In the history of the international coffee market, the period between 1990 and 2004 had been referred commonly as ''The coffee price crisis'' which had passed shading enormous economic and social impacts on smallholder coffee grower farmers around the globe (Mendez et al., 2010). In an effort to identify ways out of the periodic crisis and to confront the coffee price crisis, various 'sustainable coffee' certification initiatives have emerged as key alternative options for smallholder coffee farmers (Wollni and Zeller, 2007; Mendez et al., 2010). Following this, due to the increasing poverty and vulnerability of smallholder coffee farmers in major coffee producer countries and growing demands for healthier and more socially and environmentally-friendly coffee, certification of coffee through cooperatives has gradually gained wider recognition and significance worldwide (Petit, 2007; Stellmacher and Grote, 2011; Jena et al., 2012).

In Ethiopia, several initiatives led by various stakeholders involving the government, NGOs and multilateral development organizations have been working extensively in supporting coffee farmers' cooperatives certifications and enhancing the whole coffee value chain. As a result, over a period of a decade or so, many coffee farmers' cooperatives have been certified to different certification schemes, including Fairtrade, Organic, and Utz Kapeh. Moreover, the Ethiopian Government made institutional reforms which enhance smallholders' participation in the international coffee value chain.

Despite such initiatives and regardless of its presumed importance, the level of participation of smallholder farmers in such value chains has not been as expected and varies among farmers. Moreover, there is lack of

empirical local studies and evidence on the topic. Thus, this is study attempts to investigate determinants of smallholder farmers' level of participation in the value chain.

2. Objective of the study

The general objective of the study is to identify factors determining the level of smallholder farmers' participation in certified coffee value chain.

3. Review of Related Literature

3.1 *Sustainability Schemes in the Coffee Sector*

In the global agri-food value chain the issue of standards and certification schemes is largely entertained under the concept of "value chain governance". The term "governance" refers to inter-firm relationships and institutional mechanisms where by "some firms in the chain set and/or enforce the parameters under which others in the chain operate" (Humphrey and Schmitz, 2001). The critical parameters for value chain governance are: what is to be produced, and how it is to be produced. These parameters are often set by buyers. But sometimes parameters can also be set by agents external to the chain, including Government agencies and international organizations, not only with a view to consumer safety, but also in order to create transparent markets (Kaplinsky and Morris, 2000).

Public sector initiatives are most commonly known as sustainable coffee initiatives or simply sustainable standards. They include specifications relating to environmental impact, animal welfare concerns, and worker conditions. The concept of sustainable standards is also interlinked with "ethical trade" initiatives which include wider attributes. Ethical trade initiatives emerged due to the growing consciousness of consumers who ask more questions about the source of the products they buy.

Ethical trade can be usefully distinguished in two broad categories: (1) enterprise initiatives; and (2) certification and labeling procedures. Enterprise initiatives are most commonly applied through adopting a certain "codes of practice" (or "codes of conduct"), which show ethical responsibility and define the criteria for measuring company performance against a set of ethical objectives. The certification and labeling procedures "are used as a means of communicating information about the social or environmental conditions surrounding the production of goods or the provision of services" (Ponte, 2004). They help by setting common standards for certain sectors and avoid confusion among consumers. Examples of these are the Fairtrade label, Certified Organic, Utz Kapeh and the likes, which certifies landowners matching a series of criteria.

3.2 *Certification Experiences in Ethiopian Coffee Sector*

The use of environmental, socioeconomic, and/or health-related certification standards in agriculture is a relatively new and recent phenomenon in Ethiopia, as compared to other regions such as Latin America (Jena et al.,2012). In recent years, however, attention has been given to the certification of agricultural products in general and non-timber forest products in particular, such as coffee in Ethiopia. International certification agencies, standard bodies, governmental and non-governmental development organizations, and private companies were involved in this regard (Stellmacher and Grote, 2011 and Jena et al., 2012). The certification of forest coffee in Ethiopia was started in 2002 with the aim of conserving the coffee forests and providing the smallholder farmers with a better livelihood.

The coffee certification is mainly undertaken within the coffee cooperative structure and smallholder coffee farmers participate in certification through cooperatives (Stellmacher and Grote, 2011). In Ethiopia, the certification focuses mainly on coffee because coffee is both: a) the main export crop of the country's economy and the main income source for millions of smallholder coffee farmers that live in poverty and b) it is a resource with high potential to be marketed as a specialty gourmet product on the world's major coffee markets.

