

Transaction Arrangement Choices of Smallholder Coffee Growers along Coffee Supply Chains. The Case of South-Western Coffee Growing Areas of Ethiopia

Mebratu Alemu^{1*}, Belaineh Legesse¹, Jema Haji¹, and Moti Jaleta²

¹School of Agricultural Economics and Agribusiness, Haramaya University, Ethiopia.

²International Maize and Wheat Improvement Center (CIMMYT), Ethiopia.

ABSTRACT

Coffee production and marketing has an important place in the socio-cultural and economic activities of Ethiopians. However, the incidence of smuggling, high transaction costs and inadequate coordination of the sector are highly threatening coffee transactions in the study area. Bearing in mind the lack of scientific evidence on the determinant factors affecting smallholder coffee growers' transaction arrangement choice (TAC) in coffee supply chains, it becomes essential to investigate transaction arrangement choices of smallholder coffee growers. This study was conducted in Keffa Zone of Southern Nations Nationalities and Peoples Region, Ethiopia. The data for this study were obtained from a sample of 337 smallholder coffee growers using multistage stratified simple random sampling techniques. In order to investigate factors determining smallholder growers' TAC, Trivariate probit econometric modeling using GHK Simulated Maximum Likelihood Estimation was used. The result indicates that human asset specificity, trust, years of experience in coffee production, coffee to total land ratio, uniformity of ripeness of coffee cherry within a basket, and technical efficiency scores are factors that are significant and negatively correlated with primary market type of TAC. However, educational status and searching information before sale are the factors that are positive and significantly correlated with primary market type of TAC. The same model result indicated human asset specificity, connectedness of transactions, uncertainty of coffee prices, and trust are factors that are significant and positively correlated with smallholder coffee growers' choice of bilateral contract type of TAC. However, years of experience in coffee production is negative and significantly related with smallholder coffee growers' choice of bilateral contract type of TAC. Similarly, the model result revealed that uncertainty of coffee prices, trust, connectedness of transactions, number of training in coffee quality and technical efficiency scores are factors that are significant and positively correlated with smallholder coffee growers' choice of cooperative type of TAC. The result implies that smallholder coffee growers involved in the cooperative type of transactional arrangements are also more likely participate in spot market type of transaction arrangement; and on the contrary, these households are less likely involve in bilateral contract based types of transactions and vice versa. This study provides empirical evidence to the transaction cost theory and one step further in the Williamson's attributes of transaction by emphasizing smallholder coffee growers level of technical efficiency as a determinant attribute that worth consideration in analyzing coffee TACs in less developed countries like Ethiopia.

Key words: Transaction Arrangement Choices, TCE, Spot/Primary Market, Bilateral Contract, Cooperatives, smallholder coffee growers

^{1*} Corresponding Author, E Mail: mebselu1975@gmail.com or mebratu.alemu@amu.edu.et

1. INTRODUCTION

1.1. Background

As one of the world's most traded commodities, coffee and its cultivation play a decisive role in the livelihoods of approximately 25 million smallholder growers. These growers produce 80 percent of the world's coffee production. The world coffee production for the year 2015/16 has been 147.9 million bags², of which 85.81 million constitute an Arabica coffee (ICO, 2016). When compared with the year 2013/14, there is a 2.5 percent estimated reduction in global production of Arabica coffee in 2015/16.

African countries account for 11.4(16.8 million bags) and 7.1(10.8 million bags) percent of global coffee production and consumption, respectively. As the birthplace of *coffee Arabica*, Ethiopia is still a major producing country of high-value coffee. In Ethiopia, coffee is produced under four major production systems, *i.e.* forest coffee (8-10 percent), semi-forest coffee (30-35 percent), cottage or garden coffee (50-57 percent) and modern coffee plantations (5 percent). It has accounted, on average, for about 5 percent of gross domestic product (GDP), 10 percent of total agricultural production as in 2011, the country produced around 5 percent of world production and 39 percent of the total production of coffee in Sub-Saharan Africa (ICO, 2012).

Coffee is considered the main export crop in the country, providing 31 percent of Ethiopia's foreign exchange earnings. Over 4 million small-scale growers produce 95 percent of the total coffee output, and 25 percent of the Ethiopian population directly or indirectly depends on the coffee value chain for their income and employment (Arslan and Reicher, 2011; CSA, 2013). Ethiopia is also a coffee consuming country, with 48 percent of coffee produced in Ethiopia is locally consumed, reflecting the commodity's cultural importance in the country (USDA, 2012; ICO, 2016). In 2014/15, Ethiopia exported 2.8 million bags, making it the most important African coffee exporter and the tenth largest exporter in the world (ICO, 2016). Its share of the international coffee trade in the same year was about 3 percent. Furthermore, coffee plays an important role in social gatherings and is important in local consumption, as more than half of Ethiopia's coffee production is consumed locally (CSA, 2013).

