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IMPACT OF CERTIFICATION SYSTEM ON SMALLHOLD COFFEE FARMS' INCOME DISTRIBUTION IN VIETNAM

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Abstract

This study attempts to investigate the impact of the working certification programs on the income of the coffee farms operated by the local smallholders at Dakha District, Kontum, Vietnam. Followed by the comparisons of the socio-demographic and economic characteristics between certified and non-certified farmers, the study adopts the Binary Probit model and linear regression model were applied to analyze the decision on farmers' attitude for participation on the available certification programs and their impacts. Propensity score matching (PSM) was applied to examine the average treatment effect of certification program on net coffee income per hectare to reduce the selection bias. Statistical results show that net coffee income per hectare is positively influenced by certification participation. Furthermore, education status the household head, number of members involved in coffee cultivation, distance from household to town center, and training availability effect significantly on net coffee income. Moreover, four matching algorithms of PSM highlighted that members of the certified cooperative achieve higher net coffee income per hectare compared to non-certified ones. Finally, how to introduce an organizational framework to assist local smallhold farmers and local coffee cooperatives become more effective and influential in domestic coffee value chain are suggested.

Keywords: Certification program, coffee farmer, decision analysis, Vietnam agriculture

1. INTRODUCTION

Vietnam's coffee industry has made a long stride to become the world's first place on Robusta coffee export and second position on export in the last decade. Revenues from coffee export contribute about 3 percents to the Gross Domestic Product of Vietnam, where half of a million people earn a living by producing coffee.

According to the Ministry of Agriculture and Rural Development of Vietnam, coffee cropping areas and its production increased dramatically from 2004 to 2013. During the 2012/2013 crop

year, some 584,600 hectares were directly involved in bean production, which grows 2.1% of the last crop year.

Some studies indicate that climate change may be the most reason causes for this outcome. Besides, inconsistent quality is another key challenge in Vietnam coffee industry. In the past few years, the coffee area increases with the expansion of coffee farms which owned and operated by family with low efficiency. In addition, linkages between stages of coffee value chain in production management is fairly weak, therefore domestic farmers are hard to benefit from the market expansion. To sum up, all disadvantages above had affected the performance of Vietnam coffee in the context of global competition.

More and more coffee consumers concern not only in quality and taste, but also in the issues with rural poverty, social injustice, and environmental degradation during bean production and marketing processes. In addition, certification of product provides necessary information to identify its origin and/or its production process. With this trend, supply of the certified sustainable coffee has risen from about 1% in 2001 to 9% in 2010 and is projected to rise to 20 to 25% in 2015 (Kuit et al., 2013) in the globe market and provides opportunities for many countries to produce certified coffee.

Vietnam Coffee Annual Report 2012 (USDA, 2013) also indicated that the ratios of certified sustainable coffee held by Vietnamese coffee producers, small farm holders, and traders are increasing. Specifically, some certification programs, which introduced by the 4C Association, Fairtrade, Rainforest Alliance and UTZ certified, have been applied on Vietnam coffee since 2001. They are more than 25% of Vietnam's coffee had been certified or verified "sustainable" by the end of 2012.

The popularity of certified sustainable programs in the world created a window of opportunity for Vietnam coffee farms, which operated under groups of smallholders, to participate in certification cooperatives to export certified coffee. However, it remains unclear whether these sustainable certification programs can reconstruct market forces by delivering high incomes to participating farmers. Based on some studies of certification, it concluded that evidence from the impact of certification in Vietnam is very limited because certification is so new and certification organizations have just appeared within last decade.

This study attempts to investigate the impact of certification program on the net coffee income per unit for those farms owned by smallholders at Dakha District, Kontum, Vietnam. Three objectives are, firstly, to define the critical variables to describe and compare the socio-demographic and economic characteristics between certified and non-certified farmers at Dakha District; second, to estimate the impact of certification scheme in function of farmers' net coffee income per hectare; and last, to measure average treatment effect of certification program on farmers' net coffee income per hectare through PSM technique.

2. LITERATURE REVIEW

Certification is a procedure that a third party, the accreditation agent, can assure a production unit with written assurances if the products, process or service conforms to the specified requirements (Grieg-Gran, 2005). Moreover, certification scheme[2] is a system as related to specified products, processes or services with the same specific standards, rules, and the same procedures and applications. Particularly, coffee certification schemes have emerged as one approach to try and raise the standards in economic, social and environmental during coffee production and transaction. Five dominant certification schemes include: Fairtrade, Organic Certification, Rainforest Alliance, UTZ and Common Code, are applied at coffee community in Vietnam.

