# Investigation Small Scale Coffee Producers' Market Choice Decision (Case study Debub Ari District, SNNPR, Ethiopia)

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## Abstract

This concentrate is generally intended to analyze the Market chain and the determinants of coffee market outlet choice decisions of smallholder coffee creators in the Debub Ari Region. Unmistakable bits of knowledge and econometric models were used to examine the data. A multivariate probit model was used to recognize factors impacting market outlet choices of the smallholder coffee producers. Both fundamental and discretionary data was assembled from the survey locale. The multi-stage assessing technique has been used for this audit. An amount of 194 coffee creator family heads were erratically picked and conversed with the help of a pre-attempted coordinated survey. The middle social affair discussion and key observers interviews were directed to upgrade the customary data. The probability of picking finders, wholesalers, retailers, processors, and buyer outlets is 67.1%, 66.4%, 36.9%, 71.6%, and 15.3%, independently. The probability of families together picking the four market outlets was 0.031% more conspicuous than the likelihood of not picking all market outlets, which is 0.003%. Induction to credit unfavorably impacted retailer, processor, and customer market outlet choices, distance to the nearest market hurt processor market outlet choices, and market information of farm support insistently affected retailer and buyer market outlet choices. Thusly, intercession is supposed to additionally foster the coffee publicizing chain through propelling cooperatives, infrastructural progression, and optimal market information for a compelling displaying structure in the audit locale**.**

**Keywords:** Coffee Market, Determinant, Multivariate Probit, Outlet Choices, Southern Ethiopia

## Introduction

Coffee is the major export crop in the Ethiopian economy (Petit, 2007). Coffee in today's time is one of the most valuable sources of export for East African nations such as Ethiopia, Uganda, Kenya, and Tanzania. Coffee has accounted for an average of 60% of the total export earnings for the past five decades (Zekarias et al., 2012). Ethiopia is known to be the origin and the primary center of diversity of coffee Arabica (Labouisse *et al*., 2008).

Among African countries, Ethiopia is the leading C.Arabica producer and ranks the fifth largest Arabica producer and tenth in coffee exports worldwide (ICO, 2014). Some observers revealed that Ethiopia's annual production of coffee lies between 140,000 and 180,000 tons annually. About 44% of the coffee produced in Ethiopia is exported to other countries (Italy, United Kingdom, Netherlands, Djibouti, Germany, Japan, Saudi Arabia, France, and the United States) (Ahmedin, 2008).

The importance of coffee in the Southern region is a highly significant crop for others

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because it is one of the most valuable primary products in country trade, and most coffee producing area fetches premium prices in the world market (Wolde, 2018). In the SNNPR, the total area covered by smallholder coffee producers is 217,080.29ha, giving the total production of 1,353,831.54Qt. (CSA, 2017/18). Accordingly, in Debub Ari District, the entire area covered by coffee production is 9341ha. In the woreda, the total coffee produced annually is, on average, 44,525 Qt. About 4,986,766 Kg of red coffee and 1,096885 Kg of dry coffee were purchased from smallholder coffee producers in the woreda. Of the total, approximately 1,040,950 Kg of coffee has been marketed to the ECX (Debub Ari Woreda Agriculture Office, 2019).

Ethiopia is the leading C.Arabica producer in Africa, ranking the fifth largest Arabica coffee producer and tenth in coffee export worldwide (ICO, 2014).

The long coffee marketing chain discouraged farmers from the coffee market. Hence, the existing coffee marketing channel includes several intermediaries. The farmer's wet and dried coffee cherries are sold to local and small collectors in villages. Coming from town, those who buy coffee from farmers and suppliers to more prominent collectors reduce the coffee price to the need of more significant collectors. Marketing channel preference is one of the most critical producers' decisions to sell their products in different marketing outlets and significantly impacts household income (Shewaye et al., 2016). The collectors operate the secondary processing facilities. After decupling the dried coffee cherries, the supplier supplies coffee to the central market in Addis Ababa. Major exporters buy coffee from the primary market through an auction. Such a long market chain leads to unfair/unequal benefits farmers obtain from their coffee, which also affects the quality of coffee through its effect on farmers' capacity to invest in processing facilities (Zinabu et al., 2017).

Although farmers in the study are prominent coffee producers, literature regarding determinants of market outlet choice decisions of smallholder coffee producers in the study area, even for the countries coffee producing zones, is minimal. Therefore, this study has been conducted with the primary objective of analyzing the determinants of smallholder coffee producers' market outlet choice decisions and identifying and mapping the coffee marketing channels as well as functions and roles of actors the in the area

## Methodology and Method
### *Description of the Study Area*
### *Location and area coverage*

Debub Ari woreda is one of the eight woreda "s in the South Omo zone with an area of 1,520 km2 and is located at 50.67'-60.19' N &360.30'- 360.73'E and has a human population of 219,708. The woreda borders Semen Ari woreda in the north, Mago national park in the South, Salamago woreda in the west, Malle woreda in the east, and BenaTsemay woreda in the South East. The city of the Debub Ari woreda is Gather, which is 17 km far away from Jinka, the capital city of the South Omo Zone (the South Omo Zone Pastoral & Agro pastoral Development Office, 2018).

### *Climate*

The traditional agroecologist Dega, woina-dega, and kola cover 30, 65, and 5 percent of the total areas, respectively. The altitude of the Woreda ranges between 500m a.s.l and 3000 m a.s.l. The Woreda has a rainfall pattern of bimodal type / Belg = February – April and Meher = July – September /. The

mean annual rainfall ranges between 601-1600 mm. The mean annual temperature ranges between 10-1o C and is more significant than 27.5oC (Debub Ari Woreda Agriculture Office, 2018).

*Demographic characteristics and farming system*

There is only one ethnic group in the district, namely Ari. The human populations of these ethnic groups are a total of 219,708. The population density of the Woreda is 144.4persons per km2. The farmers in the Woreda have different common cultures, such as the style of dressing and sharing of resources such as water, forage, and food with members of other groups. They have experienced a mixed /crop-livestock/ farming system. The Woreda has an animal resource with an estimated 202,018 cattle, 108,167 sheep, 52,160 goats, 14,113 equines, 117,519 chickens, and more than 15,000 bee families. Maize, sorghum, barley, wheat, teff, and coffee are the major crops grown in the area. Regarding land use, the proportion of cultivated land, grazing land, forest land, cultivable land, non-cultivable land, and others is 17, 15.08, 22.43, 8.3, 15.36, and 21.81 percent, respectively.

