The Transformative Impact of Village Community Banks on Tanzanian Households: A Quasi-Experimental Analysis.

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Abstract: *This study examines the impact of Village Community Banks (VICOBA) on household welfare in Kilosa District, Tanzania. While VICOBA is recognized for improving livelihoods, concerns remain about its effectiveness on the welfare outcome of the participants. Using data from a randomly selected sample of 99 VICOBA members and 203 non-members, the research employed Propensity Score Matching (PSM) and Endogenous Switching Regression (ESR) methods to control for observable and unobservable selection bias to examine the impacts of VICOBA membership on welfare status of the households in Tanzania. Results showed a significant positive effect of VICOBA membership on household consumption, a key welfare indicator, with a 1% significance level. The ESR analysis confirmed these findings. The study concludes that VICOBA membership statistically and positively improve household welfare and recommends that policymakers enhance operational systems and regulatory frameworks to better integrate these community banks into local development initiatives.*

Keywords: Village Community Banks, Household's Welfare, Endogenous Switching Regression, Propensity Score Matching, Tanzania.

1.0 Introduction

Globally, saving and credit institutions for the poor people have been there for several years, giving clients an alternative to get financial services as they were customarily ignored accessing such services by commercial banks (Ngalemwa, 2013). In fact, the fast-growing need of financial services constrained by bureaucracy, remoteness and ignoring the poor who build a major group of world population alerts that something needed to be done about the suffering of the poor. With the difficulties of accessing financial services through financial institutions, microfinance models had developed to address the issue over that period since the common and well-known microfinance institutions (The Bangladesh Grameen bank) were established by social entrepreneur, banker and economist Professor Muhammad Yunus in 1976, where VICOBA emerged. Though early idea was that of cooperative bank (i.e., Raiffeisen Bank) formed in Germany

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in 1864 so as to launch and spread the awareness of "self-help" in rural communities through offering savings and microcredit services, the Bangladesh experience is more relevant to VICOBA and operates worldwide as it is named in Asia as Self Help Groups (SHG) (Mashigo & Kabir, 2016; Ngalemwa, 2013).

In developing countries of Africa there had been the same issue of minority exclusion in formal financial institutions. To address the challenge, microfinance model was adopted in early 1990s by CARE International starting in Niger and spread to other countries like Zimbabwe, Mozambique and Eritrea. Then it spread further to East African countries particularly in West Nile Uganda and in Zanzibar through CARE Tanzania in year 2000 (CEDIT, 2021). The model during its initial operation in these countries was given different names such as OPHIVELLA in Mozambique, JENGA in Uganda and JOSACA in Zanzibar (Ngalemwa, 2013; Bakari *et* al., 2014).

In Tanzania, VICOBA was first adopted from Niger, where the model was popularly known as "Mata Masu Dubara" (MMD) named in Hausa language which literally means "Women on the Move" as initiated by CARE Niger focusing on Women economic empowerment and poverty reduction. It was reformed by Social and Economic Development Initiatives of Tanzania (SEDIT) and registered as Village Community Banks, abbreviated as VICOBA (Bakari *et* al., 2014). According to the recent FinScope Surveys, there is significant share of Community Microfinance Groups led by VICOBA of about 12% in 2023 though dropped from 16% (2017) of the adults but absolutely greater from 12% of 2013 unlike formal saving groups (referring to SACCOs) whose share of the total adults is 1% in 2023 declined from 2% in 2017 and 3% of 2013 in Tanzania, and that 73% of those in community microfinance groups are found in members' self-established saving groups (FinScope Tanzania, 2017, 2023). This means community self-established saving groups such as VICOBA are significant in microfinance subsector hence financial sector in the country.

Some few studies highlight VICOBA's role in improving livelihoods and empowering low-income earners, especially women. For instance, Kihongo (2005), Ngalemwa (2013), Ollotu (2017), Massawe (2020), and Dyanka (2020) collectively affirm that VICOBA participation is associated with enhanced access to credit and savings, increased household income, greater financial autonomy, and expanded investment in small businesses. This positive correlation is further supported by macro-level data from FinScope Tanzania (2017, 2023), which confirms the significant reach of such community-based groups within the population.

Existing literature predominantly reports positive associations between membership and improved livelihoods, financial access, and women's empowerment, as evidenced by descriptive and correlational studies (Dyanka, 2020). However, this body of work

suffers from a critical methodological weakness. Since individuals choose to join VICOBA, they likely differ from non-members in both observable (e.g., motivation, social capital) and unobservable ways that also influence welfare outcomes. Without robust techniques to construct a counterfactual the celebrated impacts documented in prior research cannot be confidently attributed to the VICOBA program itself.

1.1 Research Problem

Despite the widespread adoption and documented operational success of Village Community Banks (VICOBA) as a community-based microfinance model in Tanzania, there remains a significant empirical gap in conclusively determining its causal impact on household welfare. Existing literature predominantly establishes a *correlation* between VICOBA participation and improved livelihoods, primarily through descriptive studies and simple comparative analyses (e.g., Ollotu, 2017; Massawe, 2020; Dyanka, 2020). However, these studies are fundamentally limited in their methodological rigor, failing to adequately isolate the effect of VICOBA membership from the influence of pre-existing characteristics of its members.