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[2] In some countries the same concept is covered by the term 'certification program'

Evidences on whether the sustainable certification of agricultural products can benefit farmers at farm level were diverted. There are only few researches find empirical evidences that certification has positive socioeconomic or environmental impacts on farm level. Ruben (2008) finds that those certified farmers are said to be reward for the processes by receiving stable, and sometimes higher, prices for products in relation to household income.

According to the studies from Arnould *et al.* (2009) and Bolwig *et al.* (2009), the certification has significant socioeconomic benefits to the stakeholders. After surveying 228 coffee smallholders in Northern Nicaragua, Bacon (2005) argues that although the livelihood level of small scale coffee farmers are influenced by some political, social and economical factors, those certificates, such as Fairtrade and Organic Certification, have provide potential opportunities to improve the livelihoods of those pariticipants.

Murray *et al.,* (2006) finds that the most direct benefit to small-scale farmers to apply the certificate is the product can be priced high with the Fairtrade logo. Besides, Ruben (2008) concludes that the producers participate the Fairtrade program can receive higher net incomes, particularly when they combine the Fairtrade mark with organic certification.

On the contrary, Fort and Ruben (2008) find a negative impact of Fairtrade identification on total gross and net income of coffee farms in Peru. Using a small but rich sampling group of coffee growers in Nicaragua, Valkila (2009) questions whether Fairtrade/organic coffee promotes sustainable development or it makes minor marginal contributions to growers who are trapped in an equilibrium with low-yield and low-income.

In addition, some studies find limit effect of certification program on farmers' income. Evidently, in the research of Ruben and Fort (2012) in Peru, for both groups of organic and conventional farmers, their results did not show significantly effect of Fairtrade involvement in terms of higher household income. In addition, after surveying 327 members from some conventional, organic, and organic-Fairtrade certified cooperatives in Nicaragua, Beuchelt and Zeller (2011) found that per capita net coffee incomes are insufficient to cover basic needs of all coffee producing households.

Calo and Wise (2005) and Kilian *et al.* (2006) construct farm budget models suggesting that price premiums for certification are too low to be profitable. Similarly, Lyngbaek *et al.* (2001) concludes that excluding organic certification costs, means of variable costs and net income were near for both groups, mainly because organic price premiums received by the farmers compensated the ones with low yields.

3. MATERIALS AND METHODS

3.1. Statistical models
A two stage procedure for decision estimation is adopted to describe the participation consideration for coffee farmers. The decision models for participation in studies is estimated by two parts with two functions; they are "participation decision" measured by a zero-one bi-variate response function in Probit model and the return function with the real nominal number in the OLS model.

The linearity assumption of OLS linear regression is probably too restrictive for studying impacts of certification program effect. Particularly, the endogeneity problem between different experiments may arise due to unobservable characteristics which may affect treatment, but also correlate with outcome. For instance, the decision for participating certification program may significantly correlate with the characteristics of observable households and their farms.

Several methods, such as Heckman model (Heckman, 1979), and Instrument Variable (Heckman, 1997), have been suggested to remedy the endogeneity problem occurring in OLS model. With the

advantage of correcting the selection bias, the Propensity score-matching approach (PSM) becomes popular in measuring the average treatment effect.

As this study mentioned, the invitation to farmers to participate in certification programs is not random during the organizing processes since the program administrators and local marketing agents may focus on some villages and households with some specific consideration to minimize the potential administrative costs afterward. This concern may cause the selection bias and divert the degree of impact for potential factors to join the causal program, then may activate households' self-selection intention to the certification program or cause the endogenous program placement.

Alternatively, according to Beuchelt and Zeller (2011), there is no difference between conventional and organic-fairtrade producers found in net coffee income per hectare. With the different methods applied, this outcome also concluded by Lyngbaek et al. (2001) and Kilian et al. (2006). Evidently, Ruben and Fort (2012) apply PSM method with longitudinal (before/after) analysis of certified farmers and control groups with similar attributes.

Based on empirical approaches of Rosenbaum and Rubin (1983) and Khandker et al. (2010), this study applies the PSM model to measure average treatment effect of certification program on farmers' return from coffee cropping by the net income per hectare. The idea is to match certified farmers with non-certified farmers that have very similar observable characteristics that properly affect outcomes, and to use outcomes for this matched control sample as the counterfactual outcome. The expected value is the difference between two expected outcomes from with or without participants who both were actually certified.

