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Does commitment to cooperatives affect the economic benefits of smallholder farmers? Evidence from rice cooperatives in the Western province of Zambia

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ABSTRACT

Using local provincial authorities, the government of Zambia has demonstrated renewed interest in cooperatives as a means of reaching smallholder farmers in rural areas. There exists, however, the problem of high heterogeneity within cooperatives regarding members' commitment, with many passive members holding only formal membership and having a minimal understanding of the cooperative's principles and benefits. The main objective of this study was to analyse how varying levels of members' commitment determine their economic benefits. We selected a total of 215 rice farmers (72 active and 143 passive members) from two rice-dominant districts and used the propensity score matching technique and endogenous treatment regression model for the analysis. The study results show that educational level, distance to the cooperative, members' perception about trust and acceptance, and value of the investment in the cooperative have a considerable influence on member commitment. The results further indicate that actively committed members of the cooperative achieve much more economic benefits than passive members.

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Gross margin; yield; small farmers; commitment; agricultural cooperatives; Zambia

1. Introduction

Agricultural cooperatives, as a legal form of business, have been regarded by governments, researchers and professionals in international development organisations as a potential solution for reducing poverty in rural areas through job creation, improved standards of living, food security and improved nutrition (Develtere, Pollet, and Wanyama 2009). Cooperatives also have the potential to improve the production, marketing and technical efficiency of small farmers (Bernard and Taffesse 2012) since they serve as a platform for building capacity and exchanging information and innovation in rural areas (Rao and Qaim 2011; Fischer and Qaim 2012).

A cooperative also serves as an avenue through which government and nongovernmental programmes and projects reach rural areas to improve rural welfare and livelihoods. This trend can even be observed in African countries in which farmers have had negative experiences in the recent past with state-controlled "traditional" cooperatives under socialistic experiments of national governments, where most of these rural structures collapsed during the economic liberalisation of the 1990s (ILO 2001; Chang 2009). Recently, most countries have reformed cooperative laws according to the internationally accepted cooperative principles formulated by the International

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Cooperative Alliance, resulting in the support of “New Generation Cooperatives” (Stofferahn 2014; Grashuis and Cook 2018).

Many studies have found that cooperatives are essential for building and maintaining social capital, such as through the involvement of their members, trust and reciprocity, and the active voices of their members (Hansen et al. 2002; Österberg and Nilsson 2009; Bareille et al. 2017). These rural institutions are usually established from the bottom up on the pillars of trust and relationships, and these social attributes, in turn, impact the cooperative’s performance (Paldam and Svendsen 2000).

Researchers typically assess the impact of cooperatives by comparing cooperative members with nonmembers. Holloway et al. (2000) highlighted the positive role of cooperative marketing for smallholder producers in their study in Kenya, Ethiopia, and Zambia. Their research indicated that green bean farmers were more capable of entering markets in Europe through collective action. Studies by Wollni and Zeller (2007), Fischer and Qaim (2012) and Mojo, Fischer, and Degefa (2017) revealed that participation in a cooperative led to improvement in the economic performance (household income, price, assets and adoption of innovation) of members. In Costa Rica, a coffee cooperative enabled small-scale farmers to participate in a specialty market with higher prices (Wollni and Zeller 2007).

However, membership in a cooperative alone does not capture how intensively members participate in the cooperative, and it also does not reveal the group’s internal dynamics. Being a formal member of a cooperative does not mean that all members are equally committed to the cooperative or that they all receive its benefits. One major challenge of cooperatives is the display of passivity or even free-rider behaviour by the members. Fulton (1999) indicated that free-rider behaviour in cooperatives could be inversely linked to the commitment and loyalty of the members towards the cooperative. Fischer and Qaim (2014) confirmed that members’ commitment influences marginal benefits and costs for all members in a group. High commitment contributes to the reduction of transaction costs within the cooperative (Fulton 1999). Therefore, efforts to reduce free-rider problems are essential for cooperative managers and the entire group (Cechin et al. 2013).

Studies by Ruiz Jiménez, García Martí, and Hernández Ortiz (2010), Cechin et al. (2013), Muthyalu (2013), Fischer and Qaim (2014), Verhees, Sergaki, and Van Dijk (2015) and Gyau, Mbugua, and Oduol (2016) focused on factors influencing the intensity of the commitment of cooperative members but did not empirically examine how the intensity of commitment impacts the economic performance of the cooperative members. Therefore, it is essential to analyse the intensity of member participation and study the benefits in terms of heterogeneity of behaviour towards the cooperative in various groups of members. One crucial question is, “Do members of a cooperative who are actively committed to the group objectives obtain greater economic benefit than passive members?”

Therefore, this study aims to analyse the economic impact of smallholder farmers’ commitment to Zambian rice cooperatives. The remainder of the paper is structured as follows: The theoretical background is in section 2, methods and data collection are in section 3, and section 4 introduces the results and findings. Sections 5 and 6 provide the discussion and conclusion of the findings.

2. Theoretical background

2.1 Agricultural cooperatives and transaction cost economies

Small farmers usually have high transaction costs because they have weak market power and information asymmetry when dealing with their trading partners (Hansmann 1988). Valentinov (2007) indicated that farmer organisations such as cooperatives are platforms to reduce the high cost of transactions. These arguments are derived from the theories of Coase (1937) and Williamson (1991). Williamson (1987) originally defined transaction costs as search and information costs, bargaining and decision costs, and policy and enforcement costs. He also highlighted three dimensions of transactions, including frequency, uncertainty levels and asset specificity. Transaction frequency refers to how frequently the transaction occurs. Uncertainty levels of a transaction refer to both internal and external disturbances, such as problems of inputs, outputs, transformational processes

and shifts in the institutional environment (Williamson 1991; Menard 2006). Asset specificity focuses on the value of investment lost when used for an alternative purpose (Menard 2006); it is linked to how alternative users redeploy an asset to an alternative use without destroying its value (Williamson 1991). Later, Sykuta and Chaddad (1999) indicated that each transaction cost is influenced by social, legal, political and economic institutions.

