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The Impact of Access to Cooperatives on Households' Income: An Empirical Study in Vietnam

Quoc Duy VUONG[1], Viet Thanh Truc TRAN[2], Quang Vang DANG[3], Van Nam MAI[4]

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Abstract

If one is looking for an organization that will be responsive to community needs, stimulate economic growth, and raise people's income, cooperatives should be an obvious choice (Calkins & Ngo, 2005; Larocque et al., 2002). This paper investigates whether the households' income is affected by the access to cooperatives for the case of Phong Dien district, Can Tho city of Vietnam. Data used are directly collected from 250 households that are both participating (120 observations) and not participating in the cooperatives in Truong Long, Tan Thoi, Nhon Ai and Nhon Nghia communes. By using the Probit model, the findings show that there are three statistically significant factors affecting the ability of farm households to participate in the cooperatives at the 1 percent level including land area, distance to market center, and education level. In addition, the PSM model analysis suggests that the average income of cooperative members is significantly higher than that of non-members, about 40.880 million VND/year at the significance level of 1 percent. The empirical results imply that being a cooperative member is a significant contributory factor toward an increase in household income. Based on the research findings, several recommendations to improve the households' income are proposed.

Keywords: Household Income, Cooperative, PSM Model

JEL Classification Code: B26, D14, D61, D71, G23

1. Introduction

It is widely accepted that cooperatives plays significant roles in society that transform into the improvement of living conditions of their members, particularly the low-income earning group of the population, the rural dwellers, and the urban poor. These organizations aggregate people, resources and capital into economic units. As self-controlled business organizations, cooperatives suggest the institutional framework through which local communities gain control over the productive activities from which they derive their livelihood (Wanyama et al., 2009). Additionally, the rural farmers are usually provided the opportunity by the cooperatives to raise their income. The cooperatives are democratic organizations empowering people to find their own solutions. They increase financial security for the members, and contribute directly and indirectly to gender equality (Pinto, 2009). The cooperatives are recently seen as the most effective route to transformational development, suggesting people in charge of their own destinies and helping to provide services to their community, increasing decision-making, trust, and accountability through democratic participation, providing a profitable connection to private sector, building and protecting assets at the community level, limiting the role of government, and working together to resolve the society's problems (OCDC, 2007). Cooperatives are occasionally the only providers of services in rural areas, given that traditional companies often find it too costly to invest. Cooperatives may improve living conditions, solve specific socio-economic problems such as income

[1]First Author and Corresponding Author. Associate Professor, Department of Finance and Banking, College of Economics, Can Tho University, Vienam [Postal Address: 24/4 Nguyen Trai Street, Cai Khe Ward, Ninh Kieu District, Can Tho City, 90000, Vietnam] Email: vqduy@ctu.edu.vn
[2]Lecturer, Department of Finance and Banking, College of Economics, Can Tho University, Vienam. Email: tvttruc@ctu.edu.vn
[3]Lecturer, Faculty of Economics, Ho Chi Minh University of Technology and Education, Vietnam. Email: vangdq@hcmute.edu.vn
[4]Associate Professor, Graduate School, Can Tho University, Vietnam. Email: mvnam@ctu.edu.vn

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generating, support rural development, and preserve viability of rural communities (Otto & Ukpere, 2011).

In Vietnam, agricultural cooperatives have officially formed and developed since 1958. According to the Bureau of Economic Cooperation and Rural Development (Ministry Agriculture and Rural Development), until the end of 2017, the country has 11,688 agricultural cooperatives and 30 union cooperatives. Within Can Tho city, there are 250 cooperatives with 15,000 communes and workers in the cooperative area of more than 19,000 people, attracting 50% of rural farmers engaged in collective economics. Accordingly, there are many cooperatives specializing in the production of rice seed, raising the export fish to achieve high turnover and profits, contributing to improving the income for the members. Can Tho city has about 72% of the cooperative transformation operating under the Law on Cooperative year 2012. According to the leaders of Can Tho city, in recent years, the collective economic model has a key role in local socio-economic development. Can Tho Cooperative Alliance has promoted the role in propaganda and improvement of activities for collaborative organizations, supporting cooperatives to strengthen activities, to develop and to create stable income in order to attract farmers to take part in cooperative economy. In particular, most of the farmers in Phong Dien district of Can Tho city are near or even below the economic viability. Due to its small size, the individual farm cannot influence the market on its own. These farmer cannot afford the necessary means to increase their productivity by expansion or intensification by modern farming methods; mechanization, pest control, seed selection and adequate marketing. These farmer cannot supply facilities out of their own resources, leading to lower productivity, underemployment, low income, low savings, low investment in farm and low yield (Calkins & Ngo, 2005).