Supposes that there is the average treatment effect for a single individual, τ_i, is defined as:

$$\tau_i = Y_{i1} - Y_{i0}$$
………………… (1)

Where Y is the variable of interest outcome, i is the sample under consideration where $i = 1….N$, and N denotes the total population. And Y_{i1} is the variable of interest outcome when individual ith is subject to treatment ($T=1$), and Y_{i0} is the same variable in the control group ($T=0$), T is a binary treatment.

For estimating average treatment estimation, it is necessary to estimate the potential outcomes and the counterfactual outcomes. Table 1 shows the possibilities for the potential and counterfactual outcomes.

Table 1: Evaluation framework for treatment

Group	Outcomes Y	
	Y_1	Y_0
Treatment (T = 1)	Observable	Counterfactual
Control (T = 0)	Counterfactual	Observable

From colume1 in Table 1, the counterfactual problem is clear because only the potential outcomes is observed for each individual i. Y_{i0} is not observed for treated individuals, whereas Y_{i1} is not observed for non-treated individuals. Therefore, estimating the individual treatment effect τ_i is not possible and there is a need to concentrate on average treatment effects (Caliendo and Kopeinig, 2008). The primary treatment effect of interest in quasi-experimental settings is the expected Average Treatment Effect on the Treated samples (ATT); hence.

$$\tau_{ATT} = E(\tau_i | T_i = 1) = E(Y_{i1} | T_i = 1) - E(Y_{i0} | T_i = 1)$$
……………….. (2)

Where $T_i = 1$ if individual i*th* was assigned to treatment or $T_i = 0$ if individual i*th* was assigned to control. Equation (2) cannot be directly estimated because $E(Y_{i0}|=1)$ is not observed for the treated. For ATT it can be noted as:

$$E(Y_{i1}|T_i = 1) - E(Y_{i0}|T_i = 0) = \tau_{ATT} + E(Y_{i0}|T_i = 1) - E(Y_{i0}|T_i = 0) \quad \text{………...…. (3)}$$

The expected value of ATT is now the difference between expected outcome values with and without treatment for those who actually were treated. In another way, the difference between the left hand side of Equation (3) and τ_{ATT} is the so-called "self-selection bias" or "average treatment effect" (Connelly *et al.,* 2013). ATE is rewritten as Equation (4):

$$\tau_{ATE} = E(Y_{i0}|T_i = 1) - E(Y_{i0}|T_i = 0) \quad \text{……………….. (4)}$$

The additional challenge when estimating ATE is that both counterfactual outcomes $E(Y_{i0}|T_i = 1)$ and $E(Y_{i0}|T_i = 0)$ have to be constructed. Intuitively, if Y_{i0} for the treated and comparison individuals systematically differ, then in observing only Y_{i0} for the comparison group, the study does not correctly estimate Y_{i0} for the treated group.

The true parameter of ATT is only identified if the outcome of treatment and control in the absence of treatment are the same. This is written as:

$$Y_{i1}, Y_{i0} \coprod T_i \text{ f } E(Y_{i0}|T_i = 0) = E(Y_{i0}|T_i = 1) = E(Y_i|T_i = 0) \quad \text{………..…. (5)}$$

Or
$$E(Y_{i0}|T_i = 0) - E(Y_{i0}|T_i = 1) = 0 \quad \text{………………. (6)}$$

To reduce bias problem, Rosenbaum and Rubin (1983) suggest applying the Balancing Scores approach to estimate the effects of treatment. Individuals with similar propensity scores are compared based on the outcomes of treatment, and those which with no match will be dropped due to lack of comparison base. Therefore, based on a model for the probability of assignment to treatment, *T,* conditional on observed characteristics, *X*, the propensity score can be obtained. In other words, the propensity score is the probability of an individual being assigned to a particular treatment given a set of observed covariates. It defines as:

$$P_i = P(T = i|X) \quad \text{………………….. (7)}$$

The matching method bases on two assumptions which are Conditional Independence Assumption (CIA) and presence of a common support (Khandker *et al.,* 2010). According to CIA, it states that given a set of observable covariates X that are not affected by treatment, potential outcomes Y are independent of treatment assignment T (Khandker *et al.,* 2010; Rosenbaum and Rubin, 1983). CIA based on the propensity score (Pscore) can be written as:

$$Y_{i0}, Y_{i1} \coprod T \,|\, P(X), \forall\, X \quad \text{…………………… (8)}$$

The common support or overlap condition is the second assumption. It rules out the phenomenon of perfect predictability of T given X:

$$0 < P(T = 1|X) < 1 \quad \text{……………………. (9)}$$

It ensures that farmers with the same X values have a positive probability of being both treated and non-treated individuals (Heckman *et al.,* 1999).

