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Does Membership in Agricultural Cooperatives Improve Marketing Efficiency?: Insights from Smallholder Coffee Farmers in Selected Provinces of the Philippines

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ABSTRACT

Purpose – Cooperatives are people-centric organizations that are organized to meet the common needs of their members. One key goal for the establishment of agricultural cooperatives is to help improve the marketing efficiency of their members. This study aimed to analyze the correlation between cooperative membership and marketing efficiency among coffee farmers in the provinces of Cavite, Benguet, and Mountain Province, Philippines.
Design/Methodology/Approach – Primary and secondary data were gathered in the study. Linear regression with endogenous treatment was used to analyze the data which examined both observable and unobservable factors affecting the treatment, cooperative membership, potential outcome, and the marketing efficiency.
Findings – The results of the study revealed that the average farmer generated USD0.85 more farm income for every peso spent on marketing activities if he/she was a member of an agricultural cooperative. This implied that membership positively improved the marketing efficiency of coffee farmers. Moreover, farmers who sold their processed coffee to cooperatives and who had price access were observed to have higher marketing efficiency. Farmers who were females, adopted more processing technologies, took longer to search for price information, sold to cooperatives, had more coffee experience, and whose farms were located away from technology sources were more likely to become cooperative members.
Research Implications – The study recommended the promotion of cooperative membership among farmers to improve their marketing efficiency and capacity-building activities related to the technology adoption and management of cooperatives.

Keywords: agricultural cooperatives, cooperative membership, linear regression with endogenous treatment, marketing efficiency
JEL Classifications: P13, Q13, Q16

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I. Introduction

The impact of agriculture on the economic development of the Philippines cannot be overemphasized. According to Habito (2021), the country's agriculture grew by 1.6 percent and 1.2 percent, respectively during the 2nd and 3rd quarters of 2020 amidst the strictest lockdown or locally known as enhanced community quarantine (ECQ) enforced by the government to minimize the adverse effect of the COVID-19 pandemic. Agriculture's contribution to the country's GDP is also not just limited to crop production, livestock farming, forestry, and fishery as it also supports the growth of other key sectors of the economy such as manufacturing, trade & repair services, transport, storage, and communication, and other services (Habito, 2021). Agriculture also employs almost 10 million Filipinos, or 24.3 percent of the total employment generated in 2018 (PSA, 2019). These jobs mostly benefit those in the rural areas largely dependent on agriculture. Thus, agriculture plays a critical role in the development of rural areas.

To improve the performance of agriculture, one key goal is to have an efficient agricultural marketing system. This aims to promote a seamless flow of products along the value chain from production to consumption. According to Pabuayon et.al (2014), an efficient agricultural marketing system helps in making adequate food available, accessible, and affordable to consumers. An efficient marketing system also implies that every actor in the value chain benefits from the exchange. Quilloy and Sumalde (2015) reasoned that in an efficient marketing system, farmers receive handsome compensation for produce. Market intermediaries, on the other hand, can maintain profitable business operations for performing marketing functions and services for consumers at very reasonable and affordable prices.

Achieving marketing efficiency, however, is very challenging because of some inherent challenges faced by smallholder farmers. They have poor access to market information, reasonable credit, attractive business prospects, and agricultural production technologies (Fan & Rue, 2020; Zhang et al., 2020). These pose a problem because they need these inputs and information to make decisions on the type of crops to grow, the timing that will produce the most yield, the most suitable place to market the produce, and the most appropriate farm inputs and implements that are needed in the operation. They are also disorganized, scattered, and fragmented, thereby limiting their chances of meeting the volume and quality requirements set by buyers. Institutional buyers, for example, strictly require a stable supply from their input suppliers and demand quality-specific technical standards before they enter into long-term contracts with suppliers. Smallholder farmers also have poor access to price and market information, affecting their capability to make optimal decisions.

