Innovations

Impacts of rural saving and credit cooperatives on women annual income in the case of Sinana district, Bale zone, Oromia regional state, Ethiopia

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Abstract

Rural saving and credit is one of the most powerful tools that contribute to the income of many rural women through provision of financial and supporting services to the poor. In light of the problems and the research gaps identified, this study was sought to address and generate information on the impact of rural saving and credit cooperatives on women annual income. The study was conducted in Sinana district of Bale zone, Oromiaregional state. A total of 378 sample respondentswere selected through multi-stage sampling techniques. First, Sinana district was purposively selected. Then after, simple random sampling technique was employed to select six villages from Sinana district. Finally, using stratified random sampling technique, sample women were proportionally selected from the selected villages. For data analysis, logistic regression and propensity score matching methods were employed. The result of logit regression model implied that family size, marital status, education status,distance from the center, participation in training, credit use and amount of loan borrowed were the variables that significantly affected the participation of women in rural saving and credit cooperatives. In addition, the result of propensity score matching implied that, on average, the participantwomen have increased amount of annual income by 9263.94birr during the survey year. The estimated average treatment effect showed that membership of women in the cooperative has a significant impact on women annual income. The average annualincome of member women was higher by about 61.14% when compared to non-memberwomen.Therefore, the government in collaboration with the stakeholdersshould give more

emphasis in order to increase the membership of women in rural saving and credit cooperative and improve their annual incomein the study area.

***Keywords**: 1.Income, 2.Rural Saving and Credit Cooperatives, 3.Impact, 4.logit, 5.Propensity Score Matching.*

1. Introduction

Saving and Credit Cooperatives (RUSACCOs) are likely to be the most viable and sustainable institutions to provide accessible and affordable financial services to the vast majority of urban poor (Aregawi, 2014). RUSACCOsocieties or credit unions have been developed to meet the fundamental human need to find a way of saving and borrowing methods without taking risks and without handing over too much power to a moneylender (Getachew, 2013). RUSACCOs' core business is mobilizing savings from participants, and then providing them with credit at affordable interest rates (Alecia, Elizabeth, Gideo&Dancan, 2012).

Access to credit can support rural poor economy through increasing the ability of households to meet their financial needs such as the purchase and use of improved agricultural inputs which are not available from the farm. Further, access to rural credit may increase the households' ability to adopt modern agricultural technologies that increase the income of the small farm holders and breaks poverty cycle(Anyiro & Oriaku, 2011). In developing countries microfinance, like Ethiopia, microfinance institutions have been arose as a financial institution with an aim of providing small sized financial service to the poor who were in requirement of financial services but lack of access to formal commercial banks. The microfinance institutions services include; provision of small size of loans, saving, insurance services, money transfer and other relevant services to the target poor people who were left out by conventional commercial banks due to lack of collateral requirements(Tolossa, 2014).

The study conducted in Cheliya district of Oromia regional state implied that microfinance is one of the most powerful tools that contribute to the livelihoods of many people through provision of financial and supporting services to the poor. The study indicated that the mean yearly income of participants was greater than that of non-participants. Based on finding, the study suggested that the microfinance institutions and other concerning bodies should work more on increasing rural

households' participation in microfinance services to improve the income of participant households in the area (Tadele et al., 2018).

Even though there have been many studies conducted concerning the impact of microfinance at the country level, a high proportion of them have been focusing on assistances to children's education, improving health consequences for women and children, poverty reduction and empowering women by participation in microfinance services. Moreover, those studies have compared microfinance member against non-member on outcome variables of interest using descriptive statistics and observable characteristics without addressing the key methodological issues such as selectivity bias and sensitivity analysis. In addition, those studies didn't address impact of community based saving and credit cooperatives on rural women income. So, in present study, the researcherswere aimed to assess the impacts of membership in RUSACCOs on women annual income.

Recently, in Ethiopia, many microfinance institutions have been introduced and have been working in order to solve the credit access problems of the poor especially to women those participating in the small business (Amir, 2020).Therefore, to assess the impacts of community based rural saving and credit cooperativesonwomenannual income, the study employed Propensity Score Matching (PSM) model. Research designwascross-sectional data obtained from both primary and secondary sources. In this regard, the study will have significant contribution to rural women in the study area in order to enhance their participation in RUSACCO and improve their annual income.

1.1. Research Questions

1. Which factors significantly affects the membership of women in RUSACCO?
2. Is the incomeofparticipant womenimproved after joining the cooperatives?

1.2. Objectives of the Study

1.2.1. General Objective

The general objective of the study was to assess the impact of participation in rural saving and credit cooperatives on women income in Sinanadistrict of Bale zone.

1.2.2. Specific Objectives

The specific objectives of this research were:

1. To identify the factors that affects participation of women in the cooperatives;
2. To measure the impact of participation in RUSACCO on women's income

2. Review of Related Literature

2.1. Overview of Impact of Rural Saving and Credit Cooperatives

Women are having burden and responsibilities in executing home and field activities. Cleaning the house, buying goods for home consumption, carrying agricultural products to the market, and participation in various agricultural activities like weeding are some of their responsibilities. Despite their share of labor, their work is not valued by the society and the decision to control over income goes to the men. In rural areas, women live in oppressive culture that denies their right to participate in decision making process. Therefore, socioeconomic deprivation of women is characterized by their limited access to resources, services, and employment. As a result, a large number of women are economically dependent on men (Addisu, 2016).