Therefore, the central research problem addressed by this study is the lack of robust, causal evidence on whether VICOBA membership genuinely leads to improved household welfare in Tanzania, after rigorously controlling for selection biases. Previous research has not sufficiently employed counterfactual frameworks to answer the critical question: What would have been the welfare status of VICOBA members had they not joined? This gap is critical for policy and practice. This study aims at filling the gap by employing quasi-experimental impact evaluation techniques such as Propensity Score Matching (PSM) and Endogenous Switching Regression (ESR) to analyze the impact of VICOBA membership on the household welfare as measured by consumption expenditure while hypothesizing that consumption expenditures of the members' households who are in VICOBA do not differ significantly from those who are non-members of VICOBA.

2.0 Literature Review

Numerous studies examine VICOBA's role in improving livelihoods. For instance: Okatch et al (2018) studied the practice of table banking and its economic empowerment on women in On'gata Rongai, Kajiado, Kenya. The study adopted a descriptive survey design both qualitative and quantitative data collection methods. They found that women need to access finances to invest in business in order to create a basis for future funding generation to meet various economic needs. They concluded that it has benefits and economically empowers women as generally provided women with a reliable means of access to financing, given the convenience it offers in allowing women to realize their dreams.

Ollotu (2017) had his study on Contribution of VICOBA to Economic Development of Women in Tanzania; A case of Dodoma". The study applied cross sectional design and the findings showed that VICOBA helped women in starting small businesses which enabled to earn income. And concluded that there is difference where women who participated in VICOBA benefited more unlike those who did not.

Moreover, Ngalemwa (2013) had a study on the Contribution of VICOBA to Income Poverty Alleviation in Rufiji Delta. Adopted cross-sectional design where primary data was used in analysis to determine means, frequencies and percentages. An OLS regression analysis was done and used t-test to define variation between groups. It was found that most of VICOBA members joined the programme for the sake of access to credit and they agreed that it helped as per their expectations and further concluded that attitude towards VICOBA activities was favorable.

In attempting to study impacts of Village Saving and Loan Association (VSLA) in Zanzibar, Brannen (2010) used cross-sectional quantitative survey data from treatment group (members) and control (new entrants) and crosschecked the results with information from key informants. His OLS estimation results showed that members had improved in assets accumulation, level of expenditure, increase in IGAs, social capital and marginally on education expenses. However, his approach of creating groups and estimations couldn't address selection bias and comparability.

Farida et al., (2016) used primary data through cross-sectional design and estimated impacts of credit program to micro-entrepreneurs in Indonesia using propensity score matching and found no significant impact on saving. The results were not far from De Silva (2012) findings through PSM in Sri Lanka that participation in microfinance programmes not being highly effective in terms of savings. On the other side Menza & Kebede (2016) who applied Tobit regression model to evaluate the impact of Microfinance on household saving in Ethiopia found that microfinance participation had significant impact on household saving.

Pantaleo & Chagama (2018) examined the impact of microfinance on the households' welfare in Tanzania by comparing clients who had versus those who did not access financial services through microfinance by employing the PSM. Their empirical results implied clients had higher level of income compared to the non-clients. This is joined by Ghalib et al., (2011) whose application of PSM approach on evaluating the impact of microfinance on easing Poverty of rural households in Pakistan showed that microfinance significantly improve household income.

Despite the generally positive narrative, the existing body of work exhibits several critical methodological and conceptual weaknesses. Most studies rely on descriptive

statistics, cross-tabulations, or simple mean comparisons between members and non-members. They fail to employ robust quasi-experimental or experimental designs that can establish causality. As a result, observed positive outcomes cannot be confidently attributed to VICOBA participation rather than to pre-existing differences between members and non-members. Also, previous studies measure success in terms of group sustainability, loan disbursement, or member satisfaction, rather than using well-defined welfare indicators such as household consumption expenditure, asset accumulation, or poverty incidence. With the exception of a few recent works (e.g., Pantaleo & Chagama, 2018), most VICOBA studies do not construct a credible counterfactual—i.e., what would have happened to members if they had not joined. This limits the validity of impact claims.

3.0 Methods and Material
3.1 Area of the Study
This study targeted to examine the impact of VICOBA on household welfare by taking a case from Kilosa district, one of the seven districts in Morogoro region, Tanzania located at latitude 60 50′ 0′′S and longitude 360 59′ 0′′E. The district has a total area of 12,394 square kilometers (17.5% of 70,624 km2 covering Morogoro region), out of that total land, 536,580 hectares are used for agriculture. The district is administratively divided into 7 Divisions, 40 Wards, 138 Villages and 814 Hamlets, having two township authorities of Kilosa and Mikumi (Kilosa District Council, 2020). The rationale of selecting Kilosa District lies on the fact that before the study the district had greater representation as it is one of the areas with concentrated VICOBA activities, having more than 200 registered groups with more than 4,300 members (Kilosa Distict Council, 2021).

3.2 Study Population and Sample
Referencing to the Population and Housing Census of 2012, Kilosa District had a population of 438,175 but 2018 population projection is 511,130, which is a 17% increase in population size over 6 years period (NBS, 2013; Kilosa District Council, 2020). This study had VICOBA participants as experiment group, from more than 200 registered groups with about 4,300 members (Kilosa Distict Council, 2021). But considering non-members as the reference population from which the program's counterfactual will be drawn, observing that they both possess some shared characteristics and regarded as household in terms of unit of analysis. A total of 305 individuals were involved whose determination in this study was steered by a preset sample frame which based upon the population size, compositions, margin of error and number of other considerations. The sample size for this impact evaluation was estimated using the following formula;

$$N= \frac{(Z_{\alpha/2})^2 *P*(1-P)*D}{E^2}$$

Where N = total sample size, $Z_{\alpha/2}$= corresponding value for set level of confidence, P=proportion of event of interest for the study, E=margin of error and D=designed effect

which is 1 for simple random sampling; this study used 95% level of confidence within 1% margin on error, so $Z_{\alpha/2}$=1.96, P=0.008 i.e (4,300/511,130); E=0.01

$$N = \frac{[1.96^2 * 0.008 * (1 - 0.008) * 1]}{0.01^2} = 304.9 \approx \mathbf{305}$$