Bonus (1986) and Staatz (1987) argued that cooperatives facilitate transactions, economise transaction costs and develop countervailing power for members. Bonus (1986) analysed dairy cooperatives and found that dairy farmers depended on local milk processors, which led to an opportunistic expropriation of the farmers' rent by the milk processors. The dairy cooperative provided the farmers with an opportunity to avoid expropriation by internalising the milk processing, which was then under the farmers' control. Staatz (1987) indicated that transaction costs are economised by cooperatives by developing countervailing power in the form of market power, protecting farmers from the risk inherent in agricultural markets by providing members with some revenue insurance and quality control through forward and backward linkages.

2.2 Organisational commitment

The theory of planned behaviour focuses on individual intentions as the motivational factors that influence behaviour. Ajzen (1991) stated that the stronger an individual's intention to perform a behaviour, the more likely he or she will perform the behaviour. The theory of planned behaviour argues that readily accessible behaviour and normative and control beliefs are essential foundations for attitudes, subjective norms and perceived controls. Ajzen (1991) opined that when different beliefs are activated in behaviour, they produce different attitudes and subjective norms, which result in different intentions.

Meyer and Allen (1991) defined organisational commitment as a psychological state that leads to an individual remaining in an organisation. In considering a cooperative to be an organisation, commitment can be defined as members' loyalty and emotional attachment to the cooperative and an absence of free-rider behaviour (Fulton 1999). The forms of organisational commitment can be defined as affective (the "will" to remain in the cooperative), normative (the perception of a sense of obligation to stay in the organisation), and continuance (the member has no option other than to remain in the organisation as a result of a lack of choices) (Meyer and Allen 1991; Ruiz Jiménez, García Martí, and Hernández Ortiz 2010; Cechin et al. 2013).

Commitment can be operationalised, for instance, as a member attending group meetings, participating in collective marketing, patronising and investing in cooperative capital or even taking an active role in the cooperative's governing structures (Mwambi, Bijman, and Mshenga 2020). Simmons and Birchall (2004) studied the individual and collective factors that influence members' commitment to their cooperatives. From the collective perspective, the study suggested that a sense of community, shared goals and shared values are important factors that encourage members to actively participate in a cooperative. In terms of individual factors, their study mentioned that individuals are motivated by rewards (benefits) and punishments (costs). Ruiz Jiménez, García Martí, and Hernández Ortiz (2010), Cechin et al. (2013), and Verhees, Sergaki, and Van Dijk (2015) highlighted that members' perceptions, such as having a voice in the cooperative; market linkage through the cooperative; acceptance in the cooperative; and trust, communication and reciprocity of relationships influence members' commitment to a cooperative. Household and farm characteristics, such as the age, gender and educational level of the member, distance to the cooperative centre, farm size, length of membership in the cooperative, and diversity of crops grown, affect members' commitment to a cooperative as well (Cechin et al. 2013; Muthyalu 2013; Fischer and Qaim 2014; Gyau, Mbugua, and Oduol 2016).

Trust and social capital are also essential in collective actions. Hansen et al. (2002) highlighted that as individuals seek to achieve their economic goals in a cooperative, they also strive to achieve social gains. In the pursuit of their group goals, trust develops among members of the cooperative and

between the members and the managers. Hansen et al. (2002) operationalised trust as the process by which one believes that the members of a group are trustworthy. Cohesion, an indicator of the strength of a group, is built on the level of trust or social relationship the members have with each other. Cohesion in a cooperative is created due to members' positive feelings about each other and the group as a whole (Hansen et al. 2002).

2.3 Empirical studies of economic benefits of cooperatives to farmers

Grashuis and Ye (2019) provided a review of the various economic benefits that cooperatives offer. The economic indicators of a cooperative commonly used include the price of production, input adoption, productivity and yield, gross margin, product quality and market access. The impact of cooperatives on these indicators is frequently analysed by employing a propensity score matching technique (PSM), a difference-in-differences model and endogenous switching regression.

Mojo, Fischer, and Degefa (2017) used propensity score matching and the switching regression model in their study of determinants and the economic impact of membership in a coffee cooperative in Ethiopia to analyse the effect on the financial performance of farmers. This study revealed that membership in a cooperative has a significant positive relationship with economic performance measured in household income and assets. However, the significance of cooperative membership was only evident for the endogenous switching regression model, while propensity score matching showed an insignificant impact of cooperative membership on the economic performance of the farmers.

Fischer and Qaim (2012) found a significant increase in income for cooperative members who participated in collective marketing by adopting the propensity score matching technique to study determinants and the impact of collective actions on Kenyan smallholder banana farmers. Getnet and Anullo (2012) added that cooperatives improved the livelihood of smallholder farmers in Ethiopia via increases in income, additional savings, and reduced costs of inputs. Furthermore, Ito, Bao, and Su (2012) used treatment effects to study the distributional effects of agricultural cooperatives and concluded that agrarian cooperatives are important avenues to improve members' economic status. Jardine, Lin, and Sanchirico (2014) and Getnet, Kefyalew, and Berhanu (2018) confirmed that cooperatives improved the prices that members receive for their produce.