The study conducted by Addisu (2016) in MidaWoremu district of North Shoain general revealed that advancing credit by RUSACCO to community members in the district brought an income impact of ETB 5783 per annum.However, Ethiopian women did not equally benefit from the national development endeavors because their contributions to the economy had not been fully valued (TGE, 1993). Ethiopia remains a highly traditional and religious society in which women are kept in a minor position (Gemechu, 2007). Alamirew (2006) reported that microfinance has positive impacts in reducing poverty, penned that considerable findings were drawn on market-oriented micro-financing. Yet the impacts of MFIs on rural women empowerments and socioeconomic aspects are overshadowed. There is still a need of more evidences on the impact of participating in RUSACCOs on the income of women in Sinana district where there is no any research effort to assess the impact of RUSACCOs.

The studyconducted by Kebu (2017)on the financial and operational performance of microfinance institutions by using simple descriptive analysis had focused on factors affecting

financial performance of microfinance institutions in the study area. However, the study did not say anything about the effect of microfinance services on women income in the study area. Another study conducted by Birhanu (2016) in Cheliya district of Oromia region on the role of microfinance institutions in reduction of unemployment focused on youths' participation in microfinance services by analyzing factors affecting youths' participation in microfinance institutions. The finding result showed that microfinance institutions reduced unemployment by providing loan and saving service. However, this study did not show the impact of microfinance saving and credit on women livelihood. Moreover, in Sinana district there was no observed evidence that shows whether the incomes of rural women those participated in microfinance services were improved or not. This motivated the researcher to conduct a study on the impact of participation inrural saving and credit on women income.

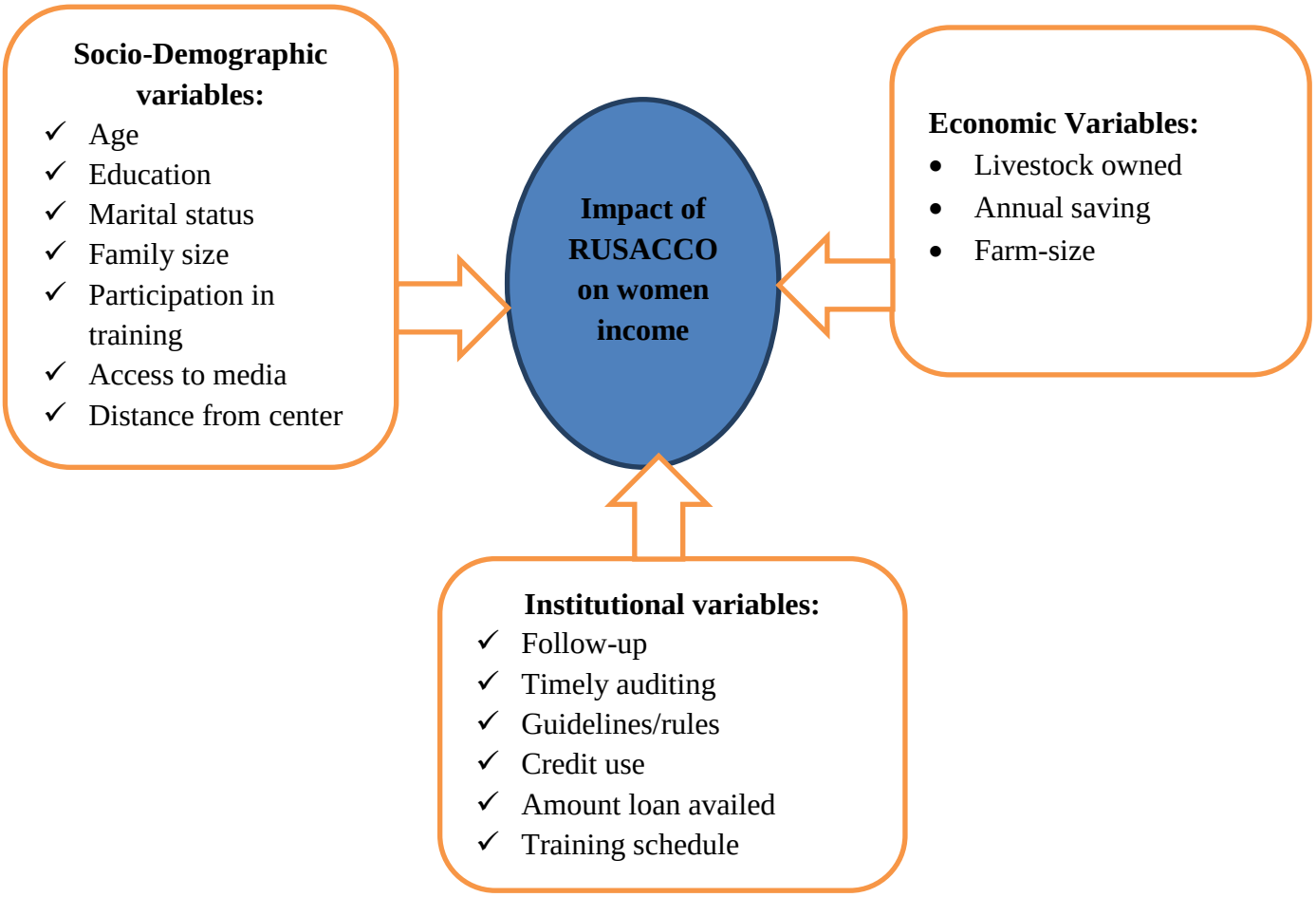
2.2. Overview of Sinana District in the Context of the Study Objective

Bale zone is one of the 21 zones in Oromiaregional statethat found on the south-east of the country. The zone has about 11 districts and two city administrations. Sinana is among 11 districts in Bale zone with 20 villages and two rural towns. It has about 172,777 population size, of which 90,185 were males and 82,592 were females. As of the Sinanadistrict case, Walko and Peace are the MFIs which take major roles. There are about 22 women cooperative groups in the district with about 1788 total active members. However, the number of members and initial capitals are different from village to village.