There has been an increase in the number of certified cooperative in the Country. Kodama (2009) indicated that the number of Fairtrade certificate-holder coffee farmers' cooperatives was relatively small. As of May 2006, only 24 of the then 165 cooperatives of the Oromia, Sidama, and Yirgacheffe coffee farmers' Cooperative Unions had FLO certificates. This was mainly due to the slow application process and lack of the necessary administrative capacity of the candidate cooperatives. Due to these and allied reasons, in 2005, the share of Fairtrade coffee from the total national export volume was approximately 2%.

Table 1: Number of certified primary cooperatives

Cooperative union	Number of primary cooperatives	% Coops with Any type of certificate	Type of Certificates			
			Organic	Fairtrade	Rainforest Alliance	Utz Certified
Sidama	47	89.4	83	87.2	6.4	10.6
Yirgacheffe	26	100	100	100	11.5	7.7
Oromia	250	16.4	9.6	16.4	1.2	1.2
Limmu Inara	27	59.3	59.3	18.5	0	0
Wolaita Damota	42	23.8	23.8	0	0	0
Kaffa	34	55.9	52.9	44.1	0	0
Bench Maji	39	7.7	7.7	0	0	0
Total	465	33.8	29.2	27.5	1.9	2.2

Source: Bart et al., (2015)

After nearly a decade much progress has been observed in this regards, with Organic certification dominating followed by Fairtrade. A recent compilation by Bart et al., (2015) indicates that there are 136 (29.2% of the total) Organic certified and 128 (27.5% of the total) Fairtrade certified coffee cooperatives in the country (Table 1).

Currently, 41 member Coffee Farmers' Cooperatives of the Sidama Coffee Farmers' Cooperatives Union have got at least one type certification (i.e. Fairtrade), and nearly 60% of them (26 Cooperatives) are double certified with Fairtrade/Organic (Sidama Coffee Farmers Cooperative Union, 2014).

4. Materials and Methods

4.1 Description of the Study Area

Dale Woreda is located in Sidama Zone, SNNPR, at 320 km south of Addis Ababa and 50 km from the regional capital, Hawassa. The total population of the Woreda as of 2012 was 237,106 (119,894 male and 117,212 female). The Woreda is one of the most densely populated areas in the region, with population density of around 856pers/km2. The average annual rainfall is 1200 mm, ranging between 801 to 1600mm. The altitude in the physical areas across the Woreda ranges between 1501 to 2500m.a.s.l (BoFED, 2012).

Currently there are eight coffee farmers' cooperatives in the study area, having a total member size of more than twenty one thousand. Out of these, five are Organic and Fairtrade certified while the rest three are Fairtrade certified.

In Sidama Zone, 51 coffee farmers' cooperatives operate under the umbrella of the Sidama Coffee Farmers Cooperative Union (SCFCU). These cooperatives have over 87,000 member farmers and this makes the Union the second largest coffee producing cooperative union in Ethiopia. The cooperatives are all established in the late 1990s and early 2000. Since 2003, the Union has been aggressively supporting its cooperatives to get Fairtrade, Organic, Utz Kapeh, and Rainforest Alliance certifications. Fairtrade and Organic certifications are the top priority schemes perused so far. Currently 41 of its member coffee cooperatives are Fairtrade certified, 39 are Organic certified, 5 with Rainforest Alliance and 2 with Utz Kepeh. Double certifications of Fairtrade and Organic are common and the number of triple certified cooperatives is also growing slowly.

4.2 Data Types and Sources

The study used both qualitative and quantitative data types from primary and secondary data sources. Primary data was collected using structured questionnaire, semi structured interview, two focus group discussions (FGD) with smallholder coffee farmers from two CFCoops, and key informant interviews with representatives of actors in the value chain including Coffee cooperatives, SCFCU, extension service providers (Woreda Agriculture and Natural Resource Development Office and Cooperative & Marketing Development Office), NGO - TechnoServe, and certification and quality inspection company called CERES. Secondary data was also collected from various sources including Sidama Coffee Cooperatives Union, Coffee cooperatives and other governmental and non-governmental organizations, different studies and official web sites.

4.3 Sampling Procedure

A two-stage sampling technique was used for this study. In the first stage out of the eight coffee farmers' cooperatives in Dale Woreda, five double certified (organic and Fairtrade) coffee farmers' cooperatives were selected purposively - to have a similar group of smallholder coffee farmer that have the same level of certification opportunity. Then, a total sample size of 155 smallholder farmers were determined using the simplified formula provided by Slovin (1960) cited by Adanza (1995) as given below.

$$n = \frac{N}{1+N(e)^2}$$ ————————————————————————————(1)

Where, n = sample size, N = population size, e = level of precision.