Given that CIA holds and assumes additionally that there is overlap between both groups called "strong ignorability" (Rosenbaum and Rubin, 1983), the PSM estimator for ATT can be written in general as following.

$$\tau_{ATT}^{PSM} = E_{P(X)|T_i=1}(E[Y_{i1}|T_i = 1, P(X)] - E[Y_{i0}|T_i = 0, P(X)) \qquad\qquad \text{……………. (10)}$$

To put it in words, the PSM estimator is simply the mean difference in outcomes over the common support, appropriately weighted by the propensity score distribution of individuals. Basing on Caliendo and Kopeinig (2008) and Li (2013), Table 1 shows a brief outline of the matching estimator in the general evaluation framework.

3.2. Data
In 2012-2014, Kontum is one of five provinces chosen to implement sustainable coffee production project of the National Agricultural Extension Center. Dakha is a special coffee area, accounting for 65% of coffee area and 75% of green coffee production of Kontum. Primary data of the study were obtained from the survey of 200 smallholders coffee farmers in Dakha District, Vietnam from July 2013 to January 2014. Out of 200 samples, 80 smallholders are members of certified cooperatives.

3.3. Statistical methods

3.3.1. Description of variables
After reviewing theory and related empirical researches, five categories of independent variables were considered in determining the net coffee income per hectare by using the regression analysis (see Table 2): 1) characteristics of the household head; 2) characteristics of household; 3) Farming environment; 4) conditions for upgrading quality of coffee; and 5) the certification.

Table 2: Description of variables and its definitions

Variable	Definition	Description of Variables
Netincome	Net coffee income per hectare	Local currency (1,000 VND)
Cert	Certification participation	No=0, Yes =1
Age	Age of the head of the household	Numbers
Gender	Gender of the head of household	"Female" =0, "Male"=1
Hsize	Household size	Numbers
Labors	Labor size in coffee cultivation	Numbers
Edu	Education level of the head of household	"Never been to school or illiterate" = 1, "Primary school"=2, "Secondary school"= 3, "High school and more"=4
Exp	Coffee farming experience of the head	"Less than 5 years"=1, "5-10 years"=2, "10-15 years"=3, "More than 15 years"=4
Area	Total harvest coffee area	Hectares
Distown	Distance from homestead to center of town	Number of Kilometers
Credit	Household has access to credit	No=0, Yes =1
Training	Number of trainings	"Less than 5 years"=1, "5-10 years"=2, "10-15 years"=3, "15-20 years"=4, "More than 20 years"=5
Record	Household keep record on coffee	No=0, Yes =1

3.3.2. Regression analysis

This study estimates impact of certification program with two stages: the decision stage and demand stage. The former part will be estimated the certification program participation decision by a binary Probit model. Next, two income response equations for those farmers with and without certification will be estimated by OLS model.

Certification participation is strongly correlated with observable household and farm characteristics. From the actual practice, households in this area may determine to participate in the programs and self-select into the program based on their access to productive resources. In addition, program administrators and agents may target certain villages and select those households with specific characteristics. With these backgroud, a decision equation is important before the income analysis. The processes can be illustrated as following stages.

First stage for constructing a decision equation

$$Cert = \alpha_0 + \alpha_1 Age + \alpha_2 Sex + \alpha_3 Edu + \alpha_4 Exp + \alpha_5 Hsize + \alpha_6 Labors + \alpha_7 Area + \alpha_8 Distown + \alpha_9 Credit + \alpha_{10} Training + \alpha_{11} Record + \alpha_{12} Netincome + \varepsilon_i$$

Next, an income reponse equation for farmers with or without certification by applying the probit model at the second stage

$$Netincome = \alpha_0 + \alpha_1 Age + \alpha_2 Sex + \alpha_3 Edu + \alpha_4 Exp + \alpha_5 Hsize + \alpha_6 Labors + \alpha_7 Area + \alpha_8 Distown + \alpha_9 Credit + \alpha_{10} Training + \alpha_{11} Record + \varepsilon_i$$