The establishment of community-based and rural institutions like cooperatives and associations has been strategically identified to address these agricultural challenges (Ahmed & Mesfin, 2017; Simmons & Birchall, 2008). These self-help groups have been tapped to level up the marketing performance of small-scale producers by improving market access, empowering farmers, enhancing livelihood, and increasing productivity (Quilloy & Sumalde, 2015). Collectively, these small-holder producers share information, pool resources, and distribute costs and risks among themselves to improve yield and productivity which would not be possible if the smallholder farmer is working alone (Abebaw, 2013; Cruz, 2016). Furthermore, the clustered farmers have stronger purchasing power and bargaining voice in the marketplace (Siebert, 2001). Simply put, organized farmers have inherent advantages in confronting the problems of agricultural inefficiency in marketing.

The Philippine coffee industry, like most commodities, is dominated by subsistent, disorganized, small-scale, scattered, and fragmented farmers with an average farm size of one to two hectares and a production yield of only

0.3 tons per hectare (Philippine Statistics Authority (PSA), 2016). In the 2017-2022 Philippine Coffee Industry Roadmap, the country has a long way to go before it can achieve its target yield of one ton per hectare, boost coffee production, and make the Philippines one of the top producers of premium-grade coffee in the world (Department of Agriculture (DA) & Department of Trade and Industry (DTI), 2018). In the same report, cooperatives and other coffee associations were highlighted to implement action programs and priority activities, such as providing access to information, infrastructure, assistance, credit, and training to improve the marketability, competitiveness, and sustainability of coffee farmers. From a policy standpoint, it is, therefore, worthwhile to investigate whether cooperative membership can enhance the marketing efficiency of coffee farmers.

In general, the study aimed to assess the role of cooperatives in improving the marketing efficiency of coffee farmers in selected provinces of the Philippines, namely: Cavite, Benguet, and Mountain Province. Specifically, it aimed to (1) determine whether membership in cooperatives and other rural/community-based organizations results in improved marketing efficiency; (2) identify factors affecting marketing efficiency and cooperative membership; and (3) provide specific recommendations on how cooperatives and other rural/community-based organizations can enhance marketing efficiency.

II. Research Methodology

1. Data Collection and Analysis

A farm household survey was conducted using a structured survey questionnaire. This covered, among others, demographic and household information, data on farmer socio-economic, farm characteristics, and marketing-related expenses and income, as well as information on the physical and institutional setting, and membership in cooperatives and farmers' associations. Key informant interviews (KII) and focus group discussions (FGD) with key executive officers of cooperatives, farmer-members, and non-members were also conducted to gather anecdotal information on the role of cooperatives in improving marketing efficiency among coffee respondents.

Multi-stage sampling was used for data collection. First, the three provinces of Cavite, Benguet, and Mountain Province were selected because these were the areas with the most mainstreamed coffee interventions from the funding agency, the Department of Science and Technology – Philippine Council for Agriculture, Aquatic, and Natural Resources Research and Development (DOST-PCAARD). Second, chosen municipalities in these provinces must (1) have the highest coffee production, (2) be recipients of DOST-PCAARRD technologies, and (3) have cooperatives or other rural-based organizations in the area. The information for the first criterion was sourced from DOST-PCAARRD, while the list of cooperatives per municipality was collected from the Regional offices of the Cooperative Development Authority (CDA) and Municipal Agriculture Offices (MAOs).

The lists of farmers were obtained from the MAOs of selected survey sites. Information gathered from DOST-PCAARRD projects was used to counter-checked the farmer list. Farmers were randomly selected from the list provided by the sample municipalities. From the list of coffee farmers, simple random sampling was employed to determine the farmer respondents in the survey.

Given the above criteria, the sample size was determined based on the total population of the three provinces. The sample size per municipality and barangay was proportionally determined. The sample size formula used was based on the assumption that the observations from the farmers were normally distributed. Under the assumption that the proportion of the farmers in the market (P) is normally distributed, the appropriate sample size formula derived is given by:

$$n = \frac{\frac{z^2 \text{ x } p(1-p)}{e^2}}{1 + \frac{z^2 \text{ x } p(1-p)}{e^2 N}} \quad (1)$$

where:
p = hypothesized proportion of farmers that adopted the technology
z = standard normal deviate associated with a certain α
e = margin of error
N = population size

In this study, the hypothesized proportion was set to 0.5 for all the provinces. The confidence level was at 95%, thus α=0.05, and the margin of error was at 5%.