It does appear, therefore, that rural farmers may not get out of their present predicament without positive external intervention. Cooperatives play a fundamental and direct role in social and economic development. Indeed, if one is looking for an organization that will be responsive to community needs, stimulate economic growth, and raise people's income, cooperatives should be an obvious choice (Calkins & Ngo, 2005; Larocque et al., 2002). Cooperatives represent a unique third way of social organizations when the other two, which are the markets and government, fail to provide inputs, social goods or services effectively. Cooperatives can therefore, be considered as ideal arrangement for income enhancement and hence pivotal to economic development. This study investigates whether the cooperative members have higher income than non-members in the case of Phong Dien district, Can Tho city of Vietnam?

2. Literature Review

It is expected that attending cooperatives is likely enhancing the member's performance in both living standards and economic perspectives. Following studies are considered as representatives for the role of cooperatives in the social issues.

Firstly, Ojiagu et al. (2015) conducted the study 'Effect of Membership of Cooperative Organisations and Determinants on Farmer-Members' income in rural Anambra State of Nigeria.' The study used data from 2506 members gathered through multi-stage stratified random sampling. The findings stressed that members' incomes depend on their socio-economic profile such as age, marital status, membership of cooperative societies, education, cooperative marketing, credit, gender and business expertise. Most of respondents relied largely on farming-related activities for generation of income in the study area. In addition, it was found that the most important challenge for the farmer-members is inadequate fund, poor education and illiteracy among most members, conflict among members and lack of access to farm input. The Nigerian government is recommended to formulate policies that will integrate information from the local level that can support planning, implementation and evaluation of programs that can improve farmers' income; this however, will create the pattern of agricultural growth in ways that can adjust income level of rural farmers to grow fast. The empirical findings implied that cooperatives should strengthen their members' education to bring more benefits, and that government, non-governmental organizations and international development agencies should illustrate interest in supervising and providing development support to Farmers Cooperative Societies in rural Nigeria.

Secondly, Taiwo et al. (2014) investigated the alternative to enhance rural income in Nigeria through agriculture in the area of Anambra State. The study used data collected from 174 members of Famers Multipurpose Cooperatives (FMCs) in the study area. The findings indicated that FMCs in Orumba South have various set of economic activities capable of promoting rural dwellers livelihood. Despite this, the results of this study also revealed that the FMCs are being constrained by various challenges in the course of livelihood promotion. As a results, the study recommend that the cooperatives should diversify their investments to be more viable so that it will yield more means of livelihood, such as earnings income, employment, and infrastructure; this will also persuade members to join actively, as well as enable members to acquire skills that will empower them, which will eventually reduce rural poverty.

Thirdly, Getnet and Anullo (2012) studied the agricultural cooperatives and rural likelihoods from Ethiopia.

Data used in the study were collected from Boricha district of Sidama Zone of the SNNPR using 212 randomly-selected farm households (99 cooperative service users and 113 non-users). By employing Propensity Score Matching methodology on rural household income, savings, agricultural input expenditure, and asset accumulation as indicator variables, this paper evaluated the livelihood impact of agricultural cooperatives in Sidama zone, Ethiopia. The findings pointed out that cooperatives improved the livelihoods of service user farmers through impacting better income, more savings and reduced input costs. In view of such evidence, further promotion, deepening and supporting of agricultural cooperatives is recommended.

Fourthly, Agbonlahor et al. (2012) examined the types of activities promoted by cooperative groups and the determinants of participation intensity of members in cooperative activities in southwestern Nigeria. The study used a multistage sampling approach to select 326 cooperators. Data collected were analyzed using descriptive statistics, difference of means test, and Tobit regression. Cooperative groups engaged in farm and off-farm activities such as arable crop production, fish farming, agricultural products processing, and product marketing, among others. Farm input procurements and access to market information (74 percent), cooperative credits and thrift (53 percent), social networking (37 percent), multipurpose commercial activities (21.6 percent), and political influence (17 percent) were given as reasons for interest and participation in groups' activities. Especially, the findings claimed that the members of cooperatives are having significantly higher income than non-members who engaged in the same economic activity. Besides that, participation intensity is influenced by gender, farm size cultivated, and the social status of members.