To obtain sample of treatment (n1) and control (n2) for effective matching and maximizing power, most literatures suggest increasing the ration of control to treatment, so ratio of 1:2 was used to have n1= 102 and n2= 203. However, 302 successful observations were used as shown in Table 1, having 99 from experiment and 203 from control group after cleaning and dropping sample observations with some missing data. This sample configuration preserves a strong treatment-to-control ratio and provides sufficient statistical power for the propensity score matching and endogenous switching regression analyses undertaken. Therefore, the minor reduction in sample size of control (from 102 to 99) does not compromise the validity, precision, or interpretability of the impact estimates reported in the study. While a power calculation based on an anticipated effect size is ideal for impact evaluation, no prior localized estimates were available. To enhance the power of the quasi-experimental matching design, a 1:2 ratio of treatment to control units was employed (Bloom, 1995). A post hoc analysis confirms the final sample provided over 85% power to detect the medium effect size (d = 0.40) observed in the results.

The sample was also designed under the assumptions of simple random sampling, implying independent observations and a homogeneous variance structure. We recognize that households within the same locality or VICOBA group may exhibit correlated outcomes. To mitigate potential biases from such clustering, our analytical strategy included locality as a conditioning variable in matching and regression models. Furthermore, robustness checks using cluster-robust standard errors at the ward level confirmed the stability of the reported treatment effects.

Table 1: Sample Distribution by Locality

Locality/ward	Group		Total sample	Percent
	Control	Treatment		
Magomeni	18	19	27	8.94
Rudewa	20	10	30	9.93
Madoto	22	19	41	13.58
Mabwerebwere	26	9	35	11.59
Kimamba B	14	14	28	9.27
Mvumi	43	8	51	16.89
Dumila	37	17	54	17.88
Msowero	23	13	36	11.92
Total	203	99	302	100.00

Source: Author's Computation from Field Data

3.3 Variables Definitions

This study uses a variety of variable in the estimation of the impact of Village Community Banks on household welfare. The variables have been selected based on the theories, empirical studies and common intuitions by the author. Table 2 presents the variables (outcome and covariates), their definition, measurements and expected signs.

Table 1: Variables definition, measurements and their expected signs

Type	Name	Definition	Measurement	Exp. sign
Outcome variable	*Consumption expenditure*	*Household income spent on potential consumption*	*TZS*	
Independent variables	Membership	If VICOBA member or not	Dummy, 0-1	
	Education	Years of schooling	Numbers	+
	Dependents	Number of dependents	Numbers	- /+
	Age	Respondent's age	years	+/-
	Gender	If female or male	Dummy, 0-1	+/-
	Training	Financial trainings	Dummy, 0-1	+
	Married	If married or otherwise	Dummy, 0-1	+
	Employment	If salaried employment or not	Dummy, 0-1	+
	Experience	Years of working	Numbers	+
	Microcredit	If received Microloans out of VICOBA or not	Dummy, 0-1	+

Source: Author based on literature

3.4 Model Specification

To capture the impact of VICOBA consumption expenditure as dependent variables, we run the outcome on membership status including control variables such as dependents, training, education, employment, age, gender, married, working experience and microcredit. The general equation is,

$$Y = f(M|X : X = covariates)$$

Assuming that household is rational to membership, the utility gain from membership $(M^* = M_1 - M_0)$ is conveyed as a function of observable characteristics (X) in a probit model as:

$$M_i^* = \theta + \beta X_i + \dots + \mu_i \quad , M_i = 1 \; if \; M_i^* > 0 \tag{1}$$

Such that
$$P(M_i = 1|X_i) = f(\theta + \beta_1 X_{i1} + \dots + \beta_n X_{in}) \tag{2}$$

where **M** is a binary variable; = 1 if household representative *i* is a VICOBA member and = 0 otherwise. $f(.)$ is a cumulative standard normal distribution function, β = vector of

coefficients to be estimated and X_i is a vector of household characteristics; and μ_i is a random error term assumed to be normally distributed.

Regression equation for outcome:

$$Y_i = \alpha + \delta M_i + \beta X_i + \ldots + \varepsilon_i \tag{3}$$

Y_i =outcome variables **consumption expenditure** in different regressions for *i*, *M* = membership dummy (it takes 1 if VICOBA member, 0 if not), X_i=household characteristics, **α** is a constant, δ = effect of VICOBA (main parameter of interest), β =coefficients to be estimated and ε is an error term.

3.5 Econometric Model Estimation

3.5.1 Propensity Score Matching (PSM)

Probit regression was used to obtain propensity scores on membership to enable matching the observations and then impact estimates by nearest neighborhood, radius matching and weighting as the joint consideration conveys a better way to assess robustness of the estimates in observational research. Conditional Independence assumption (CIA) or uncofoundedness is the central assumption of PSM to be met. This imply that, given a set of observable covariates X which are not affected by treatment (membership), potential outcome of VICOBA non-members and members would have the same distribution, independent of membership. Also, common support or overlap condition to ensure that both treated and controls have common range of propensity scores was taken into account. According to Duvendack (2010) this ensures that individuals with the same X values have positive probability of being members and non-members. However, in a particular case, it is satisfactory to assume that $Y^0 \amalg M | X$ and $P(M = 1|X) < 1$ such that the ATT be obtained as follows

$$\Delta ATT = E(Y^1|X, M = 1) - E_\chi[E(Y^0|X, M = 0)| M = 1] \tag{4}$$

Where $E(Y^1|X, M = 1)$ is the mean outcomes of treated individuals and $E_\chi[E(Y^0|X, M = 0)| M = 1]$ is the calculation for the matches from control individuals (Duvendack, 2010). By weighing, the outcome regression equations are estimated by equation 3.

