International Journal of
Economics
(IJECON)

Impact of Membership to Certified Coffee Marketing Cooperatives on the Income of Smallholder Farmers in Jimma Zone of Oromia Region, Ethiopia

Zewdu Getachew, Fekadu Beyene, Jema Haji and Tesfaye Lemma

International Journal of Economics
ISSN 2518-8437 (Online)
Vol.8, Issue 5, No.5. pp 100 - 125, 2023

www.iprjb.org

Impact of Membership to Certified Coffee Marketing Cooperatives on the Income of Smallholder Farmers in Jimma Zone of Oromia Region, Ethiopia

Zewdu Getachew[1*], Fekadu Beyene[1], Jema Haji[2], Tesfaye Lemma[1]

[1] Haramaya University, School of Rural Development and Agricultural Innovation, Ethiopia

[2] Haramaya University, School of Agricultural Economics and Agri-Business, Ethiopia

[*] Corresponding Author's Email: zewdug2001@gmail.com.

Article History

Received 5th July 2023
Received in Revised Form 17th July 2023

Accepted 26th July 2023

How to cite in APA format:
Getachew, Z., Beyene, F., Haji, J., & Lemma, T. (2023). Impact of Membership to Certified Coffee Marketing Cooperatives on the Income of Smallholder Farmers in Jimma Zone of Oromia Region, Ethiopia. *International Journal of Economics*, *8*(1), 100–126. https://doi.org/10.47604/ijecon.2047

Abstract

Purpose: Coffee is one of the most important agricultural commodities with a significant contribution to the growth and well-functioning of Ethiopia's economy, and to the livelihoods of millions of smallholder farmers and laborers. Despite its importance, smallholder coffee production and marketing performance have been unsatisfactory due to various reasons. The introduction of voluntary coffee certification schemes such as Fairtrade (FT) and Organic (Org) certification schemes through cooperatives are viewed as mechanisms to overcome the constraints smallholder farmers face in accessing high value coffee markets and earn better income. However, the impacts of these schemes on the livelihoods of smallholder farmers were not analyzed yet. The main purpose of this study was to estimate the impact of joining (FT, Org or dual FT-Org) certified coffee cooperatives on gross annual incomes earned by member farmers.

Methodology: The study employed cross-sectional data collected from randomly selected sample smallholder coffee farmers through a semi-structured questionnaire. Descriptive and simple inferential statistical tests (e.g., frequency, percentage, mean, t- and chi^2-tests), and PSM methods were employed to analyze the data.

Findings: Results of the descriptive statistics depict that 234 (62.07%) of the total 377 samples farmers were members of certified coffee marketing cooperatives. Among the cooperative members, 83 (35.47%), 84 (35.90%) and 67 (28.63%) were members of FT, Org and dual FT-Org certified coffee marketing cooperatives, respectively. The results of the binary probit model however show that the decisions to join certified coffee marketing cooperatives was significantly influenced by sex, marital status, total livestock holding size, total coffee land size (ha), log total quantity of coffee produced (kg), credit access, and walking distances to development agent's office, coffee marketing center and all-weather road in minutes, respectively. The PSM analysis results show that membership to certified coffee marketing cooperatives has a positive and significant impact on average annual gross income (ETB) earned. The average gross annual income earned by coop member farmers was ETB 14639.15, which is by 36.51% higher than their counterpart non-coop member farmers. The difference is statistically significant at 1% probability level.

Unique Contribution to Theory, Practice and Policy: The study recommended that Cooperatives should be encouraged to establish credit and saving units in their internal structure and/or work in collaboration with other saving and credit providing institutions (such as Cooperative Bank of Oromia) to be able to provide demand-driven credit services to member farmers

Keywords: *Smallholder Farmers, Certified Coffee Marketing Cooperative, Gross Annual Income, Propensity Score Matching Method, Ethiopia*

International Journal of Economics
ISSN 2518-8437 (Online)
Vol.8, Issue 5, No.5. pp 100 - 125, 2023

INTRODUCTION

Coffee is one of the most important agricultural commodities with a significant contribution to the growth and well-functioning of the economy, and the social stability of Ethiopia (Alemseged, 2012). It also serves as the main source of income to tens of millions of small-scale coffee farming populations, workers and traders (Alemseged, 2012; Abu and Tefera, 2013). While millions are dependent on the coffee sector (farming, picking, transportation, etc.), coffee also is the principal export commodity of the country (Tadesse and Yalem, 2014). It for example accounted for 47% of the total agricultural export value and 34% of total commodity export value of the country in 2017/18 (GAIN, 2019). The crop contributes approximately 10% of the total GDP of the country (Hirose, 2014).

The coffee sub-sector however is dominated by smallholder farmers, supplying a significant share (more than 90%) of the country's total coffee supply, while the remaining is contributed by plantation (commercial) coffee farmers (Petty *et al*., 2004; Babur, 2009; Stellmacher and Grote, 2011). Despite their importance, smallholder farmers face major problems in production, supply and marketing of coffee. The domestic coffee marketing system is not fair and efficient which has problems in product assembling, storing, handling, processing, quality inspection and grading, and in having fair and transparent trading system (Bastin and Matteucci, 2007; ECEA, 2008; Minten *et al*., 2015).

In the early 2000s, due to the interplay between increasing poverty of coffee smallholders in major producer countries and growing demands for healthier and more socially and environmentally-friendly produced coffee in larger consumer countries, certification of cooperatives has gradually gained wider significance worldwide (Petit, 2007; Stellmacher and Grote, 2011). Moreover, certification schemes are expected to significantly contribute to production of healthy and traceable coffee to consumers and improving the livelihoods and welfare of smallholder coffee farmers by enhancing their incomes through premium prices and stabilizing it through minimum prices (Stellmacher *et al*., 2010; Stellmacher and Grote, 2011; Ferris *et al*., 2014; Minten *et al*., 2015; Fikadu *et al*., 2017).

Despite the introduction and expansion of different smallholder and cooperative-based product certification schemes in the coffee sector of Ethiopia nearly two decades ago, there are not conclusive evidences on the impacts of cooperative-based coffee certification schemes on member farmers in Ethiopia in particular (Stellmacher *et al*., 2010; Jena *et al*., 2012; Amsaya *et al*., 2015; Amsaya, 2015; Minten *et al*., 2015; Fikadu *et al*., 2017). Specifically, there exist little and conclusive empirical evidences on the impacts of certified (e.g., Organic, Fairtrade or dual Organic-Fairtrade) certified coffee marketing cooperatives on member farmers. Many of the empirical studies carried out to investigate impacts of joining certified coffee marketing cooperatives on the livelihoods and incomes of smallholder farmers came up with mixed and inconsistent results which differ depending on the specific contexts (Tium, 2013; Jena *et al*., 2012; Jena *et al*., 2015; Jena *et al*., 2015; Amsaya, 2015; Fikadu *et al*., 2017).

Against this backdrop, this research paper aims to analyze factors influencing the decisions by smallholder farmers to join (Fairtrade, Organic or dual Fairtrade-Organic) certified coffee marketing cooperatives and the impact of membership on gross annual income earned by the member farmers in Jimma zone of Oromia region, Ethiopia.

International Journal of Economics
ISSN 2518-8437 (Online)
Vol.8, Issue 5, No.5. pp 100 - 125, 2023

www.iprjb.org

MATERIALS AND METHODS

Description of the Study Area

Ethiopia is a federal country divided into 11 regional states and 2 city administrations. Each region is subdivided into zones, and the zones into *woredas (districts)*, which are roughly equivalent to a county in the United States or UK. Woredas, in turn, are divided into peasant associations (PAs), or *kebeles*, an administrative unit consisting of a number of villages (Dercon *et al*., 2008).This study was conducted in Gomma and Limmu Kossa districts of Jimma zone, Oromia National Regional State of the country (see Figure 1). The zone is located in the southwestern part of the country about 360km away from Addis Ababa, the capital city of the country. The zone extends between $7^{0}13$'- 8°56' North latitudes and $35^{0}49$'-$38^{0}38$' east longitudes. Jimma zone is one of the major coffee producing areas with about 105,140 hectares of land covered with coffee, which includes small-scale farmers' holdings as well as state and privately owned plantations (Berhanu *et al*., 2015; Dagne *et al*., 2015). About 30-45% of the people in Jimma Zone directly or indirectly benefit from the coffee industry (Anwar, 2010). However, coffee is widely produced in eight districts, namely, Gomma, Manna, Gera, Limmu Kossa, Limmu Seka, Seka Chokorsa, Kersa and Dedo districts. Gomma and Limmu Kossa districts are among top coffee producing districts in Jimma zone. The majority of smallholder farmers in the districts are engaged in engaged in coffee production and marketing as their main livelihood acclivity and means of cash income (BoCPA, 2018).