Lastly, various studies published in prestige international journal depicted the relationship between micro and macro factors and the income of the households. Nguyen et al., (2021) investigates how education influences the income of households' heads, who are you adult in rural Vietnam. By using appropriate methods, the findings indicate that education has a positive impact on income of young households. Furthermore, the results prove that the longer schooling years, the higher income youth can attain. The results showed that, at the time of the survey (2019), the average monthly income of rural young adults who are joining the production process shows a big gap between low and high incomes. Moreover, the study has revealed that other factors positively affect the incomes, namely, joining job-related associations, land resource, hired labor, hi-tech application as well as extension of producing unit. In addition, Nguyen (2019) investigated the factor affecting on income inequality in Vietnam. By using the VHLSS data and good estimation methods, the findings found that in the period from 2010 to 2018, the factors such as the proportion of the working employees, income per capita, and inflation have positive effects on the Gini coefficient. That is, when these factors increase, there will be negative effects on improving income inequality in Vietnam. The estimated coefficients satisfied the sign expectation except the proportion of the literate adults. It means that, in Vietnam, the increase and more equilibrium in educational attainment balance the distribution of income and bring an improvement in income inequality.

Moreover, Nguyen and Nguyen (2019) studied the determinants of the Khmer people's poor by using the 300 households in seven districts and cities of Tra Vinh province. By using multivariate analysis, the findings show that a number of causes that affect poverty of poor households include lack of capital for production, lack of means of production, poor health and lack of labor, large families, lack of job opportunities or unemployment, and lack of willingness to escape poverty and education. Thus, possible recommendations are as follows: (1) Focusing on preferential loan policies for poor people; (2) Providing occupational training programs for improving incomes for the Khmer ethnic households; (3) Building up special infrastructure in the Khmer ethnic areas; (4) Concentrating on promoting cultural and belief institutions in areas of the Khmer ethnic people; and (5) Improving and build up healthcare clinics services and facilities.

3. Methodology

Measuring impact demands a careful analytical approach. A major problem in evaluating the impact of access to credit is endogeneity of program participation in the output function. Selection bias may overestimate the impact due to unobserved characteristics such as higher-than-average motivation for higher income or ability in business activities. To overcome endogeneity, this paper uses a propensity score matching approach to analyze the potential effects of taking part in the cooperatives in the research area. This approach is used to assess the impact of access to cooperatives on the poor households' income. The method employed includes two logical steps of estimation. First, a Probit model assesses the propensity score; that is the probability of the households' access to cooperatives. Second, the difference in outcomes between members and non-members is measured by a matching method while controlling for the propensity scores. This procedure guarantees that a member is compared to a non-member with the same characteristics. The impact of credit is measured on income.

3.1. Propensity Score Matching

As introduced by Rosenbaum and Rubin (1983), the propensity score is used to provide an alternative method

for estimating treatment effects when treatment assignment is not random, but can be assumed to be unconfounded. This method has been applied in a wide variety of fields (Heckman et al., 1998; Dehejia & Wahba, 1999; Moser, 2005; Smith & Todd, 2005). The propensity score is defined as the conditional probability of treatment given background variables. Normally a logit or Probit function is used for this purpose, given that treatment is typically dichotomous (i.e., $D = 1$ for the treated and D=0 for the control units) as follows:

$$\begin{aligned} P(x) &= \text{Prob}\,(X_i|D_i = 1,\ p(X_i) = p) \\ &= \text{Prob}\,(X_i|D_i = 0,\ p(X_i) = p) \\ &= \text{Prob}\,(X_i|p) \end{aligned} \tag{1}$$

Let Y_{1i} and Y_{0i} denote the potential outcomes under treatment and control groups respectively. Then treatment assignment is (conditionally) unconfounded if treatment is independent of potential outcome conditional on X.

Assumption 1: (Conditional Independence Assumption or CIA)

There is a set X of covariates (observable variables) such that after controlling for these variables, the potential outcomes are independent of the treatment status:

$$(Y_1, Y_0) \perp D \mid X \tag{2}$$

This means that, after controlling for X, the treatment assignment is as good as random. This property is also known as unconfoundeness, or selection on observables. The CIA is crucial for correctly identifying the impact of the program, since it ensures that although treated and control groups differ, these differences may be accounted for in order to calculate the selection bias. This allows the control units to be used to construct a counterfactual for the treatment group.