2. Empirical Framework

Cruz (2019) defined marketing efficiency as the ratio between the value-addition brought about by the marketing activities and the associated expenses of these processing or marketing activities. The value addition was measured by the difference between the amount paid by consumers for the processed products and the cost of producing the products. A higher ratio implied a higher marketing efficiency of the processed products and, thus, meant better marketing performance and bigger returns for every peso spent on marketing and processing.

$$Value\ Added = Revenue_{processed} - Cost_{processed} \quad (2)$$

$$Marketing\ efficiency = \frac{Value\ Added}{Cost\ of\ marketing\ or\ processing} \quad (3)$$

In analyzing the impact of cooperative membership on the marketing efficiency of farmers, linear regression with endogenous treatment (treatment effects or TE) was employed. This model data was used to determine if the treatment (i.e. cooperative membership) has a causal effect on the outcome (i.e. marketing efficiency). The model fits a nonlinear potential-outcome model that allows for a specific correlation structure between the unobservable items that affect the treatment (i.e. cooperative membership) and the unobservable items that affect the potential outcomes (i.e. marketing efficiency). This is used to address the sample selection bias that may result from observed and unobserved factors. This model also determined the significant factors that affect outcome (i.e. marketing efficiency) and treatment (i.e. cooperative membership).

The endogenous treatment-regression model is composed of an equation for the outcome ME_j , and an equation for the treatment z_j. The outcome equation is:

$$ME_j = x_j\beta + \delta z_j + \varepsilon_j \quad (4)$$

where x_j are the variables used to model the outcome. The treatment equation is modeled as:

$$z_j = w_j\gamma + u_j \quad (5)$$

and the observed decision is,

$$z_j = \begin{cases} 1, & w_j\gamma + \mu_j > 0 \\ 0, & otherwise \end{cases} \quad (6)$$

z_j is a binary variable with a value of 1 if a person opted to be a cooperative member, and 0 otherwise. w_j are the covariates used to model treatment which are observable characteristics affecting cooperative membership. The error terms ε_j and μ_j are bivariate normal with means of 0 and the covariance matrix

$$\begin{bmatrix} \sigma^2 & \sigma\rho \\ \sigma\rho & 1 \end{bmatrix} \quad (7)$$

The covariates x_j and w_j are unrelated to the error terms; in other words, they are exogenous.

III. Analysis and Findings

1. The Socio-Demographic Profile of Respondents

The three provinces were generally dominated by members (58 percent) that were males (53 percent), older than 41 (93 percent), married (78 percent), and had less than or equal to 10 years of formal education (66 percent), or about a high school level (Table 1). This study also showed that there were more members in Benguet and Mountain Province, while Cavite had more non-members. While there was an equal ratio of members and non-members among men, the result showed that there were more members among females (68 percent). Women member dominance in cooperatives was aligned to and even higher than the study findings of 55 percent female membership by Lamberte and Manlagnit (2003) among credit cooperatives in the Philippines.

In terms of average age, members seemed to be younger than non-members. This was in contrast with the findings of Shumeta and D'Haese (2016), which showed that members were relatively older than their counterparts. In the FGDs, some members attributed their decision to join cooperatives to their openness to accept new technologies and willingness to change their old farming practices compared to older coffee non-member farmers. The motivation of farmer-members to accept new farm practices could also be attributed to their having relatively more education compared to non-members (i.e. average of 10 versus 9 years of schooling of members and non-members, respectively). This was supported and observed by the same study of Shumeta and D'Haese, which showed more schooling years for members than non-members. In terms of coffee farming experience, non-members were more experienced (26 years) than members (21 years), supporting the anecdotal claim that non-members tended to stick to their usual farming practices due to their long experience in coffee farming.

2. The Philippine Coffee Species

Four species of coffee were commonly planted in the country, namely: Robusta, Arabica, Liberica, and Excelsa (Table 2). Robusta was more commonly produced in Cavite (95 percent) while Arabica was the dominant species planted in Benguet and Mt. Province. Members mainly produce Arabica coffee while a majority of the non-members plant Robusta coffee. However, the choice of coffee species planted was not based on preference, but was attributable to the topography where these coffee species thrived. Robusta was produced by most non-members as 73 percent of this group were from Cavite, and this was where this particular coffee species was commonly grown. Arabica, on the other hand, is suited to the climate and terrain of Benguet and Mountain Province.