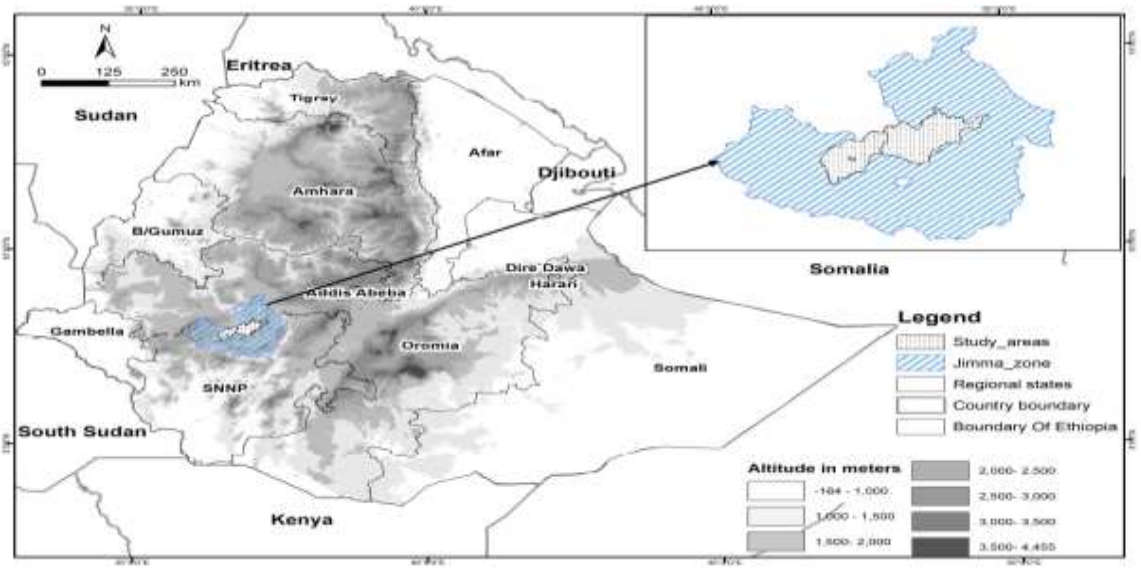

Figure 1: Map of the Study Area

Source: Tibebu Kasawmar, Staff of Addis Ababa University (2021)

In Jimma zone, there were 516 farmers' associations and 288 agricultural service cooperatives with 125468 male and 3307 female farmers, making up a total of 128775 member farmers in 2010 (BoFED, 2011). Based on the information obtained through personal contacts from Jimma zone offices of agriculture and cooperatives' promotion agency in 2018, there were about 60, 472 smallholder coffee farmers in Gomma and Limmu Kossa districts in 2017/18 coffee season. Of the total 60, 472 farmers, 18251 (30.18%) were members of primary cooperatives registered for Fairtrade, Organic or dual Fairtrade-Organic certified coffee marketing (see Table 1).

International Journal of Economics
ISSN 2518-8437 (Online)
Vol.8, Issue 5, No.5. pp 100 - 125, 2023

IPRJB
INTERNATIONAL PEER REVIEWED JOURNAL AND BOOK PUBLISHING

www.iprjb.org

Table 1: Selected Districts, Coffee Certification Schemes, Cooperatives, Kebeles and Samples of the Study

District	Cert scheme	Coop	Kebeles with access to cert coop	Population and sample sizes by cooperative membership status				Combined size	
				Members		Non-members		Pop	Sample
				Pop	Sample	Pop	Sample		
Gomma	Fairtrade cert	Choche Gudda	Bulbulo	146	5	705	49	851	39
			Choche Lemi	588	20	313	22	901	41
		Ilbu	Ilbu	469	16	592	41	1061	48
		Omo Beko	Omo Beko	878	29	281	20	1159	52
			Omo Guride	685	23	645	45	1330	60
	Subtotal	**3**	**5**	**2766**	**93**	**2536**	**177**	**5302**	**240**
Limmu Kossa	Organic cert	Tencho	Tencho	414	14	30	8	444	20
		Shogole	Gena Denbi	257	8	155	39	412	19
		Chime	Chime	291	10	39	10	330	15
		Mito Gundub	Mito Gundub	394	13	27	7	421	19
		Chefe Ilfeta	Chefe Ilfeta	414	14	96	24	510	23
	Subtotal	**5**	**5**	**1770**	**59**	**347**	**24**	**2117**	**96**
	Dual Org-FT cert	Babu	Babu	465	16	28	2	493	22
		Debello	Debello	368	12	36	3	404	18
		Harewa Jimate	Harewa Jimate	304	10	41	3	345	16
		Kacho Tirtira	Kacho Tirtira	620	21	50	3	670	31
	Subtotal	**4**	**4**	**1757**	**5 9**	**155**	**11**	**1912**	**87**
	Total	**12**	**14**	**6293**	**211**	**3038**	**212**	**9331**	**423**

Source: Cooperative promotion agencies of Jimma zone, Gomma and Limmu Kossa districts (2019)

Sampling Method and Data

The question of how large a sample to take arises early in the planning of any survey or experiment. This is an important question that should not be treated lightly. Sample size determination however can be done based on whether the samples are needed for estimating population mean or percentage or proportion under study (Kothari, 2004; Daniel and Cross, 2013). Since the aim of this study is to estimate the impact of cooperatives on gross annual income earned by the proportion of member farmers, the initial sample size (n_0) was determined

by using the formula for estimating the population proportion or percentage as given by the above-mentioned authors as follows:

$$n_0 = \frac{z^2 pq}{d^2} \quad (1)$$

$n_0 = 384$

Where, n_0 is the initial desired sample size; Z = 1.96 for a 95% desired confidence level, p is the estimated population percentage or proportion (which is usually set at 0.5 for a population proportion which is unknown *a priori*), q = 1-q = 1-0.50 = 0.50, and d = ±0.05 for a 95% desired precision level, respectively.

Then, a total of 423 sample farmers including 10% more samples in compensation for possible drop out of respondents or missing or incomplete survey questionnaires were selected from 14 kebeles covered by certified coffee marketing cooperatives for conducting the sample survey. Finally, a multistage stage sampling technique was employed to select 211 cooperative member and 212 non-cooperative member sample farmers based on probability proportional to the size of the respective coop member and non-coop member farmers in the total population in the two districts.

Methods of Data Analysis

Impact Evaluation

The outcome variables (impact indicators) are those that can express the effect of the treatment (cooperative membership in this case). Several approaches exist on how to evaluate the impacts of a treatment on the performance of an individual or an organization. The common practices, among these, are either quantitatively measuring the output or directly asking the performance levels based on different scales. Prior to taking a measurement on the variable of interest, it is important to determine the indicator that captures the impact under investigation (Dagne *et al*., 2015). Empirical studies however used agricultural yield and productivity level achieved, sales volume and prices received, and crop-specific and gross-annual incomes earned by households as indicators of economic impacts of cooperatives on member farmers (Zekarias and D'Haese, 2016; Fikadu *et a*l., 2017; Fikadu *et al*., 2020). In this study, as such, gross annual income earned (ETB) is used as an indicator of economic impact of of membership to certified coffee marketing cooperatives on member farmers in 2017/18 coffee season as it is one of the most commonly used proxy variables to analyze poverty and welfare impacts of certification schemes (Jena *et al*., 2012; Tium, 2013; Fikadu *et al*., 2020).

Econometric Analysis of Factors Influencing the Decisions to Join Cooperatives

The decisions to join (Fairtrade, Organic or dual Fairtrade-Organic) certified coffee marketing cooperative can be modeled using the random utility framework (Berhanu, 2012; Degnet and Mekbib, 2013). According to this framework, the actual utility level gained from membership to a certified coffee marketing cooperative by the member household is unknown. However, the household chooses to be member of a cooperative if the utility gained from membership (U_i^m) is larger than the utility of non-membership (U_i^n). The utility gain, (U_i^m - U_i^n) of cooperative membership can then be expressed as a function of observed characteristics (Z) in the latent variable model as follows:

$$C_i^* = \beta Z_i + \varepsilon_i \quad (2)$$

International Journal of Economics
ISSN 2518-8437 (Online)
Vol.8, Issue 5, No.5. pp 100 - 125, 2023

IPRJB
INTERNATIONAL PEER REVIEWED JOURNAL AND BOOK PUBLISHING

www.iprjb.org

Where C^*_i is an indicator of the latent cooperative membership and ε_i is the disturbance term. In turn, the observed dependent variable, which depicts cooperative membership status (C_i), where C_i=1 for member of a cooperative and C_i = 0 for non-member of a cooperative, is related to C^*_i as follows:

$$C_i = \begin{cases} 1 \text{ if } C_i > 0 \\ 0 \text{ otherwise} \end{cases} \quad (3)$$

The choices of the explanatory variables included in Z is guided by relevant economic theories and previous empirical studies on factors influencing decisions to join agricultural cooperatives by smallholder farmers in developing countries that include Ethiopia (**Wollni and Zeller, 2007**; **Bernard *et al*., 2008a**; **Bernard and Spielman, 2009**; **Francesconi and Heerink, 2011**; **Fischer and Qaim, 2012**; **Degnet and Mekbib, 2013**). The definitions and hypothesized influences of the socio-economic, institutional and infrastructure related explanatory variables on the decisions to join certified coffee marketing cooperatives thus are as given in Table 2.

Table 2: Econometric Model Variables Hypothesized to Influence Decisions to Join Cooperatives

Variable name	Description	Hypothesized influence
Dependent variable: Coop_(1= Yes; 0 otherwise)	Membership status of a household to (Fairtrade, Organic or dual Fairtrade and Organic) certified coffee marketing cooperative (1= Yes; 0 otherwise)	
Independent variable:		
Sex (Sex)	Sex of household head (1 = male, 0= female)	-
Age (Age)	Age of the household head in years.	+
Marital status (Marstat)	Marital status of the household head (1= Married, 0 = Single, divorced or Separated).	-
Literacy level (Literacy)	Literacy level of the household head (1 Literate= reads and/or writes, 0 Illiterate= cannot read and/or write at all)	+
Family size (FamS_ME)	Total number of family members (in adult equivalent).	+
Total livestock holding size	Total livestock holding size in tropical livestock unit (TLU).	-
Total land size under coffee production (LANDCP)	Land size land under coffee production in ha.	+
Coffee farming experience (CFarming_EXP)	Full years of experience in coffee farming.	+
Access to extension services (Access_extension)	It refers to whether the farmer had access to extension services (1= Yes, 0 otherwise).	+
Social capital (SCapital)	Membership to traditional rural organizations (e.g., *idir*[1]or *ekub* (rotating saving and credit association) (1= Yes, 0 otherwise).	+
Access to credit (Access_Credit)	It refers to whether the household head had access to credit services (1= Yes, 0 otherwise)	+
Off-farm income sources (Off_farm_Income)	Participation in off-farm income earning activities (such as serving as daily laborers on others farms) (1= Yes, 0 otherwise).	-
Non-farm income sources (Nonfrm_Income)	Participation in non-farm income earning activities (such as carpentry and non-farm labour markets) (1= Yes, 0 otherwise).	-
Distance to development agents' offices (DISTDAWM)	Walking distance traveled to reach to development agents' offices in minutes.	+
Distance to coffee marketing centers (DISTTRCMC)	Walking distance traveled to reach to coffee marketing centers in minutes .	-
Distance to cooperative's office (DISTCOOPWM)	Walking distance traveled to reach to cooperative's office in minutes.	+
Distance to all-weather road (DISTTRAWR)	Walking distance traveled to reach to the nearest all-weather road in minutes.	-

[1]Is a traditional association which provides insurance for members during death and other accidents (Degnet and Mekbib, 2013).