The women (target population) proposed for this study were rural residents. Most of the members and non-members of the cooperative saving and credit in the selected study area were women relying on farming activities. Though majority was farmers, there were active women who participate in mixed activities like farming and merchant. To be the member of the saving and credit cooperative group, the only requirement is their interest. The cooperative office of the district is working on the issue by preparing timely guidelines, rules and regulations, making awareness on the benefit of RUSACCO, giving trainings relating how to be effective being the member of the cooperative group, conducting back-payment follow-up, follow-up of business plan, etc.

2.3. Conceptual Framework

The independent variables in the conceptual frame work were designated after extensive literature review. The frame work undertakes that participation is a net result of the positive or negative effects exerted by all the explanatory variables on the dependent variable.



3. Research Methods

3.1. Research Approaches

This study was used quantitative research approach for the sake of assessingthe factors affecting the membership of women and impacts of RUSACCO on women annual income in the study area.

3.2. Research Design

From different types of research designs, descriptive and causal type of research designs have been employed as main research designs for this study in order to meet the intended objectives.

3.3.Data Sources and Methods of Collection

This study was conducted based on cross-sectional data obtained from primary datawhich was collected through structured questionnaires and face-to-face personal interviews methods. Cooperative official and other officers (or auditors) at higher position in Sinanadistrictwere interviewed. At the highest level, a zonal cooperative agency and RUSACCO expertswere used as to collect appropriate data.Focus group discussion and key informants' interview were also applied to collect sufficient information and to capture relevant data of beneficiaries. The focus group discussion was conducted with clients of microfinance institutions. A total of five focus group discussions involving 7 to 10 participants in each group were used. Key informants were also held with the staff participants of microfinance institutions so as to get information about how the institution is operating in the area and about the opinion of the people towards the program intervention. On the other hand, secondary data were collected from secondary relevant sources such as unpublished study documents and other official reports of relevant quality, and internet sources.

3.4. Sampling Techniques and Sample Size Determination

To get the representative sample, the researcher usedmulti-stage sampling technique. Sinana district was selected purposively because none of the studies done on the impact of RUSACCO on rural women's income. Furthermore, both simple random (to select villages from Sinana district) and stratified random sampling techniques were employed to select sample of

respondent women. The sample size of the women for the present study was determined by applying Kothari (2004) sample size determination formula:

$$n = \frac{Z^2 pqN}{e^2(N-1) + Z^2 pq},$$

where n=sample size; N=total population (19,570); Z=95% confidence interval under normal curve (1.96); e=acceptable error term (0.05) and p and q are estimates of the proportion of population to be sampled (p=0.5 and p + q=1). Five percent (5%) of error term (e=0.05) was used to take representative and cost effective data for this study.

Accordingly, the sample size for the study was determined as below:

$$n = \frac{(1.96)^2 * 0.5 * 0.5 * 19{,}570}{(0.05)^2(19{,}570-1) + (1.96)^2 * 0.5 * 0.5} \approx 378$$

Thus, from a total of 378 sample women, 189 participants and 189 non-participants were selected to get good matching in the propensity score matching estimation. Due to time, effort and cost constraints, out of 22 women cooperative groups in Sinanadistrict, only sixvillages were selected based on their number of participants in the group (two from each of small, medium and highnumber of membership group), and then, women in the sample villages were stratified proportionally into participants and non-participants.Then after, the samples from each of the selected villagewere selected using simple random sampling technique.

3.5. Variable Definition and Hypothesis

Dependent Variableis **"**membership in RUSACCO"; it is a dichotomous dependent variable in the model and it takes "1" if the woman isRUSACCO member and "0", otherwise.

Outcome Variables is the total annual income generated from crop production, livestock production, off-farm and non-farm activities in 2021.

Independent Variablesthat tend to explain a given dependent variable were age, family size, marital status, educationalstatus, annual income, distance fromRUSACCOscenter, annual expenditure, amount of loan borrowed, participation in training, credit use, participation to social association/groups, livestock size and farm size.