*Natural resource base*

Land and vegetation coverage is the leading natural resource base at which the livelihood of people and livestock directly depending on. The proportion of cultivated land, grazing land, forest land, cultivable land, no cultivable land, and others is 17, 15.08, 22.43, 8.3, 15.36, and 21.81 percent, respectively. The total forest coverage of the Woreda was divided by natural forests 9476.43 ha, artificial forests 1455.05 ha, government enclosure forests 3556.8 ha, cooperative forests 938.08 ha and bamboo

forests 1640 ha (Debub Ari Woreda Agriculture Office, 2018).

*Research design*

The study employed a cross-sectional survey research design. Primary data was collected from the study population simultaneously to examine the relationship between variables. The research design concept deals with the elements, data collection methods, data analysis, sample size determination, and sampling techniques.

*Data types and source*

Both qualitative and quantitative data were collected from primary and secondary sources. The primary data that was collected from households include: household's demographic, socioeconomic, land characteristics, institutional factors and other factors are supposed to explain smallholder coffee producers' marketing outlet choice decisions. Secondary data sources for this study include journals, relevant textbooks, bulletins, government and non-government reports, South Omo Zone agricultural office and trade and industry office, Debub Ari agricultural office, marketing office, and notices. This study's target population in which data was collected was all 30 coffee producers' kebeles within the Woreda.

*Sampling procedure*

Debub Ari District was selected purposively based on the coffee production potential and marketing practice for this particular study. The study employed multi-stage sampling techniques to draw a sample of household heads. Accordingly, from 48 kebeles in the Woreda in the first stage, 30 potential kebeles in coffee production and marketing were selected purposely for this study based on

woreda information. In the second stage, out of 30 potential Kebeles, 5 Kebeles were chosen randomly. These selected kebeles were Shepi, Gedir, Shesher, Meter, and Shamamer. In the third stage, the number of sample households from each sample Kebeles was determined using proportionality from the recent lists of homes. Therefore, given the relative homogeneity of families regarding their socioeconomic characteristics and livelihood style, sample households were drawn using a simple random sampling method from each kebele.

## *Sample size determination*

To determine the appropriate sample size, the essential factors to be considered were the level of precision required by users, the confidence level desired, and the degree of variability.

Thus, it was determined using a simplified formula (Kothari, 2004).

$$n= \frac{z^2 pqN}{e^2(N-1)+z^2 pq} \qquad (1)$$

Where: n: is the sample size for a finite population N: the size of the population, which is the number of coffee producers' households in the Woreda p: population reliability (or frequency estimated for a sample of size n), where p is 0.5 which is taken for all developing countries population and p + q= 1 e: margin of error considered was 7% for this study because of budget constraint to collect the large sample with a margin of error 5%. Z α /2: average reduced. The variable at 0.05 level of significance z is 1.96. The sampling unit here was households, and the sampling frame was all the 5 kebeles coffee producers' household lists that have

been available in the kebele. Accordingly, the sample size was determined as follows:

N = 18,426 Hhds

$$n= \frac{(1.96 \text{x} 1.96) \text{x}(0.5 \text{x} 0.5) \text{x}(18,426)}{(0.07 x 0.07) x 18,426+(1.96 x 1.96) x(0.15 x 0.85)} = 194$$

## *Methods of Data Collection*

Formal and informal methods of data collection tools were implemented to acquire primary data. Among the everyday data collection tools, key informant interviews and focus group discussions with pre-defined social groups (elders, model farmers, women's, DAs, and experts) were conducted before the formal surveys to collect general information about the study area, coffee production, and marketing. A checklist was also used to guide the informal discussion conducted to generate data that could not be collected from individual interviews. Formal data collection was employed with the help of a pre-tested structured questionnaire. In this study, both secondary and primary data were used from different sources. Preliminary data was collected from a total of 194 coffee producer sample households, four wholesalers, five processors, 3 retailers, 2 brokers, 3 collectors about their buying and selling strategies, source of market information, demographic characteristics, and other relevant information. The study used commodity chain analysis (CCA), which involves mapping the market chains involved in particular production sectors, different types of activity, geographical locations, and actors in various roles at different levels.

*Data Analysis*

Descriptive analysis was employed to estimate average, weighted average, frequencies, and percentages. Besides this, the econometric model was used to empirically indicate the relationship between variables.

*Econometric Approach*

A random utility model (RUM) analyzes the producers' market outlet choice. The utility function to be fitted to the "no-yes" data type should be a threshold type. It is appropriate for modeling discrete choice decisions such as market outlet choices. It is an indirect utility function where an individual with specific characteristics associates an average utility level with each alternative outlet in a choice set. The base for market outlet choice is the theory of rational choice that assumes farmers are sensible and is ranked alternative marketing outlet for utility maximization. The choice of the marketing outlet depends on farmers' socioeconomic characteristics and essential factors influencing the choice entrenched in each outlet (Greene, 2012).

According to Arinloye et al. (2014); Addisu (2016); Shewaye et al. (2016); Kassa et al. (2017); Honja et al. (2017), and (Fikru et al., 2017), producers are more likely to choose two or more market outlets simultaneously assuming the selection of different marketing outlets as well as their simultaneous use depends on producers willingness to maximize their profit and conditional to socioeconomic, institutional, production and market-related factors. Following the literature, a producer's decision to sell in a profitable market derives from the maximization of profit they expect to gain from these markets.

Econometric models such as multivariate probit/logit, multinomial probit/logit, conditional or mixed, or nested logit help analyze categorical choice dependent variables. Several studies have been done. That has revealed factors influencing marketing channel choice decisions. A study by (Xaba & Masuku, 2012), Atsbaha (2015), (Bezabih et al., 2015), and (Kifle et al., 2015) used a multinomial logit model in an attempt to determine factors affecting producers' market outlet choice. At the same time, Djalalou et al. (2015), Addisu (2016), Shewaye et al. (2016), (Kassa et al., 2017), (Honja et al., 2017), and Fikru et al. (2017) employed a multivariate probit model to analyze factors affecting producers' market outlet choice.