Estimation of Impact of Cooperatives Using the PSM Method

To test if there was significant difference in the means of the annual gross incomes earned per household between members and non-members of certified coffee marketing cooperatives the propensity score matching (PSM) method was used. According to Caliendo and Kopeinig (2008), there are steps in implementing PSM. These are estimation of the propensity scores, choosing a matching algorithm, checking on common support condition, testing the matching quality and sensitivity analysis. In what follows, we discuss each step one by one. The first step in the implementation of the PSM method is to estimate the predicted probability (propensity score) that a household would be member of a certified coffee marketing cooperative, conditional on observed covariates of the household using binary logit model (Caliendo and Kopeinig, 2008). The propensity score then was estimated as:

$$P(Z_i) = \text{Prob}(Z_i = 1|X_i) \quad (5)$$

where P is the propensity score, Z_i is the i^{th} household, the $P(Z_i)$ the propensity score of the i^{th} household and Prob $(Z_i = 1|X_i)$ is the probability of the i^{th} household to join certified coffee marketing cooperative membership conditional on observed personal, household, farm and location characteristics, X_i. These household level factors influencing the decision of a household to join a certified coffee marketing cooperative were identified based on relevant economic theories and previous empirical studies (see Table 2).

Once the propensity scores to join certified coffee marketing cooperatives are estimated, the next step is to match the propensity scores of the treatment group with that of the non-treatment or control group to identify households from both groups with similar propensity scores using appropriate matching estimators. In this step thus each member household of a certified coffee marketing cooperative was matched with that of the non-cooperative member household with similar propensity score values, in order to estimate the average treatment effect for the treated (ATT). Though various matching methods exist, the nearest neighbor matching (NNM), caliper or radius matching (CM) and kernel-based matching (KBM) methods are the most widely used matching methods (Caliendo and Kopeinig, 2008). However, the NNM and KBM methods are the most commonly used matching methods as they enable to ensure that members are matched with the non- members over a common region of the matching variables. Any remaining bias in the matching estimator can thus be attributed to unobserved characteristics (Jalan and Ravallion, 2003).

Checking overlap and finding common support region between the treatment and control groups is the third step in PSM matching (Bryson *et al*., 2002). The common support region is the area which contains the minimum and maximum propensity scores of treatment and control group households, respectively. Comparing the incomparable must be avoided, *i.e*., only the subset of the comparison group that is comparable to the treatment group should be used in the analysis (Caliendo and Kopeinig, 2008). No matches can be made to estimate the average treatment effects on the ATT parameter when there is no overlap between the treatment and non-treatment groups. In this study, the KBM method was used to pair cooperative members to similar non-members using the estimated propensity scores. The data was analyzed using alternative matching estimators to check the robustness of the results (Degnet and Mekbib, 2013).

In the fourth step, the average treatment effect on the treated (ATT), which in our case is the impact of membership to certified coffee marketing cooperatives on member farmers, is

estimated. Following Becker and Ichino (2002), the average treatment effect on the treated (ATT) was estimated as follows:

$$ATT = E(Y_1 - Y_0|X, M=1) = E(Y_1|X, M = 1) - E(Y_0|X, M = 1) \quad (6)$$

Where ATT denotes the effect of certified coffee marketing cooperative on average gross annual income of smallholder member farmers, Y_1 and Y_0 denote outcomes of members and non-members in certified coffee marketing cooperative, respectively, X is a vector of observed characteristics of the a sample farmer that may influence his/her decision to join certified coffee marketing cooperative and/or the expected outcome of membership or non-membership to such a cooperative. The Xs are used as explanatory variables, and M denotes cooperative membership decision (M = 1, if a farmer joined the cooperative or = 0, otherwise).

There is however fundamental problem when estimating ATT, given Equation (6), that it is impossible to observe a person's outcome for with and without the treatment at the same time. While it is possible to observe the post-intervention outcome, $E(Y_0|X, M =1)$, however, the counterfactual outcome of the i^{th} household when she/he does not get the treatment is not observable in the data. A solution to this problem is to construct the unobserved outcome which is called the counterfactual outcome that households would have experienced, on average, had they not joined the cooperatives (Rosenbaum and Rubin, 1983), and this is the central idea of matching.

The counterfactual outcome, $E(Y_0|X, M= 0)$, then is constructed by replacing the unobserved outcome value (missing value) of a cooperative member farmer, $E(Y_0|X, M= 1)$, with the expected outcome value (observed outcome value) of the matched non-cooperative member farmer who had similar observable characteristics with the cooperative member farmers. Therefore, Equation (6) can be re-written as:

$$ATT = E(Y_1 - Y_0|X, M=1) = E(Y_1|X, M=1) - E(Y_0|X, M = 0) \quad (7)$$

The conditional average effect of treatment on the treated however has a problem, if the number of the set of conditioning variables (X's) is high, and thus the degree of complexity for finding identical households both from members and non-members of certified coffee marketing cooperative becomes difficult to reduce the dimensionality problem in computing the conditional expectation, Rosenbaum and Rubin (1983) showed that instead of matching on the base of X's one can equivalently match treated and control units on the basis of the "propensity score" defined as the conditional probability of receiving the treatment given the values of X's. Therefore, Equation (7) was used to estimate the effect of membership to certified coffee marketing cooperative on gross annual average income of cooperative member farmers.

To use PSM for estimating ATT, however, two important assumptions must be satisfied. The effectiveness of matching estimators as a feasible estimator for impact evaluation however depends on two fundamental assumptions (Rosenbaum and Rubin, 1983). These assumptions are the conditional Independence Assumption (CIA) and the assumption of common support condition. The CIA imposes a restriction that choosing to join a cooperative is purely random for similar individuals. As a consequence, this assumption excludes the familiar dependence between outcomes and membership to a cooperative that lead to a self selection problem (Heckman *et al*., 1998). The conditional average effect of treatment on the treated has a problem, if the number of the set of conditioning variables (X's) is high, and thus the degree of complexity for finding identical households both from members and non-members of certified coffee marketing cooperative becomes difficult. To reduce the dimensionality problem in computing the conditional expectation, Rosenbaum and Rubin (1983) showed that

instead of matching on the base of X's one can equivalently match treated and control units on the basis of the "propensity score" defined as the conditional probability of receiving the treatment given the values of X's.

The assumption of the common support region implies that the P(x) lies between 0 and 1, where P(x) denotes the propensity scores of both members and non-members of certified coffee marketing cooperatives in our case. This restriction implies that the test of the balancing property is performed only on the observations whose propensity score belongs to the common support region of the propensity scores of treated and control groups (Becker and Ichino, 2002). Individuals that fall outside the common support region would be excluded in the treatment effect estimation. This is an important condition to guarantee improving the quality of the matching used to estimate the ATT. Moreover, implementing the common support condition ensures that a person with the same X values (explanatory variables) has a positive probability of being both member and non-member of a certified coffee marketing cooperative (Heckman *et al*., 1999). This implies that a match may not be found for every individual sample.

Bootstrap standard errors were used to test the statistical significance of the estimated ATT in order to account for the variation caused as a result of the matching process. Finally, the robustness of the evaluation results was tested for their sensitivity for the hidden variables that may affect cooperative membership decision of households.

RESULTS AND DISCUSSION

Descriptive Statistics

Table 3 presents descriptive statistics of categorical pre-treatment socio-economic characteristics of the sample farmers. Results show that 234 (62.07%) of the total 377 samples farmers were members of certified coffee marketing cooperatives. Amongst the cooperative members, 83 (35.47%), 84 (35.90%) and 67 (28.63%) were members of Fairtrade, Organic and dual Fairtrade and Organic certified coffee marketing cooperatives, respectively. Regarding marital status, 340 (90.19 %) were married household heads. In terms of literacy level, 319 (84.61%) were literate (*i.e.*, they can read and/or write). On the hand only 75 (19.88%) of the total sample farmers had social capital or networks (*i.e.*, member of *idir*, *senbete* or *ekub*, *etc.*). With regard to access to extension services, 260 (68.96%) of the total sample farmers reported they had access to extension services related to coffee production, farm management and post-harvest handling practices. Development agents and cooperative officials were reported as the main sources of the extension services. On the other hand, 329 (87.27%) of the total sample farmers responded that they participated in various training programs related to coffee production and marketing activities. The results on income earning sources indicate that on-farm income was the sole source of income to all of the sample farmers. Only 232 (61.54%) and 48 (12.73%) of the sample farmers earned incomes from off-farm and non-farm income sources, respectively. However, the proportion of coop member farmers (15.81%) who earned income from the non-farm income sources is significantly greater than the proportion of non-coop member farmers (7.69%) who earned income from the non-income sources. The difference is significant at 10% probability level.