The level of precision is the range in which the true value of the population is estimated to be; it is expressed in percentage points, and 8% level of precision is considered for this study.

And the respective sample unit from each cooperative was determined using probability proportional to size sampling technique (Table 2). Finally individual sample smallholder farmers were selected by using systematic random sampling technique.

Table 2: List of selected cooperatives and number of sample smallholder coffee farmers

Name of Selected Coops	Member Size			Number of smallholder farmers sampled (n)
	Male	Female	Total	
Shoye	4332	127	4459	46
Boa Bedegelo	3159	183	3342	34
Waycho	1825	87	1912	20
Wicho	3321	136	3457	35
Goyida	1803	116	1919	20
Total	14,440	649	15089	155

Source: Author's compilation based on data from Dale Woreda Marketing and Cooperatives Development Office and SCFCU (2014)

4.4 *Definition of Variables and Working Hypothesis*

Based on literature review conducted sixteen explanatory variables were hypothesized to influence smallholder farmers' level of participation in certified coffee value chain. List of the explanatory variables explanatory variables with brief definition and working hypothesis (expected sign) is shown below in table 3.

Table 3: List of explanatory variables with their definition, measurement and working hypothesis

Variables	Definition and Measurement	Type	Expected sign
AOHH	Age of the household head, number of years	Continuous	+ve / -ve
SOHH	Sex of the household head, 1 if male 0 female	Dummy	+ve
EDUL	Number of formal schooling grade the farmer completed,	Discrete	+ve
FSHH	Number of people living in the same roof,	Discrete	+ve / -ve
EXCC	Number of years passed since the farmers started growing coffee, years	Continuous	+ve
PPLAC	Proportion of land allocated for coffee, ratio	Continuous	+ve
ACOP	Annual coffee production, Kg	Continuous	+ve
AFINC	Annual agricultural cash income, Birr	Continuous	+ve
AMKTI	Access to coffee market information, 1 if yes, 0 otherwise	Dummy	+ve
UCR	Utilization of credit for coffee production and marketing, 1 if yes, 0 otherwise	Dummy	+ve
AEXS	Number of extension visit the farmer had within 12 months regarding coffee production and/or marketing, Frequency	Continuous	+ve
YERM	Number of years the farmers spent as a member of a Coop	Continuous	+ve
DISTCOP	The distance between the farmer's house and the local coffee spot market, Km	Continuous	-ve
PPB	Farmer's perception on the benefit of participation in certified coffee value chain, 1 if beneficial , 0 otherwise	Dummy	+ve
TICMM	Farmer's degree of agreement to the statement: "*the members of our cooperative are committed to the bylaws and delivery obligation of the cooperative*", 5-point Likert scale	Categorical	+ve
TCMINDX	Summated Multi-item Likert scale	Continuous	+ve

4.4.1 *Method of Data Analysis (Econometrics model)*

In this study, descriptive statistics was used for the purpose of discussion and comparison of some important variables of the sample. The descriptive analysis was made using mean, standard deviation, minimum as well as maximum values. In addition, chi-square and t-tests were employed to compare participants in certified coffee value chain with respect to the explanatory variables.

Econometrics model (truncated regression) was used to identify and analyze socioeconomic and institutional factors, which affect the level of participation of smallholder farmers in certified coffee value chain. Inferring the characteristic of a population from a sample drawn from a restricted part of the population is done in two ways based on the type of truncation; i.e. incidental truncation and truncation by survey design (Greene, 2003).

Truncation due to survey design, which is the case at hand in this study, happens when a sample is drawn

from a certain restricted sub population as determined by the surveyor's decision. This type of truncation happens because the surveyor samples people based on the value of y-variable (smallholder farmers who are supplying coffee through certified coffee value chain are sampled for the study).