Table 3.1: Summary of hypothesis of response and explanatory variables

Variables	Measurement scale	Codes	Expected sign
Participation in RUSACCO	Dummy	"1" for participants and "0" otherwise	+
Age	Continuous	Year	+
Education level	Categorical	Level of education or year of schooling	+
Cultivated farm-size	Continuous	Hectare	+
Family size	Discrete	Number of family	+
Livestock owned	Continuous	Tropical livestock unit (TLU)	+/-
Occupation	Categorical	1=farmer, 2=employed, 3=merchant, 4=other	-
Distance from MFIs	Continuous	Hour	-
Access to social media	Dummy	"1" for those have access to social network(radio, mobile phone) and "0" otherwise	+
Training regarding saving and credit	Dummy	"1" for those have training and "0" otherwise	+
Annual income (TAINCM)	Continuous	Birr	

3.5. Methods of Data Analysis

In this study, both descriptive and econometric analyses were used. The descriptive statistics was used to evaluate the significances of effects in some key parameters. Accordingly, frequency distribution, mean, standard deviation, chi-square test and independent t-test values of some important variables were computed to compare the mean differences between members and non-members of RUSACCOs.

Logit Model: This study employedbinary logistic regression model to identify the factors that significantly determine the membership (participation) of women in RUSACCO and to estimate the propensity scores.The dependent variable was the membership of woman in RUSACCOs ("1" = member, "0" = non-member). Accordingly, a logit distribution model was defined following Liao (1994), Gujarati (1988) and Aldrich and Nelson (1984):

$$\text{logit}(p_i) = \log\left(\frac{p_i}{1-p_i}\right) = \beta_0 + \beta_1 x_{1i} + \beta_2 x_{2i} + \cdots + \beta_p x_{pi},$$

where, p_i= (y=1) =probability of success and could be estimated:

$$P_i = \frac{1}{1+e^{-Z_i}} = \frac{e^{Z_i}}{1+e^{Z_i}},$$

where$p_i$is a probability that the i[th] woman is in the membergroup (category).

e^{Z_i}: stands for the irrational number e to the power of Z_i

Z_i: is a function of n-explanatory variables which is also expressed as:

$$Z_i = \beta_0 + \beta_1 x_{1i} + \beta_2 x_{2i} + \cdots + \beta_p x_{pi},$$

where $x_1, x_2, \ldots, x_n$ are explanatory variables;β_0 is the intercept;β_1, β_2, ---, β_p are the logit parameters (slopes) of the equation in the model.

Propensity Score Matching Model(PSM): This study employedPSM model to analyze the impact of RUSACCO on the annual income of women. PSM is a non-parametric method that is widely used in the impact evaluation of different interventions (Heckman, 1998; Ravallion, 2005). In order to estimate the average treatment effect on treated (ATT) by using propensity score matching method the steps like estimation of the propensity scores, choosing a matching algorithm, checking on common support region, testing the matching balance and sensitivity analysis were employed. The impactof RUSACCO on the income of womenis explained as:

$$\tau_i = Y_i(D_i = 1) - Y_i(D_i = 0),$$

whereτ_i is effect because of membership in RUSACCO, Y_i is the outcome (the impact of membership in RUSACCO on women income) and D_i is whether women i was member or not. However, $Y_i(D_i = 1)$ and $Y_i(D_i = 0)$ cannot be occurred simultaneously for the same individual at the same time. Based on this, the position woman in the treatment either $Y_i(D_i = 1)$ or $Y_i(D_i = 0)$is unobserved outcome. Hence, analyzing individual treatment effect,τ_i, is difficult. Therefore, estimating the average treatment effects of the population than the individual woman was very important. Among the average treatment effect, average treatment effect on treated (ATT) is one of the most commonly used in impact assessment and it is described as:

$$\tau_{-ATT} = E(\tau/D = 1) = E[Y_{(1)}/D = 1] - E[Y_{(0)}/D = 1]$$

Here, the outcome variable of woman who was a member,$E[Y(1)/D = 1]$ is observed. However, the outcome variable of memberwomen had they not member, $E[Y(0)/D = 1]$ is not observed. Hence, substituting the outcome (total annual income of participant women had they not participated) $E[Y(0)/D = 1]$, for outcome (total annual income of non-participant women) is impossible in non-experimental impact assessment. If substitute, it implies that variables that determine women's participation decision in microfinance credit also determine the total annual income of women. This means that, the total annual income of women from participant and non-participant would differ even in absence participation, this leading to a self-selection bias. By deducting E[Y(0) /D=0] from the left and the right side of the equation we can specify the average treatment effect on treated as follow:

$$E[Y(1)/D = 1] = E[Y(0)/D = 1] - E[Y(0)/D = 0] = \tau\_ATT + E[Y(0)/D = 1] - E[Y(0)/D = 0].$$

In this case, the terms in the left side are observables and the average treatment effect on treated can determined if and only if $E[Y(0)/D = 1] - E[Y(0)/D = 0]$ zero. This occurs when there is self-selection bias. In order to resolve the selection matter in non-experimental impact studies the following two assumptions are required.

Conditional independence assumption: It indicates the outcomes are independent of treatment and conditional on (X_i). This assumption shows that the selection is only depend on observable characteristics that affect both participation decision of women and the outcome variables simultaneously (Caliendo&Kopeinig, 2008).

Common support: Is refers to the area in which both participant and non-participant women have propensity score values in common. In other words, it is the area which contains the minimum and maximum propensity score of participant and non-participant groups, respectively. Those observations whose propensity scores is smaller than the minimum and larger than the maximum prosperity score value are discarded from the treatment and control groups (Caliendo&Kopeinig, 2008).

That is $0 < P(D = 1)/X < 1$.