3.3.3. PSM in practice

Steps to practice PSM are described as following four steps. First, do a representative sample survey of 80 certified farmers as well as one for 120 non-certified farmers with the same questionnaire, same interviewer training, and same survey period. Next, calculate the probability of certification participation or propensity score (Pscore). A binary model is applied with the zero-one treatment variable (T), certification status of the farmers in the present study, as the selection variable conditional on basic characteristics (X) of both groups to estimate these propensity scores (P_{i1}), where $P_i = P(T = 1|X)$. Third, organize two balanced groups based on their estimated propensity scores for farmers in each group have most close propensity scores, which are measured by different matching algorithms.

Last, calculate the mean value of the individual gains for each matching algorithm to obtain the average overall gain. This value is the average effect of the certification program on farmers' household income from coffee production (ATT) following the equation below:

$$ATT = E_{P(X)|Ti=1} = E[Y_{i1}|T_i = 1, P(X)] - E[Y_{i0}|T_i = 0, P(X)] \qquad \text{........................ (11)}$$

Where Y_{i1} is net coffee income per hectare when the i*th* farmer is subject to certified groups (1), and Y_{i0} is the value of the same variable when the individual is exposed to non-certified group (0).

4. RESULTS AND DISCUSSIONS

4.1. Regression analysis results

4.1.1. Decision equation

From Table 3, we can conclude that the certification participation decision is strongly supported by the following variables, they are: age of head, experience of head, numbers of labor, credit condition and production record. Young and experienced farm head who keep financial relation

with credit units and consistent record for coffee farming with limited labors at the farm is with high propensity to participate the certificate program.

Table 3: Certification participation decision analysis –Probit model

Variables	Coefficient	S.E	t-test
Age	-0.059	0.015	-3.871***
Labors	-1.873	0.392	-4.769***
Experience	0.452	0.195	2.309**
Credit	0.659	0.287	2.293**
Record	2.920	0.633	4.611***
Netincome	0.00004	0.000008	4.552***
Constant	0.216	1.045	0.207

N = 200, McFadden R^2 = 0.5817,
Note: ***, **, and * show the value statistically significant level at 1%, 5%, and 10%

4.1.2. Income response equation for with and without certification

This study applied OLS regression to investigate the influential factors, including certification participation, that affect net coffee income per hectare. Table 4 summarizes the results of response equations below. All estimated coefficients show the expected signs as prior discussed.

Table 4: OLS regression analysis results

Variables	Coefficient	S.E	T
Certification participation	16,326.06	3,584.69	4.55***
Age	89.24	132.94	0.67
Gender	1,942.55	-3,237.68	-0.60
Hsize	-691.76	852.77	-0.81
Labor	33,715.10	1,823.34	18.49***
Edu	2,779.06	1,277.83	2.17**
Exp	1,419.04	1,892.47	0.75
Distown	-1,837.70	466.72	-3.94***
Area	148.06	1,508.98	0.10
Credit	-5,324.89	2,739.19	-1.94*
Traning	7,850.80	1,390.45	5.65***
Record	5,924.13	3,377.04	1.75*
Constant	-35,109.33	9,433.11	-3.72***
	Number of obs		= 200
	F(12, 187)		= 130.48
	Prob > F		= 0.0000
	R-squared		= 0.8933
	Adj R-squared		= 0.8865

Note: ***, **, and * show the value statistically significant level at 1%, 5%, and 10%

First of all, the estimated coefficients in Table 4 show that the certification dummy is statistically insignificant for net income earned from coffee production per hectare at a 1% critical level. OLS regression result indicates that certified farmers earn about 16.33 million VND[3] than non-certified farmers.

Besides, the estimated coefficients in Table 4 show that the number of labor, education of head, training, production record and the distance between the homestead and downtown are the factors significantly influence the net income level for those farms without certification.

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[3] The exchange rate between USD and VND is 1NTD for 21,091 VND. 16.33 million VND equals 77,43 USD, approximately.

The number of family members participating in coffee production positively and significantly affects coffee net income at 1% critical level. This result implies that labor may increase the costs, but it also increase of coffee productivity as well. In coffee production, some activities, such as watering, fertilizing, transporting, require labors. With this understanding, more family members participate in production could improve the family income by coffee sales. This is the reason why coefficient of household labor size involving coffee cultivation is 33,246.10. It means that every household member could earn approximately 33.72 million VND for net coffee income per hectare.