Assumption 2: (Common Support Condition):

For each value of X, there is a positive probability of being both treated and control.

$$0 < P\,(X_i|D = 1) < 1 \tag{3}$$

This equation implies that the probability of receiving treatment for each value of X lies between 0 and 1. By the rules of probability, this means that the probability of not receiving treatment lies between the same values. A simple way of interpreting this formula is the following: the proportion of treated and control individuals must be greater than 0 for every possible value of X. The second requirement is also known as the overlap condition, because it ensures that there is sufficient overlap in the characteristics of the treated and control units to find adequate matches (or a common support). When these two assumptions are satisfied, the treatment assignment is said to be strongly ignorable (Rosenbaum & Rubin, 1983). This is because $P(X_i|D = 0) = 1 - P(X_i|D = 1)$

It is important to distinguish the CIA from the balancing property of propensity scores. One does not imply the other. For example, it is possible to obtain balance for examples of data where the CIA is valid or where it does not hold. The simplest case is when X is a univariate variable, when it is clear that the CIA does not hold and where it is very easy to obtain balance. Similarity, even if the CIA is fulfilled, the balancing property might not hold because $p(X)$ could be an inadequate balancing score, perhaps because the functional form of X is not presented correctly when estimating $p(X)$. For further information see Smith and Todd (2005).

The primary purpose of the propensity score is that it serves as a balancing score. Consequently, the idea behind balancing tests is to check whether the propensity score is an adequate balancing score. In other words, it checks if at each value of the propensity score, X has the same distribution for the treatment and control group. More formally, this becomes: $D \perp X \mid p(X)$ where X is a set of covariates that are chosen to fulfill the CIA. After conditioning on $p(X)$, additional conditioning on X should not provide new information on D. The propensity scores themselves serve only as devices to balance that observed distribution of covariates across the treated and control groups. The success of propensity score estimation is therefore assessed by the resultant balance rather than by the fit of the models used to create the estimated propensity scores (Heinrich et al., 2010).

3.2. Propensity Score Matching Method

The average treatment effects on the treated (ATT) are defined as the average treatment effect for the sub-population with a given value of the pre-treatment variables. It is estimated by taking the difference between the treatment and control averages in the sub-population that are matched through the propensity scores. The ATT are then estimated by weighting these sub-population estimates. The ATT effect is thus (Becker & Ichino, 2002):

$$\text{ATT} = E\{Y_{1i} - Y_{0i}|D_i = 1\} \tag{4}$$

$$\text{ATT} = E[E\{Y_{1i} - Y_{0i}|D_i = 1, p(X_i)\}] \tag{5}$$

$$\begin{aligned} \text{ATT} = E[&E\{Y_{1i}|D_i = 1, p(X_i)\} \\ &- E\{Y_{0i}|D_i = 0, p(X_i)\}|D_i = 1] \end{aligned} \tag{6}$$

where ATT is the average treatment on the treated; Y_{1i} and Y_{0i} are the potential outcomes in the two counterfactual situations of the members and non-members respectively; $p(X_i)|D_i = 1$ is the propensity score of the treated households,

given its characteristics X_i. Several matching techniques can be used (Caliendo & Kopeinig, 2008). This paper uses a Stratification matching and a Kernel matching approach.

3.2.1. Stratification Matching Approach (SM)

The stratification procedure is based on the same approach used for estimating the propensity scores such that, within each interval, treated and control units have on average the same propensity score (Dehejia & Wahba, 1999). It is advisable to use the same blocks within which the balancing property is examined. Within each interval, the difference between the average outcomes of the treated and the control observation is computed as follows (Dehejia & Wahba, 1999):

$$T_q^S = \frac{\sum_{i \in I(q)} Y_i^T}{N_q^T} - \frac{\sum_{i \in I(q)} Y_j^C}{N_q^C} \quad (7)$$

where: $I(q)$ is the set of units in block q that is automatically chosen in the propensity score estimation; Y_i^T and Y_j^C are the outcomes of the treated and control units respectively; N_q^T, N_q^C are the numbers of treated and control units in block q respectively. The total number of blocks is Q.