Despite all the economic and the social importance of coffee, unfortunately, smallholder coffee growers in south western part of Ethiopia are often unable to take advantage of this business opportunity due to lack of "know how" about which actor to choose to sell their produce, illegal smuggling, poor quality and presence of few coffee suppliers or *Akrabis*³. Moreover, degraded soils, prevalence of different sources of risks, inadequate access to inputs, poor management practice, prevalence of oligopolistic market structures are added barriers that put sustainable livelihoods out of the reach of many smallholder coffee growers in south western part of Ethiopia.

As a result, they are often unable to negotiate better prices or reduce their market risk. For instance, Aklilu and Ludi (2009) indicated that even though the government deals with coffee

² One bag weighs 60 kg of coffee

³Akrabi-is an Amharic word indicating a coffee supplier who buys coffee from smallholder coffee growers at the primary markets and supplies coffee to ECX auction market.

marketing, there are still serious problems faced by smallholder coffee growers. Moreover, Zekarias *et al.* (2012) pointed out that there exists insufficient regulation of the price of coffee where collectors and suppliers set their own price which is usually below the market price. Hence, smallholder coffee producers are less beneficiaries than other actors along coffee supply chains in the study areas.

The success of the coffee supply chains is of high importance for Ethiopia as coffee is the primary export earning product. Taking a supply-chain approach is often essential to successful economic development since all actors in the chain will benefit over the long term if the coffee supply chain as a whole is competitive. Within the existing portfolio of transaction arrangement choices in the coffee supply chain ranging from spot market to collective actions, smallholder coffee growers are making several transaction arrangement choices for transacting coffee—characterized by various quality levels sold in different markets. Bearing in mind, the lack of scientific evidence on the determinant and factors affecting the choices of transaction arrangements in coffee transaction in Ethiopia, it becomes essential to investigate the different transaction arrangement choices that smallholder coffee growers choose to supply their produce in the study areas.

1.2. Objectives of the study

The main objective of the study is to assess transactional arrangement choices of smallholder coffee growers in south western part of Ethiopia. More specifically the study aims to:

- Analyze smallholder coffee growers choice of transaction arrangements in the study area, and;
- Identify factors affecting transaction arrangement choices of smallholder coffee growers in the study area

1.3. Significance of the Study

The study also contributes to validate a new construct, namely “Transaction Arrangement”, to deepen the understanding of how and why coffee growers select a specific transaction arrangement choice in Ethiopia. In light of transaction cost theory, the study helps in understanding the major reasons guiding the choice of specific transaction arrangements in coffee transaction, using a broader range of explanatory factors. This study also provides empirical evidence in the transaction cost theory and the choice of a specific transaction arrangement, among smallholder coffee growers in south western coffee growing areas of Ethiopia. Moreover, this study will give empirical evidence on the relationship between technical efficiency scores with specific transaction arrangement choices. The results of this study may fill this gap. The study may also serve as a reference material for academicians, government bodies, researchers and to all who are interested to pursue further on similar topic.

1.4. Scope and Limitations of the Study

This study is a microeconomic analysis based on data collected using cross-sectional survey of coffee growers, and traders in Keffa zone of SNNPR. Actually the findings are pertinent mainly to the study areas; but also may be extended to other areas with similar socio-economic and agro-ecological characteristics. More importantly, further studies require large and rich dataset, such

as longitudinal or panel dataset, and more coffee growing sample woredas from other Zones has not been addressed due to time and budget constraints.

2. Methodology of the Study

2.1. The Study Area

This study was conducted in Keffa zone of Southern Nations Nationalities and Peoples Region. The Zone is selected based on the importance (the contribution) in coffee production to the region. Of the zonal (Keffa) stimulant crop area, 92.31 percent was under coffee yielding 88.07 percent of the production of this crop. Coffee is very important cash crop in all Woredas of the Keffa zone.

2.2. Data Types, Sources and Sampling

Both primary and secondary data sources were used to collect the information required to address the objectives of this study. The data for this study were obtained from a sample of 337 smallholder coffee growers and 42 coffee collectors (at primary markets) using multistage stratified simple random sampling technique. Both primary and secondary data sources were used to collect the information required to address the objectives of this study.

The socio economic factors that were included in this study are: household size, educational status, coffee to total land ratio, experience in coffee production, communication, log of coffee income, and technical efficiency score of sample households. Regarding institutional and transaction attributes data about trust, institutional support, human asset specificity, number of buyers at primary markets, uncertainty of coffee prices and quality attributes such as, number of training in coffee production and quality and uniformity of the ripeness of coffee cherry within a basket were collected.