International Journal of Economics
ISSN 2518-8437 (Online)
Vol.8, Issue 5, No.5. pp 100 - 125, 2023

IPRJB
INTERNATIONAL PEER REVIEWED JOURNAL AND BOOK PUBLISHING

www.iprjb.org

Table 3: Descriptive Statistics of Categorical Pre-Treatment Characteristics of the Sample Farmers

Pre-treatment variable		*Pooled sample (N=377)*		*Cooperative membership status*				*Chi² test*
				Non-members (N=143)		Members (N=234)		
		Freq.	%	Freq.	%	Freq.	%	
Coop membership status (Yes if a Member)	No	143	37.93	114	43.02	29	25.89	**0.002****
	Yes	234	62.07	151	56.98	83	74.11	
	Total	**377**	**100.00**	**143**	**100.00**	**234**	**100.00**	
Sex (Yes if Male)	No	21	5.57	8	5.59	13	5.56	0.987
	Yes	356	94.43	135	94.41	221	94.44	
	Total	**377**	**100.00**	**143**	**100.00**	**234**	**100.00**	
Religion (Yes if Muslim)	No	63	16.71	29	20.28	34	14.53	0.147
	Yes	314	83.29	114	79.72	200	85.47	
	Total	**377**	**100.00**	**143**	**100.00**	**234**	**100.00**	
Marital status (Yes if Married)	No	36	9.55	18	15.59	18	7.69	0.117
	Yes	341	90.45	125	87.41	216	92.31	
	Total	**377**	**100.00**	**143**	**100.00**	**234**	**100.00**	
Literacy level (Yes if Literate)	No	58	15.39	21	14.69	37	15.81	0.769
	Yes	319	84.61	122	52.31	197	84.19	
	Total	**377**	**100.00**	**143**	**100.00**	**234**	**100.00**	
Social capital (Yes if Member of *idir* or *coop*)	No	302	80.12	124	86.71	178	76.07	**0.012****
	Yes	75	19.88	19	13.19	56	23.93	
	Total	**377**	**100.00**	**143**	**100.00**	**234**	**100.00**	
Contact with DA (Yes if the sample had contact)	No	34	9.02	11	7.69	23	9.83	0.482
	Yes	343	90.98	132	92.31	211	90.17	
	Total	**377**	**100.00**	**143**	**100.00**	**234**	**100.00**	
Access to extension services (Yes = if the sample farmer had access to extension)	No	17	31.04	7	4.90	10	4.27	**0.077***
	Yes	260	68.96	136	95.10	224	95.73	
	Total	**377**	**100.00**	**143**	**100.00**	**234**	**100.00**	
Access to training (Yes = if the sample farmer had access to training)	No	48	12.73	21	14.69	27	45.09	0.374
	Yes	329	87.27	122	85.31	207	54.91	
	Total	**377**	**100.00**	**143**	**100.00**	**234**	**100.00**	
Off-farm income sources (Yes = 1)	No	145	38.46	57	39.86	88	37.61	0.413
	Yes	232	61.54	86	60.14	146	62.39	
	Total	**377**	**100.00**	**143**	**100.00**	**234**	**100.00**	
Non-farm income sources (Yes = 1)	No	329	87.27	132	92.31	197	84.19	**0.097***
	Yes	48	12.73	11	7.69	37	15.81	
	Total	**377**	**100.00**	**143**	**100.00**	**234**	**100.00**	

*Source: Own Survey Data (2019).; Key: ***, **, And * Refer To Probability at 1%, 5% and 10% Probability Level, Respectively.*

Table 4 below presents the results of descriptive statistics of the relevant continuous socioeconomic and other proximity to offices and infrastructure related characteristics of the sample farmers. As shown in table 4, the age of the total sample respondents ranged from 19 to 100 years with a mean age of 43.17 years. The average family size was 3.63 in adult equivalent. On average, a sample farmer had 4.77 livestock holding size in tropical livestock unit and 2.18 ha of agricultural land, respectively. Cereals, flowering and oil crops, coffee, khat

(*Katha edulis*), vegetables and sugar cane were the main crops cultivated by the sample farmers. However, fruit crops such as orange, mango, avocado, papaya and sugar apple) were also grown on mini plots of land. Regarding coffee production, the sample farmers on average had 1.15 ha of land under coffee production in 2017/18 G.C. coffee season, with the average 18.86 years of coffee farming experience. However, a sample farmer needed to walk on average for 29.40, 36.15 and 55.14 minutes to reach to his/her nearest coffee plots, development agent (DA) office and nearest coffee marketing center, respectively. There is significant difference in the means of the walking distances traveled in minutes to reach to the DA's office between coop member and non-coop member households at 5% probability level. The implication is that the non-cooperative member farmers needed to walk for longer time than their counter but cooperative member farmers needed to reach to DA's office.

On the other hand, the sample farmers on average needed to walk for 36.32 minutes to reach to all-weather road. However, there is significant difference in the walking time needed to reach to all-weather road between non-coop member and coop member farmers at 5% probability level. The implication is that coop member farmers are relatively closer to all-weather roads than the non-coop member farmers. The results on income earned indicate (in Table 3) that the sample farmers earned incomes from three income sources, *viz.*, on-farm, off-farm and non-farm income sources), respectively. They earned on average ETB 13253.20, 6784.79 and 5440.10 gross annual income from on-farm, off-farm and non-farm income earning sources, respectively. The total average gross annual income earned by the sample farmers was ETB 41745.64. However, the gross annual incomes earned by the coop member and non-coop member farmers were ETB 48358.36 and 30924.81, respectively. But there is no significant difference between the average gross annual incomes earned between the two groups.

International Journal of Economics
ISSN 2518-8437 (Online)
Vol.8, Issue 5, No.5. pp 100 - 125, 2023

www.iprjb.org

Table 4: Descriptive Statistics of Continuous Pre-Treatment Characteristics of the Sample Farmers

Pre-treatment variable	Combined (N=377)		Cooperative membership status				Combined difference in		*t-test*
			Non-members (N=143)		Members (N=234)				
	Mean	SD	Mean	SD	Mean	SD	Mean	SD[a]	
Age in years	43.17	11.19	42.44	12.39	43.62	10.39	-1.179	1.24	0.84
Coffee farming experience in years	18.86	8.615	18.62	9.84	19.00	7.79	-0.382	0.97	0.66
Family size in adult equivalent	3.60	1.60	3.50	1.60	3.67	1.61	-0.170	0.17	0.84
Livestock holding size in TLU	4.77	2.42	4.68	2.37	4.82	2.46	-0.144	0.27	0.70
Total land size owned, hectare	2.18	2.016	1.71	1.37	2.46	2.28	-0.759	0.19	0.19
Coffee land size, hectare	1.15	1.24	0.93	1.145	1.286	1.274	1.149	0.13	1.00
Walking distance to coffee plot in minutes	29.40	25.79	31.18	28.04	28.31	25.79	2.864	2.25	0.148
Walking distance to DA's office in minutes	36.15	26.43	39.48	28.19	34.11	25.14	5.368	2.32	**0.028****
Walking distance to coffee marketing center in minutes	55.14	38.93	55.79	38.68	54.74	39.16	1.054	3.62	0.400
Walking distance to all-weather road in minutes	36.32	35.32	41.11	35.89	33.37	34.71	7.736	3.21	**0.020****
On-farm income earned in ETB	13253.20	11823.57	9435.93	6611.61	15585.97	13584.76	-6150.04	1255.91	1.000
Off-farm income earned in ETB	6784.79	5055.365	5677.65	4226.52	7380.934	5377.46	-1703.28	797.208	0.972
Non-farm income earned in ETB	5440.10	6261.213	2377.14	1196.04	6599.054	6993.055	-4221.91	1625.85	0.985
Total income earned in ETB	41745.64	34987.41	30924.81	25857.88	48358.36	38106.86	-17433.55	3522.98	1.000

Source: Own Survey Data (2019).

***, ** and * Stand For Probability* at the 1%, 5% and 10% Levels, Respectively.

International Journal of Economics
ISSN 2518-8437 (Online)
Vol.8, Issue 5, No.5. pp 100 - 125, 2023

www.iprjb.org

[a]STD for mean difference = $\sqrt{\frac{STD_1^2}{N_1} + \frac{STD_2^2}{N_2}}$

Econometric Analyses

Econometric Model Results of the Determinants of the Decisions to Join Cooperatives

As shown in Table 5, the binary probit model was used for identifying factors influencing decisions to join cooperatives. The model sufficiently fitted the data as the Wald chi-square (LR χ^2 (14) = 47.83) is significant at 1% probability level indicating that the null hypothesis of no explanatory power of the model was strongly rejected. The pseudo-R^2 is 0.108, which is moderately low, indicating that there was no systematic difference in the distribution of covariates between cooperative member and non-cooperative member farmers. While the coefficients of the covariates are used to report their relationships on the decisions to join certified coffee marketing cooperatives, their P>|z| values are used for explaining the probability levels influences on the decisions to join certified coffee marketing cooperatives. The marginal effects of the dummy variables after probit model estimation are used to report their effects on the decisions to join cooperatives. However, the coefficients of the continuous variables are used to explain their respective effects on the decisions to join the cooperatives.