Table 1. Socio-Demographic Profile of Coffee Farmers by Membership, Philippines, 2017-2018

Items	Member N= 222 (%)	Non-Members N=138 (%)	Total N=380 (%)
Provinces			
Cavite	41	59	52
Benguet	77	23	36
Mountain Province	77	23	12
% to Total	58	42	100
Sex			
Male	50	50	53
Female	68	32	47
Age			
21 – 40	69	31	7
41- 60	56	44	52
> 60	59	41	41
Average Age*	57	59	58
School Years			
Less than or equal to 10	57	43	66
11 to 15	61	39	32
Greater than 15	71	29	2
Ave. Schooling Years*	10	9	10
Farm Experience			
Less than or equal to 20	63	37	54
21 – 30	58	42	16
31 – 40	56	44	15
Greater than 40	46	54	15
Ave. farming years*	21	26	23

Note: * values are in units.

Table 2. Distribution of Coffee Species by Province and Membership, Philippines, 2017-2018.

Coffee Species	Province			Membership Status		Total
	Cavite %	Benguet %	MProv. %	Mem %	Non-mem %	%
Robusta	95	1	2	35	71	35
Arabica	5	99	100	67	44	67
Liberica	13			6	12	6
Excelsa	6			4	5	4
N=	196	136	48	222	158	380

Note: * multiple responses, MProv = Mountain Province, N = total respondents.

3. The Coffee Processing and Marketing

Almost all respondents conducted further processing of their coffee products across the 3 provinces (Table 3). Increasing their income was the main driver cited by respondents as the reason why they undertook further processing. FGD results showed that members could sell a kilo of their fresh cherry Robusta coffee for only USD 0.5 per kilo, which, if processed into dried beans, could fetch a price of 1 USD per kilo. Arabica cherries, on the other hand, could be sold at 1 USD per kilo but processed green beans ready for roasting could be sold at 5.2 USD per kilo. Aside from type of coffee, price also differed based on membership type. The FGD result showed that members got better prices for coffee products than non-members. Table 4 showed the price difference per kilo of coffee sold by these 2 groups.

Table 3. Distribution of Respondents Who Undertook Marketing and Processing Activities by Province and Membership, Philippines, 2017-2018.

Respondents who undertook Marketing	Province			Membership Status		Total
	Cavite %	Benguet %	MProv. %	Mem %	Non-mem %	%
Yes	96	97	98	97	96	97
No	4	3	2	3	4	3

Note: * multiple responses; MProv = Mountain Province.

Table 4. Average Price of Coffee Products by Coffee Species and Membership, Philippines, 2017-2018.

Coffee Products	Robusta (Price in USD/kilo)		Arabica (Price in USD/kilo)	
	Members	Non-Mem	Members	Non-Mem
Coffee Cherries	0.5	0.3 to 0.5	1.0	0.6 to 1.0
Dried Coffee Beans	1.0	0.6 to 1.0	2.0	1.6
Parchment Coffee	-	-	4.0	3.6
Green Beans	-	-	5.2	4.8

4. Type of Coffee Buyers

Coffee farmers sold the majority of processed coffee products to traders across the three provinces and membership types (Table 5). However, coffee farmers in Benguet and Mountain Province showed also a high preference for cooperatives as buyers of their coffee products. The general reason for choosing buyers across the three areas was the importance of being a regular buyer and choosing someone easy to deal with (Table 6).

Table 5. Types of Buyers of Coffee Per Province and Membership, Philippines, 2017-2018

Types of Buyers of Processed Coffee	Province			Membership Status		Total
	Cavite (%)	Benguet (%)	MProv. (%)	Mem (%)	Non-mem (%)	%
Direct Seller	14	10	13	16	8	13
Market Stall	2	10	13	7	4	6
Traders	96	47	35	67	76	71
Processors	3	1	2	1	4	2
Cooperatives	0	41	35	26	9	19

Note: * multiple responses, MProv = Mountain Province.