2.2.1. Sampling technique

Although cereals and cash crops are grown in almost all regions of Ethiopia, Oromiya and SNNPR stand first and second in terms of coffee production and of area cultivated respectively in the year 2008/09 (CSA, 2010). A multi stage sampling technique was employed to collect data. The study population is smallholder coffee growers, and collectors, along coffee supply chain in Keffa zone, South Western Ethiopia. Primarily all woredas in the zone were stratified into three strata based on the level of coffee productivity per hectare as high, medium and low. The cut-off points are determined by calculating the standard deviation of coffee productivity for all woredas of the zone using 2014/15 data obtained from Kefa zone department of agriculture.

Based on the cut-off points, one from each stratum which is a total three woredas were selected randomly from 3 stratas which are classified as high, medium and low production per hectare. The three woredas were selected randomly among the three stratified levels of coffee production per capita (High, Medium, and low productivity strata) In the second stage, all kebeles in the sample districts were stratified based on the type of relatively varied agro-ecology (wet, moist and woinadega); one kebele was selected randomly from each agro-ecology. In the third stage, household heads in the sample kebeles were randomly selected proportionally from agro-ecologically varied kebeles.

Moreover, the choice of the woredas is also necessitated by the need to cover as many diverse factors as possible that might affect the households' decision to grow and transact coffee. Thus, Gimbo, Decha and Chena woredas are selected randomly from the high, medium and low levels of production, respectively.

In addition, for the sake of triangulation, three FGDS and 10 key informant interviews were conducted with Woreda agricultural experts, coffee growers, collectors, cooperatives, and unions in the study woredas.

2.2.2. Sample size

To determine representative sample size for smallholder coffee growers' survey, the study focuses on coffee growers in Keffa zone. Taking CSA (2010/11) estimate, there are 32,480 coffee growers in Keffa zone. Among these, the proportion of coffee growers in the sampled woredas comprises about 60 percent ($P=0.6$) of the total coffee growers in Keffa zone. Hence, for 95 percent ($Z=1.96$, 2 tailed test) level of confidence, within ± 5 percent ($e=0.05$) margin of error and taking into account the proportion of coffee growers in three woredas of the zone, the sample size n is calculated as:

$$n = \frac{Z^2(1-P)P}{e^2} = \frac{1.96^2(1-0.64)0.64}{0.05^2} = 354$$

From a total of 354 questionnaires distributed, 337 were completely filled in and returned back. Concerning the proportion of sample households, 137, 90, and 127 sample households from Gimbo, Decha and Chena woredas were considered respectively based on their CSA (2010/11) coffee growers population proportion. In addition, since the population of intermediaries is small in size, samples of 41 coffee suppliers⁴ were randomly selected from primary coffee transaction centers in the study areas.

2.3. Data Analysis

To analyze the collected data different descriptive, statistical and econometric methods were employed. Specifically first, descriptive statistics were used to assess the socio economic information of households and collectors of coffee at primary markets in the study areas. And then different econometric models such as trivariate and/or multivariate probit regression analysis techniques were employed using STATA software package.

2.4. Empirical Model Specification

2.4.1. Determinants of transactional arrangement choices

The study intends to explain the effect of internal and external factors (transaction attributes, institutional environment and socio-economic characteristics) on TACs, and therefore two dependent variables are investigated. As one actor can be involved in one or more than one type of transaction arrangement, it is found appropriate to use a multivariate probit model to analyze the determinants of TACs in the coffee supply chain in the study areas. Trivariate probit estimates Three-equation probit models, by the method of maximum simulated likelihood (Cappellari and Jenkins, 2003).

⁴ Coffee supplier means that a person who, upon meeting the required criteria, collects coffee with pulp or red cherry from producers or from his own farm for delivery to auction centres or to the Ethiopian Commodity Exchange.

The variance-covariance matrix of the cross-equation error terms has values of 1 on the leading diagonal, and the off-diagonal elements are correlations to be estimated ($\rho_{ji} = \rho_{ij}$, and $\rho_{ii} = 1$, for all $i = 1 \dots 3$). The Trivariate probit using GHK simulator evaluates the 3-dimensional normal integrals in the likelihood function. For each observation, a likelihood contribution is calculated for each replication, and the simulated likelihood contribution is the average of the values derived from all the replications. The simulated likelihood function for the sample as a whole is then maximized using standard methods. A detailed description of this model is shown in Greene (2003) and Train (2003). In this model, the choice of transaction arrangement is considered as a system of a multiple choice equation ($i = 1 \dots 3$; $j = 1 \dots n$) respective to each type of transaction arrangement.