3.5.2 Endogenous Switching Regression (ESR);

The first step is decision to join VICOBA, which is a choice equation (equation 1), then it follows that the two regime outcome equations are:

Regime 1: $Y_{1i} = \alpha_1 x_i + \ldots + \mu_{1i}$ if $M = 1$ (members)   (5)
Regime 2: $Y_{2i} = \gamma_2 x_i + \ldots + \varepsilon_{2i}$ if $M = 0$ (non − members)   (6)

Where x_i =household characteristics, Y_1 and Y_2 represent outcome variables for VICOBA members (Y_1) and non-members (Y_2), μ and ε are Error terms, α and γ are the parameters to be estimated. Then; average treatment effect on treated (ATT) and average treatment effect on untreated (ATU) are given as;

$$ATT = E[Y_{1i} | M = 1] - E[Y_{2i} | M = 1] \tag{7}$$
$$ATU = E[Y_{1i} | M = 0] - E[Y_{2i} | M = 0] \tag{8}$$

Where;

$E[Y_{1i}|M=1]$ =expected outcome of members with membership of VICOBA (real)

$E[Y_{2i}|M=1]$ = expected outcome of members if they were without membership of VICOBA (counterfactual)

$E[Y_{1i}|M=0]$ = expected outcome of non-members if had membership of VICOBA (counterfactual)

$E[Y_{2i}|M=0]$ = expected outcome of non-members without membership of VICOBA (real).

4.0 Results and Discussion

4.1 Descriptive Statistics

In general, 302 household representatives were observed with 99 from treatment group and 203 respondents from control group. Overall, 238 (81 from treatment and 157) who made 78.81 percent of the observations were female and remaining 21.19 percent were male, with an average of 43.95 years of age having a minimum of 18 years and maximum of 76 years. 75.83 percent of the sample were married and had an average of 3 dependents per household. The statistics imply that most households are coupled and sometimes headed by both young and old people, but on average, the population is active middle-aged which is economically productive.

Table 3: Employment status of the respondents

Employment category	VICOBA Membership				Total	
	Non-members		Members			
	n	%	n	%	n	%
Crop Farming	131	64.53	52	52.53	183	60.60
Livestock keeping	31	15.27	23	23.23	54	17.88
Salaried employment-in government	19	9.36	6	6.06	25	8.28
Salaried employment-private sector	6	2.96	6	6.06	12	3.97
Self-employed	11	5.42	9	9.09	20	6.62
Casual labourer	5	2.46	3	3.03	8	2.65
Total	203	100	99	100	302	100

Source: Author's Computation from Field Data

The study also found that only 12.25 percent of the respondents had salaried employment (Table 3), meaning that the majority of the households depended on self-income generating activities led by 60.6 percent in crop cultivation and 17.88 percent in livestock

keeping, with an average of about 20 and maximum of 55 years of working experience. These results are in line with available statistics that 79 percent of Kilosa district's employment positions are within agriculture (NBS, 2013), meaning that people's livelihood depend highly on agriculture and likely to have seasonal income fluctuations which affects individual household welfare status.

On average, respondents had an education level equivalent of standard III, with the highest level being a diploma level; meaning that the education level was generally low which also reflect the employment status of the households (Table 4). About 33.44 percent of all respondents hadn't attained education at all while 47 percent had attended at least standard four to standard seven primary school education. The rest of about 20 percent had had a minimum of form two secondary education level and the maximum of ordinary diploma level.

Table 4: Educational status of the respondents

Education level	VICOBA Membership				Total	
	Non-members		Members			
	n	%	n	%	n	%
No education	67	33.00	34	34.34	101	33.44
Standard four	5	2.46	2	2.02	7	2.32
Standard seven	90	44.33	45	45.45	135	44.70
Form two	9	4.43	2	2.02	11	3.64
Form three	0	0.00	1	1.01	1	0.33
Form four	16	7.88	8	8.08	24	7.95
Form four (+training course)	12	5.91	6	6.06	18	5.96
Ordinary diploma	4	1.97	1	1.01	5	1.66
Total	203	100	99	100	302	100

Source: Author's Computations from Field Data

The access to financial services is not quite easy since about 77.3 percent admitted that they (and other household members) neither own nor use bank accounts and rely on public transport with an average of more than 31.5 kilometers to reach any nearest bank. The 22.7 percent who have or use bank services is above average of 12.3 percent presented by 2017-18 household budget survey and only 16 percent shown in National Financial Inclusion Framework 2018-2022, but within a maximum average of 31.3 percent of households which have at least one person who operates a bank account (National Council for Financial Inclusion, 2018; NBS, 2019). On the other hand, only 21.2 percent declared to have got financial related training in the study area. These statistics indicate

that many households incur substantive costs in terms of time and finances to access formal financial services and thus limited their usage of financial services and little is covered on financial literacy in the area. Table 5 shows these statistics.