Given these two assumptions, the propensity score matching algorithm to estimate ATT can be described as:

$$\tau_{ATT}^{PSM} = E_{P(X)/D=1}\{E[Y(1)/D = 1, P(X)] - E[Y(0)/D = 0, P(X)]\}$$

Where, $p(X)$ is the propensity score calculated from covariate X. Equation is explained as; the PSM estimators is the difference between mean of outcomes over common support region.

Matching Estimate of Propensity Score

A logit model was estimated using all explanatory variables to estimate the propensity scores. Next, the best matching estimator that fit the data was chosen. Then, depend on the propensity scores estimated and matching estimator selected, matching between treatment and control groups was carried out to measure the effect of ruralsaving and credit on the average total annual income of women.

4. Results and Discussion

4.1. Factors Affecting Women Participation in RUSACCOs

In order to assess the impact of rural saving and credit cooperative (RUSACCOs) on women income, the PSM method was used. The estimation process was done using psmatch2 in STATA 14. In PSM estimation, the following steps were performed.

The first step in PSM estimation is choosing binary outcome models in estimating the probability of membership in RUSACCO of women. The dependent variable in the impact assessment analysis takes the value of 1 if woman was participants of RUSACCO and 0, otherwise.

A binary discrete choice regression model (logit or probit) can be used for estimation of the propensity score. Both logit and probit regression models were compared. Given the two models, the one with the smaller AIC and BIC fits the data better. Accordingly, logit model was preferred over probit model in estimating the propensity score. Thus, Table 4.5 illustrates the binary logit regression estimates for membership of RUSACCO of women. There were multiple factors which affects the membership of women in rural saving and credit cooperatives. Based on the collected data and using the appropriate econometrics model (logit), the following analysis was drawn and has been discussed on the significant explanatory variables below (see Table 4.1).

Marital status: it is positively related with women to be membership of RUSACCO and statistically significant at 1%. The result shows that if woman was married the probability of being membership of RUSACCO increases by 26.8%.The result was consistent with the result of Zemen which is conducted in 2014. In addition, Amir (2020) stated that married women can handle and manage their overall activities than women who divorced or single, which enabled them to produce more income and save more also, attracts the women to join rural saving and credit cooperatives.

Education status: it is positively correlated with women to be membership of RUSACCO and statistically significant at 1% significance level. The marginal effects result shows that if educational level of woman increases by 1 grade, the probability of being membership of RUSACCOs increase by 6.8%. In other words, themarginaleffect of value 0.068 implies that a unit increment ineducational level would increase the women participation by 6.8 percentages.This study was also consistent with Zemenwhich is conducted in 2014.Educated woman tend to understand the new intervention more quickly thanilliterate woman. The assumption of the study was that, if the level of respondent woman educationallevel increases, the probability of joining a RUSACCO will also increase (Amir, 2020).

Family size: Family size of women was statistically significant at 1% and negatively affectswoman to be membership of RUSACCOs. The result shows that if family size of women increase by one unit the probability of being participant of RUSACCO decreases by 5.2% (or the marginaleffect of value 0.052 implies that a unit decrement infamily size would increase the women participation by 5.2 percentages).The family size increase means that the women had to meetthe family expenses of their children forschooling, food, health expenses, in addition tofarm input expenses, thereby leadingwomen not to have more money.Therefore, women with high family size were decrease the probability of joining RUSACCOs, in the study area.High family size had negative impact on income due to the spent of much money on consumption (Amir, 2020).

Distance from RUSACCOs center: is correlated negatively with woman to be membership of RUSACCO and statistically significant at 5% significance level. The result shows that if the woman living area'sdistance from RUSACCO increase by 1km, the probability of being membership of RUSACCO decreases by 14.2%. In other words, themarginaleffect of value

0.142 implies that a unit decrement to distance would increase the women participation by 14.2 percentages.The scholars also stated that the close proximity of RUSACCO to the beneficiaries would save resources (time, labor) which otherwise would have been spent to access different financial products and services and it also motivate women to join the RUSACCOs. RUSACCOs which were located at far distant areas, on the other hand, discourage women's joining in the cooperative and it was difficult to follow up and control the operational system of the cooperatives.

Participation in training: is related with women to be membership of RUSACCO positively and statistically significant at 5% probability level. The analysis result shows that if the woman participates in training, the probability of being membership of RUSACCO increases by 22%. This implies that women who have participated in RUSACCOs training programs have a higher probability of joining RUSACCO than women who have not got training. The possible reason might that in the rural area there is a great gap between the demand for financial product by the farm women and the supply of products by financial product providers. Often, under such circumstances possible options and experiences needed to deal with this issue are not available in the rural settings. Therefore, knowledge gained through training might give a chance to the beneficiaries to be part of the solution. The other possible reason is that RUSACCOs are financial institutions that are owned by the participants providing financial services, products and net benefits obtained from the operation to the participants themselves. Hence, an in-depth understanding about the operation system of the cooperatives through training might encourage them to be membership of the RUSACCOs. This study is consistent with the result of Teka which is conducted in 2008.

Credit use: The credit use was statistically significant at 1% and positively related with the membership of RUSACCO. The result shows that the probability of woman being membership of RUSACCO increases by 48.4% if a woman is credit user.In the study area, those participantwomen who werethe beneficiaries of credits over the past 12 months would develop experiences on how to use credit purposefully and enhance the earning potential than non-participants women. Since one of the major objectives of RUSACCOs was to offer credit to the participants, those who had credit use experience were expected to be membership in RUSACCOs. This result was consistent with Abiy's finding that conducted in 2017.