$$\text{TransArg}_{ij} = \alpha_{0j} + \beta_{1j} \cdot \text{TransAttrib}_{ij} + \beta_{2j} \cdot \text{InstEnv}_{ij} + \beta_{3j} \cdot \text{Charact}_{ij} + \dots + \beta_{5j} \cdot \text{Eff}_{ij} + \varepsilon_{ij} \quad (1)$$

$$\text{SM}_j = \text{AS}'_j \beta_{\text{AS}} + \text{UN}'_j \beta_{\text{UN}} + \text{TR}'_j \beta_{\text{TR}} + \text{HH}'_j \beta_{\text{hh}} + \text{Eff}'_j \beta_{\text{Eff}} + \varepsilon_{\text{SM}j}$$

$$\text{BC}_j = \text{AS}'_j \beta_{\text{AS}} + \text{UN}'_j \beta_{\text{UN}} + \text{TR}'_j \beta_{\text{TR}} + \text{HH}'_j \beta_{\text{hh}} + \text{Eff}'_j \beta_{\text{Eff}} + \varepsilon_{\text{BC}_j}$$

$$\text{CO}_j = \text{AS}'_j \beta_{\text{AS}} + \text{UN}'_j \beta_{\text{UN}} + \text{TR}'_j \beta_{\text{TR}} + \text{HH}'_j \beta_{\text{hh}} + \text{Eff}'_j \beta_{\text{Eff}} + \varepsilon_{\text{CO}j}$$

Where: TransArg = Transaction arrangement j choice by the coffee grower i, TransAttrib_{ij} = Transaction attribute i of the farmer j, InstEnv = Institutional environment, Charact = Households characteristics, Eff= technical efficiency scores of households, SM_j = Spot market, BC_j= Bilateral Contract, CO_j= Cooperatives, ε_{ij} = Error terms, α_{ij} , and β_s , the coefficients to be estimated.

3. Result and Discussions

3.1. 4.1. Types of Transaction Arrangement Choices

Data collected from 337 smallholder coffee growers indicates that more than 68 and 55 percent are involved in cooperative type and spot/primary market type transaction arrangement and 50 percent of these households are involved in a bilateral contract based transaction arrangement scheme(see table 2).

Table 2: Types of transaction arrangements identified among sample households

Types of Transaction arrangement	Observation	Percentage (%)	Std. Err.	[95% Conf. Interval]	
Spot/primary market	185	55	0.027	0.495	0.602
Bilateral contracts	170	50	0.027	0.451	0.558
Cooperatives	228	68	0.026	0.624	0.725
Total	583	100			

Source: Own computation based on survey data, 2015

Table 3 summarizes the number of transaction arrangements in which one sample household involved. As indicated, most of the respondents (45%) are involved in only one type of TAC. And about 36 and 18 percent of the sampled households are involved with two and three types of transaction arrangements. These categories of sample households involved in multi-transaction arrangements are used to simultaneously select at least two types of transaction arrangements.

Sample households who are exclusively choosing only one type of transaction arrangement are considered as having zero degree of multi-transaction arrangements. As one farmer can be involved in one or more types of transaction arrangements, this implies that the smallholder coffee grower has an option of transacting in more than one exchange relationship.

Table 3. Number of transaction arrangement in which a household is involved.

Degree of multi –Transaction arrangement	Freq.	Percentage (%)	Std. Err.	[95% Conf. Interval]	
Households with 1 type of GS	153	45.4	0.027	0.401	0.508
Households with 2 types of GS	122	36.2	0.026	0.312	0.415
Households with 3 types of GS	62	18.4	0.021	0.146	0.229
Total	337	100.0			

Source: Own computation based on survey data, 2015

Considering that for each smallholder coffee grower, one transaction arrangement is used per exchange relationship. Sampled households, key informants and focus group discussants portrayed the main reasons for selecting multi-transaction arrangements are to safeguard their investment, take advantage of minimizing different sources of risks and avoid post harvest loses of the coffee beans from being rejected by buyers (of weighting and sorting). Table 4 presents a distribution of sampled household's response respective to their farm size and the number of transaction arrangement in which they are involved. It can be inferred that 67, 30 and 2.6 percents of the sampled households who are involved in one type of transaction arrangement are producing coffee under small coffee farm land respectively, on medium (1 to 5ha) and large coffee farm size (> 5ha), respectively. While 69, 28, and 10 percents of households with two types of transaction arrangement are producing coffee on small, medium and large coffee farm sizes, respectively.

It can also be inferred that the majority 47 percent of smallholder coffee households who are involved with three types of transaction arrangement are producing coffee on medium coffee farm sizes and the remaining 45.5 and 9 percent households are producing coffee on small and large coffee farm sizes respectively.