The results in Table 6 show that the decisions to join (FT, Org or dual FT-Org) certified coffee marketing cooperatives were significantly influenced by sex, marital status, total livestock holding, total land size under coffee production (ha), log total quantity of coffee produced in kg, access to credit, and walking distances to DA's office and nearby coffee marketing center and all-weather road in walking minutes, respectively. Sex of the household head had a negative and statistically significant relationship with the decision to join cooperative at 10% probability level. The finding of this study is consistent with our hypothesis. The finding of this study is consistent with the findings of previous empirical evidences (e,g., Bernard *et al*., 2008; Dagne *et al*., 2017 and Fikadu *et al*., 2017) in which gender of the household head negatively and significantly influenced the decisions to join agricultural cooperatives by rural households in Ethiopia.

Marital status of the household head (*i.e.*, being married) had a positive and significant relationship with the decision to join certified coffee marketing cooperative at 5% probability level. The finding is against the hypothesis but consistent with previous empirical studies. Dagne *et al*. (2015) for example found that marital status had a negative and significant influence on the decisions to join agricultural cooperatives among rural households in Ethiopia. The empirical evidences are plausible since married households expected to have more access to information regarding cooperatives owing to their better social capital than the unmarried household heads. Thus, married household heads are more likely to join cooperatives than the unmarried household heads. The finding on social capital also depicts that farm households having a social capital (who were members of *idir* or *ekub*) were more likely to join certified coffee marketing cooperatives than the household heads with no such social capital.The total livestock holding size (as measured in tropical livestock unit, TLU) negatively and statistically significantly influenced the decision to join cooperative at 5% probability level. This finding agrees with its hypothesized influence and empirical evidences (Fikadu *et al*., 2017; Manda *et al*., 2020). Fikadu *et al*. (2017) find that livestock holding in TLU had a negative and significant influence on the decisions to join certified coffee marketing cooperatives at 1% probability level. Similarly, Manda *et al*. (2020) find that livestock ownership positively and significantly influenced the decision to join agricultural cooperatives at 5% probability level.

On the other hand, land size under coffee production (in ha) had a positive and statistically significant relationship with the decision to join cooperatives at 1% probability level. The finding is in agreement with the hypothesize. Previous empirical evidences also support this finding (Bernard *et al*., 2008; Bernard and Spielman, 2009; Zekarias and D'Haese, 2016). Bernard *et al*. (2008) and Bernard and Spielman (2009) indicate that landholding size had a positive and significant influence on the probability of participation in agricultural cooperatives among smallholder farmers in Ethiopia. However, they report that the squared landholding size rather had a negative and significant influence on the decisions to join cooperatives, reflecting what they call the middle class effect of landholding size on the decision to join cooperatives. According to the authors, though the probability of cooperative participation increases for each additional hectare of landholding, its marginal effect on cooperative membership decision decreases with the amount of land after a maximum is reached.

The result on credit access indicates that credit access negatively and statistically significantly influenced the decision to join cooperatives at 10% probability level. The finding is against the hypothesized influence and previous empirical evidences **(**Manda *et al*., 2020). Manda *et al*. (2020) shows that access to credit influenced positively and significantly the decision to join agricultural cooperatives in Zambia at 5% probability level. Against these findings, Jena *et al*. (2015) find that access to credit from cooperatives positively and significantly influenced the decisions to join cooperatives registered for FT and Org certified coffee marketing in Jinotega, Nicaragua. The walking distance traveled to reach to DA's office negatively and significantly influenced the decisions to join certified coffee marketing cooperatives at 5% probability level. Distance to DA's office has a direct implication on not only access but also frequency of access to information by smallholder farmers as the DA is the main source of such information to the farmers. Thus, farmers farther away from DAs offices are less likely to have sufficient information about farmers' organizations and so do they less likely join cooperatives.

On the other hand, the distance traveled to reach to the nearest coffee marketing center had a positive and significant effect on the decision to join certified coffee marketing cooperatives at 5% probability level (see Table 5 above). This finding is in agreement with the hypothesized influence of the variable. The finding is plausible since farmers are more like to join cooperatives with coffee marketing or collection centers nearby their villages (*ibid*.). Previous empirical studies (e.g., Jena and Grote, 2015; Zekarias and D'Haese, 2016; Musa and Hiwot, 2017) also support the finding of this study. However, walking distance to all-weather road in minutes had a negative and statistically significantly influence on the decisions to join certified coffee marketing cooperatives at 10% probability level. This finding is consistent with the hypothesis. Previous empirical evidences (Degnet and Mekbib, 2013). Degnet and Mekbib (2013) found similar findings in which road distance had a positive and significant effect on the decision to join agricultural cooperatives by smallholder farmers in Ethiopia.

International Journal of Economics
ISSN 2518-8437 (Online)
Vol.8, Issue 5, No.5. pp 100 - 125, 2023

www.iprjb.org

Table 5: Binary Probit Model Results of Determinants of the Decisions to Join Cooperatives

Variable	Coef.	z	P>|z|	dy/dx*
The dependent variable = Decision to join cooperative (1= Yes, 0 = No)				
The independent variable:				
Sex* (1= Male, 0 = Female)	-0.628	-1.69	**0.091***	-0.198
Age in years	0.012	1.28	0.201	0.004
Marital status* (1= Married, 0 Otherwise)	0.703	2.05	**0.041****	0.273
Family size in adult equivalent	-0.063	-1.11	0.267	-0. 023
Total livestock holding in tropical livestock unit (TLU)	-0.070	-2.01	**0.044****	-0.026
Total land size under coffee production in ha	0.318	2.43	**0.015****	0.117
Coffee farming experience in years	-0.018	-1.44	0.151	-0.007
Log total quantity of coffee produced in kg (log_TQCH)	0.511	1.83	**0.067***	0.189
Social capital* (1= Member of *idir*, *senbete* or *ekub*, *etc.*, 0 otherwise)	0.274	1.36	0.174	0.098
Access to extension services* (1= Yes, 0 otherwise)	0.459	1.22	0.222	0.178
Access to credit* (1= Yes, 0 otherwise)	-0.353	-1.85	**0.064***	-0.134
Walking distance to DA's office in minutes	-0.007	-2.24	**0.025****	-0.003
Walking distance to nearest coffee marketing center in minutes	-0.008	2.83	**0.005****	0.003
Walking distance to all-weather road in minutes	-0. 004	-1.40	0.162	-0.002
Constant	-1.612	-1.65	**0.098***	
Number of obs.		336		
Wald chi^2 (14)		47.83		
Prob > chi^2		**0.000*****		
Pseudo R^2		0.108		
Log likelihood		-197.852		

Source: Own Survey Data (2019).

*dy/dx is for discrete change of dummy variable from 0 to 1, and shows marginal effect of the variable after probit model.

Note: ***, ** and * represent 1%, 5% and 10% probability level, respectively.

Impact of Cooperatives on Gross Annual Income Earned

After estimating the propensity scores to join (FT, Org or dual FT-Org) certified coffee marketing cooperatives using the binary probit model, the next step is to determine the common support region. The results in Table 6 depict that the propensity scores of both treated and control groups of the sample households vary between 0.213 and 0.996 (with mean =0.628) for coop member households (treatment group) and between 0.080 and 0.928 (with mean =0.540) for non-coop member households (control group). Then, the range of the propensity scores in the common support region for both the treatment and control groups was selected based on the minima and maxima selection criteria. The basic criterion of this approach is to delete all observations whose propensity score is smaller than the minimum and larger than the maximum in the opposite group (Caliendo and Kopeinig, 2008). Thus, based on these selection criteria, the common support region for the two groups would then lie between 0.213 and 0.928 propensity scores. In other words, the sample households in treatment and control groups with estimated propensity scores less than 0.213 and greater than 0.928 were excluded from further matching exercise. As a result of this restriction, of the total 336 (211 treated and 125 control) sample farmers considered for propensity score analysis, 320 sample farmers (195 from the treated and all 125 from the control groups) were retained and all of the remaining 16 sample farmers from the treated group were discarded from further analysis (See figures 2 to 4).

International Journal of Economics
ISSN 2518-8437 (Online)
Vol.8, Issue 5, No.5. pp 100 - 125, 2023

www.iprjb.org

Table 6: Distribution of the Estimated Propensity Scores to Join Cooperatives

Group	Obs.	Mean	Std. Dev.	Min	Max	Obs on support
Coop member HHs	211	.680	.180	.213	.996	195
Non-coop member HHs	125	.540	.152	.080	.928	125
Total	**336**	**.628**	**.183**	**.080**	**.996**	**320**

Source: Own survey data (2019)

HHs = Households

Figure 2 portrays the distribution of the households with respect to their estimated propensity scores. Most of the treatment households are found in the right side and partly in the middle. On the other hand, most of control households are found in the left side of the distribution. In general, the graph shows that there is wide area in which the propensity scores of cooperative member households are similar with that of non-cooperative member households.