Table 5: Descriptive Statistics of Household Covariates and Outcome Variables

Characteristics	Members Nt=99		Non-Members Nc=203		Total Sample N=302	
	Mean	SD	Mean	SD	Mean	SD
Age	43.2	11.3	44.3	11.5	43.9	11.4
Gender	0.18	.39	0.23	0.42	0.21	0.41
Marital status	0.85***	0.36	0.714	0.453	0.758	0.429
Dependents	2.98 **	1.355	2.576	1.349	2.709	1.362
Training	0.212	0.411	0.163	0.369	0.179	0.384
Education	12.485	9.571	12.897	9.679	12.762	9.629
Employment	0.121	0.328	0.123	0.329	0.123	0.328
Microcredit	0.475	0.502	0.438	0.497	0.45	0.498
Ease of Access to Bank Services						
Use/ownership of bank account	0.227	0.283	0.056	–1.06	0.227	0.283
Distance to nearest Bank	31.502	30.808	0.694	0.26	31.502	30.808
Experience	19.162	11.896	20.379	11.896	19.98	11.89
Outcome Variables						
Cons. expenditure	162030.3***	92645.3	119881.8	65175.21	133698.7	77704.3

***Significant 1%, **Significant 5% and *Significant 10%

Source: Author's Computations from Field Data

On VICOBA banking operations, members had an average share value contribution of TZS 6040, the minimum share value bought was TZS 1,000 and the maximum was TZS 15,000 per week per member. This means on average a person saves TZS 24,160 with VICOBA alternative per month. A mean value of loan provided was TZS 112,626.3 where maximum loan from VICOBA obtained was TZS. 600,000 as shown in Table 6.

Table 6: Summary of VICOBA Banking Services (Share and Loans)

Variable	Observations	Mean	Std. Dev.	Min	Max
VICOBA share	99	6040.404	3559.75	1000	15000
VICOBA loan	99	112626.3	161210.9	0.000	600000

Mean, Minimum and Maximum values in TZS

Source: Author's Computations from Field Data

In terms of outcome variables, the descriptive as presented in table 5 shows that on average monthly income spent on household consumption was used as an indicator of household welfare, where on average, household's monthly income spent to finance the basic needs was TZS 133,698.7, where average for members was TZS 162030.3 and for non-members TZS 119881.8. Considering an average consumption per household per month in rural Tanzania mainland of TZS 361,956 (NBS, 2019), the result implies that on average, households in the study area are low income earners and thus limits their consumption opportunities, hence deprive their welfare attainments.

Table 7 indicate that a total of 203 non-members, which is 67.22 percent of the whole sample, and 99 VICOBA members, which makes 32.78 percent of the whole sample were observed. The PSM models matched the treated individuals with the untreated individuals based on the propensity score which was calculated based on the covariates thought to affect treatment status.

Table 7: Summary of Treatment Status

VICOBA membership	Frequency	Percent	Cum. percent
Non-members	203	67.22	67.22
Members	99	32.78	100
Total	302	100	

Source: Author's Computations from Field Data

The individuals on treatment (VICOBA Members) were matched with corresponding untreated counterpart (non-members) which had a similar propensity score in a given range depending on the matching process.

4.2 Econometric Results

In order to achieve the impact of VICOBA on household welfare (Consumption), the estimation procedures start with determining the probability to belong to VICOBA. This was done by estimating a probit model which is equation 1 estimated at 1%, 5% and 10% significant level. Results of estimation indicate that membership in VICOBA is significantly influenced by the marital status of the household head and the number of household's dependents. The household dependency size has also a positive and significant effect on membership in VICOBA groups, where the household's dependents increase has a higher probability (5%) of being members of VICOBA groups, this goes in contrast to estimation by Cintina & Love (2017), but concurs with the results by Ghalib et al (2011) who found that households with greater dependency ratio had a positive and statistically significant effect on the probability of joining microfinance programme. This reflects the fact that household members are in deprivation, inciting one of the members

to join VICOBA may be with an expectation of gaining relief to smooth household consumption and accommodate the dependents. Other covariates which are age, gender, employment status, training and access to microcredit as well as working experience were found insignificant individually, partly contrary to Cintina & Love (2017) who found significant positive influence of age and gender (female) and negative influence of education on probability of joining microfinance programme. The other study found gender to have positive and other loans (microcredit) to have negative significant influence (Farida et al., 2016).

Table 8: Probit estimation of membership in VICOBA

Variable	Coefficients	Marginal effects
Age	- 0.0037826	-0.0013497
	(0.0091624)	(0.00327)
Gender	-0.1758753	-0.0611343
	(0.1995059)	(0.06732)
Marital status	0.4869904**	0.1614229**
	(0.1896883)	(0.05743)
Dependents	0.1423543**	0.0507938**
	(0.0580818)	(0.02073)
Training	0.1872583	0.0685346 (0.07593)
	(0.2027853)	
Education	-0.0036312	-0.0012957
	(0.0099277)	(0.00354)
Employment	-0.0649559	-0.0229002
	(0.2686466)	(0.09355)
Microcredit	0.1789046	0.0640343
	(0.1577475)	(0.05651)
Work Experience	-0.0068434	-0.0024418
	(0.0090912)	(0.00324)
Constant	-0.9467986**	
	(0.4499891)	
Log Likelihood	-182.54163	
Prob > chi2	0.0399	
Pseudo R²	0.0445	
Number of obs.	302	
Standard Errors in Parentheses	***p<0.01, **p<0.05, *p<0.1	

Source: Author's Computations from Field Data

4.3 Testing the Assumptions of the model

For the PSM model to be sound, some assumptions or conditions of overlap or regions of common support, the balancing property and unconfoundness have to be met. Although these assumptions are not generally testable, the checking processes in the propensity score estimation procedure were done in this study to ensure the robustness of the estimated propensity scores. In the PSM procedure, the region of common support is selected by identifying the minimum and maximum propensity scores that are observed in both the treatment and control groups. The test for the balancing property is performed by comparing the means of propensity scores as well as covariates across both VICOBA members and non-members after matching algorithm is incorporated in the propensity score estimation procedure to ensure that the households are no longer different in covariates and the average propensity score between members and non-members and hence treatment effect on the treated can be estimated with no selection bias (Pantaleo & Chagama, 2018). Table 9 and figure 2 and 3 shows the test procedures.