Finally, the ATT is obtained as an average of the ATT of each block with the weight of each block given by the corresponding fraction of treated units as follows (Dehejia & Wahba, 1999):

$$\tau^S = \sum_{q=1}^{Q} \tau_q^S \frac{\sum_{i \in I(q)} D_i}{\sum_{\forall i} D_i} \quad (8)$$

3.2.2. Kernel Matching (KM) Approach

In the Kernel matching method, all treated cases are matched with a weighted average of all controls using weights that are inversely proportional to the distance between the propensity scores of treated and controls. The ATT is then calculated as follows (Heckman et al., 1997).

$$\tau^K = \frac{1}{N^T} \sum_{i \in T} \left\{ Y_i^T - \frac{\sum_{j \in C} Y_j^C G\left(\frac{p_j - p_i}{h_n}\right)}{\sum_{k \in C} G\left(\frac{p_k - p_i}{h_n}\right)} \right\} \quad (9)$$

where Y_i, and Y_j are the outcomes of treated and non-treated households respectively; $K(.)$ is the Kernel function; h is the estimated bandwidth; I_1 is the sample of the treated cases and I_0 is the sample of non-treated controls; $P(.)$ are the probabilities of treated and non-treated cases.

Apart from the two methods used in this paper, other propensity score matching methods are available (Heckman et al., 1997). But these have a number disadvantages and therefore were not considered for this study. The Nearest Neighbor matching approach (NNM) method should be used very carefully as it may violate the common support assumption (Cochran & Rubin, 1973). This approach will provide an estimate even when there are no sufficient comparable units.

Radius Matching (RM) is more suitable, but the estimated results are relatively imprecise compared to the SM and KM approaches because only one control is matched with each participant. Instead, the SM method matches the average of several individuals. However, equal weights are given to an individual at the limit of the stratum and to an individual close to the observed unit, since the average is only arithmetic (Chemin, 2008). The KM method overcomes this problem by giving each individual a weight decreasing in distance compared to the intentional unit. As all individuals in the control group are used, the KM method is also likely to relax the common support assumption (Chemin, 2008).

It is meaningful to conduct checks on the robustness of the estimations. The robustness checks of standard errors of propensity score matching are obtained by using a bootstrap method. These robustness checks help to increase the reliability of the results by demonstrating that the estimations do not depend too much on the particular methodology chosen.

4. Results and Discussion

4.1. Descriptive Statistics

Table 1 illustrates the overviews of poor households' characteristics in the Phong Dien district, Can Tho city.

Firstly, it is clearly shown in Table 1 that the male households' head interviewed accounts for 72 percent (181 people) while the female ones occupy the rest of observations 28 percent (69 people). In fact, the gender of the households' head play a significant role in the decision-making for the households. In addition, educational level of households' head is major considered as key social capital in the socio-economics development plan of the households. In particular, the households' head studied until secondary schools occupy highest observations of 146 (58 percent) and the lowest one is dominated by the group of household with high school level (49 people corresponding to 20 percent). Turning to the age of the household's head, the households' head who are more than 40 years old account for a higher proportion of the total sample with 75 percent (187 people) than those under 40 years old with 25 percent (63 people). As a motivation for the households' income generation, the households with more than three persons

accounts for 84 percent of total observation (209 people) that are dramatically higher than those households with less than three persons (41 people, corresponding to 16 percent). These findings reflect the accuracy of the representatives of the rural households' size. Lastly, 196 households' head engage in activities of agricultural cooperatives while 54 households' head do not (see Table 1).

From the results in Table 2, it can be observed that the average distance to market center of the households in our sample is 7.2 km. Besides that, the household closest to market center has a distance of 1.4 km, whereas the farthest one has a distance of 14.3 km. This variable shows the ability of each household to access market information, prices, scientific and technical information. So, a group of households that lives near the market center will often easily access the information. As a result, they will have better production capacity, thereby improving the income of their family.

One of the important indicators showing the wealth of the farm household is the total land area of the household. The results from Table 2 show that the average cultivated area of the household is about 11,388 m^2, the smallest and the largest cultivated land area are approximately 4,446 m^2 and 11,388 m^2, respectively. The households owning small arable land area are those who live separately to establish their own career, or those who have a small scale of production. The rest of the households have large asset value possibly because they have long-term production activities, with a larger scale, so they have more cultivated land and better conditions for family economic development.