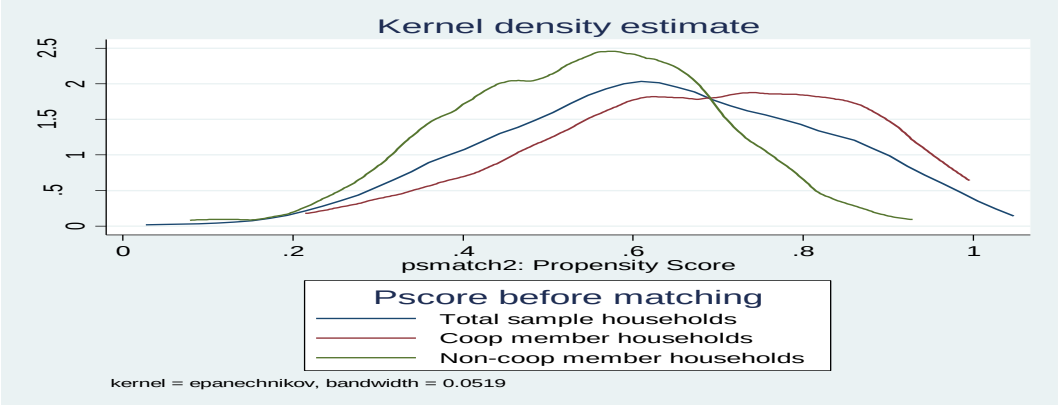

Figure 2. The Kernel Density Distribution of Propensity Scores of Coop Member and Non-Coop Member Households

Source: Own Survey Data (2019)

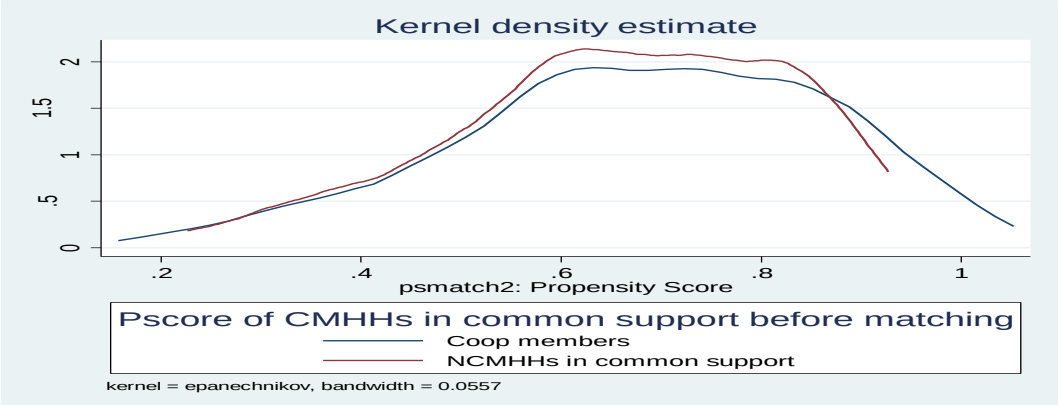

Figure 3: The Propensity Scores of Coop Members in Common Support before Matching.

Source: Own Survey Data (2019)

NCMHHS = Non-Cooperative Member Households

International Journal of Economics
ISSN 2518-8437 (Online)
Vol.8, Issue 5, No.5. pp 100 - 125, 2023

www.iprjb.org

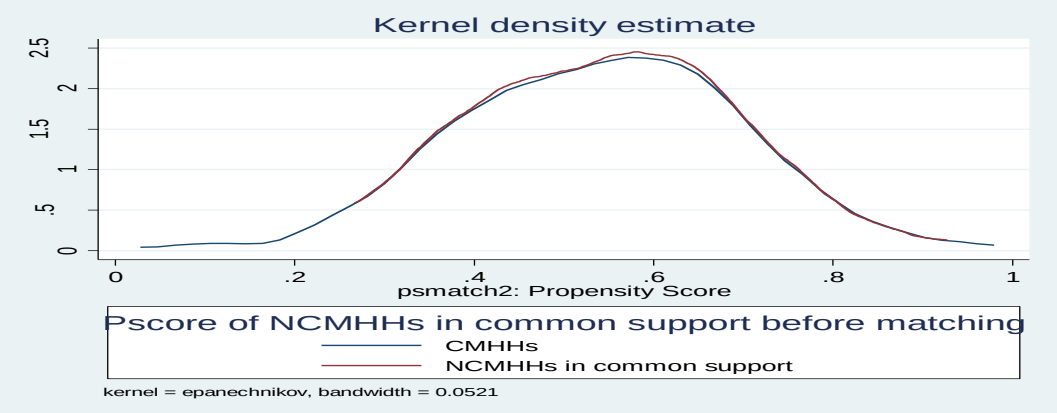

Figure 4: Propensity Scores of Non-Coop Members in Common Support before Matching

Source: Own Survey Data (2019)

CMHHs = Cooperative member households; NCMHHs = Non-cooperative member households

Figures 3 and 4 depict the distribution of estimated propensity scores, with and without the imposition of the common support condition, for coop member and non-coop member households, respectively.

After estimating the propensity scores and determining the common support region, the next step is finding an appropriate matching estimator. In this regard, alternative matching estimators can be employed in matching the cooperative members and comparison households in the common support region. The final choice of a matching estimator was done by taking different criteria such as equal means test referred to as the balancing test (Dehejia and Wahba, 2002), pseudo R^2 and matched sample size. Specifically, a matching estimator which balances all explanatory variables (*i.e*., results in insignificant mean differences between the two groups), a model which bears a lower pseudo R^2 value and results in larger matched sample size is a preferable matching algorithm (Alemu, 2010;Yemisrach *et al*., 2011).

Table 7 depicts the results of the matching qualities of the three matching methods. Thus, based on the above mentioned performance criteria, the kernel matching method (bw =0.1) was used for identifying the common support region for both coop member and non-coop member households because it retained the highest number of matched sample households. Thus, the kernel matching method as a whole is suitable for bootstrapping standard errors of the average treatment effects (Alemu, 2010; Tihitina, 2011; Tium, 2013).

Thus, using the kernel matching method (bw =0.1), 336 sample households (211 from cooperative member and 125 from non-cooperative member households) out of the total 377 sample households were retained for further matching exercise.

International Journal of Economics
ISSN 2518-8437 (Online)
Vol.8, Issue 5, No.5. pp 100 - 125, 2023

www.iprjb.org

Table 7: Performance of Matching Qualities of the Different Estimators (Algorithms)

Matching estimator		Matching performance criteria			
		Balancing test*	**Pseudo-R^2**	**Mean bias**	**Matched sample size**
Nearest neighbor matching	Neighbor (1)	10	0.054	4.34	324
	Neighbor (2)	10	0.048	4.32	337
	Neighbor (3)	12	0.033	4.32	337
	Neighbor (4)	11	0.026	4.32	336
	Neighbor (5)	12	0.031	4.32	337
Kernel matching	Bandwidth (0.01)	11	0.026	4.32	317
	Bandwidth (0.1)	**11**	0.026	**4.32**	**336**
	Bandwidth (0.25)	11	0.026	4.32	336
Radius caliper matching	Caliper (0.10)	11	0.026	4.32	234
	Caliper (0.25)	11	0.025	4.32	250
	Caliper (0.50)	11	0.025	4.32	250

Source: Own Survey Data (2019)

*Number of explanatory variables with no statistically significant mean differences between the matched groups of participant and non-participant households.

After choosing the best performing matching algorithm, the next job is to check the balancing properties of the propensity scores and covariates between the treated and control groups by using the selected matching algorithm which is kernel matching with 0.1 bandwidth. Table 8 shows the balancing tests of the propensity scores and covariates of the matching groups before and after matching. As such, the results indicate that the propensity scores and covariates of the matching groups after matching were insignificant making it possible to estimate the average treatment effect of cooperative membership on the gross annual income earned by cooperative member households.

International Journal of Economics
ISSN 2518-8437 (Online)
Vol.8, Issue 5, No.5. pp 100 - 125, 2023

IPRJB
INTERNATIONAL PEER REVIEWED JOURNAL AND BOOK PUBLISHING

www.iprjb.org

Table 8: Balancing Tests of the Propensity Scores and Covariates of the Matching Groups

Covariate	Matching group	Kernel-based matching (bw: 0.1)				
		Mean		%bias	t-test	
		Treated	Control		t	p>|t|
_ pscore	Unmatched	0.64584	0.60348		-3.942	1.000
	Matched	0.64487	0.64521	-0.3	-0.04	0.965
Sex	Unmatched	0.9444	0.9441		0.0003	0.987
	Matched	0.94811	0.9500	-0.8	0.09	0.930
Age	Unmatched	43.61966	42.44056		-0.9928	0.839
	Matched	44.104	43.341	6.9	0.71	0.475
Literacy	Unmatched	0.8419	0.8531		0.0865	0.769
	Matched	0.83491	0.84151	-1.9	-0.18	0.854
Family size, AE	Unmatched	3.66692	3.49762		-0.9946	0.8397
	Matched	3.7456	3.8293	-5.4	-0.56	0.577
Livestock holding size, TLU	Unmatched	4.82208	4.75279		-0.2556	0.601
	Matched	4.8141	4.8195	-0.2	-0.02	0.981
Coffee farming experience, years	Unmatched	19.00427	18.62238		-0.4172	0.662
	Matched	18.769	18.976	-2.5	-0.24	0.812
Extension access	Unmatched	0.9573	0.9510		0.0796	0.778
	Matched	0.95283	0.97547	-10.2	-1.25	0.211
Training access	Unmatched	0.8846	0.8531		0.7911	0.374
	Matched	0.88208	0. 90755	-7.7	-0.85	0.394
Off-farm income source	Unmatched	0.3846	0.3427		0.6713	0.413
	Matched	0.3868	0.3632	4.8	0.500	0.617
Non-farm income source	Unmatched	0.1624	0.0979		3.1046	**0.078***
	Matched	0.15566	0.12925	7.8	0.78	0.438
DISTDAWM	Unmatched	34.1111	39.4790		1.9200	**0.028****
	Matched	34.863	36.835	-7.2	-0.78	0.437
DISTCOOPWM	Unmatched	35.5769	39.9475		1.4862	0.069
	Matched	36.34	35.114	4.2	0.47	0.635

Source: Own Survey Data (2019).

Key: ***, **, and * refer to probability at 1%, 5% and 10% probability level, respectively.