Table 9: Common support for propensity score matching

Treatment assignment	On support	Off support	Total
Untreated	203	0	203
Treated	98	1	99
Total	301	1	302

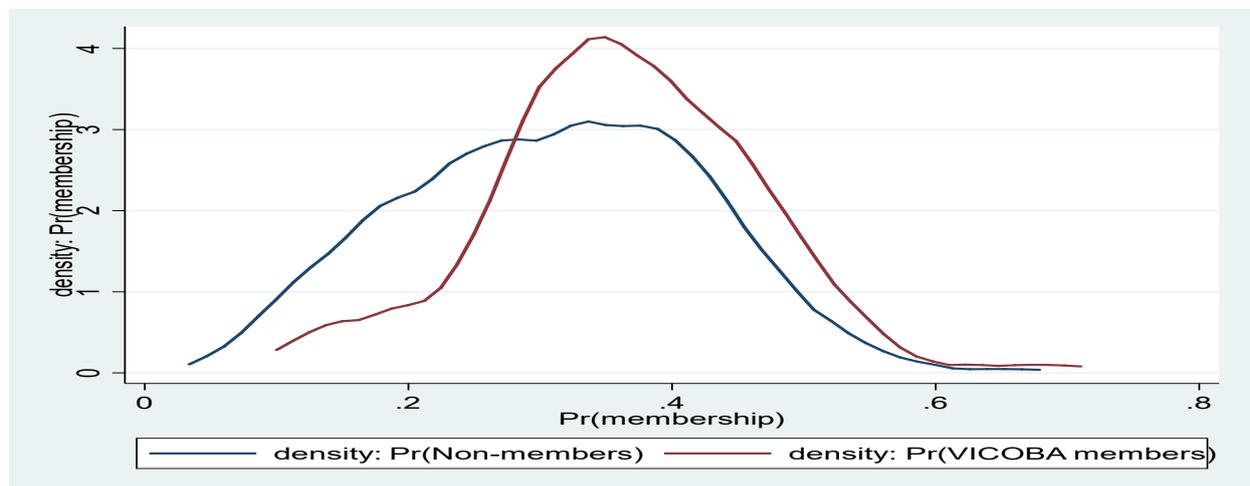**Source:** Author's Computations from Field Data

Figure 1: Kernel density of the estimated propensity score
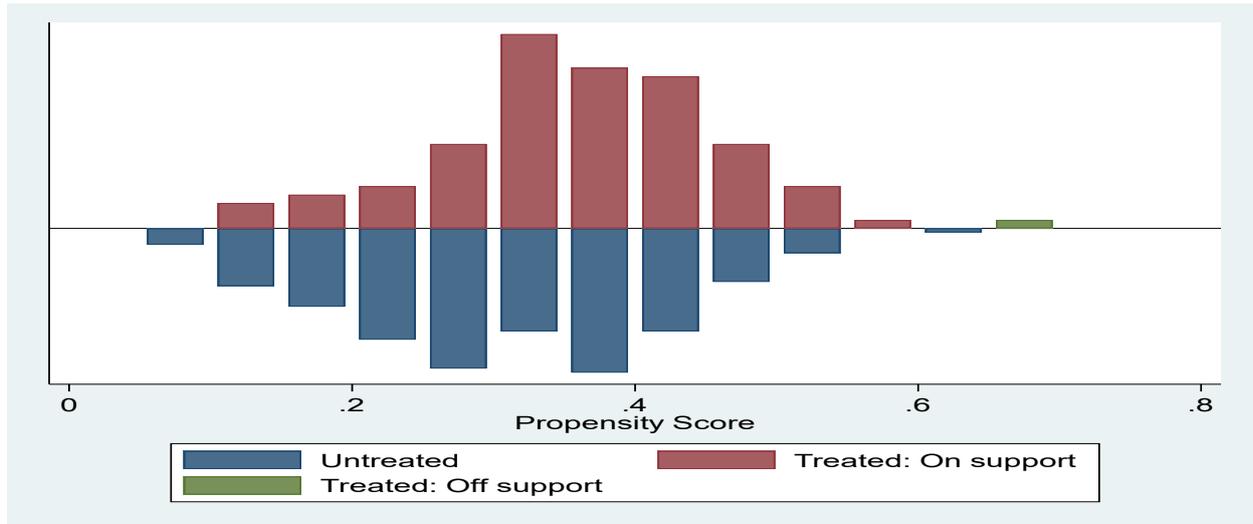**Source:** Author's Computations from Field Data

Figure 2: Propensity score graph for both VICOBA members and Non-members
Source: Author's Computations from Field Data

The two graphs (Figure 2 and 3) show that there was overlapping of the propensity score between the treated and the control observations, suggesting that PSM estimation is possible as the two groups are comparable based on the described covariates. Further diagnostic approach of ensuring that the propensity scores can be used to assess the effect of treatment and addressing confounding is stratification.