Multinomial models are appropriate when individuals can choose only one outcome from among the set of mutually exclusive, collectively exhaustive alternatives. However, in this study, producers' market outlet choices are not mutually exclusive, considering the possibility of simultaneous options of outlets and the potential correlations among these market outlet choice decisions. Therefore, the multivariate probit model has been adopted for this study to estimate several correlated binary outcomes jointly because it simultaneously captures the influence of the set of explanatory variables on each of the different outlet choices while allowing for the potential correlations between unobserved disturbances, as well as the relationships between the options of varying market outlets (Greene, 2012).

The multivariate probit approach simultaneously models the influence of the set of explanatory variables on the choice of market outlets while allowing for the potential correlations between unobserved disturbances and the relationships between the options of different market outlets (Hailemariam et al., 2012). The observed outcome of market outlet choice can be modeled following random utility formulation. Consider the ith farm household

(i=1, 2…... N) Facing a decision on whether or not to choose available market outlets. The functional form of the multivariate probit model is specified as follows, a set of binary dependent variables characterizes the econometric approach for this study yit such that

$$\mathbf{Yit}^* = \beta_{it} \, x_{it} + \varepsilon_{it} \qquad (2)$$
$$y_{it} = \begin{cases} 1, \text{if } y > 0 \\ 0, \text{Otherwise} \end{cases}$$

Where $Y^*it$ (t=1, 2,T) denotes the market outlet choices available; Hence T= wholesaler, collector, retailer, processor, and consumer outlets, xit is a vector of explanatory variables, β represents the vector of parameters to be estimated, and eit is random error terms distributed as a multivariate normal distribution with zero means and variance-covariance matrix. It is assumed that a rational farmer has a latent variable, yit*, which captures the unobserved preferences or demands associated with the market outlet choice. This latent variable is assumed to be a linear combination of observed households and other characteristics that affect the market outlet choice and unobserved traits captured by the stochastic error term. Given the latent nature of the variable, yit*, the estimation is based on the observed variable yit that indicates whether a household chooses a particular market outlet. Since choosing several market outlet choices is possible, the error terms in the equation are assumed to follow a multivariate normal distribution, with zero conditional mean and variance normalized to unity.

The multivariate probit model considers the potential interdependence in market outlet choices and the possible correlation in selecting alternative outlets. The probability of preferring any particular market outlet is estimated conditional on choosing any other related outlet. The multivariate probit model assumes that each subject has distinct binary responses and a matrix of covariates that can be any mixture of discrete and continuous variables. Generally speaking, the multivariate probit model assumes that given a set of explanatory variables, the multivariate response indicates the event that some unobserved latent variable falls within a specific interval. The multivariate probit is an extension of the probit model (Greene, 2003) and is used to jointly estimate several correlated binary dependent variables. The model is specified as follows:

$Y1^* = x1\beta1 + \varepsilon1$ $Y1 = 1$ if $Y1^*$ is $> 0$, $Y1 = 0$ otherwise

$Y2^* = x2\beta2 + \varepsilon2$ $Y2 = 1$ if $Y2*$ is $> 0$, $Y2 = 0$ otherwise

$Y3^* = x3\beta3 + \varepsilon3$ $Y3 = 1$ if $Y3*$ is $> 0$, $Y3 = 0$ otherwise

$Y4^* = x4\beta4 + \varepsilon4$ $Y4 = 1$ if $Y4*$ is $> 0$, $Y4 = 0$ otherwise

$Y5^* = x5\beta4 + \varepsilon5$ $Y5=1$ if $Y5*$is$>0$, $Y5= \quad 0$ otherwise $\qquad (3)$

This system of equations was jointly estimated using the maximum likelihood method. Ten joint probabilities correspond to the ten possible combinations of preferring and not preferring each of the five market outlets. The likelihood that household' i' has chosen all five market outlets is given as:

Pr (y1i = 1, y2i = 1, y3i = 1, y4i = y5i = 1) = Pr ($\varepsilon$1i ≤ $\beta_1$x1i, $\varepsilon$2i ≤ $\beta_2$x2i, $\varepsilon$3i ≤ $\beta_3$x3i, $\varepsilon$4i ≤ $\beta_4$x4i, $\varepsilon$5i ≤ $\beta_5$x5i) = Pr ($\varepsilon$5i ≤ $\beta_5$x5i∕$\varepsilon$4i≤ Pr ($\varepsilon$4i ≤ $\beta_4$x4i∕$\varepsilon$3i ≤ $\beta_3$x3i∕$\varepsilon$2i ≤ $\beta_2$x2i, $\varepsilon$1i ≤ $\beta$1x1i × Pr ($\varepsilon$3i ≤ $\beta_3$x3i∕$\varepsilon$2i < $\beta_2$x2i∕$\varepsilon$1i < $\qquad \beta_1$x1i $\qquad\qquad$ × $\qquad$ Pr $\qquad$ ($\varepsilon$1i $\beta_1$x1i) ................................................................ (4)

**Table 1** .The Summary of Independent Variables, Description their Measurements and Expected Relationship

| N<u>o</u> | Independent Variables | Variable Types | Units of Measurement | Expected Sign |
|---|---|---|---|---|
| 1. | Sex of the household | Dummy | 0 and 1 | +/- |
| 2. | Age of the respondent | Continuous | Year | +/- |
| 3. | Educational level of the respondents | Continuous | Year of schooling | +/- |
| 4. | Family size of the respondents | Continuous | Number | +/- |
| 5. | Membership to cooperatives | Dummy | 0 and 1 | +/- |
| 6. | Access to credit | Dummy | 0 and 1 | +/- |
| 7. | Distance to the nearest market | Continuous | Km | +/- |
| 8. | Price offer | Continuous | Birr | +/- |
| 9. | Access to market information | Dummy | 0 and 1 | +/- |
| 10. | Extension contact | Continuous | Number of contact | +/- |
| 11. | Owning pack animal | Dummy | 0 and1 | +/- |
| 12. | Farm experience | Continuous | Year | +/- |
| 13. | Off-farm income | Dummy | 0 and 1 | +/- |
| 14. | Bargaining power of producers | Dummy | 0 and 1 | +/- |
| 15. | Total coffee landholding and total land | Continuous | Ha | +/- |

## Result

### *Socio-economic and Demographic Characteristics of the Respondents*
### *Sex of household respondents*

Gender was analyzed by checking the number of male and female headed households. The sample population of farmer respondents considered during the survey was 194. Out of the total households head interviewed 95% were male headed households while 5% were female headed households.