Turning to access to credit variable, this indicator represents financial leverage as well as the ability of farmers to make production plans. Normally, households who have long-term production experience and effective cultivation and husbandry plans are able to borrow from credit institutions to implement plans in order to improve the family economic. The survey results from Table 2 revealed that each household in the research area borrowed money from credit institutions with the average amount of 126.1 million VND. The non-borrowers are usually those who do not take part in activities in any local groups or cooperatives and those who do not make a clear production and business plan. Additionally, the highest loan amount of the household in our sample is 295 million VND.

Based on the results in Table 2, it can be seen that for the group of 196 households joining cooperatives, the mean income is 187.5 million VND per year, which is much higher than the income of the group of households that do not participate in cooperatives (averaged at 141.5 million VND per year). Moreover, the highest amount of income among 250 surveyed households reached 317.68 million VND per year, belonging to the group of households taking part in activities in cooperatives. Thereby, it can be concluded

Table 1: Characteristics of the Poor Households in the Study (Obs. = 250)

Variables	Value	Frequency	Percentage (%)
Gender	Male	181	72
	Female	69	28
Education level	Illiteracy	0	0
	Primary School	55	22
	Secondary School	146	58
	High School	49	20
Age	Less than 40 years	63	25
	More than 40 years	187	75
Household size	Less than 3 persons	41	16
	More than 3 persons	209	84
Cooperative participation	Yes	196	80
	No	54	20

Table 2: External Issues Related to Poor Households' Participation in Cooperatives (Obs. = 250)

Variables		Unit	Average	Minimum	Maximum
Distance to market center		Km	7.20	1.40	14.30
Total land area		Thousand M^2	11.39	4.45	22.46
Access to credit		Million VND/household	126.10	0.00	295.00
Income of households	Participant	Million VND/year	187.50	317.68	94.85
	Non-Participant	Million VND/year	141.50	212.38	68.45

that joining the cooperatives has a positive effect on the household income.

4.2. Factors Affecting the Ability to Participate in the Cooperatives

As presented in the research methodology, the Probit model is used to analyze factors affecting the ability of farmers to join cooperatives in Phong Dien district, Can Tho city. The estimated results derived from the Probit regression model are shown in Table 3 as follows.

It can be seen from Table 3 that the predictability and the significance level of the model are quite good. The estimated coefficients of independent variables including total land area, distance to market center, and education level are all statistically significant at the 1 percent level, and have the expected considerable effect on the farmer's ability to join a cooperative. The impacts of these three independent variables on the ability of household to take part in a cooperative can be explained as follows:

As expected, the positive relationship between total land use and the ability to participate in the cooperatives exists. This is clearly shown through the research results in Table 3 that the estimated coefficient is positive (β_1 = 0.0002828) at the significance level of 1 percent. Land area owned by farmers consists of residential land, agricultural land, garden land and other types of land. Land use is an important factor influencing the participation in local production models, cooperative groups and other welfare improvement opportunities. The synthesis report on poverty assessment in Vietnam with the participation of farm household conducted by the World Bank (1999) has shown that owning relatively large amount of high-quality land for production is the basis for improving productivity. Households with high-quality land (low slope, close to residential house, good irrigation system and no salinity) will be better off than others. Farm households with large amount of cultivated land can easily join production groups, diversify crops, thereby improving their living standards. This empirical finding is in accordance with previous studies conducted by Khandker (2009), Datar et al. (2009), Nguyen (2005). These authors also stated that the area of land owned and the ability to access cooperative groups positively influence the income and expenditure of the households.

Table 3: Estimated Results of the Probit Regression Model (Obs. = 250)

Variables	Estimated Coefficient
Total land area	0.0002828*** (5.82)
Distance to market center	–0.2077971*** (–4.01)
Household size	0.0408644 (0.33)
Education level	0.5384311*** (3.08)
Gender	0.2683462 (1.04)
Age	0.0006786 (0.04)
Access to credit	0.0000599 (0.02)
Constant	–1.912794** (–2.15)
LR χ^2	79.86
Prob > χ^2	0.0000
Pseudo R^2	0.3061
Log likelihood	–90.520467

Note: The values in parentheses () are *z*-values, *, ** and *** indicate statistical significance at the 10%, 5%, and 1% level, respectively.