Furthermore, the education level of the household head has an effect on coffee net income at significant level 10%. Specifically, Table 4 highlights that the education level of family head increase a level more, it helps household earn more 2.69 million VND net coffee income per hectare. Alternatively, in the term of distance from homestead to center of town, the result shows a negative impact on net coffee income per hectare. Furthermore, the distance from homestead to center of town significantly affects coffee net income at critical level 1%. As the distances increases 1 kilometre, net income from coffee production will decrease 1.55 million VND for non-certificate farms.

The accessibility to the training or number of trainings which farmers attended in one year has a strong effect on the net income per from coffee. For example, if a farmer takes more than about 5 training courses, they can add annually 7.1 million VND into net coffee income per hectare. Particularly, during the application processes to become a member of the certification cooperatives, the famers can access to the training programs by attaining workshops or being instructed by extension agent to improve their productivity in cropping coffee.

Also, the variable, household keep records on coffee farm, is significant in the statistical result for non-certificate farms; it may due to the reason that records help farmers to monitor those activities of production and can manage the risks and vulnerability for farming operations. Keeping record of cultivating coffee has a positive effect net coffee income at a 10% critical level. Moreover, in global competition, it is necessary to encourage and increase farmers' aware in the important role of keeping records in international trading and organic farming for traceability.

For income response equation of certificated farms, numbers of labors, gender of head, distance between homestead to downtown, and training are significant variables to influence the level of net income. The negative sign for gender implies that male farmers earn less than female colleagues when their farms are all in the certification program. Also the more distance between homestead and downtown, the more income the farm can earn, which is different from the case in non certification group.

4.2. PSM results

After calculating Pscores for each farmer, these Pscore are stratified in five blocks. The study eliminates the farmers of non-certified group with Pscore lower than minimum Pscore in the certified group, and the farmers of certified group with Pscore higher than maximum Pscore in the non-certified group. This results in reduction of the sample with 25 farmers in non-certified group. And, there are no farmers removed in certified group. The distribution of Pscores of farmers is illustrated in Figure 1 below.
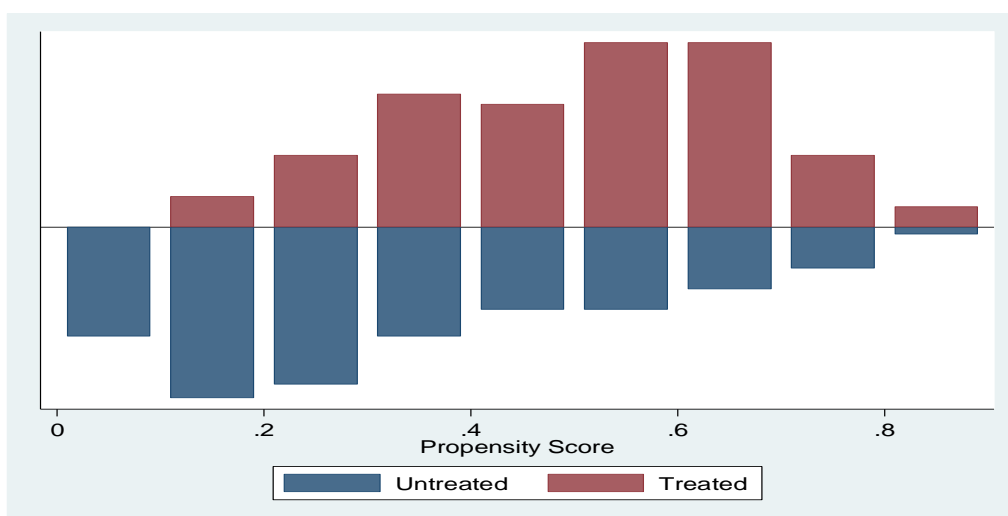
Figure 1: Propensity score distribution

Next, the study referred to four different matching algorithms in order to verify the robustness of the results to the method applied: (1) Nearest neighbor matching; (2) caliper and radius matching; (3) kernel matching; and (4) stratificaion matching. Illustratively, Table 5 presented the matching estimates of the average treatment effect of certification program for outcome variable below:

Table 5: PSM results for certification participation ('000 VND)

Matching Algorithms	Average Effect of Participation	SE	t-test
Nearest Neighbour	24,137.13	9,215.561	2.62***
Caliper and Radius	21,745.35	4,217.374	5.16***
Kernel	19,207.52	7,547.768	2.56***
Stratification	19,951.26	7,506.779	2.66***

Note: ***, **, and * show the value statistically significant level at 1%, 5%, and 10%

The estimates of the net coffee annual income per hectares of a household earned from certification participation range from 19,208 million VND to 24,137 million VND depending on the matching method used. Also, all estimates are statistically significantly different from zero with at 1% critical level.