### *Education level of the respondents*

In the study area according to sample respondents the mean grade level achieved by respondents was about grade 3.25. The minimum grade achieved was grade 0 and the maximum was grade 10.

In both theoretical and practical situations, education level plays an important role in ensuring household access to basic needs such as food, shelter and clothing. Skills and education enhances the working efficiency resulting into more income and food security.

Furthermore, education is important to manage the business as well as in decision making (Kadigi, 2013)

### *Age of the household respondents*

The survey on this major demographic factor, measured in years, provided a clue on working ages of households. The mean age of the sample household heads was 40.04 years with the minimum and maximum age of 25 and 80 years, respectively. This result is almost similar with that of Zekarias (2012) who found the mean age of the sample household was 40 years old.

### *Family size and experience*

The mean family size of the total sample households was 7.31 persons ranging from 2 to 14 with standard deviation of 2.83 and this might assist them for a better market outlet choices of households during coffee marketing because of labor availability .This is supported by Dawit (2015) who revealed that the availability of labor helps them for a

better participation of households in vegetable marketing.

The respondents have an average 11.85 years Market Outlet Choice of marketing experience in coffee marketing with a standard deviation of 8.342 years.

**Table 2.** The Socio- economic and Demographic Characteristics of Sample Households

| Variables | Minimum | Maximum | Mean | Std. Deviation |
|---|---|---|---|---|
| Age of the household head | 25 | 80 | 40.13 | 11.610 |
| Total family size | 2 | 14 | 7.31 | 2.826 |
| Educational level | 0 | 10 | 3.25 | 3.205 |
| Experience in coffee  marketing | 1 | 35 | 11.85 | 8.342 |

Source:  Survey Result, 2019

Age and education level of the sample respondents have positive and significance mean difference at 1% on processors and wholesalers outlet choice decision of coffee producers. Whereas, quantity of coffee produced has negative and significant mean difference at 1% on retailer's outlet choice decision. According to survey result family size has positive and significant mean difference at 5% on the smallholder coffee producer's consumers outlet choice decision.

**Table 3.** Access to Credit for Sample Households on Outlet Choices

| Variable | Market outlets | | Chi-square value |
|---|---|---|---|
| 1. | Sold to collectors(62) | Total(194) | (1.6264)NS |
| Credit access | Yes(132) | | |
| Yes | 68(51.5) | 106(54.6) | |
| No | 64(48.5 | 88(45.4) | |
| 2. | Sold to wholesaler | Total(194) | (6.7200)** |
| | Yes(129) | | |
| Yes | 62(48) | 106(54.6) | |
| No | 67(52) | 88(45.4) | |
| 3. | Sold to retailers | Total(194) | (8.5972)*** |
| | Yes(71) | | |
| Yes | 29 | 106(54.6) | |
| No | 42 | 88(45.4) | |
| 4. | Sold to processors | Total(194) | (6.7728)** |
| | Yes(141) | | |
| Yes | 69(49) | 106(54.6) | |
| No | 72(51) | 88(45.6) | |
| 5. | Sold to consumers | Total(194) | (22.9526)*** |
| | Yes(29) | | |
| Yes | 4(13.8) | | |

Source, Survey Result, 2019, NS = Non Significant

As depicted on the table 5 above, access to credit has positive and significant effect on the smallholder coffee producer's outlet preferences at 1% for retailers, processors and consumers and and wholesalers market outlet at 5%.

*Coffee Marketing Outlets*

The survey result indicated that sample households in the study area sold their coffee at different marketing center. The sample households sold varying proportion of their coffee to different market outlets in the district which include: collectors, wholesalers, retailers, processors and consumers. Result of the survey in (Table 8),

indicated that 68% of households sold their coffee to collectors whereas 66.5%,36.6%,72.5% and 15% of the sample households sold their coffee to wholesalers, retailers, processors and consumers, respectively. The total amount of coffee produced and marketed by the sample household was 911 qts. And 900.17qtls, respectively. The survey result showed that out of total output sold in the market collectors, wholesalers, retailers, processors and consumers purchased 18.3%, 33%, 13%, 34% and 1.4% of coffee with the mean supply of 134.53qt, 231.96qt, 178.11qt, 227.94qt and 72.22qt, respectively.

**Table 5.** Smallholder Coffee producer Market Outlet Choices

| Outlet choices | Collector | | Wholesaler | | Retailer | | Processor | | Consumer | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Freque ncy | % | Freque ncy | % | Freque ncy | % | Freque ncy | % | Freque ncy | % |
| Yes | 87 | 45% | 81 | 42% | 57 | 29% | 88 | 45.4% | 29 | 15% |
| No | 107 | 55% | 113 | 58% | 137 | 71% | 106 | 54.6% | 165 | 85% |
| Av.amountsold to each outlet (in Qt.) | | 134.5 | | 231.9 | | 178.1 | | 227.9 | | 72.2 |

Source: Survey Result, 2019

The result indicates that most of the sample respondents have been used to sell their coffee to collectors, wholesalers and processors. According to the sample respondents the reason for choosing those marketing outlets was due to the fact that about 41.3% was those who said better price offer and fairness of scaling, 33% closeness in distance, 11.3% was those who said due to transport availability while the rest 14.4% was due to absence of alternative market in the study area.

*COFFEE MARKETING ACTORS AND THEIR FUNCTIONS*

According to survey result six coffee marketing actors have been identified in the study area. These were producers, collector, wholesalers, retailer's processors and consumers which was the main actors on the coffee marketing. The role of each actors on coffee production and marketing, their interaction among different actors as well as the flow of coffee through each market channels were indicated in figure and table below.

**Collectors:** These are an actors that collect a large volume of coffee at the farm gate from the smallholder coffee producer and provide to the wholesaler and processor in the study area. The total amount of coffee purchased from smallholder coffee producer through collectors are amounted to be 177.58 qtls. The main market outlets for the collectors are wholesaler and processor.