However, the majority of such impact studies lack control for the varying amounts of members' commitment. It may only be assumed that the economic impact will be higher for those actively committed to the cooperative. Several authors have concluded that the critical challenge of cooperatives is the inactive participation of the members. Fischer and Qaim (2012) confirmed that inactive participation in the collective marketing of a cooperative by its members (also known as free riding) leads to inefficiency of the entire group. It can have an impact on the members or the cooperative as a whole. The passivity of some members can decrease the total volume of production available for sale and related competitive power and thus increase the market failures of the cooperative (Fulton 1999; Ahmed and Mesfin 2017). From the individual member point of view, it can lead to renewed opportunistic expropriation of farmers by their trading partners in the market. Put differently, individual farmers may miss the opportunity to economise the transaction costs resulting from cooperation with other members in the cooperative (Bonus 1986; Staatz 1987).

2.4 Rice cooperatives in Zambia

The first cooperative that was established in rural Zambia was the North Rhodesia farmers' cooperative in 1914. There were approximately seven agricultural cooperatives, one labour recruitment cooperative, one consumer cooperative, and one rural credit cooperative in 1947 (Öjermak and Chabala 1994). The Zambian cooperative ordinance was enacted in 1948 for the registration of various types of cooperatives. Between 1947 and 1964, there was a substantial increase in agricultural production because of the active formation of marketing cooperatives by primary cooperative

societies (Öjermank and Chabala 1994; Chabu 2020). Cooperatives were viewed as a means for stimulating rural development, achieving increased production, raising rural living standards, and improving the quality of crop production (Öjermank and Chabala 1994; Chabu 2020). In the 1970s, the Cooperatives Act was enacted, and the Zambia Cooperative Federation (ZCF) was established as the main “administrative body” for national cooperative development.

Through the Department of Cooperatives, the Government of Zambia is responsible for the formulation of cooperative policy. In collaboration with the Ministry of Agriculture and Livestock, the Department of Cooperatives provides input subsidies (known as the Farmer Input Support Programme (FISP)) to farmers who belong to cooperatives or similar farmer organisations. The members of the cooperatives obtain access to the subsidies through a system of e-vouchers. International donors and related organisations also undertake programmes to create employment, increase the income of rural people, and enhance food security through rural cooperatives. Some of the international agencies involved in the strengthening of the cooperative movement include the Swedish International Development Agency (SIDA), the Food and Agricultural Organization (FAO), the International Labour Organization (ILO), The United States Agency for International Development (USAID), the Netherlands Development Organization (SNU), the World Bank, CIDP, World Wide Fund for Nature (WWF), Enhanced Smallholder Agribusiness Promotion Programme (E-SAPP) and the Czech Development Agency (Lolojih 2009).

3. Data and methodology

3.1 Data collection

This study was conducted in the Mongu and Limulunga districts in the Western province of Zambia. The two target groups for this research were the active and passive members of rice marketing cooperatives. The sample size was 215 (72 active and 143 passive) respondents. The initial determination of whether a member was actively committed was based on a brief assessment interview, where an active member was defined as selling through the cooperative. In contrast, passive members did not sell through the cooperative. Respondents were selected using random and nonrandom sampling techniques by first obtaining a list of 25 rice cooperatives from the Mongu and Limulunga districts. Ten cooperatives were randomly chosen from the list and a nonrandom sampling technique (purposive technique) was used to select active and passive members. Based on information obtained from the provincial chief cooperative officer, the reality of Zambian cooperatives is that most of the members are passive (approximately 80% of the cooperative members in the district), with only a few actively selling through their cooperatives. We increased our effort to obtain more active members to obtain a balanced sample size, but we could not because of the lower number of active cooperative members in the study area.

In addition to the standard characteristics of the farmers, we measured their perceptions about the level of acceptance, trust in members of the cooperative, monetary value of members’ investment in the cooperative, and economic indicators for the impact assessment through a face-to-face questionnaire. We collected financial data for the 2017/2018 farming period with a structured questionnaire using an electronic Nestforms application between August and September 2019. In addition, we interviewed key informants (e.g., the district chief cooperative officer in the Western province of Zambia) and other cooperative members using a qualitative approach to better understand the local context in which the targeted farmers operate.

3.2 Analytical framework

We adopted a random utility framework to determine the factors that influence members’ commitment to the cooperative. Members’ decisions to be committed to their cooperative are associated with the members’ perceived cost and benefits (Fischer and Qaim 2012, 2014). The members’ decisions to be committed to the cooperative were modelled as binary, either active or passive

commitment. The utility function of a vector of explanatory variables X_i and vector of parameters β is expressed as follows:

$$V_i(\beta X_i), \quad \text{where } U_i = V_i(\beta X_i) + u_i \quad (1)$$

Vector X includes all observable parts of members' utility, such as members' perceived cost and benefits of the cooperative and farm and household characteristics. The unobservable part of the utility is denoted by an error term u_i .

A member will become committed to a cooperative if the benefit from being actively committed to the cooperative is higher than the benefit received from being passively committed. The probability of a member becoming committed to a cooperative can be expressed as $P(u_i < \beta X_i)$. The model of commitment to a cooperative is, therefore, estimated as follows:

$$P(C_i = 1) = P(u_i < \beta X_i) = \beta X_i + u_i \quad (2)$$

where $C_i = 1$ if $U_i^c > U_i^f$ and $C_i = 0$ if otherwise, U_i^c is the utility derived from being actively committed to the cooperative and U_i^f is the utility derived from passive commitment to the cooperative.