Moreover, by comparison with OLS results, the results of the PSM are different with those from the OLS estimation; it suggests that original estimates are affected by either selection bias or the endogeneity. It also implies that OLS and PSM methods both provide consistent evidences for positive income effects from certification scheme.

Besides, the study also recognized that the PSM results are similar to the previous studies which established a positive impact of certification on income levels (Arnould *et al.,* 2009; Bacon, 2005; Bolwig *et al.,* 2009; Fromm and Dubón, 2006; Ruben, 2008). In addition, the significance of certification for income levels of farmers actually indicates that there is a success of the farmer's organization as well as a success of certification.

Generally, the main challenge for farmers in certified coffee production is how to keep the record since it is crucial for traceability in international trade. Furthermore, the cost of coffee production is quite large. Specifically, agriculture assets, fertilizer, and pesticide are expensive, particularly soil conditioner applied in organic farming. Moreover, it is not easy to preserve and keep the quality of coffee cherries or beans since it depends on equipment, storehouse. In addition, the quantity and quality of coffee production depend severely on weather and market. In general, certification

participation, therefore, can be considered to be an interesting and reliable opportunity for the coffee farmers in the study area.

Although, in comparison to non-certified farmers, certified farmers have to implement strict requirements and need to be compensated by cooperative with indirect benefits. Apart from paying a premium price, certified farmers supported from cooperative by providing materials, such as fertilizer, safety working clothing, feeding-up allowances per training course or meeting. Other benefits also come from the cooperative's welfare fund. In 2012 this resource of fund supported the certified members at 15.8 million VND per coffee hectares and some infrastructures.

5. CONCLUSIONS

The objective of this study is to investigate the impact of certification program on smallholder farmers' net coffee income per unit at Dakha District, Kontum, Vietnam. Both regression and PSM results show that certification participation has a positive significant effect on household income per hectare.

This study reveals the certified coffee potential for smallholder farmers. Specifically, the results of OLS regression and PSM provide consistent evidence for positive income effects arising from certification scheme. When comparing certified with noncertified cooperatives, it becomes evident that participation in certification program guarantee the members of certified cooperatives a higher net coffee income can be received. Furthermore, our findings are considered as quantitative and qualitative evidences to policy makers and donors who are currently supporting or planning to support certification schemes to conclude that the farming management program acts as a tool can improve the income level for local smallhold coffee farms. Therefore, it must be ascertained to not only focus on coffee cooperatives, but to turn these cooperatives into stronger and more effective partners in the value chain if the farmers' income is the issue of the industry-chain policy for the domestic coffee farming sector.

The statistical results also support for the importance that education and training can contribute to improve coffee farm income. Also, the record of farming is critical factors, both in improving the economic situation for farms with and without certification in Vietnam.

From this study of the organization for coffee farmers in Vietnam, it is essential to increase awareness among local farmers with promising high incomes for becoming certified farmers to develop a sustainable coffee industry. Hence, cooperatives should regard to provide specific training courses as well as a strict follow-up system for introducing global markets. All of the above, the participating members can learn the required knowledge in improving productivity and these schemes can strengthen the royalty to the organizations after participation.

Also, local cooperatives and certification programs will authorize farmers to opt organic fertilizer, soil conditioner or pesticide both under acceptable nomenclature and regular inspections from cooperatives. Furthermore, the cooperatives can provide credit service to build up the royalty of farmers to cooperate.

Although the effect of the program on an aspect of income is not so big, the statistical results conclude that the certification participation has a positive welfare impact on smallhold farm and is pushing them move towards a more decentralized, integrated and participatory system. Therefore, extending the certification programs or cooperatives further to reach the majority of smallholder household farmers at Dakha District will likely benefit smallholder farmers' income in various aspects.

References

Arnould, E. J., Plastina, A., & Ball, D. (2009). Does Fair Trade Deliver on Its Core Value Proposition? Effects on Income, Educational Attainment, and Health in Three Countries. *Journal of Public Policy & Marketing,* 28, 186-201.