A sample from such truncated population cannot be used to make inferences about the entire population without correction for the fact that those included individuals are not randomly selected from the population at large. While it might appear that we could use these truncated data to make inferences about the subpopulation, we cannot even do that. A regression estimated from the sub-population will yield coefficients that are biased toward zero or attenuated as well as an estimate of σ_u^2 that is biased downward. Consider the following regression which satisfies all the OLS assumptions.

$$y_i^* = x_i'\beta + \varepsilon_i \qquad \text{with } \varepsilon_i \sim N(0, \sigma^2)$$

The distribution of y_i^* given x_i is therefore also normal: $y_i^*|x_i \sim N(x_i'\beta, \sigma^2)$

The expected value of the latent variable is $Ey_i^* = x_i'\beta$

Observation i is only observed if y_i^* is above a certain known threshold a i.e,

$$y_i = \begin{cases} y_i^* \text{ if } y_i^* > a \\ n.a. \text{ if } y_i^* \leq a \end{cases}$$

As can be seen, running OLS on the truncated data will cause biases. The model that produces unbiased estimates is based on the Maximum Likelihood Estimation. For each observation, we can write $\varepsilon_i = x_i'\beta - y_i$. Thus, the likelihood contribution is the height of the density function. However, since we select sample only if $y_i^* > a$, we have to use the density function of ε conditional on $y_i^* > a$.

The density function of the observed truncated variable yi is therefore the pdf of the latent variable conditional on it being observed, i.e.:

$$f(y_i|x_i) = f(y_i^*|y_i^* > a, x_i) = \frac{f(y_i^*|x_i)}{P(y_i^* > a|x_i)} = \frac{\sigma^{-1}\emptyset\left(\frac{y_i - x_i'\beta}{\sigma}\right)}{1 - \Phi\left(\frac{a - x_i'\beta}{\sigma}\right)} = \frac{1}{\sigma}\frac{\emptyset\left(\frac{x_i'\beta - y_i}{\sigma}\right)}{\Phi\left(\frac{x_i'\beta - a}{\sigma}\right)}$$

where φ and Φ are the density and distribution functions of the standard normal distribution.

Thus, the likelihood contribution for ith observation is given by:

$$L_i = \frac{1}{\sigma}\frac{\emptyset\left(\frac{x_i'\beta - y_i}{\sigma}\right)}{\Phi\left(\frac{x_i'\beta - a}{\sigma}\right)}$$

And the likelihood function is given by:

$$L(\beta, \sigma) = \prod_{i-1}^{n} L_i$$

The values of β, σ that maximizes L is the estimators of the Truncated Regression.

The expected value of the observed variable is given by:

$$E(y_i|x_i) = E(y_i^*|y_i^* > a, x_i) = x_i'\beta + \sigma\frac{\emptyset[(x_i'\beta - a/\sigma)]}{\Phi[(x_i'\beta - a/\sigma)]} = x_i'\beta + \sigma\lambda_i$$

Where $\lambda_i \equiv \emptyset(\alpha_i)/\Phi(\alpha_i)$ and $\alpha_i = (x_i'\beta - a/\sigma)$

The underlying linear relationship in the whole population can be obtained by interpreting the slope coefficients β as marginal effects. However, the marginal effect on the observed subpopulation is given by:

$$\frac{\partial E(y_i|x_i)}{\partial x_{ik}} = \frac{\partial E(y_i^*|y_i^* > a, x_i)}{\partial x_{ik}} = \beta_k + \sigma\frac{\partial\lambda_i}{\partial x_{ik}} = \beta_k[1 - \lambda_i^2 - \alpha_i\lambda_i]$$

5. RESULTS AND DISCUSSION
5.1 Econometrics Model Result
The results from the STATA truncated regression model estimated coefficients (Table15), shows that level of

participation is significantly influenced by eight explanatory variables. These are age of household head (AOHH), sex of the household head (SOHH), education level of the household head (EDUL), proportion of land allocated for coffee production (PPLAC), annual coffee production (ACOP), distance between the cooperative office and the farmers house (DISTCOP), annual agricultural cash income (AGINC), and trust in cooperative management (TCMINDX).

Among these significant explanatory variables, age of the household head (AOHH), education level of the household head (EDUL), and distance between the cooperative office and the farmers' house (DISTCOP) were the factors which negatively and significantly influenced the level of participation of smallholder coffee farmers. The former two at 1% level of significance and the later at 5% level of significance. Besides these the remaining five significant variables; i.e. sex of the household head (SOHH), proportion of land allocated for coffee (PPLAC), annual coffee production (ACOP), annual agricultural cash income (AGINC), and trust in cooperative management (TCMINDX) have a positive influence on the dependent variable.

The regression coefficient estimates of truncated regression model are interpreted in the same manner as OLS regression coefficients: for a one unit increase in the predictor variable, the expected value of the outcome variable changes by the regression coefficient, given the other predictor variables in the model are held constant.