**Wholesaler:** Wholesaler are traders that collect a large volume of coffee from collectors and mainly sell to exporters through ECX. According to sample survey result the total amount of coffee purchased by wholesaler from the sample smallholder coffee producer was about 292.27 qtls. They play significant role in the market chain who mainly known for purchase of bulky products with better financial and information capacity as well as reside in the town. They are major actors in the channel and they purchase coffee either directly from farmer or mainly through collectors.

**Retailers:** Retailers are known for their limited purchasing with low financial and information capacity. They are the main actors along the channel and deliver coffee to the consumer in small amount. The amount of coffee purchased through these actors was estimated to be 113.99qtls. From smallholder coffee producer in the study area.

**Processor:** These are the market actors with their main motive of creating large profit through value addition on the product. These actors purchase large volume of coffee from smallholder as well as collectors and market it to the exporters through ECX.The total amount purchased by this actors in the study area was 303.16 qtls.

**Consumers:** Consumers are the final purchasers of coffee mostly from retailers for consumption purpose and it is the last link along the channel. The total amount of coffee sold to this market actor was estimated to be 13 qtls. Which is provided from the smallholder coffee producers.

**Exporters:** These marketing actors purchase coffee from different coffee traders within all around the country and provide to the international market in order to get more benefit from the business. ECX plays a significant role in market facilitation which is a government established exchange market that brings the customers such as wholesaler, processor and exporters together for undertaking effective marketing of coffee and other export commodity. According to the secondary information obtained from the district about 6615.57 qtls. Washed and 3793.93 qtls. Unwashed coffees have been marketed to ECX for export by the traders from the district.

According to the secondary information obtained from the ECX, the coffee from South Omo Zone was categorized under the E- type which lies between grade 5 and 8 due to poor quality of coffee supplied by the farmers.

Prior to the estimation of the model parameter, it is important to check the problems of multicollinearity or the association among potential variables. Accordingly the variance inflating factor (VIF) has been used to test for multicollinearity among continuous variables. The value of VIF for the variables were found to be small which less than 10 is. Therefore, the data has no serious problem of multicollinearity.

Moreover, the contingency coefficient which measures the association between different discreet variables based on the Chi-square test were computed to check the degree of association among the discrete variables and the values of contingency coefficients ranges between 0 and 1 with zero indicating no association between the variables and the values close to 1 indicating a high degree of association. Accordingly, the results of the computation reveal that there was no serious problem of association among the discrete explanatory variables.

Also pair wise correlation has been conducted to check the relation among continuous variables. Accordingly, there is no cross correlation between the explanatory variable because the correlation within continuous independent variables are below 0.8. Therefore, there is no cross tabulation correlation between the continuous explanatory variables.

Furthermore, the model mis-specification problem has been checked which shows there is no model mis-specification problem. Finally, the robust has been taken into account to diagnose hetroscedacity problem and shows almost similar coefficients has been observed before and after robust.

The multivariate probit model has been used to estimate several correlated binary outcomes jointly. In this study the decisions of smallholder coffee producers choosing, collectors wholesalers, retailers, processors and consumers are correlated. Since the decisions are binary the multivariate probit model was found to be appropriate for jointly predicting these five outlet choices on an individual-specific basis and the parameter estimates are simulated maximum likelihood (SML) estimators. Thus, an econometric approach was employed to test effects of the explanatory variables on the selection of a particular market outlet. The Wald chi2 (75) = 181.89 is significant at 1% significance level, which indicates that the subset of coefficients of the model is jointly significant and that the explanatory power of the variables included in the model is acceptable. Therefore, the MVP model fits the data reasonably well. Similarly, the model is significant because the null that choice decision of the five coffee market outlets is independent was rejected at 1% significance level.

The results of the likelihood ratio test in the model (LR $\chi2$ (10) = 54.85, $\chi2 > p = 0.0000$) indicates the null that the independence between market outlet choice decision ($\rho21 = \rho31 = \rho41 = \rho51 = \rho32 = \rho42 = \rho52 = \rho43 = \rho53 = \rho54 = 0$) is rejected at 1% significance level and there are significant joint correlations for two estimated coefficients across the equations in the models. This verifies that separate estimation of choice decision of these outlets is biased, and the decisions to choose the five coffee marketing outlets are interdependent household decisions.

There are differences in market outlet selection behavior among producers, which are reflected in the likelihood ratio statistics of estimated correlation matrix. Separately considered, the $\rho$ values ($\rho ij$) indicate the degree of correlation between each pair of dependent variables. The $\rho31$ (correlation between the choice for retailer and collector outlet), $\rho41$ (correlation between the choice for processor and collector $\rho42$( correlation between the choice for processor and

wholesaler) are negatively interdependent and significant at the 1% significance level indicating a competitive relationship of retailer outlet with collector outlet and processor outlet with collector outlet, $\rho32$ (correlation between the choice for retailer and wholesaler) is negatively interdependent and significant at 10% significance level and also has competitive relationship of retailer outlet with wholesaler. This indicates that the smallholder coffee producers have been used collector's outlets as substitute for retailers and processors and wholesaler outlets as substitute for processors. The result also indicates that farmers selling their coffee to the wholesaler outlets and collector's outlets are less likely to deliver to retailer and processor outlets in the study area. However, $\rho43$ (correlation between the choice for processor and retailer) is positively interdependent and significant at 10% significance level which shows the complementarity relationship of processors and retailer outlets in the study area. The complementarity relationship between processors and retailers which indicates that those smallholder coffee producer who deliver to retailers are more likely deliver to processor.

The simulated maximum likelihood (SML) estimation result shows that the probability that smallholder coffee producers choose collector, wholesaler, retailer, processor and consumer market outlets were 67.1, 66.4, 36.9, 71.6 and 15.3%, respectively. This indicates that the likelihood of choosing consumer outlet is relatively low (15.3%) as compared to the probability of choosing collector outlet (67.1%), wholesaler's outlet (66.4), retailer outlet (36.9%) and processor outlet (71.6). The result indicates that the processor market outlet is the most likely chosen market outlet by farmers whereas the consumer market outlets are less likely chosen due to high transaction cost incurred by the smallholder coffee producers during search of consumer market outlet choices.

As depicted in below some of the variables used in the model were significant at more than one market outlets while some others were significant in one market outlet but not in the other outlet.