The binary choice model was estimated using a probit regression model similar to those used by Cechin et al. (2013), Muthyalu (2013), Fischer and Qaim (2014), Verhees, Sergaki, and Van Dijk (2015) and Gyau, Mbugua, and Oduol (2016) to analyse the factors that influence members' commitment to cooperatives and to generate propensity scores for consequent matching between the active and passive members.

For the classification of active and passive commitment to the group, we used a framework of the typical activities that involve member participation in a cooperative society – selling the produce through the cooperative; attending meetings; serving on committees; involvement in recruiting others; and patronage (Österberg and Nilsson 2009). Staatz (1987) defined three levels of such members' commitment: Firstly, whether or not to become a member of the cooperative. Secondly, how much business the member decides to do with the cooperative. Thirdly, member's involvement in the democratic process by attending meetings, voting at member meetings and becoming an elected representative.

Every member of the Zambian cooperative under our research contributes a small financial amount to the cooperative and the majority also attends the meetings as part of their community activities. Therefore, we cannot use these conditions for distinguishing between passive and active members and we operationalised actively committed members as members who sell all or some of their rice through the cooperative and passive members as those who do not sell through the cooperative at all. Out of all mentioned criteria of active commitment, we believe that selling own produce through the cooperative proves the strongest intention to be actively committed to the group in the Zambian context.

The independent variables used in this probit model were members' perception about acceptance in the cooperative, member perception about trust, amount of member contribution to the cooperative, member age, gender, educational level, farm size, experience, crop diversity, and distance to the cooperative headquarters. The members' perceptions regarding the acceptance and trust existing in the cooperative were measured on a five-point Likert scale, with five being the highest, indicating strong agreement with the perception statement, and one being the lowest, indicating strong disagreement with the perception statement.

Related to the economic impact of active commitment, balancing scores were used to perform the analysis. Balancing scores were used to maintain the treated (active members) and control group (passive members) on a level playing field since there may be a selection bias due to the observable and unobservable characteristics between the active and passive members. These forms of biases were resolved by adopting the propensity score matching technique first used by Rosenbaum and Rubin (1983) to match active and passive members and to estimate the average treatment effect on the treated (ATT). In the first stage, propensity scores or covariates $P(x)$ were generated from a probit regression model, which show the farmer's probability of participating

intensively in a cooperative. The variables selected for matching were used as exogenous (treatment independent) and dummy variables and the intensity of participation was used as an endogenous (treatment dependent) variable. The impact of the intensity of commitment to the cooperative on the outcome variables (Y) was estimated using matched observations of active and passive members of the cooperative. Empirically, ATT was represented as follows:

$$ATT = E_{P(X|C=1)}\{E[Y(1)|C = 1, P(X)] - [E Y(0)|C = 0, P(X)]\} \tag{3}$$

where Y(1) and Y(0) are the outcomes for those farmers in the treated (active members) and control groups without treatment (passive members), respectively, while C = 1 for treated farmers and C = 0 for control farmers. The difference between the two outcomes refers to the treatment effect on the treated (ATT).

Of note, the PSM controls for only observable factors but cannot control for unobservable factors. To ensure consistent evaluation of the impact of commitment on the economic benefits, an endogenous treatment regression model was adopted to account for unobserved bias. The endogenous treatment effect model is a linear potential outcome model that allows for a specific correlation structure between the unobserved variables that influence the treatment and the unobservable variables that affect the possible outcomes (StataCorp 2017). Suppose the effect for commitment to a cooperative is Y_C and the endogenous treatment is t_C ; the outcome equation for the endogenous regression was estimated as follows:

$$Y_C = X_C\beta + \delta t_C + \varepsilon_C, \quad \text{and} \quad t_C = \begin{cases} 1, & \text{if } w_C\lambda + u_C > 0 \\ 0, & \text{if } w_C\lambda + u_C \leq 0 \end{cases} \tag{4}$$

where X_C are the covariates that affect the outcome variable and w_C refer to the covariates used to model the treatment variable. The covariates x_C and w_C are exogenous. ε_C and u_C are error terms that are bivariate normal with a mean of zero and the covariate matrix is as follows:

$$\begin{bmatrix} \sigma^2 & \rho\sigma \\ \rho\sigma & 1 \end{bmatrix} \tag{5}$$

Inspired by Green (2000), the likelihood function for observation c of the endogenous treatment regression model was estimated as follows:

$$\ln L_C = \begin{cases} \ln\phi\left\{\frac{w_C\lambda + (y_C - x_C\beta - \delta)\rho/\sigma}{\sqrt{1 - \rho^2}}\right\} - \frac{1}{2}\left(\frac{y_C - x_C\beta - \delta}{\sigma}\right)^2 - \ln(\sqrt{2\pi}\sigma) & t_C = 1 \\ \ln\phi\left\{\frac{-w_C\lambda - (y_C - x_C\beta - \delta)\rho/\sigma}{\sqrt{1 - \rho^2}}\right\} - \frac{1}{2}\left(\frac{y_C - x_C\beta}{\sigma}\right)^2 - \ln(\sqrt{2\pi}\sigma) & t_C = 0 \end{cases} \tag{6}$$

$\phi(\cdot)$ is the cumulative distribution function of the standard normal distribution. The ATE estimates from the treatment regression model maximum likelihood estimation can also be used for ATT when the outcome is not conditionally independent of the treatment (StataCorp 2017).