From the estimated results in Table 3, it can be seen that distance to market center has a negative correlation with the decision to join cooperatives of the farmer households with the estimated coefficient (β_2 = –0.2077971) at the significance level of 1 percent. This result is in line with the original assumption. People living close to the market center tend to gradually shift to non-agricultural economic development, so they will be less likely to participate in pure agricultural production cooperative groups. In the report "Vietnam - Poverty assessment and strategy" conducted by the World Bank (1995) also affirmed that infrastructure is a determinant factor of agricultural productivity, and is associated with the development of off-farm jobs as well as the promotion of farmer participation in the market economy. Residents living close to infrastructure have a higher standard of living and are able to take advantage of the market's benefits better than remote households, so these households tend to gradually shift to off-farm production.

The estimated result in Table 3 indicates that education level of farmers positively influence their decision to join the cooperative group, their selection of production method in order to boost their income with the positive estimated coefficient (β_4 = 0.5384311) at the significance level of 0.01. Educational level is determined based on the highest educational level of the households' head and its ranks are based on the current education hierarchy in Vietnam (Le & Huynh, 2017). In fact, people with high education level are often aware of the benefits that cooperatives, cooperative groups bring in changing farming methods, the output of agricultural product, prices, seedlings, breeds, etc., thus, they are more willing to take part in a cooperative. Besides that, households with a large number of highly qualified people are more likely to have a higher income than others since they can access production information from the local economic models, thereby generating more income. Baulch and McCulloch (2002) studied poverty in Pakistan for five years and also drew a conclusion that higher levels of education, especially general education, leads to an increase in households' ability to escape poverty.

The World Bank (2004) claimed that investment in education is the best way to increase income sustainably. Higher educated people are not only more productive, but also more likely to switch their careers if something goes wrong with their current job.

However, the study has not found the significant impacts of household size, gender, age of household's head and access to credit on the ability of household to participate in the cooperatives. Since p-value for each coefficient of these variables is quite high, it can be concluded that these factors are not decisive factors in the ability to participate in agricultural groups and cooperatives of farmers in the study area of Phong Dien District - Can Tho city.

In many farmer households, participation in cooperatives or changing the production method is often decided by the household's head, who is the owner of the property, regardless of the number of family members. Therefore, it can be said that household size has no considerable influence on participating or not participating in activities of the cooperatives of the farmers.

Similarly, gender is also not a determinant factor of the household's ability to participate in cooperatives and local cooperative groups. In fact, social life is more and more advanced, focusing on gender equality does not affect the work and important decisions of the family.

Turning to the age of the household's head, from the estimated results in Table 3, the estimated coefficient of this variable is positive, which means that the age of the household's head has a positive correlation with the ability to join cooperatives, but this coefficient is not statistically significant at the significance level of 10 percent (β_6 = 0.0006786; p-value > 0.1). Thus, it cannot be concluded that age of household's head significantly influences the ability to join local agricultural cooperatives. With the development of information and communication, whether farmers are young or old, they all access to local information easily, thereby narrowing the gap in experience and production information between these two groups. The decision to join the cooperative mainly depends on the thoughts and the recognition of the benefits as well as the production conditions of each household.

Finally, the probability of the households' access to cooperatives is not influenced by the amount of loans borrowing from credit institutions. Because one of the specific characteristics of farmers is that they need capital for production, in fact, most of the interviewed farmers have borrowed money from credit institutions. However, the choice to join the cooperative depends on the means of production, the recognition of benefits as well as the perception of concentrated production, farming techniques, etc.

4.3. The Impact of Participation in Cooperative on Household Income

In the first stage of the analysis, Probit regression model is employed to analyze the determinants of taking part in the cooperatives. The estimation results of the regression model in Table 3 provide important evidence that the factors of total land area, distance to market center, and education level significantly affect the probability of the households' participation in the cooperative of farmers in Phong Dien district. The effects of observed factors in this model are similar to the prior research results of Khandker (2009), Datar et al. (2009), the World Bank (1995, 1999), Nguyen (2005), Baulch and McCulloch (2002). Hence, the results from the Probit regression model presented in Table 3 are employed to determine the propensity score, which is the probability of the households' access to cooperatives.