Out of fifteen explanatory variables included in multivariate probit model, three variables significantly affected collector market outlet choices, five variables significantly affected wholesaler market outlet; seven variables significantly affected retailer outlet, seven variables significantly affected processor market outlet choices and six variables significantly affected consumer outlet at 1, 5 and 10 percent of probability levels.

**Table 6**. Multivariate Probit Estimations of Smallholder Coffee Producers' Market Outlet Choices

| Variables | Market Outlet Choice | | | | |
|---|---|---|---|---|---|
| | **Collector** | **Wholesaler** | **Retailor** | **Processor** | **Consumer** |
| Sex of household head | -.2137123 (.4918306) | -.0295653 (.4935537) | .0472331 (.5269698) | -3.299526 (132.4195) | -.3759172 (.4677587) |
| Age of the respondent | -.0093304 (.0120569) | -.0148831 (.0123609) | .0339768 (.0132263)** | -.0088816 (.013178) | -.0275244 (.0182429) |
| Educational level of the respondent | -.0727509 ( .0354859)** | -.0627296 (.0364709)* | -.0407201 (.0391008) | .0340325 (.0425687) | -.0438721 (.0501552) |
| Family size of the respondent | -.085016 (.0434293)** | -.0118866 (.0440926) | -.0904821 (.0516101)* | .0181341 (.0493665) | -.166687 (.0672679)** |
| Membership to cooperative | .0042346 (.229583) | .4653586 (.2540951)* | .3448373 (.2795502) | -.2378586 (.281681) | .2222986 (.3380974) |
| Access to credit | -.1715698 (.2161162) | -.4564046 (.2474172)** | -1.092729 (.2642758)*** | -.6426178 (.2474172)*** | -1.702854 (.4399507)*** |
| Distance to the nearest market | .0449695 (.027838) | .052931 (.0264987)** | .0329049 (.0315226) | -.0750814 (.0285683)*** | .0774774 (.0559312) |
| Price offer | -.0184364 (.0192507) | .0021473 (.0198921) | .0693522 (.0220586)*** | -.0867134 (.0220265)*** | -.0516291 (.0317817) |
| Access to market information | .0114819 (.2068744) | -.2698496 (.2128004) | .2282144 (.2251588) | .3032092 (.2255842) | 1.068095 (.3587039)*** |
| No. of extension contact | -.0075893 (.007406) | -.0096642 (.0073909) | .0043083 (.0077596) | -.0013918 (.0077166) | -.0276665 (.0116884)** |
| Pack animal ownership | .0249593 (.2107561) | .2675632 (.2179898) | -.3232452 (.2345576) | .2645599 (.2401084) | -.348984 (.3101969) |
| Market experience | .0010213 (.0164185) | .0220701 (.0167251) | -.1176459 (.0247324)*** | -.0430564 (.0168894)** | .0559403 (.0276098)** |
| Offarm participation | .5187433 (.3016288)* | -.3870921 (.276207) | .9800829 (.3152704)*** | .7974893 (.3762208)** | 1.222317 (.4572158)*** |
| Bargaining power | .162345 (.2165205) | -.075089 (.2218985) | -.6880981 (.2659015)*** | .5093613 (.277375)* | .5469023 (.3378193) |
| Total coffee land holding | .2565628 (.3308201) | -.5386478 (.2985607)* | .0919487 (.3120869) | .6800661 (.3492307)** | .5922614 (.3994225) |
| Constant | 2.017852 (.7204324)*** | 1.511933 (.7205627)** | -.4667619 (.7537089) | 5.791882 (132.421) | 1.346013 (1.002858) |
| Predicted probability | 0.68 | 0.66 | 0.37 | 0.72 | 0.15 |
| Joint probability success | | | | 0.031 | |
| Joint probability failure | | | | 0.003 | |
| Number of simulations( draw) | | | | 5 | |
| Number of observation | | | | 194 | |
| Log Likelihood | | | | -404.61 | |
| Wald chi2 (75) | | | | 181.89 | |
| Prob > chi2 | | | | 0.0000 | |

Source: Survey Result, 2019

Joint Probability of success or smallholder coffee producers the mean probability to choose the 5 outlets jointly is 0.031 whereas not to choose the 5 outlets or the mean probability of failure is 0.003. The joint

probabilities of success or failure of choosing the five coffee market outlet choices suggest that households are more likely jointly select the five coffee market outlet.

**Table 7.** Estimated Correlation Matrix

| Estimated Correlation Matrix | | | | | |
|---|---|---|---|---|---|
| | **Collectors(P1)** | **Wholesalers(P2)** | **Retailers(P3)** | **Processors(P4)** | **Consumers(P5)** |
| **P1** | 1.00 | | | | |
| **P2** | -.0335023 (.1243007 ) | 1.00 | | | |
| **P3** | -.5666774 (.1573199)*** | -.2911016 (.1512992)* | 1.00 | | |
| **P4** | -.576239 (.1493325)*** | -.5928373 (.1590032)*** | .2607122 (.1534766)* | 1.00 | |
| **P5** | .1793567 (.1828691) | .3429076 (.2289634) | -.0613303 (.2184162) | -.0576187 (.2340145) | 1.00 |
| Likelihood ratio test of rho21 = rho31 = rho41 = rho51 = rho32 = rho42 = rho52 = rho43 = rho53 = rho54 = 0: chi2(10) = 54.8535 Prob > chi2 = 0.0000 | | | | | |

Source: Own computation from survey result, 2019
Note: Coefficient and standard errors in the parentheses
Symbols: ***, ** and * indicates significant at 1%, 5% and 10% levels, respectively.

**Age of household:** Age of household head was found to be statistically significant at 5% significance level and positively influenced choice of retailer market outlet by coffee producer smallholder farmers in the study area. The results implied that, as age of household head increases the probability of choosing retailer market outlet increased by 3.4%. This implies that, older farmers may take their decision to choose better market outlet which gives higher price more easily than the young farmers, because older people might have marketing experience, accumulated capital or a long term relationship with their clients or might have preferential access to credit due to their age, availability of land, or family size. This is in line with Taye et al. (2018) which revealed that age of household was to be statistically significant at 10% significance level and

positively influenced the retailer market outlets of smallholder onion producers.