We used the rice yield and gross margin as the primary outcome variables. Gross margin was measured as the value of harvested produce in the 2017/2018 farming period minus the total variable cost incurred for producing the rice in the period in ZK, while yield was measured as the quantity of produce that was harvested in the 2017/2018 farming period, as inspired by Wollni and Zeller (2007), Wossen et al. (2017) and Hoken and Su (2018).

The independent variables that influenced the outcome variables in the endogenous treatment regression model were commitment as the treatment variables, i.e., the cost of seed and labour, age, education, gender, farm size, experience in the cooperative, distance, and crop diversity. The amount of investment in the cooperative, perceived level of trust and acceptance were included in the endogenous treatment as instrumental variables to account for endogeneity.

We acknowledge several important limitations in our nonexperimental research design, operationalisation of main indicators and data collection processes. We considered that commitment could have been measured by selling through the cooperative and other measures, such as participation in training, meetings and governance structures (e.g., the board). However, based on key informant interviews, the major commitment problem distinguishing active and passive members in cooperatives is collective marketing.

4. Results

4.1 Description of respondents

From Table 1, comparatively, before matching, the active members are older than the passive members. In terms of education, active members have a higher level of education than passive members. Active members have larger rice farms than passive members. The active members are more diversified in terms of the number of crops cultivated in addition to rice and they are located further from the cooperative centre than passive members.

Perceptions of being accepted in the cooperative are higher for active members than for passive members. However, passive members have higher perceptions of trust than active members. The active members have contributed more to the cooperative than the passive members in terms of the value of shares owned. While the active members used less quantity and spent less on seed than the passive members, they used and spent more money on labour during the production year than the passive members. Additionally, female farmers are more prevalent than male farmers in both the active and passive groups.

Table 1. Descriptive statistics.

Variable	Active (N = 72) Mean	Passive (N = 143) Mean	Mean difference
Age (years)	50.76 (12.61)	49.54 (14.91)	1.33*
Education (years)	9.88 (2.21)	7.87 (4.33)	2.00*
Farm size (Ha)	2.73 (2.83)	2.15 (1.90)	0.57***
Distance to cooperative (km)	11.83 (12.28)	7.43 (9.52)	4.40***
Crop diversity (Number of crops in addition to rice)	2.69 (1.46)	2.74 (1.31)	-0.05*
Experience (Length of membership in years)	5.25 (4.47)	4.12 (5.09)	1.13
Days to sell produce	29.94 (31.76)	15.93 (23.74)	-11.01***
Perceived acceptance (five-point ordinal scale with five highest and one lowest)	4.79 (0.36)	4.21 (1.24)	0.58***
Perceived trust (five-point ordinal scale with five highest and one lowest)	4.51 (0.71)	4.73 (0.52)	-0.22***
Amount of investment	370.14 (259.47)	196.49 (135.33)	173.64***
Seed quantity (kg)	65.91 (61.62)	87.57 (78.40)	-21.65**
Quantity of labour used	10.57 (10.88)	5.34 (8.57)	5.23***
Cost of seed (ZK)	267.13 (285.79)	371.66 (408.11)	-104.53**
Cost of labour (ZK)	7639.42 (8112.96)	4969.44 (5258.10)	2669.98***
Gender – Male	47.94%	34.50%	
Female	52.06%	65.50%	

4.2 Determinants of intensity of commitment

The determinants of intensive participation were tested with a probit regression model, as shown in Table 2. The goodness-of-fit tests show that the covariates selected provide a reasonable estimate of the conditional density of intensive participation. The independent variables are jointly statistically significant with Wald $\chi^2 = 77.45$, $p < 0.00$, and the pseudo R^2 of 0.28 indicates a good fit model.

The educational level of members, distance to the cooperative centre, members' perception of acceptance and amount of members' investment have significant positive relationships with the

Table 2. Probit model results of determinants' commitment to the cooperative.

Intensive	Coefficient	Marginal effects
Gender	0.13 (0.22)	0.04
Age (years)	-0.01 (0.01)	-0.01
Education (years)	0.07 (0.04)***	0.02
Farm size (Ha)	-0.01 (0.05)	-0.01
Distance to cooperative centre (km)	0.02 (0.01)**	0.01
Number of crops in addition to rice	-0.06 (0.08)	-0.02
Length of membership in cooperative (years)	0.03 (0.02)	0.01
Perceived acceptance	0.55 (0.17)***	0.18
Perceived trust	-0.41 (0.18)***	-0.13
Amount of investment	0.01 (0.01)***	0.01
Constant	-2.39 (1.24)*	
Wald χ^2 (10)	77.45	
p-value	0.00	
Pseudo R^2	0.28	
Log pseudolikelihood	-99.03	
Number of observations	215.00	

level of commitment to the cooperative. However, perception about trust has a significant negative influence on the intensity of members' commitment to the cooperative.