Table 4. Number of transaction arrangements in relation to coffee farm size

Coffee farm size	Total number of GS in which a household is involved			
	1	2	3	Total
Small (<1ha)	103(67.32)	84(68.85)	27(43.55)	214(63.5)
Medium (1-5ha)	46(30.07)	34(27.87)	29(46.77)	109 (32.34)
large (>5h)	4(2.61)	4(10.66)	6(9.68)	14(4.15)
Total	153(100)	122(100)	62(100)	337(100)

Pearson chi2 (4) = 15.43 Pr = 0.004. (..) Column percentage in brackets

Source: Own computation based on survey data, 2015

The computed Pearson Chi² at four (4) degree of freedom to test the differences between smallholder growers' categories shows that there is a significant difference between the three (3)

categories of growers considering their coffee farm size at 5 % level of significance. Smallholder coffee growers with low production potentials in terms of coffee land size under coffee production are most likely engaged in 1 or 2 types of transaction arrangements simultaneously in coffee supply chain in the study areas.

3.2. Determinants of Transaction Arrangement Choices

In order to investigate factors determining sample households choice of TACs, Trivariate probit regression using GHK simulated maximum likelihood estimation was used.

As shown in the Trivariate probit regression result (Table 5), the Wald test is used to examine whether any of the parameters of the model that currently have nonzero values could be set to zero without any statistically significant loss in the model's overall fit to the data ($\beta_{1i}=\beta_{2i}=\beta_{3i}=\dots=0$). It tests the overall significance of the variables included in the econometric model (Ryan and Watson, 2009). Results show that the Wald Chi² is statically significant at 1 percent level, which indicates that the subset of coefficients of the model are jointly significant and that the explanatory power of the factors included in the model is satisfactory.

To test the null hypothesis that correlation matrix is compound symmetric (all correlations are equal), we calculated Lawley chi². The value of Lawley chi² was found to be [Lawley chi² (135) = 1467.81]. And we rejected the null hypothesis that all correlations are equal was with ($p=0.000$). Moreover, [Hotelling T² = 56183.02; Hotelling F (16,321) = 3354.68 is significant; implying that the null hypothesis that all means are the same is rejected with [Prob > F = 0.000].

The Likelihood ratio test is also significant; implying that the null hypotheses of all the ρ (Rho) values are jointly equal to zero is rejected. Basically, the ρ -values explain the degree of correlation between each pair of the dependant variable levels (each type of transaction arrangement choice).

Individually considered, we found two ρ -values statistically significant (see Table 3). The ρ_{31} (correlation between the cooperative transaction arrangement and the spot/primary market) is positive at 10 percent ($P < 0.1$) level of significance and the ρ_{32} (correlation between cooperative and the bilateral based transaction arrangement) is negatively correlated at 1 percent critical level ($p < 0.01$). This generally implies that growers involved in the cooperative transaction arrangement are more likely to be involved in spot market type of governance choice as well; and on the contrary, growers who are involved in cooperative transaction arrangement are less likely involve in bilateral contract based type of transaction arrangement choice and vice versa. However, the multivariate probit indicates only the value ρ_{31} is negative and significant at 5 percent ($p < 0.05$) critical level. That means growers that are involved in bilateral contracts are less likely to involve in cooperative type of transaction arrangement and vice versa (see appendix 2). This shows the less specificity and exclusivity of this type of transaction arrangement along coffee supply chains in the study areas.

We observe different factors determine the farmer's decision (Tables 3) when we look at the factors affecting the choice of each type of transaction arrangement. First, the human asset specificity is significantly and negatively correlated with the spot/primary market transaction

arrangement at 1 percent level of significance. This shows that there is no specific investment made in the transaction under market governance in capacity building with respect to production practices, when shifting to another product or buyer. This result is in line with the transaction cost theory stating that the lower the human and asset specificity, the more likely the actors are involved in less constraining and less integrated types of transaction arrangement choices.

Also the specific human asset specificity is found to be significantly and positively correlated with bilateral contract based type of transaction arrangement at 5 percent critical level. This implies that the choice of bilateral contract based transaction arrangement, where households preferably choose their buyers based on social relationships (familial and/or friendship) and on both (formal and/or informal) contractual relationships, is determined by the growers' ability to invest in capacity building activities. This may be justified by the fact that in this kind of transaction arrangement, there is high degree of trust between the parties involved in coffee transactions.

The transaction connectedness refers to how the transactions differ in how they are connected to other transactions in the chain. Milgrom and Roberts (1992) argued that when the transactions have a strong connection, strong coordination governance is favorable. It was found a positive and statistically significant correlation between the transaction connectedness and bilateral contract and cooperative type of transaction arrangements at 1 and 5 percent level of significance, respectively. From this result, one can infer that the more growers are engaged in a highly coordinated type of transaction arrangement, the more likely they are aware of the end consumer's quality requirements, and the more they adjust production practices to fulfill the demand. It can also be inferred that, the more "hierarchy" the transaction arrangement in coffee transactions, then one expects a positive correlation with transaction connectedness.