In the second stage of analysis, this study employs the Propensity Score Matching (PSM) method to investigate the influence of joining cooperatives on the income of farm household in Phong Dien district - Can Tho city. Applying PSM method, the individual propensity scores based on the set of characteristics (independent variables) are estimated. This paper employs probabilistic pairing and eliminates households who have too high or too low probability of participation in cooperatives. The results of the paired comparison are used to estimate the average treatment effects on the treated (ATT). This average treatment effects on the treated is the difference in income between the group of households participating in the cooperative's activities and the group of households that does not. The analytical results of the impact of participation in cooperative on household income by applying the Propensity Score Matching (PSM) method are presented in Table 4 as follows.

The results of the comparison between the group of 196 farm households participating in cooperatives as well

Table 4: Analytical Results of the Impact of Participation in Cooperative on Farmer Household Income (Obs. = 250)

Number of Households Joining Cooperatives (Households)	Number of Households Not Joining Cooperatives (Households)	ATT	Difference in Income (Million VND/Year)
196	54	40.880***(5.07)	40.880

Note: The value in parentheses () is z-value, *** indicates statistical significance at the 1% level.

as cooperative groups in Phong Dien district - Can Tho city, and the group of 54 farm households who do not join any cooperatives or cooperative groups in this same study area. Based on the analytical results in Table 4, it is clearly observed that there is a disparity in income between the group of households taking part in the cooperatives and the group of households not taking part in any cooperatives. Specifically, on average, compared to farm households that are not members in cooperatives, farm households who are cooperatives' members generate higher income of 40.880 million VND per year. This is clearly shown through the research results in Table 4 that the correlation coefficient is positive and statistically significant at the significance level of 1 percent.

This empirical finding implies that the farmers who are members in the cooperatives have received the benefits of accessing better agricultural production models, training in farming techniques, and accessing to the advantages of production conditions such as clean seedlings, fertilizers, preferential input prices, guaranteed-prices for output products, agricultural production costs reduction, etc., which considerably contributes to an increase in household income. Hence, it can be concluded that the local agricultural cooperatives positively influence farm household income. In other words, participating in activities and production in these cooperatives significantly contributes to stabilize and increase income for farm household in Phong Dien district - Can Tho city.

5. Conclusion and Recommendations

This paper investigates the factors affecting the probability of farm households' participation in cooperatives and examines the impact of this participation on the farm household's income in Phong Dien district - Can Tho city. Data were collected from direct surveys of 250 households in the study area. By employing Probit regression model and PSM method, this study founds that there are three factors that significantly affect the ability of farmer households to participate in the cooperatives at the significance level of 1 percent, including total land area, distance to market center, and education level. The remaining variables consisting of household size, gender, age of household's head and access to credit have no considerable effect on the ability of farmers to participate in cooperatives. In addition, the analytical results from the PSM method indicates that the income gap exists between the households joining the local cooperatives and those who do not participate. On average, farm households participating in the cooperative activities are able to generate more income than those who do not join, namely at 40.880 million VND per year, at the statistical significance of 1 percent. Based on given empirical findings, several solutions are proposed to enhance the probability of the households' access to cooperatives in order to boost the income of the households' income.

From the research results, this study provides several implications for the cooperatives as well as Agricultural Committee Division of Phong Dien district as follows:

The Cooperative Alliance of Can Tho city should coordinate with the People's Committees of districts, communes and relevant agencies and units to innovate the methods of propagating the Party's policies and the State's laws on the development of cooperatives and the benefits of participation in cooperatives for members, thereby raising the awareness of local people about the new type of cooperatives. Besides that, the Cooperative Alliance of Can Tho city should organize training courses in policies for cooperative economic development for local people and organizations.

The Agricultural Committee Division of Phong Dien district, the agricultural extension organization should identify the problems and difficulties of cooperatives. Then, training should be provided for the cooperatives' managers to improve their management capacity, for local officials to widen the knowledge of collective economy. Additionally, Agricultural Committee Division should facilitate the development of agricultural product consumption markets and the expansion of production links through linking cooperatives with firms supporting infrastructure for production development. Moreover, Agricultural Committee Division should regularly organize agricultural extension programs, transfer scientific and technological advances, modern techniques in agricultural production to farmers, organize scientific seminars to introduce as well as replicate effective agricultural models, and to share production experiences among farmers.

To successfully implement all of these recommendations, the local Farmers' Union plays an important role in connecting all parties and advising all levels on related agricultural work. This organization also represents farmers to express farmers' desires and aspirations for agricultural development in rural areas.

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