4.3 Economic impact estimation results of the commitment to the cooperative

After matching, the substantial overlap in the distribution of propensity scores, as shown in Figure 1, indicates that the condition of common support has been fulfilled (Fischer and Qaim 2012; Mojo, Fischer, and Degefa 2017). The majority of the active members are comparable to the passive

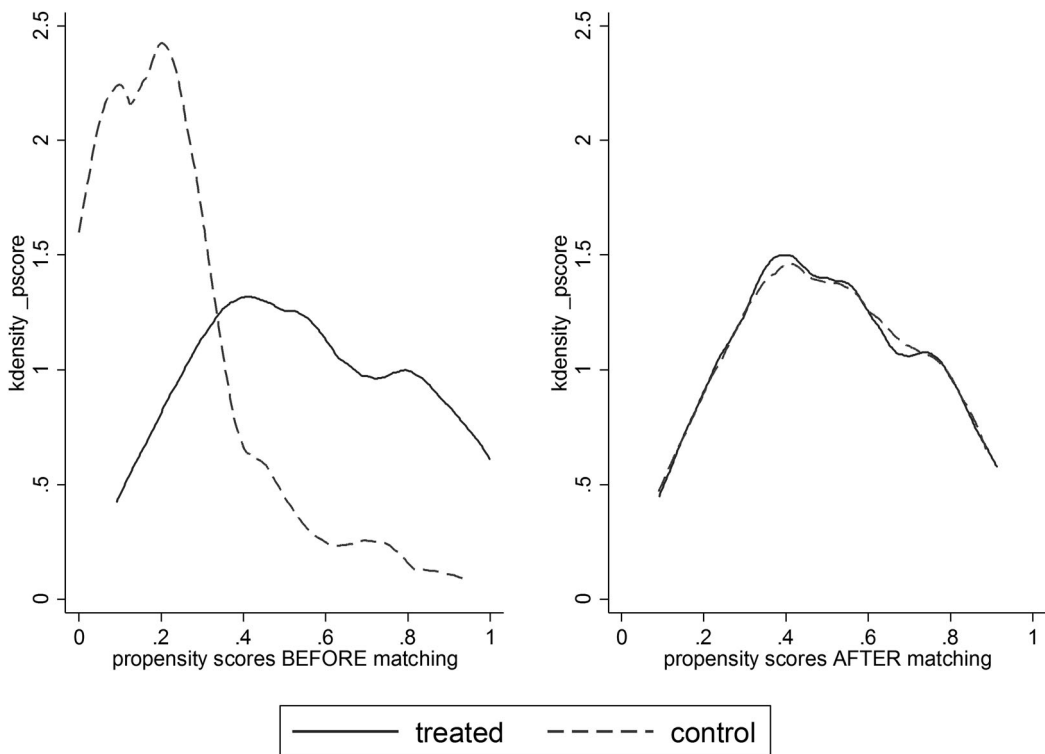


Figure 1. Propensity score distribution.

members. Seven members were outside of the support region. As a result, the final sample size for estimating the average treatment effect on the treated (ATT) was 208 (66 active members and 142 passive members). Additionally, from Table 3, the balancing properties of the PSM indicate that the matching is of good quality. The test shows that the mean bias and median bias have been reduced (the radius and kernel algorithms are not significant).

From Table 4, we can see that after matching, the members who are actively committed to the cooperative have a higher yield of rice than the passive members. Additionally, active members earn more than passive farmers after deducting the total variable cost used in production, although the nearest neighbour algorithm is statistically insignificant.

4.4 Linear regression with endogenous treatment effect

From Tables 5 and 6, the likelihood ratio tests of joint independence are significant at the 10% and 5% levels of probability, respectively, indicating that the two equations are dependent on each other. The signs and significance of the error of correlation terms (ρ) show that the covariance terms of active commitment are statistically significant, that is, self-selection occurred in an active commitment to the cooperative (Abdulai and Huffman 2014; Kanburi Bidzakin et al. 2019). There is, again, a significant influence of members' commitment on the yield of rice and gross margin in the endogenous treatment regression model. The ATT for the yield and gross margin is approximately 1797 kg and 9937 ZK, respectively, from the endogenous treatment regression model in Tables 5 and 6.

In terms of the personal characteristics of the members, farm size, members' experience in the cooperative and the quantity of labour significantly influence the yield of rice (Table 5). Additionally, from Table 6, farm size and cost of labour substantially influence the gross margin.

5. Discussion

In terms of the personal characteristics of the members, years of education of members and distance to the cooperative centre have significant positive relationships with the intensity of commitment to the cooperative. A one-year increase in educational level increases the probability of a member being committed to the cooperative by 7%. A kilometre increase in the distance to the cooperative increases the likelihood by 2%. It can be assumed that more educated members better understand the basic principles and benefits of cooperative enterprises, the economic reasons behind collective actions, and collective marketing, as confirmed by Cechin et al. (2013), Muthyalu (2013) and Fischer and Qaim (2014). However, the results showing that a longer distance to the cooperative office has a positive relationship with commitment contradict the existing evidence (studies such as Fischer and Qaim (2014) and Gyau, Mbugua, and Oduol (2016)). In the case of our respondents, the positive relationship can be explained by the fact that cooperative offices are located in larger provincial towns, in other words, close to the regional markets. The farmers who are closer to the cooperative headquarters are also closer to the nearest regional market and they are not dependent on the cooperative as a marketing channel for their produce. The delayed payments by the cooperative encourage members to use the easily available spot market to sell their rice.

Table 3. Matching quality test.

Test	Before matching	After matching		
		Nearest neighbour	Radius	Kernel
Pseudo R^2	0.19	0.11	0.13	0.13
LR χ^2	53.01	19.54	25.24	28.20
p -value	0.00	0.27	0.03	0.02
Mean bias	73.6	41.7	55.4	61.0
Median bias	73.6	41.7	55.4	61.0

Table 4. PSM estimates of economic impacts.