One positive and favorable indicator for choosing bilateral contracts and cooperative types of transaction arrangements is the uncertain behavior of households about the stability of coffee quantities, prices and quality. This factor is positively and significantly correlated with bilateral contracts and cooperative choices at 10 and 1 percent level of significance, respectively. We can infer from this result that households who have uncertain behavior about the stability of coffee quantities, prices and quality are more likely to involve in cooperative and bilateral contract based types of transaction arrangements in the study areas.

Another construct that was considered in explaining the growers' choice of a transaction arrangement is the institutional environment in which the smallholder coffee growers are transacting. Under institutional environment, we considered the facilities and supports received from private and public services for improving the quality of coffee and the uniformity of the ripeness of coffee cherry in the basket. These include technical and financial support, training on good agronomical practices, quality norms and standards, market facilities, etc. The model result indicates that cooperative type of transaction arrangement choice is positively and significantly influenced by differences in the form of training received by smallholder coffee growers at 5 percent level of significance. We further observed that the public and private sectors are most likely to support cooperatives, rather than spot market and bilateral contract based types of transaction arrangements. Also, the national policies and strategies of agricultural development give more priority in assisting collective actions (associations, cooperatives) than individuals. In conformity with the above statement, the model result pointed out that the higher the uniformity

of the ripeness of coffee cherry within a bag, the less likely that smallholder coffee growers participate in spot/primary markets at 1 percent level of significance. From these result we can infer that growers that produce quality coffee are not willing to sell their coffee produce at primary markets. In other words, households that produce quality coffee are more likely willing to transact their coffee in a cooperative type of transaction arrangement.

The other institutional factor which was considered in this analysis is the degree of trust between the transacting parties i.e. between smallholder growers and buyers. It was previously demonstrated that the spot/primary market transaction arrangement is characterized by less human specific investment while the bilateral contract based transaction arrangement is characterized by a high human specific investment on capacity building.

Considering trust as an institutional variable, the finding shows that there exist a significant and positive relationship between degree of trust and the choice of bilateral contracts and cooperative based types of transaction arrangements between smallholder growers and buyers involved in the transaction of coffee at 1 and 10 percent critical level, respectively. This indicates that households who do trust their buyers are more likely participate in bilateral and cooperative types of transaction arrangement choices. On contrary, as hypothesized, there is negative and significant correlation between trust and the spot market based transaction arrangement at 5 percent level of significance. This indicates that households who trust their buyers do not likely choose spot market type of transaction arrangement along coffee supply chain in the study areas.

Market attributes were also considered in assessing the household's choice of transaction arrangements. Among the different indicators we used to measure the market attributes is the growers' inquire of information about coffee prices from different buyers before selling their produce. The trivariate probit result (Table 3) shows there exists a positive and significant relationship between growers who do communicate with different buyers to seek price information before sale and the spot market type of transaction arrangement at 1 percent level of significance. This is because growers that involve in bilateral contracts and cooperatives do have a pre-defined market arrangement and thus households mainly do not inquire to communicate to different buyers before sale. And this is in line with the hypothesis that when more pre-agreements exist in market arrangements, growers are more likely to go for an integrated type of transaction arrangement to safeguard their investments (Williamson, 1985).

Our study further shows that within a spot market type of transaction arrangement, the quantity and price can be agreed at the moment and the place where the transaction takes place. It is important to note that in the coffee supply chain, under a spot market arrangement, the market agreements are generally informal (oral) without any written and formal engagement. The drawback of this informal arrangement is that the agreed transaction can unexpectedly be changed at any moment of the transaction, which generally is not the case within cooperative and bilateral contract types of transaction arrangements.

As a control variable, the growers and the farm characteristics have been included in Trivariate probit model. The result shows that there is negative and significant relationship between coffee farm to total farm size ratio and the spot market type of transaction arrangement at 10 percent level of significance. This indicates that sample households involved in spot market transactions are those having less hectares of coffee farm to total agricultural land ratio for coffee production.

As these sample households are generally not only producing coffee, the importance of land devoted to coffee production as compared to other crops was calculated using the ratio of land used for coffee cultivation to the total hectare of cultivated land in the year 2015. We can infer from the regression model that the households under spot market arrangement devote less of their land to coffee production as compared to other categories of transaction arrangements.

Other control variables include, the farmer's experience in coffee farming, their education status (literate or not), and the technical efficiency score of each sampled household. Among these factors, the growers' experience in coffee production is shown to be negatively significant at 5 percent critical levels using trivariate probit result (Table 5) for the spot market and bilateral contract based types of transaction arrangements, respectively. This implies that the more the farming experience the households have, less likely they participate in a spot market and bilateral contract based types of transaction arrangements. In other words, the more the households have coffee farming experience, the more likely they transact in cooperative type of transaction arrangement.