Table 4.1: The logit regression estimate of membership of RUSACCO

Independent Variables	Coefficient	Std. error	P>z	dy/dx
Age	-0.018	0.02	0.534	-0.003
Family size	-0.311***	0.10	0.006	-0.052
Marital status	1.62***	0.08	0.028	0.268
Educational status	0.26**	0.09	0.013	0.068
Livestock	0.209	0.15	0.169	0.037
Farm size	0.08	0.46	0.863	0.019
Distance from RUSACCOs	-0.70**	0.34	0.048	-0.142
Participation in training	1.10**	0.07	0.023	0.220
Credit use	2.40***	0.56	0.001	0.380
Participation in social association	-0.29	0.51	0.351	-0.070
Total annual saving	1.60	0.81	0.461	0.356
Total annual expenditure	-0.04	0.94	0.324	-0.03
Amount of loan borrowed	0.41***	0.06	0.000	0.073
Constant	-12.32	8.26	0.074	
Wald chi^2(14) = 123.61, Pseudo R^2 = 0.817, Log pseudo likelihood = -69.25 Number of obs = 378 Note: *** and ** represent level of significance at 1% and 5%, respectively.				

Source: Computed from survey data.

Amount of loan borrowed: This variable is correlated with women to be membership of RUSACCO positively and statistically significant at 1% probability level. Themarginaleffect of value 0.073 implies that a unit access to loan would increase the women participation by 7.3 percentages.The reason forthis relationship might be the fact that the higher savings amount would naturally have led to higher loan amount. Other reason would have been that higher loan could have enabled the farmers to earn more and attracts women to join the RUSACCOs.This result is consistent with the result of Abiy (2017).

In connection with the above results, the study by Eyob et al. (2019) retorted that women participation in RUSACCO was significantly affected by access to loan, level of education and participation in training and interest rate.Furthermore, the study done by Berhan et al. (2011) revealed that there were positive effects of access to training, formal education, contribution to the household income, duration of loan use and utilization of loan on participation of women in

RUSACCO.Genet (2008) also added that poor management, low credit access, and smallness of the loan size were the significant determinants of women membership, and the number of drop outs is also increased.

4.2. Impact Assessment of RUSACCOs on Women Annual Income

After propensity score estimation, the common support region should be imposed on the propensity scores distribution of the participants of RUSACCO women and non-participant women. As shown in Table 4.2, the estimated propensity scores vary between 0.0106and 1 (mean = 0.782) for participants of RUSACCO (treatment) women, and between 0.0001and 0.9576 (mean = 0.119) for non-participants of RUSACCO (control) women. The common support region would then lie between 0.0106 and 0.9926. In other words, women whose estimated propensity scores are less than 0.0106 and larger than 0.9926 are not considered for the matching exercise. As a result of this restriction, 67members and 72 non-members of RUSACCO totally 139women were detected from the analysis.

Table 4.2: Distribution of Estimated Propensity Scores

Groups	Observation	Mean	Std. Dev.	Min	Max
Total sample women	378	0.421	0.379	0.0001	1
Participants	189	0.782	0.230	0.0106	1
Non-participants	189	0.119	0.109	0.0001	0.9926

Source: Computed from survey data.

After the estimation of propensity scores and the common support region, the next step is looking for an appropriate matching estimator. The alternative matching estimators (algorithms) were searched in matching the participants and non-participants women in the common support region. Therefore, nearest neighbor matching with neighbor (2) was chosen sinceit resulted in a relatively low pseudo-R2, best balancing test-all covariates were insignificant after matching, and it also contains large matched sample size as compared to other matching estimators as indicated in Table 4.3.