Variable	Matching Algorithms	Treated	Controls	ATT	Bootstrapped S.E.	z
Rice Yield (kg)	Unmatched	2515.07	830.28	1684.79	218.99	7.69***
	Nearest Neighbour	2266.66	1118.93	1147.72	425.70	2.70***
	Radius	2342.95	1023.49	1319.46	289.06	4.56***
	Kernel	2515.06	1022.20	1492.86	376.42	3.97***
Gross Margin (ZK)	Unmatched	1394.81	-3618.79	5013.60	1381.93	3.63***
	Nearest Neighbour	618.93	-1103.43	1722.37	2317.49	0.74
	Radius	1035.17	-2444.25	3745.05	2037.43	1.71*
	Kernel	1394.80	-2211.57	3606.37	1823.53	1.98**

Note: ***, **, and * represent 1%, 5%, and 10% significance levels, respectively; 1 USD = 14.77 ZK.

The results of acceptance influencing commitment to cooperatives are consistent with Ruiz Jiménez, García Martí, and Hernández Ortiz (2010), Cechin et al. (2013) and Verhees, Sergaki, and Van Dijk (2015). When members perceive that they are accepted in the cooperative, they feel emotionally attached and dedicated to the cooperative, and as such, their apathy decreases. Members who perceive that they are received in their cooperative consider the long-term success of the cooperative, and as such, they forgo their short-term gains for the sake of the cooperative's long-term development. The study by Simmons and Birchall (2004) highlighted that reciprocity, collectively shared goals, shared values, and a sense of community significantly influence the intensity of participation in a cooperative.

However, one interesting finding is the negative relationship between trust and commitment. Passive members, on average, have higher confidence in the other members of the cooperative than actively committed members. Active members seem to have deeper insights into the group dynamics and thus are more critical of the passive behaviour of others. A similar finding was found by Gyau, Mbugua, and Oduol (2016), and it may be attributed to the reversed causal chain,

Table 5. Endogenous treatment regression estimate for yield.

Yield	Coefficient
Gender	247.55 (202.69)
Age	-8.99 (7.01)
Education	-21.26 (26.84)
Farm size	128.41 (47.68)***
Distance	-2.02 (10.15)
Number crops	88.40 (71.55)
Experience	43.55 (20.61)**
Quantity of seed	-1.71 (0.28)
Quantity of labour	42.51 (10.40)***
1. Commitment	1796.54 (355.26)***
Constant	439.61 (485.20)
Commitment	Coefficient
Gender	0.14 (0.22)
Age	-0.01 (0.01)
Education	0.06 (0.02)**
Farm size	-0.01 (0.05)
Distance	0.02 (0.01)**
Number crops	-0.06 (0.08)
Experience	0.02 (0.02)
Trust	-0.44 (0.18)**
Acceptance	0.62 (0.19)***
Investment	0.01 (0.01)***
Constant	2.31 (1.24)*
/athrho	-0.30 (0.16)*
/Insigma	7.23 (0.05)***
p-value	0.00
Wald χ^2 (10)	502.92
Number of observations	215

LR test of indep. eqns. (rho = 0): chi2(1) = 2.99 Prob > chi2 = 0.08

Table 6. Endogenous treatment regression estimate for gross margin.

Gross margin	Coefficient
Gender	1122.86 (1148.38)
Age	-11.00 (40.15)
Education	12.20 (149.90)
Farm size	580.29 (272.62)**
Distance	-23.62 (56.77)
Number crops	-272.03 (402.45)
Experience	177.69 (116.60)
Cost of seeds	-1.45 (1.42)
Cost of labour	-0.943 (0.09)***
1. Commitment	9937.14 (1693.74)***
Constant	-468.71 (2799.91)
Commitment	Coefficient
Gender	0.14 (0.22)
Age	-0.01 (0.01)
Education	0.06 (0.02)**
Farm size	-0.01 (0.05)
Distance	0.02 (0.01)**
Number crops	-0.06 (0.08)
Experience	0.02 (0.02)
Trust	-0.44 (0.18)**
Acceptance	0.62 (0.19)***
Investment	0.01 (0.01)***
Constant	2.31 (1.24)*
/athrho	-0.36 (0.13)***
/lnsigma	8.96 (0.05)***
<i>p</i> -value	0.00
Wald χ^2 (10)	150.87
Number of observations	215
LR test of indep. eqns. (rho = 0): chi2(1) = 4.98 Prob > chi2 = 0.0257	

indicating that committed members are more reserved and perceive passive members as free riders in the group who decrease the economic potential of the entire group.

The value of members' investment in the cooperative has a statistically significant influence on commitment. The assumption is that such members are affectionately committed to the cooperative because they have gone beyond mere participation in the cooperative for socialisation but seek alignment of the cooperative objectives with their personal business and livelihood objectives and financial strategies.

However, due to our research design, the direction of the causality between some of the factors mentioned above and commitment is not straightforward, and it is not easy to prove. Our data indicate that feeling accepted, perceived trust and willingness to invest in the cooperative are positively associated with the farmer's commitment to the group. Nonetheless, we must admit that we cannot fully establish the causality between the observed phenomena. They all might increase commitment, while higher commitment might also increase the positive perception of the member and willingness to share the financial burden of the cooperative.

The PSM estimates indicate a significant positive impact of active commitment on rice yield and gross margin. The results show that although participation in cooperatives offers economic benefits to members in general, as found by other researchers such as Getnet and Anullo (2012), Ito, Bao, and Su (2012), Fischer and Qaim (2014), Mojo, Fischer, and Degefa (2017), and Getnet, Keyfalew, and Berhanu (2018), the benefits that members who undertake collective marketing achieve are greater than those of the members who do not participate actively in collective marketing.