Regarding the relationship about the educational status and transaction arrangement choices of sampled households, there exist a positive and significant correlation between educational status and the spot market form of transaction arrangement at 5 % level of significance. This indicates that literate coffee growers are more likely to choose spot market form of transaction arrangement than illiterate growers. This is not in conformity with our expectation that literate coffee growers will participate in cooperative transaction arrangements to take advantage of the different institutional supports delivered to cooperatives. However, the reason literate coffee growers' choose spot market type of transaction arrangement might be due to the need to acquire cashes immediately after sale (to get ride off asset hold-up problems) and invest in other productive activities.

The other interesting result is about the relationship between the technical efficiency score of sampled households and transaction arrangement choices. As indicated on (Table 3) we found a negative correlation between technical efficiency scores and spot market and positive correlation with cooperative type of transaction arrangements at 10 percent level of significance. From these we can infer that, technically efficient smallholder coffee growers less likely participate in spot market transactions but more likely participate in cooperative type of transaction arrangements. This is one of the most novel results of our study.

3.3. Challenges in Coffee Transactions

The following challenges affecting coffee sector are identified during the focus group discussion and key informant interviews.

a. Transacting coffee out of transaction centers

According to Article 6(1) of the Coffee Quality Control and Marketing Proclamation No. 602/2008, any person involved in coffee transaction shall conduct coffee transaction only in transaction centers. However, the reality on the ground is quite different. Discussants from government side indicated this proclamation was issued to make coffee marketing system fast, cost effective and enable coffee producers earn income from coffee transactions. But due to

inefficient marketing system, loose government monitoring and control, there exist illegal smuggling of coffee to different areas. And most of the interviewed coffee suppliers showed that they are unable to compete with illegal coffee suppliers (sebsabies) because the illegal coffee suppliers do not pay tax and hence pay higher prices for a kilo of red or dry cherry coffee than could legal coffee suppliers pay to smallholder coffee producers in the primary markets in the study areas. During the discussion participants raised a question regarding property right issue about their own coffee saying that "Our coffee belongs to whom? To government or to the producer or to the trader?" indicating this proclamation force us to sell our product in transaction centers it is prohibited to sell or buy coffee outside ECX or a transaction center established by the Ministry or the appropriate regional body. They further indicated storing coffee by any person for more than one production season is prohibited.

b. Poor quality, less availability and high price of standard coffee bags

When buying and selling coffee, it has to be bought by the sack. It's useful to know the standard sack weights and its cost. However, it was indicated during the FGD that there exists limited availability of standard coffee sacks. Moreover, due to the high price of the standard sacks, actors in the supply chain usually use poor quality sacks.

c. Supply of poor quality coffee and low volume of transactions

A key informant discussion with officers of ECX officials and cooperative union leaders it was indicated that the quality of coffee supplied by local coffee collectors is not up to standard. Moreover it was indicated that sometimes coffee supplies which were expected to be of high standard were given lower grades and as the same time coffee supplies that were considered of lower quality were given higher standards. This has confused many local officials and actors in the coffee supply chain in the study areas and they told it is difficult to build trust the grading of coffee by ECX. Additionally, it was also indicated that annual coffee production forecast of the Keffa Zone Agricultural office department and the zonal coffee supply to ECX has a big difference. The discussants agreed that the main reason for the difference is due to illegal coffee smuggling to neighboring areas and to Kenya.

a. Limited availability of coffee washing and/ or processing plants

During the FGD and key informant interview, the discussants and interviewees pointed out that there exists a small number of coffee washing and processing plants nearby smallholder coffee producers in the study areas. As a result, coffee growers are obliged to go longer distances to sell their produce and hence they incur higher transport costs.

b. Presence of very few coffee suppliers at primary transaction centers

The survey result indicates that on average 3-4 coffee suppliers (Akrabies) were found at each primary markets. Key informant interviewees and focus group discussants also indicated that the presence of few coffee suppliers at primary markets has affected the bargaining power of smallholder growers and hence transact their coffee at lower prices. For these reason they used to sell their products to illegal traders.

Table 5: Determinants of transaction arrangement choices (Trivariate probit, GHK simulator, 25 draws)

Variables	Transaction arrangement choices					
	Spot/primary market		Bilateral contract		Cooperatives	
	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.
Human asset specificity	-1.40***	0.24	0.57**	0.19	-0.24	0.21
Uncertainty	-0.40	0.22	0.41*	0.19	0.50*	0.20
Connectedness	-0.12	0.20	1.29***	0.19	0.67***	0.19
Trust	-0.57**	0.19	0.89***	0.18	0.54**	0.20
Communication	0.78***	0.18	-0.15	0.16	-0.06	0.19
Experience	-0.02**	0.01	-0.02**	0.01	0.02	0.01
HH size	0.01	0.04	0.00	0.04	0.07	0.04
Education	0.57**	0.22	-0.31	0.19	0.22	0.21
Training	-0.01	0.23	-0.38	0.22	0.71**	0.23
Uniformity of ripeness	-0.65***	0.18	-0.01	0.16	0.27	0.18
Coffee to total land ratio	-0.86*	0.41	0.19	0.37	0.19	0.39
Log coffee income	-0.34	0.42	0.37	0.37	0.38	0.39
Efficiency score	-1.55	0.79	-0.13	0.74	1.84*	0.80
Constant	4.49***	1.26	-1.64	1.08	-4.62***	1.17
ρ_{21}	-0.110					
ρ_{31}	0.24**					
ρ_{32}	-.54***					
wald chi2(df)	294.76(39)***					
Number of observation	337					
Log likelihood	-449.86					
LR test of $\rho_{21} = \rho_{31} = \rho_{32} = 0$: chi2(3) = 18.75***						