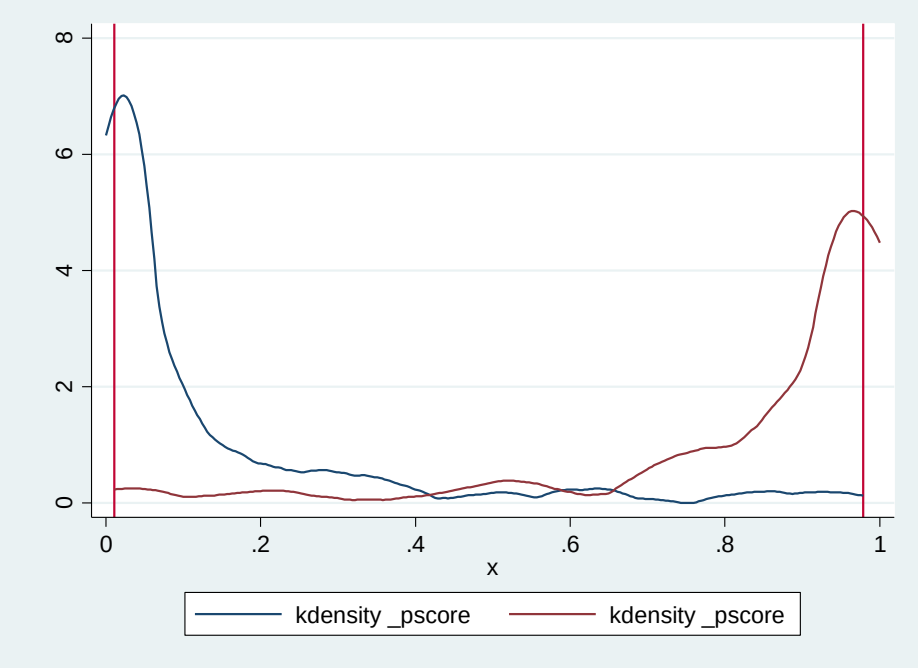


Figure 4.1: Graph of common support region

Table 4.3: Performance of Different Matching Algorithms

Matching Estimator		**Matching performance criteria**		
		Balancing test*	**Pseudo-R^2**	**Matched sample size**
Nearest neighbor	neighbor(1)	9	0.079	239
	neighbor(2)	12	0.032	239
	neighbor(3)	9	0.071	239
	neighbor(4)	11	0.059	239
	neighbor(5)	11	0.037	239
	bwidth(0.01)	7	0.055	239
Kernel	bwidth(0.1)	9	0.062	239
	bwidth(0.25)	9	0.056	239
	bwidth(0.5)	9	0.052	239
	radius caliper (0.01)	7	0.047	239
Caliper or Radius	radius caliper (0.1)	9	0.081	239
	radius caliper (0.25)	11	0.070	239
	radius caliper (0.5)	11	0.048	239
* Number of independent variables with no statistically significant mean difference between the matched groups of women.				

Source: Computed from survey data.

Table 4.4: Balancing test of impact of participation in RUSACCO on woman's income

Variables	Matching Sample	Mean		% Bias		t-test	
		treated	control	standard	reduction	t	p>|t|
Age	Unmatched	43.26	43.25	-22.8		2.23	0.027
	Matched	44.15	43.25	-9.96	66.1	0.72	0.472
Family size	Unmatched	5.65	3.34	-30.1		-2.51	0.013
	Matched	5.41	5.12	13.2	57.2	1.10	0.304
Marital status	Unmatched	0.85	0.79	26.0		2.22	0.027
	Matched	0.82	0.68	47.9	-89.9	2.42	0.016
Education status	Unmatched	6.24	4.42	61.10		5.30	0
	Matched	2.82	1.10	23.0	60.9	1.51	0.132
Livestock	Unmatched	10.19	5.45	33.9		2.77	0.006
	Matched	40.10	42.23	-25.5	95.9	-2.21	0.028
Farmsize	Unmatched	2.74	1.18	49.8		6.03	0
	Matched	1.53	1.50	7	89.1	0.42	0.675
Dist. RUSACCO	Unmatched	1.56	2.08	-64.1		-6.12	0
	Matched	1.48	1.72	-32.9	48.21	-2.23	0.027
Part. Training	Unmatched	0.94	0.57	125		9.21	0
	Matched	0.93	0.94	-2.9	96.2	-0.42	0.675
Crediuse	Unmatched	0.94	0.21	221.1		16.2	0
	Matched	0.89	0.92	7.3	97.2	0.60	0.549
Dependent ratio	Unmatched	0.64	0.88	-54.1		-3.76	0
	Matched	0.66	0.70	-9.6	80.7	-0.78	0.436
Participation in social ass.	Unmatched	0.58	0.29	70.2		6.16	0
	Matched	0.55	0.47	27	64.3	1.67	0.096
Total saving	Unmatched	9802	853	78.2		15.2	0
	Matched	6350	846	0.2	95.6	20.8	0
Total expenditure	Unmatched	92721	70920	7.2		1.02	0.309
	Matched	91048	91280	-27.6	-82.2	-5.57	0
Amount loan	Unmatched	9075.5	1513.1	86.2		10.3	0
	Matched	7356.3	7032.4	-23.1	66.2	-4.94	0

Source: Computed from survey data.

After choosing the best performing matching algorithm, the next task is to check the balancing of propensity score and covariate using different procedures by applying the selected matching

algorithm (in our case, Nearest neighbor N(2) matching). The main purpose of the propensity score estimation is not to obtain a precise prediction of selection into treatment, but rather to balance the distributions of relevant variables in both groups. The balancing powers of the estimations are ensured by different testing methods such as reduction in the mean standardized bias between the matched and unmatched women, equality of means using t-test and chi-square test for joint significance of the variables used (Table 4.4).

In all cases, it is evident that sample differences in the unmatched data significantly exceed those in the samples of matched cases. Therefore, the process of matching those creates a high degree of covariate balance between the treatment and control samples that are ready to use in the estimation procedure.

The final step in the PSM process is to estimate treatment effects on the outcome variable in the matched sample through a student's t-statistic. In Table 4.5, the estimation result presented a supportive evidence of statistically significant impacts of memberships in RUSACCO on womanincome. The estimation result presented that, on average, membership of women in RUSACCO have increased annual income by 9263.94birr during the survey year. The estimated average treatment effect (ATT) showed that membership of women in RUSACCO has significant impact on income of participantwomen with significant t-statistic (25.42) at 1% significance level. The average amount of annual income of participantwomen was higher by 61.14% when compared with the average amount of income of non-participantwomen in the study area during survey year.Scholars also supported this issue. For instance, the study conducted by Tadele et al. (2018) revealed that the mean yearly income of participants was greater than that of non-participants of RUSACCO. In line with this, Eyob et al. (2019) also stated that women through cooperative were able to acquire more assets than before and have an improved well-being. Most of them were able to increase their monthly income, consumption and educational expense and improve savings.