Table 6. Distribution of the Reasons for Buyer Preference Per Province and Membership, Philippines, 2017-2018

Reasons for Choosing a Buyer	Province			Membership Status		Total
	Cavite (%)	Benguet (%)	MProv. (%)	Mem (%)	Non-mem (%)	%
Easy to Deal with	16	14	25	18	15	17
Regular Buyer	34	24	13	32	27	30
Close to the Farm	1	11	4	5	4	5
Offer High Price	3	10	6	7	4	6
Provide Pick-up services	4	2	2	3	3	3
No choice	4	4	2	4	3	3

Note: * multiple responses, MProv = Mountain Province.

5. The Empirical Analysis of the Marketing Technical Efficiency Model

A linear regression with endogenous treatment effects was adopted in the study, which utilized the maximum likelihood approach for both the treatment and outcome models. The study aimed to examine if there was a difference in the marketing efficiency between members and non-members. Particularly, it tested the null hypothesis that there was no difference between the marketing efficiency of these two groups. As shown in Table 7, the potential outcome means of the marketing efficiency were higher for members. This implied that an average farmer generated PhP 42.60, or USD 0.852[1] more per PhP 1 spending in marketing activities if he/she was a cooperative member. This suggested that the marketing and processing-related services availed by the members translated into higher marketing efficiency than non-members. Results confirmed that a member tended to be 4.3 times more efficient than non-members. This result empirically reinforced the qualitative study of Quilloy and Sumalde (2015) that membership in cooperatives improved the marketing efficiency of two cooperatives in the Philippines.

Table 7. Impact of Cooperative Membership on the Marketing Efficiency of Coffee Farmers, Philippines, 2017-2018.

	Coef.	Robust S.E	P>|z|
Potential Outcome Means			
Non-Mem (0)	11.497	4.0020	***
Member (1)	54.122	15.6351	***
Average Treatment Effect (ATE)			
Mem (1 vs 0)	42.625	16.1391	***
Ave. Treatment Effect on Treated (ATET)			
Mem (1 vs 0)	42.625	0.0164	***

Notes: 1. Dependent variable: Marketing Efficiency = Value Added/marketing cost.
2. *** denote significance level at 1% probability.

As shown in Table 8, having access to price information positively and statistically affected marketing efficiency. This result was consistent with studies that showed farmers with access to price information were able to negotiate higher prices (Nakasone, 2013; Nyarko et. al., 2013). Farmers who sold coffee products to cooperatives were inclined to be more efficient than those who opted for other marketing channels. Results from the study also showed that farmers became more productive when dealing with cooperatives because some marketing-related activities were done by the cooperatives, leaving farmers more time to concentrate on improving farm operations

1. Foreign Exchange conversion used: PhP 50:USD 1.

and yields. Factors that negatively influenced marketing efficiency were the tendency of farmers to use their own vehicles to haul and transport coffee products during the rainy season. These extra functions entailed extra cost and effort on the side of the farmers with few extra benefits, translating to lower marketing efficiency for the farmers.

Table 8. Factors Influencing Marketing Efficiency and Cooperative Membership, Philippines, 2017-2018

	Marketing Efficiency		Cooperative Membership	
	Coef.	Robust S.E	Coef.	Robust S.E
No. of processing tech adopted (count)	0.718	0.523	0.139***	0.047
Distance of technology from farm (km)	0.013	0.016	0.043*	0.023
No. of years selling to buyers (years)	-0.029	0.043	-0.003	0.005
No. of days searching for a price (days)	0.003	0.009	0.008**	0.004
Served cooperatives as buyers (dummy)	7.301**	3.195	0.506***	0.105
Served Traders as buyers (dummy)	1.840	1.284	0.108	0.146
Access to Price (dummy)	3.218*	1.743	0.100	0.127
Access to Training (dummy)			-0.006	0.187
With own vehicle (dummy)	-2.367**	1.125	-0.226*	0.116
Looking for a buyer (dummy)	-0.993	0.946	0.002	0.111
Transport when raining (dummy)	-0.738**	0.992	0.077	0.114
Sex (dummy)			-0. 058**	0.072
No. of years of coffee farming			0.079*	0.002
No. of fruit-bearing trees			0.009	0.017
_cons	4.431	1.429	-0.482**	0.229
/athrho	1.656**	0.320		
/lnsigma	2.389***	0.295		
rho	0.930	0.043		
Sigma	10.900***	3.213		
lambda	10.134***	3.415		
Log pseudolikelihood	-1524.8***			
Wald test of Indep. Eqns.	26.72***			
Observations	380			

Notes: 1. Dependent variable: Marketing Efficiency = Value Added/marketing cost.
2. ***, **, and * denote significance level at the 1%, 5% and 10% probability levels, respectively.