Bacon, C. (2005). Confronting the coffee crisis: Can fair trade, organic, and specialty coffees reduce small-scale farmer vulnerability in northern Nicaragua?. *World Development,* 33, 497-511.

Beuchelt, T. D., & Zeller, M. (2011). Profits and Poverty: Certification's Troubled Link for Nicaragua's Organic and Fairtrade Coffee Producers. *Ecological Economics,* 70, 1316-1324.

Bolwig, S., Gibbon, P., & Jones, S. (2009). The economics of smallholder organic contract farming in tropical Africa. *World Development,* 37, 1094-1104.

Caliendo, M., & Kopeinig, S. (2008). Some Practical Guidance for the Implementation of Propensity Score Matching. *Journal of Economic Surveys*, 22, 31-72.

Calo, M., & Wise, T. A. (2005). *Revaluing peasant coffee: Organic and fair trade markets in mexico.* An Agricultural Economic Report, Medford, Mass.: Global Development and Environment Institute, 26.

Connelly, B. S., Sackett, P. R., & Waters, S. D. (2013). Balancing treatment and control groups in quasi-experiments: an introduction to propensity scoring. *Personnel Psychology*, 66, 407-442.

Fort, R., & Ruben, R. (2008). *The impact of fair trade certification on coffee producers in Peru.* in: Ruben, R. (Ed.), The impact of fair trade. Wageningen Academic Publisher, Wageningen, The Netherlands, 75-98.

Fromm, I., & Dubón, J.A. (2006). *Upgrading and the value chain analysis: The case of small-scale coffee farmers in Honduras.* Paper presented at Seminar on Propesty and Poverty in a Globalized World: Challenges for Agricultural Reseach Tropentag 2006, Octobor 11-13, Bonn, Germany.

Grieg-Gran, M. (2005). *From bean to cup: how consumer choice impacts upon coffee producers and the environment.* Consumer International and International Institute for Environment and Development, London, UK.

Heckman, J. J. (1979). Selection bias as a specification error. *Econometrica,* 47, 53-161.

Heckman, J. J. (1997). Instrumental variables: A study of implicit behavioral assumptions used in making program evaluations. *Journal of Human Resources,* 32(3), 441-462.

Heckman, J. J., LaLonde, R. J., & Smith, J. A. (1999). The economics and econometrics of active labor market programs. *Handbook of Labor Economics,* 3, 1865-2097.

Khandker, S. R., Koolwal, G. B., & Samad, H. A. (2010). *Handbook on impact evaluation: Quantitative methods and practices*. World Bank, Washington, D.C.

Kilian, B., Jones, C., Pratt, L., & Villalobos, A. (2006). Is sustainable agriculture a viable strategy to improve farm income in Central America? A case study on coffee. *Journal of Business Research*, 59, 322-330.

Kuit, M., Rijn, F. C., Vu, T. M. T., & Pham, V. A. (2013). *The sustainable coffee conundrum: a study into the effects.* Cost and Benefits of Implementation Modalities of Sustainable Coffee Production in Vietnam. Wageningen UR, Netherlands.

Li, M. (2013). Using the propensity score method to estimate causal effects: A review and practical guide. *Organizational Research Methods,* 16, 188-226.

Lyngbaek, A. E., Muschler, R. G., & Sinclair, F. L. (2001). Productivity and profitability of multistrata organic versus conventional coffee farms in Costa Rica. *Agroforestry Systems,* 53, 205-213.

Murray, D. L., Raynolds P. L., & Taylor, P. L. (2006). The future of fair trade coffee: Dilemmas facing latin america's small-scale producers. *Development in Practice,* 16(2), 179-192.

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

Ruben, R. (2008). *The development impact of fair trade: From discourse to data*. in: Ruben, R. (Ed.), The impact of fair trade. Wageningen academic publisher, Wageningen, The Netherlands, 19-47.

Ruben, R., & Fort, R. (2012). The impact of fair trade certification for coffee farmers in Peru. *World Development*, 40, 570-582.

USDA (2013). *Vietman coffee annual 2012*. Foreign Agricultural Service, GAIN Report Number VM3029, Washington, US.

Valkila, J. (2009). Fair trade organic coffee production in Nicaragua-sustainable development or a poverty trap?. *Ecological Economics,* 68, 3018-3025.