Based on the above matching tests, all the propensity scores and covariates of the matching groups after matching were selected for estimating the average treatment effect of cooperative membership on gross annual total income earned because their mean values were statistically insignificantly different between the treatment and control groups of the sample farmers. Table 9 presents the results on the average treatment effect of membership to certified coffee marketing cooperative on gross annual income earned by cooperative member farmers computed using the kernel PSM method (bandwidth = 0.1). The results show that membership to certified coffee marketing cooperative had a positive and significant effect on the average annual gross income earned (ETB) by the member farmers. The average gross annual income earned by the coop member farmers was ETB 14639.15, which is by 36.51% higher than that of the non-cooperative member farmers. The difference is statistically significant at 1% probability level.

International Journal of Economics
ISSN 2518-8437 (Online)
Vol.8, Issue 5, No.5. pp 100 - 125, 2023

www.iprjb.org

Table 9: Average Treatment Effect of Coop Membership on Gross Annual Income Earned (ETB) Using Kernel Matching Method (Bw= 0.1)

Outcome variable	PSM group			Mean	
	Treated	Control	Difference	S.E.[b]	T-stat
Gross annual income earned (ETB)	48903.79	34264.64	14.639.15	3697.22	**4.53*****

Source: Computation Based on Own Survey Data (2019)

Key:*** indicate statistical significance at 1% probability level.

[b]Bootstrapped standard errors (S.E.) obtained after 100 replications.

The bootstrapped standard errors of the mean of the treatment effect (*i.e.*, cooperative membership) on gross annual income earned in Ethiopian Birr, obtained after 100 replications, indicate that there are significant differences in the variances of the average of gross annual income earned between cooperative member and non-cooperative member household (see Table 10).

Table 10: Bootstrapped Statistics of Standard Errors of the Average Treatment Effect

Variable	Reps	Observed	Bias	Std. Err.	[95% Conf. Interval]		
Tot income earned (ETB)	100	6561.62	830.12	4471.3	-2310.415	15433.65	(N)
					362.452		(P)
					-1407.292		(BC)

Source: Computation Based on Own Survey Data (2019)

Note: Reps = Replications; N = normal' P = percentile; BC = bias-corrected

Last but not the least, the result on the Rosenbaum bounding sensitivity analysis of the average treatment effect on the treated (ATT) (*i.e.*, the effect of certified coffee marketing cooperative membership) on average gross annual income earned by the coop member households, indicates that the observed treatment effect of certified coffee marketing cooperative membership on the average gross annual income earned was insensitive to selection, unobservable or hidden biases (see Table 11).

Table 11: Sensitivity Analysis of the ATT Using the Rosenbaum Bounding Method

Gamma	sig+	sig-
1	0	0
2	0	0
3	0	0
4	0	0
5	2.6e-14	0
6	3.2e-12	0
7	1.0e-10	0
8	1.3e-09	0
9	1.0e-08	0
10	5.2e-08	0

Source: Computation Based on Own Survey Data (2019).

*gamma - log odds of differential assignment due to unobserved factors, sig+ - upper bound probability level, sig- - lower bound probability level

CONCLUSION AND RECOMMENDATIONS

The study analyzed factors influencing the decisions to join FT, Org or dual FT-Org certified coffee marketing cooperatives and its impact on gross annual income earned by the member farmers in two major coffee growing district of Jimma zone, southwestern Ethiopia. The binary probit model results show that the decision to join (FT, Org or duak FT-Org) certified coffee marketing cooperatives was negatively and significantly influenced by sex, total livestock holding size, credit access, and walking distances to DA's office, nearby coffee marketing center and all-weather road in minutes, respectively. However, marital status, total coffee land size (ha), log total quantity of coffee produced (kg) had positive and significant influences on the decisions to join these cooperatives. Regarding the impact of cooperative membership, the PSM results show that certified coffee marketing had positive and significant effect on average gross annual income earned by the member farmers.

It is thus important to strengthen existing certified coffee marketing cooperatives so that members continue to derive income benefit from the cooperatives. No members residing in kebeles covered by such types of cooperatives should be encouraged to join such cooperatives and derive membership benefits. Moreover, we call for promotion of the establishment cooperatives registered for coffee certification schemes in kebeles without such cooperatives by smallholder coffee farmers so that they earn better income.

In order to increase the likelihood of non-members joining existing certified coffee marketing cooperatives however both the public sector, the cooperatives themselves and other stakeholders should work hard to identify and address gender-and marital status-based factors that influence cooperative membership decisions. Moreover, cooperatives are advised to incorporate credit or loan schemes in order to attract non-members non-members join them. On the other hand, concerned stakeholders (the cooperatives themselves and development agents' (DAs')) should provide information regarding the relevance of cooperatives specially for smallholder farmers relatively living far away from the cooperatives' and development agents' (DAs') offices using various communication channels.

On the other hand, cooperatives should establish harvested coffee collection centers nearby farmers' residences so as to attract non-members join the cooperatives. Moreover, factors hindering decisions to join certified coffee marketing cooperatives by smallholder farmers with relatively smaller coffee land size (ha) and lower coffee yield should be identified and addressed in order to encourage such farmers join the cooperatives and derive membership benefits such as better gross annual income.

Cooperatives should also be encouraged to establish credit and saving units in their internal structure and/or work in collaboration with other saving and credit providing institutions (such as Cooperative Bank of Oromia) to be able to provide demand-driven credit services to member farmers (Zekarias and D'Haese, 2018; Minten *et al.*, 2018).

Acknowledgments

The authors are grateful to the Ministry of Education for funding the research through Haramaya University. We also owe special thanks to the officials of bureaus of agriculture and cooperative promotion agencies of Iimma zone, and Gomma and Limmu Kossa districts of Jimma zone for generously providing the information needed throughout the study. We are highly indebted to the farmers, enumerators and supervisors for their wholehearted participation in the study and provision of invaluable information in the course of data collection. Last but not the least, we wish to thank friends, colleagues and staff of the

Department of Rural Development and Agricultural Extension at Haramaya University and Madda Walabu University for their encouragements and invaluable supports which made this research possible.

Funding

This research was funded by the Ministry of Education through Haramaya University, Ethiopia.

Competing interests

The authors declare no competing interests.

Citation information

Cite this article as: Impact of certified coffee marketing cooperatives on income of smallholder farmers in Jimma Zone of Oromia region, Ethiopia, Zewdu Getachew, Fekadu Beyene, Jema Haji & Tesfaye Lemma, *Cogent Food & Agriculture* (22), …

REFERENCES

Abu Tefera and Teddy Tefera, 2013. *Coffee Annual Report. Ethiopia*. Global Agricultural Information Network (GAIN). USDA Foreign Agricultural Service. GAIN Report Number: ET-1302. Date: Accessed on 22/07/2016.

Alemseged Assefa. 2012. Ethiopia's Coffee Export Performance Report - Fiscal Year 2011-12 by Alemseged General Manager, ECEA Addis Ababa.

Alemu Tolemariam. 2010. Impact Assessment of Input and Output Market Development Interventions by IPMS Project: The Case of Gomma Woreda. MSc. Thesis Research. Haramaya University.

Amsaya Anteneh, R. Muradian and R. Ruben. Chapter 4: Impact of multiple certification on smallholder coffee farmers' livelihoods: evidence from southern Ethiopia. In 'Ruben R. and P. Hoebink. 2015. Editors. Coffee certification in East Africa: Impact on farms, families and cooperatives Wageningen Academic.Publishers. http://www.tandfonline.com/doi/pdf/10.1080/19439342.2015.1073893?needAccess=true.

Bastin, A. and N. Matteucci. 2007. Financing Coffee Farmers in Jimma Zone, Ethiopia: Challenges and Opportunities, International Conference on Rural Finance Research: Moving Results into Policies and Practice, FAO Headquarters, Rome, Italy, 19-21 March 2007.

Becker, S. O. and A. Ichino. 2002. Estimation of average treatment effects based on propensity scores. *The Stata Journal*, 2(4): 358–377.

Berhanu Tsegaye, Ali Mohammed, and Essubalew Getachew, 2015. Effect of Sun Drying Methods and Layer Thickness on Quality of Selected Natural Arabica Coffee Varieties at Jimma, South west Ethiopia. *Discourse Journal of Agriculture and Food Sciences.* www.resjournals.org/JAFS ISSN: 2346-7002 Vol. 3(9): 135-147.

Bernard, T., Alemayehu Seyoum and Eleni Gabre-Madhin. 2008a. Impact of Cooperatives on Smallholders' Commercialization Behavior: Evidence from Ethiopia. *Agricultural Economics*, 39 (2): 147–61.

Bernard, T. and D. Spielman. 2009. Reaching the Rural Poor through Rural Producers Organizations? A Study of Agricultural Marketing Cooperatives in Ethiopia. *Food Policy*, 34 (1): 60–69.

Bernard T., 2010. *Cooperatives for Staple crop Marketing: evidence from Ethiopia. Washington, USA. IFPRI research monograph; 164.* http://www.ifpri.org/sites/default/files/publications/rr164.pdf.

BoCPA (Bureau of Cooperative Promotion Agency) of Jimma zone. 2018. Jimma zone. Jimma.

BoFED (Bureau of Finance and Economic Development). 2019. Physical and Socio-Economic Profile of Jimma zone. Jimma.

Bryson, A., Dorsett, R., and S. Purdon, 2002. The Use of Propensity Score Matching in the Evaluation of Active Labor Market Policies. Working Paper 4. Department for Work and Pensions, London.

Caliendo, M., and S. Kopeining. 2008. Some Practical Guidance for The Implementation Of Propensity Score Matching. *Journal of Economic Surveys*, 32: 31–72.

Dagne Mojo, C. Fischer and Terefe Degefa, 2015. Social and environmental impacts of agricultural cooperatives: evidence from Ethiopia. *International Journal of Sustainable Development & World Ecology*. http://www.tandfonline.com/doi/pdf/10.1080/13504509.2015.1052860?needAccess=true.