Table 10 Blocks of Propensity Score for Treatment

Quintile of pscore	Membership		Total
	Non-members	Members	
1	54	7	61
	88.52	11.48	100.00
2	45	15	60
	75.00	25.00	100.00
3	32	30	62
	51.61	48.39	100.00
4	38	21	59
	64.41	35.59	100.00
5	34	26	60
	56.67	43.33	100.00
Total	**203**	**99**	**302**
	67.22	**32.78**	**100.00**

Numbers in rows are in frequency and percentage

Source: Author's Computations from Field Data

The observations were divided into strata/blocks based on the propensity score in a cross-tabulation of membership having both treatment and control observations by quintile. The results are presented in Table 10 showing that there are some treated and some untreated observations in every quintile of the propensity score, suggesting that it is possible to evaluate the effect of VICOBA membership in each block(quintile). Since the smaller the strata are, the better the balance of covariates and more confounding they remove, so it was then divided into deciles of the propensity score and it was still found to have both treated and untreated in each stratum.

4.4 Estimating the Propensity Score Matching (PSM)

In order to have a potential counterfactual of the treated and then calculate ATT and test its significance using t statistical test we present the treatment effects estimated from the PSM models to match the treated and the control groups with similar observable. The validity and quality of this evaluations procedure depends on matching of the calculated propensity score between treated and the untreated observations (Austin, 2011). Therefore, several analyses were carried out to ensure that the propensity score satisfy the required property and hence the calculation of ATT is selection bias free. After ensuring that the conditions are met, impact was estimated using Nearest Neighbor caliper matching, then radius matching and linear regressions of weighted averages in common support as follows;

4.4.1 Nearest Neighborhood Matching (NNM) Estimations

The NNM method chooses the closest score from the covariate of the control group. The process is good for treatment group and control group that tend to be similar (Farida et al., 2016). In the matching process of PSM, the number of covariates that got paired in the matching or that got common support (Table 11) are 301 observations, of which 203 are for control group and 98 for the treatment group, only 1 treated observation was out of common support so not used in matching.

Table 11: PSM impact estimator using Nearest Neighbor Matching

Variable	Sample	Treated	Controls	Difference	S.E.	T–stat
Consumption expenditure	Unmatched	162030.30	119881.77	42148.53	9225.72	4.57
	ATT	160622.45	133438.78	27183.67	13238.14	2.05**
Number of obs		= 302				
LR chi2(9)		= 17.02				
Prob > chi2		= 0.0484				
Pseudo R2		=0.0445				
Log likelihood		–82.54163				

***Significant 1%, **Significant 5% and *Significant 10%. Unmatched=before matching.

Source: Author's Computations from Field Data

Since the common support hypothesis is achieved with almost all units being reliable for matching, except one from treatment group, the NNM technique was possible and provides results similar to kernel with 0.05 bandwidth. The empirical estimations of the average treatment effect on the treated (ATT) within common support based on equation 4 developed in the methodology section are as displayed in Table 11 with Nearest Neighbor Caliper matching within 0.05 caliper.

ATT is the difference in the outcome between the treatment and control groups, after controlling for covariates. It can only be estimated at the population or sample level and not at an individual level because it is the average effect of the treatment on the entire population, and not the effect of the treatment on any one individual.

4.4.2 Radius Matching Estimations

Nearest-neighbor matches each treated unit with the control unit that has the most similar propensity score, therefore covering shortfalls of stratification matching which can lead to some treated units being discarded if there are no control units in their block. But NNM can lead to poor matches if the nearest neighbor has very different characteristics or propensity score from the treated unit. So, radius matching can address the limitations of stratification and nearest-neighbor matching. Radius matching matches each treated unit with control units that have propensity scores within a predefined radius of the treated unit's propensity score. This allows for more flexibility in matching treated units with control units, and it can lead to better covariate balance(Austin, 2011, 2014). Nevertheless, radius matching can also lead to some treated units not being matched if there are no control units within the radius; therefore, some treated units may be discarded from the analysis. So far, their joint consideration brings a better way to assess robustness of the estimates. In this case radius matching estimated the impacts with default radius size of 0.1 and the results are in Table 12.

Table 12: PSM impact estimator using Radius Matching

Variable	Sample	Treated	Controls	Difference	S.E.	T-stat
Consumption expenditure	ATT	160622.45	133997.96	26624.49	11639.74	2.29**
Number of obs		= 302				
LR chi2(9)		= 17.02				
Prob > chi2		= 0.0484				
Pseudo R2		=0.0445				
Log likelihood		-82.54163				

***significant 1%, **significant 5% and *significant 10%

Source: Author's Computations from Field Data

4.4.3   Endogenous Switching Regression (ESR)

Estimation of impacts by most of non-experimental methods fails to capture observable and/or unobservable characteristics that affect choice and outcome variables, For example, Propensity Score Matching controls for observable covariates under the assumptions of overlapping or regions of common support, the balancing property and unconfoundness assumption (Austin, 2011). In comparison to, using regression models to analyze the impact using pooled samples of members and non-members might be improper since it gives the similar effect on both groups (Sileshi et al., 2019). So, an estimation approach that overcomes these limitations is endogenous switching regression (ESR). According to Adlin et al., (2020) ESR models have a very strong exclusion restriction and the falsification test may not be sufficient to confirm identification, so results may be sensitive to selection of instrumental variables. Therefore, the use binary PSM is helpful to further robustness check of the results obtains from ESR as it adjusts for initial differences between treated and control groups by constructing a statistical comparison group using observed covariates on a probit model of selection decision.