* P < 0.1, ** P < 0.05, and *** P < 0.01.

Source: Own computation based on survey data, 2015

c. Lack of adequate access to finance by cooperatives

During focus group and key informant discussions, it is indicated that a significant number of coffee growers remain outside unions and even outside cooperatives. But the cooperative unions themselves indicated that they are challenged with lack of finance and inadequate access to risk management services, low levels of production and productivity, limited agro-entrepreneurship skills and inadequate organizational and management skills at primary cooperative level.

4. Conclusion and Recommendations

Our result regarding households choice of transaction arrangement is in line with the transaction cost theory stating that the lower the value of transaction attributes and institutional factors, the more likely the households' are involved in less constraining and less integrated transaction arrangements i.e. in spot/primary market type of transaction arrangement. The result implies that smallholder coffee farmers involved in the cooperative type of transaction arrangement are also more likely to be involved in spot market type of governance choice; and on the contrary, these households who are involved in cooperative transaction arrangement are less likely to involve in bilateral contract based type of transaction arrangement and vice versa.

The transaction cost economy provides many insights into the choice of transaction arrangement, suggesting that everything remaining constant, the rational household will chose a transaction arrangement that is best performing in minimizing the production and transaction costs. This study provides empirical evidence to the transaction cost theory and a one step further in the Williamson's attributes of transaction by emphasizing smallholder coffee grower's level of technical efficiency as a determinant attribute that worth consideration in analyzing the choice of the transaction arrangement/transaction arrangements in less developed countries like Ethiopia.

A new construct of "multi-transaction" arrangement is investigated in order to increase the understanding of how and why smallholder coffee growers select among these transaction arrangements and what guides their decision. The Multi-transaction arrangement choice has been observed as a strategy of farmers to safeguard their investments. Farmers involved in the cooperative transaction arrangement are less likely to be involved in bilateral contract but are more likely to involve in spot market type of transaction arrangement in the coffee supply chain. With regard to the choice of each type of transaction arrangement, results can be used as powerful tool in defining intervention strategies in promoting the contract enforcement in bilateral or multilateral partnerships in commodity supply chains. Thus, this study suggests that creating awareness to smallholder coffee growers by all stakeholders about the significance of cooperatives in improving household's level of technical efficiency is highly crucial.

Although the study found evidence about the determinants of transaction arrangement choices of smallholder coffee growers within the study area, from the data collected it was not possible to determine the impact of household's choices of transaction arrangement on their welfare. Further studies are therefore necessary to determine the effect of transaction arrangement choice on welfare and food security among smallholder coffee growers.

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Appendix 1: Description, measurement and expected sign of explanatory variables on governance structure choices

Explanatory Variables	Description of variables and measurement	Expected sign on dependent variables		
		Governance structural choices		
		Primary markets	Bilateral contracts	Cooperatives
HH size	The total number of members of the household (continuous)	+	+/-	+/-
Education	Educational level of a HH head (1 literate; 0 otherwise)	+/-	+/-	+
Land ratio	Land under coffee divided by total land holding in hectares (continuous)	-	+	+
Log income	The log of annual HH income from coffee sale (continuous)	-	+	+
Human asset specificity	The HH head or a buyer invests his money or time to build strong relationships during transactions (1= yes; 0= otherwise)	-	+	+
Connectedness	HH heads awareness about quality required by the customers of their buyers and the awareness of the price paid by them(1=yes; 0=not)	-	+	+
Uncertainty	Coffee quantities, prices, and quality are highly uncertain (1=yes; 0= no)	-	+	+
Communication	HH head communicates with other buyers about prices before sale (1=yes; 0= not)	+	-	-
Trust	HH head trusts coffee buyers(1= yes; 0 = not)	-	+	+
Training	No. of times a HH head took training on coffee production and quality maintenance (continuous)	-	+	+
Uniformity	Uniformity of ripeness of coffee cherry in a basket(1= uniform; 0= not uniform)	-	+	+
Efficiency	HHs technical efficiency score obtained from stochastic frontier	-	+	+