**Education level of the respondent:** Educational level has significant and negative relationship with the likelihood of choosing collectors market outlet and wholesaler's market outlet at 5% and 10% significance level, respectively. As the education level increase, the probability of choosing the collectors and wholesalers market outlet decreased by 7.3 and 6.3%, respectively. This indicates that educated farmers would less likely sell coffee to collectors and wholesaler than other channels in the study area. This is due existence of limited number of wholesaler in the study area, the price given by wholesalers are slightly different from that of collectors. As farmers educated more and more they less likely to sell their products to collector

market outlet. The reason might be that as the educational level of farmers enable them to produce more and supply for appropriate outlets. Education increases the knowledge of farmers that can be used to collect information, interpret the information received, and make informed decisions on the choice of appropriate market channel. The result is consistent with the study by Abraham (2013) who found that educational level has significant negative relation with collector market outlets. However ,in contrary with Gizachew et al. ( 2018) that revealed that the more educated the farmer is, the more likely to sell pepper through wholesalers because more educated farmers spend less time on doing marketing activities.

**Family size:** Family size is negatively and significantly associated with selling coffee to collectors, retailer and consumers at 10%, 10% and 5% significance level, respectively. As family size increase, the probability of choosing collectors, retailers and consumers outlet choice by the smallholder coffee producers decreased by 8.5, 9 and 16.7%, respectively. This result shows that those households with large family size are less likely to choose collectors, retailers and consumers outlets and deliver more likely to other outlets like wholesaler or processor outlets. This may imply large household size is an indicator of labor availability which enables farmers to produce more and supply large volume of coffee and sell to wholesaler or processors outlets rather selling small units to retailers and consumers. This is in line with Addisu ( 2016) who revealed that family size is positively and significantly associated with selling potato to wholesalers at 1% significance level.

**Membership to cooperative:** The membership of the smallholder coffee producer has positively influence the wholesaler and significant at 10%

significance level. This indicates that those who are the member of cooperative has been more likely to sale to wholesaler in the study area. The reason is that the cooperative members have access more information with regard to benefits obtained in providing coffee in large volume and because of this they sale to wholesale market outlets that can able to reduce transaction cost. The reason for smallholder coffee producers not to sell their coffee to cooperative was that currently nonfunctioning of cooperative in coffee marketing activities in the study area instead it has been distributing sugars and oil for its members. This is not consistent with Fikru et al. (2017) who revealed that those who are members of cooperative has been more likely to sell for cooperative and has the probability of choosing wholesalers and collector outlet decreases.

**Access to credit:** Access to credit negatively and significantly affected wholesaler at 5% and the retailer, processor and consumer market outlet choices of the smallholder coffee producers at 1% in the study area. This result indicates that as the smallholders have more access to credit the less likely to sell to the wholesaler, retailers, processors and consumers. The reason is that those farmers who have access to credit need to participate in off-farm activities rather than spending their time in searching other alternative marketing outlets to sell their coffee. Also they do not need to incur the cost in searching better market instead they need to convert loan into asset because of considering interest rate and purchase agricultural input. This is consistent with Efa and Tura (2018) who revealed that those who access to credit has been less likely to sell to wholesaler and consumers but it is inconsistent with more likely to sell to retailers.

**Distance to the nearest market:** Distance to the nearest market is positively and

negatively associated with the likelihood of producers selling to wholesaler and processors at 5% and 1% significance level, respectively. This indicates that households who are closer to market were assumed to have more probability to choose wholesalers outlet and less likely to sell for processor. This is because the wholesalers have temporary coffee purchasing center at the nearest market to the smallholder coffee producers in the study area. Hence as the distance from the market center increase, transportation and other marketing costs are increased. This is consistent with Taye et al. (2018) who revealed that direct relationship of wholesaler onion market outlets with nearest distance to the market and significant at 1% .

**Price offer:** The market price was found to be positively and negatively affected both the retailer and processors market outlet at the 1% significance level. This indicates that the smallholder coffee producer more likely to sell to the retailers and less likely to sell to the processors outlet as market price increase. The reason could be that the retailers give better price for their coffee as compared to the processors in the study area. In contrary with Addisu ( 2016) who revealed that Price is associated negatively and significantly at 5% level of probability with choosing retailer outlet.

**Access to market information:** Access to market information was found to be positively and significantly influence the consumer's market outlet at 1% significance level. This indicates that as the smallholder coffee producers are more accessible to the market information they more likely to sell to the consumers market outlet than other outlets in the study area. This is due to the fact that the consumer outlet gives higher price for their coffee as compared to other market

outlets. This is in line with Takele et al. ( 2017) who revealed that access to market information determined the probability of the choosing consumer outlet positively at 10% for mango producers.

**Access to extension contact**: Access to extension services was found to be negative and significant influence in the likelihood of choosing consumer outlets at 5% significant level. This indicates that those who have access to extension service are less likely to sell to the consumer's market outlet. Access to extension service enhanced the ability of smallholder coffee producers to get relevant market information as well as other related agricultural information which in turn increases producers' ability to choose the best market outlets for their product. This might be due to reducing the transaction cost in searching the consumer market outlet and enables the coffee producers to provide their coffee for legal traders who can supply to the exporters. This finding is in line with the findings of Oliyad et al. ( 2017) that revealed that access to extension service had significant negative effect on the likelihood of choosing consumer outlets at 5% significant level for groundnut producers. It is also similar with the findings of Mekonnin (2015) who revealed that access to extension service has significant negative relation with the choice of end consumer outlet in coffee market outlet choice.

**Market experience:** The market experience or farm experience was found to be negatively and significantly influenced the retailers and processors at 1% significance level and positively affected the consumer's outlet at 5% significant level. The result indicates that those who have more experience are less likely to sell to the retailers and processors and more likely to consumers. This might be due to the fact that

those who have more experience in coffee marketing have knowledge to receive more benefit in providing the coffee to the one that can give better price and more likely choose consumer market outlet than those who have less marketing experience. This is consistent with the findings of Addisu ( 2016) who found that the likelihood of choosing consumer outlet was positively and significantly affected by number of years that a farmer had been growing onion at 10% levels of significance. With regard to negative relationship between experience and choosing of retailers market outlet the smallholder coffee producer less likely provide to the retailers market out let. This is in line with Gizachew et al. ( 2018) who revealed the likelihood of choosing retailer outlet was negatively and significantly affected by farming experience at 5% significance level.