Table 3: Truncated regression model estimation for level of participation in certified coffee value chain

Variables	Estimated coefficient	Robust Std. Err.	z
AOHH	-15.81569	3.790735	-4.17***
SOHH	206.7353	72.74743	2.84***
EDUL	-14.12131	8.040386	-1.76*
FSHH	23.02452	27.90429	0.83
EXCC	-1.034491	4.338171	-0.24
PPLAC	14.22683	6.585209	2.16**
ACOP	0.6043556	0.0712917	8.48***
YERM	-3.837484	3.853798	-1.00
DISTCOP	-50.10403	22.14615	-2.26**
PPB	30.73339	48.73745	0.63
AMKTI	143.116	100.0452	1.43
UCR	-122.5546	78.79261	-1.56
AEXS	2.332469	4.279911	0.54
AGINC	0.0169618	0.0071757	2.36**
TICMM	99.34998	65.98977	1.51
TCMINDX	55.67919	12.46128	4.47***
_cons	-1450.332	575.3326	-2.52
/sigma	274.6438	29.71627	9.24

Limit: lower = 0 , upper = +inf   Number of obs =   155

Wald chi2(16) =5749.58, Log pseudo likelihood = -1058.9254, Prob > chi2 = 0.0000

***, ** And * represent 1%, 5% and 10% significance level respectively

Source: Model output (2016)

The finding in this study regarding the age of households contradicts to that of Wubeshet, 2010; Tium, 2013, who found positive relationships. However as hypothesized in this study, it can be associated with the innovative nature of the scheme, where by younger farmers might appear to be more proactive to adopt new technologies and engage in new initiatives-like the certified coffee value chain. Apart from this the distance explanatory variable can be explained by the additional costs (either on monitory terms or time and energy) associated with transporting coffee produce to a designated coffee marketing centers. The proximity of the cooperative office for the farmer house reduces the cost of time and labor that the farmer spent in searching for a buyer for his coffee. Bishop and McConnen, 1999, also identified that as the farmer is closer (near) to the cooperative, s/he will have more knowledge about the cooperative and its benefits which further strengthens their participation.

Proportion of land allocated for coffee (PPLAC) is among the explanatory variables which has a positive and significant influence on the smallholders' level of participation in certified coffee value chain. The result of the econometric analysis showed that, given the other variables in the model are held constant, as the percentage of land allocated for coffee production increases by 1%, the expected value of the amount of coffee supplied through certified coffee value chain also increases by 14.12Kg. Wubeshet (2010) also found that an increase in farm land allocated for coffee land increases the quantity of coffee supplied by through cooperatives.

Annual coffee production (ACOP) has also a positive and significant (at 1% level) influence on the dependent variable. The results of the econometric analysis indicated that when the amount of annual coffee production increases by 1Kg, the expected amount of coffee supplied through certified coffee value chain also increases by 0.60Kg, given the other variables in the model are held constant. This shows out of the total volume of annual coffee production around 60% goes through the certified coffee value chain.

Annual agricultural cash income (AGINC) is the other explanatory variable which affected the dependent variable both positively and significantly (at 5% level). The variable measures the amount of estimated cash income earned from different agricultural activities (excluding coffee) which includes: sale of cereals, fruits and vegetable, livestock, agro-forestry and other timber products. The regression outcome shows that as the average annual farm income from of the smallholder coffee farmer increases by birr one the expected amount of coffee supplied through the certified coffee value chain increases by 0.02Kg, other things held constant.

Trust on cooperative management (TCMINDX) is the other explanatory variable having a positive and significant (at 1% level) influence on the dependent variable. The result further indicates that a unit increase in the mean score of the Likert-scale proxy variable will be accompanied by 55.68Kg increase in the expected amount of coffee supplied through the certified coffee value chain, other things held constant.

6. Conclusion
The objective of this study was to identify determinants of smallholder farmers' level of participation in the chain. Accordingly the results of the econometrics model indicated that sex, proportion of land allocated for coffee, trust in cooperative management, annual coffee production & agricultural cash income influenced the dependent variable positively, while age, education level, and distance from the cooperative office have a negative influence. The results indicate that, in the study area, smallholders' participation in the certified coffee value chain is mainly determined by the farmers' physical access to marketing center, their coffee production and productivity, amount of agricultural income and the level of trust in cooperative management and transparency.

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