One of the determinants that positively and statistically influenced membership was the number of processing technologies adopted by coffee farmers. This implied that access to processing technologies was a strong motivation for organizational membership among farmers. Insights collected from the FGDs revealed that cooperatives were targeted by government agencies as recipients of coffee processing equipment, such as dryers, dehullers, and roasters in which members were prioritized, if not given full exclusivity over non-members. Furthermore, some coffee farmers were also encouraged to join cooperatives to avail themselves to technical assistance and training offered by cooperatives that were commonly restricted to members only. This result was also observed by Zhang et al. (2020) in a study that showed a positive correlation between membership and technology adoption.

The farther the distance of accessing technology from a farmer's farm, the more likely the farmers were motivated to become members of cooperatives. Similarly, the longer they searched for price information, the more determined the farmers were in joining cooperatives. This indicated that farmers would rather let cooperatives shoulder transaction costs related to the sourcing of technologies. Furthermore, cooperatives were observed to provide fair prices to their members, and at the same time supply extra economic benefits through their practice of distributing patronage refunds and dividends to members.

Another factor affecting the decision of farmers to join cooperatives was having cooperatives as buyers of their coffee produce. Additionally, the more experienced the farmers were in coffee farming, the higher the tendencies were for these farmers to become members. As discovered from the FGDs, exposure to cooperatives as buyers enabled farmers to learn first-hand about the benefits of membership, such as access to technology, inputs, training, credit, and discounts. As a result, the longer the farmers were in the coffee industry, the more exposed they were to the benefits of organizational membership.

Those with their own vehicles for transporting coffee products were seen to be less likely to become members, which implied that membership in cooperatives was more attractive for farmers with lesser means. In addition, females were observed to have a higher propensity to become members than males. When asked what drove them to join cooperatives, they cited that they were influenced by their affinity to belong in groups and be accepted by peers, which were observed to be higher for females than males. This implied that socialization played a part in female decisions to join organizations. This result also confirmed the empirical findings of Balgah (2018) that showed the negative effect of gender (1=male; 0=female) on membership decisions.

The Wald chi2, which was statistically significant at 5%, showed a good model fit. This implied that there was a strong correlation between the error terms of the treatment model (membership) and the outcome model (marketing efficiency) denoting the presence of potential selectivity bias. This justified the use of the treatment-effect model in this study.

IV. Conclusions and Recommendations

Various studies showed the important role of cooperatives in improving small-scale production. However, very limited studies provided in-depth understandings using empirical analysis on the impact of organizational membership in enhancing marketing efficiency among coffee farmers in the Philippines. The model used in the study was a linear regression with endogenous treatment in which one of the regressors was an endogenous binary treatment. The model considered the correlation between the observable and unobservable items that affect treatment (i.e. cooperative membership) and those that affect the potential outcomes (i.e. marketing efficiency). The results obtained in this study showed that cooperatives and other community-based organizations played a significant role in improving the marketing efficiency of members, as

shown in the positive and significant relationship between membership and marketing efficiency. This suggests that policymakers should continue with policy incentives to support smallholder farmers to join and establish coffee organizations.

There must also be a focus on strengthening the agricultural cooperative sector to maximize its role: for instance, through programs with technical, financial, and management components that will complement the technical programs advocated by the government and other private institutions. Focusing on the operational and managerial improvement of cooperatives will address the low awareness of coffee farmers on the proper procedures and sustainable management of these coffee associations. Thus, extension services should not only focus on coffee technology and practices but also the internal management of cooperatives must be emphasized to ensure a higher success rate among these coffee groups. Close coordination and collaboration among cooperative stakeholders with the government, private, and academe would be needed to support this strategy.

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