**Off-farm participation:** Off-farm participation has been influenced collectors, retailers, processors and consumers positively and significantly at 10%, 1%, 5% and 1% significance level, respectively. This indicates that those who participated in off-farm activities have more likely to sell in all market outlets which are available in the study area than those who didn't participated in off-farm activities. This might be due to the fact that those who have participated in off-farm activities have better awareness, bargaining power and capacity to use all the alternative market outlets which are available in the study area to maximize their benefit from coffee marketing. Therefore off-farm participation has positive relationship with all market outlets and enables the smallholder coffee producer to use those alternative market outlets in the study area. This is in line with Taye *et al.* (2018) who found that non/off farm income affect the probability of choosing assembler and retailer market outlet positively at 1 and 5% levels of significance,

respectively. It is also consistent with Abebe *et al.*(2018) who revealed that consumer market channel was positively and significantly affected by the participation in non-farm activities at 5% level of significance.

**Bargaining power:** Bargaining power has negative and positive influence on the retailers and processors at 1% and 10% significance level, respectively. The result indicates that as the smallholder coffee producers have more bargaining power they more likely to sell to the processors and less likely to the retailers. The possible reason is that negotiation on price makes smallholder coffee producers empowered on price decision making and enable them to sell their coffee with a better price by using other better alternative market outlets. Also those farmers who have bargaining power can easily negotiate with the processors market outlet than other outlets because processors pay more for those who can supply quality coffee. This is consistent with Gizachew et al. ( 2018) who revealed that the likelihood of choosing district retailers and local collectors' market outlet was negatively affected by the bargaining power of the producers at 1% level of significance. This finding is also consistent with Bezabih et al. (2015) who revealed in his study that bargaining power has significant and negative relationship with the likelihood of choosing collector only, retailer only and wholesaler only at 1 percent level of significance.

**Total coffee land holding:** The total coffee land holding was found to be negatively and positively affected wholesaler and processor at 10% significance level. This indicates that those with large coffee land holding less likely sell to the wholesaler and more likely sell to the processor in the study area. This might be due to the fact that the processors

give relatively better price for the smallholder coffee producer as compared to the wholesaler in the study area. Although both have the capacity to purchase coffee from the smallholder in large volume, the purchasing volume of processors are greater than that of wholesalers. This is in contrary with Oliyad et al. ( 2017) who revealed that the size of land allocated to groundnut influenced the likelihood choice of wholesaler and retailer outlets positively at 10% and 5% significance levels and negatively affected consumers outlet at 10% significance level.

## Conclusion

A total of 194 sample household head of coffee producers have been randomly selected and interviewed using structured questionnaire.
The sample households sold different proportion of their coffee to different market outlets in the district which include: collectors, wholesalers, retailers, processors and consumers. Result of the survey revealed that about 68% of households sold their coffee to collectors whereas 66.5%, 36.6%, 72.5% and 15% of the sample households sold their coffee to wholesalers, retailers, processors and consumers, respectively. The majority of sample respondents have been sold to the processors market outlets while less amount of coffee was sold to consumers. The simulated maximum likelihood (SML) estimation result shows that the probability that smallholder coffee producers choose collector, wholesaler, retailer, processor and consumer market outlets were 67.1, 66.4, 36.9, 71.6 and 15.3%, respectively. This indicates that the likelihood of choosing consumer outlet is relatively low (15.3%) as compared to the probability of choosing collector outlet (67.1%), wholesaler's outlet (66.4), retailer's outlet (36.9%) and processor outlet (71.6). The result indicates that the

processor market outlet is the most likely chosen market outlet by farmers whereas the consumer market outlets are less likely chosen. This is due to high transaction cost incurred by the smallholder coffee producers during search of consumer market outlet choices.
The market information is very crucial component in marketing system for a given commodity. The smallholder coffee producers have been getting the informal market information from relatives, neighbor, traders as well as visiting the market. Access to market information was found to be significantly influence the smallholder coffee producers in choosing better market outlet. It enables the smallholder coffee producers in analyzing the price difference on the farm gate and consumer market outlets that increases the probability to choose the consumers outlet market which gives better price. This indicates that as the smallholder coffee producers are more accessible to the market information they more likely to sell to the better market outlet than other outlets in the study area. Therefore, the provision of adequate, timely, reliable and formal market information from concerned body is essential to enhance coffee producers' benefit and bargaining power through avoiding information asymmetry.
Promoting the cooperative is very essential to enhance the agricultural product marketing in general and coffee marketing in particular. It plays a great role in the coffee marketing and able to lower the transaction costs in order to increases the benefits of the farmers. Being a member of cooperative was significantly influenced in searching for better market for their coffee that can able to maximize coffee producers' benefit in the study area. However, although there was multipurpose cooperative in the study area it has been functioning on the sugar and oil distribution for its member rather than coffee marketing.

Therefore, the development and promotion of coffee marketing cooperative is needed in the study area in order to increase the incomes of smallholder coffee producers through purchasing at reasonable price and paying the dividend for its members.

Education level is very important in searching for better market outlets. Therefore, providing an awareness in the benefits of attending adult and formal education is needed in order to help coffee producers in choosing the outlets that can able to maximize their benefit.

The development of infrastructure and market accessibility is critical for the smallholder coffee producers that enables them to choose the better alternative market outlets. Households who live far from the nearest market were negatively and significantly influenced the processors outlet choices which has been made the smallholder coffee producers to sell less likely for the processors market outlet. The adequate infrastructural development and market accessibility is important that can able to enhance the benefits of smallholder coffee producers in the study area. Therefore, adequate infrastructural development and market accessibility with good facility is needed to enable the smallholder coffee producers in choosing the better market outlets to increase the benefit.

Access to extension contact is very important for smallholder coffee producers in searching the better market. This indicates that the extension services helps the farmer in production, properly harvesting coffee and disseminating of market information in order to aware the coffee producers and able to search for better market. Therefore, the provision of extension services focusing on the coffee production and marketing as well as the capacity building for the extension agent with technical skill and marketing knowledge is needed in order to make

smallholder coffee producers to supply quality coffee as per market demand.

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## Competing interests

The authors declare that they have no competing interests.

## Ethics approval

Not applicable.

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