In addition, the study done by Getahun (2019) stated that the participation in RUSACCO plays a great role for the improvement of household economy and life quality.The participant women had increased their household saving and income after they joined RUSACCO. In addition, from

past studies in Ethiopia it is observed that, RUSACCOs had substantial impact on improving women's income, to have their own assets and brought change in decision making and asset formation compared to the "before" situation of the women member. RUSACCOs provided a comprehensive service of micro-credit, savings generation, skill development and awareness education, and other necessary support for raising their income and employment opportunities and their level of empowerment (Berhan, 2011).

Table 4.5: The impact of participation in RUSACCO on woman's income

Variable	Sample	Participants	Non-participants	Difference	Se	T-stat
Annual income	Unmatched	94885.90	71232.33	23653.57	598.76	39.50
	ATT	90278.18	81014.24	9263.94	364.45	25.42***

Source: Computed from survey data.

The sensitivity test is the final step used to investigate whether the causal effect estimated from the PSM was susceptible to the influence of unobserved covariates. The legitimacy of propensity score analysis is based on the assumption of strongly ignorable treatment assignment that assumes all relevant covariates are employed in the treatment assignment and the bias due to the unmeasured covariates is ignorable. The sensitivity result in (Table 4.6) shows that the impact result estimates are insensitive to unobserved selection bias. That means for all outcome variables estimated, at various level of critical values of gamma, the p-critical values are significant. We could not get the critical value gamma where the estimated ATT is questioned even if we have set largely up to 10. Thus, we can conclude that our impact estimates (ATT) are insensitive to unobserved selection bias and are a pure impact of membership in RUSACCO on womanincome.

Table 4.6: Sensitivity Analysis

Outcomes	$e^{\gamma} = 1$	$e^{\gamma} = 1.5$	$e^{\gamma} = 2$	$e^{\gamma} = 2.5$	$e^{\gamma} = 3$
Total income	0	0	0	$2.63x10^{-14}$	$3.15x10^{-12}$

Source: Computed from survey data.

5. Conclusion and Recommendations

5.1. Conclusion

This study was carried out in Sinana district, Bale zone of Oromia regional state. The study has identified the impact of RUSACCO on womanincome in the study area. The primary data for this study were collected from 378women from six rural Villagesof the district using multistage sampling. The primary data collected from sampled women were analyzed using descriptive and econometric analyses.

Descriptive statistics results indicated that there is a significant difference between the participants and non-participants women in terms of marital status, participation in training,credit use, access to media, family size, education level, annual income, farm size, annual saving,distance from RUSACCO center and expenditure; whereas there was insignificance difference between the participants and non-participants women in terms of ageand total livestock size in TLU. Furthermore, the survey data results implied that distance to the RUSACCO center, high interest rate, irregular general body meetings, lack of awareness on saving habit, lack of information, lack of knowledge, lack of proper saving, limited training opportunities, scattered settlementand weak educational status were major challenges of women to participate in RUSACCO;whereas lack of follow-up, untimely auditing, unclear and incompatible guidelines/rules, insufficient membership duration, low credit usage opportunity, limited amount of loan, weak management and inappropriate training schedule were the institutional problems hidden with credit providing agency.

Propensity score matching (PSM) method was employed to determine the impacts of RUSACCO on womanincome in the study area. The logit model result showed that the impact ofparticipation in RUSACCO was significantly influenced by eight explanatory variables. These variables werefamily size anddistances from RUSACCO center were negatively affected, whereas the other five(i.e.marital status, educational level, participation in training, credit useand amount of loan borrowed) werepositively affected woman'sparticipation in RUSACCOs. In the next stage, three matching algorithms (Nearest-Neighbor, Radius and Kernel) were used to estimate the income difference between participants and non-participants women. The impact estimation

results then indicated significant differences in amount of income between participant and non-participantwomen.

The estimation result revealed that, on average, participation of women in RUSACCO have increased amount of annual income by 9263.94birr during the survey year. The estimated average treatment effect (ATT) showed that membership of women in RUSACCO has significant impact on income of participantwomen with significant t-statistic (25.42) at 5% significance level. The average amount of income of participantwomen was higher by 61.14 percent when compared with the average amount of income of non-participantwomen in the study area during survey year.

Finally, sensitivity analysis was carried out on the estimated average treatment effect using alternative matching estimators. When comparing with non-participants women,participants are found to have more income. The result of sensitivity analysis shows that estimated ATT for income (the outcome variable) is insensitive which clearly indicates its robustness.

5.2. Recommendations

Based on the findings of this study the following were recommended:

- Family size,marital status, level of woman education,distance from RUSACCO centeraccess to training,credit use, and amount of loan borrowed were the variables thatsignificantly influenced membership of women in RUSACCO. To address this problem, the government with cooperative agency must give due attention to maximize the members of RUSACCO and generate more income for the improvement of their entire life.
- In addition, the result of this study indicated that participation in RUSACCO have had a positive and significant impact on the total women annual income. Hence, the RUSACCO and other concerned body should give attention for rural women in the study area in order to enhance rural women's participation in the area.
- The all the stakeholders need to improve the provision of short term as well as long term training for their experts in order to build their capacity and create awareness on benefits of rural saving and credit on the annual income of women.

- ✓ The government should give more attention in supporting rural saving and credit in order to improve the benefit of RUSACCO in the study area.

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