Dagne Mojo, C. Fischer , Terefe Degefa, 2017. The determinants and economic impacts of membership in coffee farmer cooperatives: recent evidence from rural Ethiopia. *Journal of Rural Studies*, 50: 84-94. ScienceDirect. Elsevier Ltd.

Daniel, W.W. and C. L. Cross. 2013. *Biostatistics: A Foundation for Analysis in the Health Sciences*. 10th edition. John Wiley & Sons, Inc. Library of Congress Cataloging-in-Publication Data. ISBN 978-1-118-30279-8 (cloth). Printed in the United States of America.

Delelegne A. Tefera, J. Bijman and M. A. Slingerland. 2017. Agricultural cooperatives in Ethiopia-Evolution, function and impact. Review Article. *Journal of International Development*, 29, 431–453.

Dercon S., D. O. Gilligan, J. Hoddinott and Tassew Woldehanna. 2008. The Impact of Agricultural Extension and Roads on Poverty and Consumption Growth in Fifteen Ethiopian Villages. Food Consumption and Nutrition Division. IFPRI Discussion Paper 00840.

ECEA (Ethiopian Commodity Exchange Authority). 2008. Analysis of Coffee Supply, Production, Utilization and Marketing Issues and Challenges in Ethiopia. Understanding Commodities to be Traded at Ethiopia Commodity Exchange. Volume I. Policy Analysis and Economic Research Team. Addis Ababa.

Ferris, S., P. Robbins, R. Best, D. Seville, A. Buxton, J. Shriver and E. Wei, 2014. Linking Smallholder Farmers to Markets and the Implications for Extension and Advisory Services. MEAS Discussion Paper Series on Good Practices and Best Fit Approaches in Extension and Advisory Service Provision.

Fikadu Gutu, Wondaferahu Mulugeta and Sisay Tolla. 2020. Economic Impact of Fair-Trade Certification on Small-Scale Coffee Producers in Ethiopia. *Journal of International Trade, Logistics and Law, Vol. 6, Num. 1, 2020, 52-60.*

Fikadu Mitiku, Y. de Mey., J Nyssen and M. Maertens. 2017. Do Private Sustainability Standards Contribute to Income Growth and Poverty Alleviation? A Comparison of Different Coffee Certification Schemes in Ethiopia. http://www.mdpi.com/2071-1050/9/2/246/pdf.

Fischer, E. and Qaim, M. 2011. Smallholder Farmers and Collective Action: What Determines the Intensity of Participation? Proceedings of the German Development Economics Conference, Berlin, No. 28.

Francesconi G. and N.Heerink. 2010, 'Ethiopian agricultural cooperatives in an era of global commodity exchange: does organizational form matter?' *Journal of African Economies*, 20(1): 1-25.

Heckman, J.J., Ichimura, H. and Todd, P. 1998. Matching as an Econometric Evaluation Estimator. *Review of Economic Studies*, 65 (2): 261-94.

Heckman, J. J., LaLonde, R. and Smith, J. 1999. The Economics and econometrics of Active Labor Market Programs. In "Ashenfelter, O. and Card, D. 1999. Editors. *Handbook of Labor Economics*, (3): 1865-2097. Amsterdam: North-Holland."

Holloway G., C. Nicholson and C. Delgado, 2000. Agroindustrialization through Institutional Innovation: Transactions Costs, Cooperatives and Milk-Market Development in the Ethiopian Highlands. MSSD Discussion Paper No. 35.

Jalan J. and M. Ravallion. 2003. Estimating the Benefit Incidence of an Antipoverty Program by Propensity-Score Matching. *Journal of Business & Economic Statistics*, 21 (1):19-30.

Jawtuch J. B. Oehen, and U. Nihhli. 2011. Environmental, Social, and Economic Impacts of Sustainability Certification in the Agricultural Sector-– The Current State of Empirical Research. Standards And Regulations. FiBL & IFOAM (2011): The World of Organic Agriculture 2011. Bonn and Frick.

Jena, P. R., Stellmacher, T. and U. Grote. 2012. The Impact of Coffee Certification on Small-Scale Producers' Livelihoods: Evidence from Ethiopia. Selected Paper prepared for presentation at the International Association of Agricultural Economists (IAAE) Triennial Conference, Foz do Iguaçu, Brazil.

Jena, P. R., T. Stellmacher and U. Grote. 2015. Can coffee certification schemes increase incomes of smallholder farmers? Evidence from Jinotega, Nicaragua. *Environment, Development and Sustainability*, 19: 45–66. Springer. DOI: 10.1007/s10668-015-9732-0.

Kherallah M. and J.F. Kirsten. 2002. The new institutional economics-Applications for agricultural policy research in Developing countries. *Agrekon*, (41) 2.

Manda J., M. G. Khonjeb, A. D. Alenec, A. H Tufa, T. Abdoulayed, M. Mutenjee, P. Setimelae and V. Manyong. 2020. Does cooperative membership increase and accelerate agricultural technology adoption? Empirical evidence from Zambia. *Technological Forecasting & Social Change*, 158, 120160.

Minten B., Mekdim Dereje, Ermias Engeda, and Seneshaw Tamru. 2015. Who Benefits from the Rapidly Increasing Voluntary Sustainability Standards? Evidence from Fairtrade and Organic Coffee in Ethiopia. Agriculture in an Interconnected World. International Conference of Agricultual Economics. August 8-14. Milan, Italy. https://ageconsearch.umn.edu/record/212708/files/MintenDerejeEtAl_ValueChain_IAAE2015.pdf.

Minten B., Mekdim Dereje, Ermias Engida, Seneshaw Tamru. 2018. Tracking the Quality Premium of Certified Coffee: Evidence from Ethiopia. *World Development*, 101:119-132. https://doi.org/10.1016/j.worlddev.2017.08.010.

MoT (Ministry of Trade). 2012. Proposal for Coffee Platform in Ethiopia. Draft. United Nations Development Programme.

Musa Hasen and Hiwot Mekonnen. 2017. The impact of agricultural cooperatives membership on the wellbeing of smallholder farmers: empirical evidence from eastern Ethiopia. *Agricultural and Food Economics* (2017) 5:6. DOI 10.1186/s40100-017-0075-z.

Nilsson J., G. T. Svendsen and Large and G. L. Svendsen. 2012. Are Complex Agricultural Cooperatives Losing Their Social Capital? Article in Agribusiness · March 2012. DOI: 10.1002/agr.21285.

Petit, E. 2007. Ethiopia's Coffee Sector-A Bitter or Better Future. *Journal of Agrarian Change*, (7)2: 225–263. Blackwell Publishing Ltd, Henry Bernstein and Terence J. Byres.

Petty, C., Seaman, J. and Majid, N. with F. Grootenhuis. 2004. Coffee and Household Food Security-A Study of Coffee and Household Economy in Two Districts of Ethiopia. Funded by DFID, Save the Children UK.

Rosenbaum, P. R. and D. B. Rubin. 1983. 'The central role of the propensity score in observational studies for causal effects'. *Biometrica*, 70 (1): 41-55.

Shrestha R. K. 2015. Building social capital within the framework of agricultural cooperatives development in rural Nepal. A thesis submitted for the degree of Doctor of Philosophy at the School of Agriculture and Food Sciences, the University of Queensland.

Stellmacher T., U. Grote and J. Volkmann. 2010. Protection of biodiversity through coffee certification? The case of forest coffee in Bench Maji and Kaffa Zone, Ethiopia. Certification for forest coffee, Ethiopia. TEEBcase available at: TEEBweb.org.

Stellmacher, T. and U. Grote, 2011. Forest Coffee Certificationin Ethiopia: Economic Boon or Ecological Bane? ZEF Working Paper Series, ISSN 1864-6638. Department of Political and Cultural Change. Center for Development Research, University of Bonn.

Tadesse Meskela and Yalem Teshome, 2014. From Economic Vulnerability to Sustainable Livelihoods: The Case of the Oromia Coffee Farmers Cooperatives Union in Ethiopia.

Tihitina Abebe, 2011. Impact Assessment of Input and Output Market Development Intervention of the IPMS Project: The Case of Meiso Woreda, Oromia National Regional State, Ethiopia. MSc. Thesis Submitted to the Department of Agricultural Economics, School of Graduate Studies, Haramaya University.

Tium Gebrehiwet. 2013. Impact of Fairtrade Certification on Smallholder Coffee Producers' Income: The Case of Gimbo District, South Western Ethiopia. M.Sc. Thesis. Haramaya University.

Wollni, M. and M. Zeller. 2007. Do farmers benefit from participating in speciality markets and cooperatives? The case of coffee marketing in Costa Rica. *Agricultural Economics* 37, 243–248.

Yemisrach Getachew, Moti Jaleta and Birhanu G/medihin. 2011. Impact of Input and Output Market Development Interventions on Input Use and Net Income of Households in Ethiopia. *Journal of Economics and Sustainable Development*, (2)9. www.iiste.org.

Zekarias Shumeta and M. D'Haese. 2016. Do Coffee Cooperatives Benefit Farmers? An Exploration of Heterogeneous Impact of Coffee Cooperative Membership in Southwest Ethiopia. Research Article. *International Food and Agribusiness Management Review*, (19) 4: 37-52. http://www.wageningenacademic.com/doi/pdf/10.22434/IFAMR2015.0110. 06/02/2017.

Zekarias Shumeta and M. D'Haese. 2018. Do Coffee Farmers Benefit in Food Security from Participating in Coffee Cooperatives? Evidence from Southwest Ethiopia Coffee Cooperatives. *Food and Nutrition Bulletin,* 39(2): 266-280.