Higher gross margins for active members can be explained either by reducing variable costs of production at the same level of output or increasing output at the same variable cost of production. Both outcomes can be achieved in a cooperative through the economisation of transaction costs. Ruiz Jiménez, García Martí, and Hernández Ortiz (2010) stated that activeness in a cooperative leads to reductions in cost and that the profit margin that third parties could have enjoyed is

now shared proportionally among the members. Active farmers benefit from selling through the cooperative by reducing transportation costs to the market, cost of storage and other marketing costs. The significant impact of active participation in a cooperative on gross margin is similar to previous studies by Getnet and Anullo (2012) and Ito, Bao, and Su (2012).

The significant positive influence on yield by smallholder rice farmers is consistent with the findings of Hoken and Su (2018). Active members may be motivated to produce more rice because the cooperative adds one more marketing channel in addition to the traditional middlemen, wholesalers, spot markets and farm gates available to all members. It provides active members with the perception of more options to sell their produce and negotiate better prices. Active members obtain better services and feel less exploited in market power by their trading partners.

Our findings also confirm one of the fundamental cooperative principles defined by the International Cooperative Alliance (ICA), which is that cooperative members should be economically participating in their cooperative businesses. Without members' economic participation, both active and passive members achieve only noneconomic and social benefits, which might even cease in the long run when group cohesion and trust diminish with increasing numbers of inactive and free-riding members.

From additional qualitative interviews, we learned that the active members see the cooperative as a market that provides them secure, fixed pricing and offers a higher price than the other market outlets. Active members also have other motives that include obtaining dividends, retaining control and participating in the organisation. These motives, in turn, encourage cooperative sustainability and efficiency. Some of the active members highlighted that *"selling through the cooperative would help the cooperative to be sustainable in the future while they also achieve a higher price"*. However, although the active members sell through the cooperative, they also sell some quantity of product through the other channels because they need money for transactive and precautionary motives. In an interview with members of the cooperative, they indicated that *"it takes longer for the cooperative to offer payment for their products compared to the other market channels"*. Compared to active members, passive members prefer to sell more of their rice through the spot market. The other rice market channels available to both active and passive members are middlemen, wholesalers (farmers sell their rice to buyers such as the Food Reserve Agency (FRA) and local milling plants), and farm gates (traders or other local community customers come to the farm to buy from the farmers). Like the active members, the passive members believe that selling through the other channels helps them sell their rice more rapidly. This belief indicates a lack of management skills in the cooperative and a lack of innovative ways (e.g., contracting with large participants within the rice value chain and finding buyers before the members harvest the produce) to increase the sufficient liquidity of the cooperative. However, it was interesting to learn from interviews with cooperative leadership that *"the members are ignorant of the importance of selling through the cooperative"*.

Additionally, the Zambian government, which uses membership in cooperatives as a condition for farmers to attain access to input subsidies, contributes to passive behaviour. It can be argued that passive members continue as cooperative members only as rent-seekers, without any economic justification related to their businesses; this was also found by other researchers, such as Francesconi and Wouterse (2015) and Michalek, Ciaian, and Pokrivcak (2018). In many African countries, farmers join cooperatives because the government and NGOs provide them with benefits and input subsidies. Francesconi and Wouterse (2015) highlighted that incentives provided by MiDA and other NGOs led to the formation of many cooperatives in Ghana with artificial rent-seeking as their sole objective.

Our study did not identify significant importance or variation between the active and passive members in terms of their capital investments in the cooperative. The primary source of cooperative capital is the membership fees and shares paid by all members. Each member must own ten shares at a value of 50–100 Kw per share, depending on the cooperative. The other source of capital for cooperatives is obtaining funds from development agencies in Zambia. However, these sources

are not sufficient to fund cooperative marketing activities. Additional income generated from the margin from member sales is needed for the financial survival and sustainability of the cooperatives.

6. Conclusion

Since there has been no empirical attention focused on how the intensity of commitment impacts the economic performance of cooperative members, this study investigated the economic benefits that rice farmers achieve because they are committed to their cooperative.

The probit regression model was used to estimate the determinants of commitment and estimate propensity scores. The propensity score matching technique was used to assess the impact of commitment on the economic benefit of smallholder member rice farmers. The endogenous treatment regression model was then used to estimate the effect of commitment on the financial benefit of members since PSM cannot control for unobserved bias.

The probit regression model showed that members' education, distance to cooperative, members' perceived trust and acceptance, and monetary value of their investment in the cooperative have a significant influence on commitment. Members who are actively committed to the cooperative achieve higher financial benefits than passive members. All the economic impact indicators (yield and gross margin) were statistically significant.

Based on the results of this study, the study recommends that awareness of the importance of selling through a cooperative should be created by education and training among cooperative members since active selling through the cooperative yields members higher prices and higher gross margins.

For a cooperative to be effective and sustainable, cooperative leaders should increase their group management skills, effectively communicate the cooperative's business and marketing goals to the members and focus on their achievements (e.g., members' sales or volume through the cooperative). Leaders should also maintain social relationships within the cooperative and adapt to changing value chain and market conditions.

Management should be trained and encouraged to seek additional market opportunities to provide additional members with cooperative marketing services. Management should look for innovative ways to obtain buyers, such as contracting with supermarkets or agribusiness firms within the rice value chain and capitalising on the Zambian warehouse receipt system to generate revenue for members.

Additionally, to encourage inactive farmers to become active in the cooperative, the government's distribution of the input subsidy (FISP) should be conditioned on a cooperative's level of activeness rather than merely formal membership.

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