The impact of VICOBA membership on household welfare under the ESR approach follows two stages. The first stage, decision to join VICOBA is estimated using a binary probit model as selection. After estimating a probit model which is for equation 1 (choice equation), the second step for ESR estimation to bear results is to estimate the two regime outcome equations which are equations 5 for treatment group and 6 for control group.

To ensure the validity of the instruments to be used before running ESR with full-information maximum likelihood, the probit model for the equation 1 was estimated and OLS regressions for outcome equations (5), and (6) separately and checked in which equation these variables were effectually significant considering only 1% and 5% significance level to check for endogeneity and satisfying exclusion restriction. Marital status and number of dependents were found strongly influencing selection equation. In consumption expenditure equation these instruments did not satisfy exclusion restriction as they were found to influence choice and outcome equations.

Nevertheless, the endogenous switching regression model is appropriate and valid method if the covariance $\sigma 0$ and $\sigma 1$ are significantly different from zero and/or if one of the estimates of correlation coefficients $\rho 0$ or $\rho 1$ is statistically significant, which show the existence of selection bias due to unobserved covariates (Hasebe, 2020; Christophe et al., 2020). So, for this case the method was valid to be used given the results in Tables 13. The results derived by Endogenous Switching Regression model in estimating the impacts of VICOBA membership on household's welfare (consumption expenditure) are shown in Table 13, where amounts are in TZS.

Table 13: ESR Regression of Consumption expenditure (Full Information Maximum Likelihood)

Variable	Consumption expenditure		
	Selection Equation	Members	Non-Members
Constant	-0.9468 (0.00003)**	-634052 (341564.8)*	132498.1
Age	-0.0038 (0.0025)	-5038.499 (6339.976)	-1698.267 (522.0136) ***
Gender	-0.1759 (0.1697)	-77502.38 (147830.4)	-6015.495 (35569.7)
Marital Status	0.487 (0.00003)**	236546.5 (165425.4)	74357.94
Dependents	0.1424 (0.000006)**	82583.39 (45303.07)*	37695.41
Experience	-0.0068 (0.000006)	-1031.306 (6113.879)	461.6654
Education Level	-0.0036 (0.0073)	-2199.628 (6807.299)	-6.642257 (1532.195)
Employment	-0.065 (0.2408)	-9243.064 (193235.8)	21395.46 (50478.54)
Financial Training	0.1873 (0.1915)	113010.3 (143808.1)	19008.09 (40145.44)
Microcredit	0.1789 (0.1422)	44692.56 (127297.3)	13882.36 (29805.9)
σ0	209648.8		
σ1	556431.7		
ρ0	-1.0000**		
ρ1	1.0000		
Log likelihood	-77893.73		
Number of obs	302		

***$p<0.01$, **$p<0.05$ and * $p<0.1$. Standard errors in parentheses

Source: Author's computation of field data

The average treatment effect on the treated (ATT) and the average treatment effect on untreated (ATU) were obtained by estimating equations 7 and 8 respectively for each outcome variable. The ATT provides average effects attributed by the programme on those involved in it (treated) as the difference between actual and its counterfactual, while ATU provides anticipated average effects of the programme on those who are not

involved (control) as the difference between its counterfactual (what would have been the results for untreated if they were treated) and actual (as they are untreated) as shown in Table 14. The system of choice and two regime equations, that is equation 1, 5, and 6 are estimated simultaneously using full-information maximum likelihood method (Christophe et al., 2020).

Table 14: Average Treatment Effects using Endogenous Switching Regression

Outcome variable	Treatment effect type	Decision stage		Treatment effect
		To be a member	Not be a member	
Consumption	ATT	162030.3	35242.64	126787.7***
Expenditure	ATU	-790665.3	334613.8	-1125279

***Significant 1%, **significant 5% and *significant 10%

Source: Author's computation of field data,

4.4.4 The Impact of VICOBA Membership on Household Welfare.

Impacts of VICOBA membership on household welfare was captured on monthly income spent on household basic consumption which was significant across both methods. Nearest neighbor matching results (Table 10) indicate monthly consumption expenditure difference after matching was TZS 27,183.67, where the average monthly income of treatment group was TZS 160,622.45 and the control groups was TZS 133,438.78, meaning that VICOBA members had higher expenditure than comparable non-members. These are supported by radius matching results (Table 10) with ATT of TZS 26,624.49. ESR estimation shows results of the same direction though difference in magnitude, as Table 13 illustrate that ATT was TZS 126,787.7 where the average monthly expenditure of the treatment group was TZS 162,030.3 and its counterfactual had average of TZS. 35,242.64. In practical terms, the estimated increase in household consumption of TZS 126,787.7 per month is economically meaningful. This amount represents a substantial share of average monthly household consumption in Tanzania, particularly for low- and middle-income households. Such an increase can significantly enhance households' ability to meet basic needs, including food, education, and health-related expenditures, thereby underscoring the welfare implications of the observed effect. The results are concurring with Chemin (2008) who found that joining microfinance had consumption smoothing effects in Bangladesh, similar to Ghalib et al., (2011) whose application of propensity score matching approach on evaluating the impact of microfinance on easing Poverty of rural households showed that microfinance significantly improve household income. Therefore supporting other descriptive and OLS results like those done by Ngalemwa (2013), Ollotu (2017) and Massawe (2020) in assessing VICOBA in Tanzania.

The ATU presented in ESR results (Table 14) shows that VICOBA membership would have no significant impacts on income of non-members if they had received the treatment, since the observed difference of decrease by TZS 1,125,279 is not statistically significant. The insignificant and negative ATU suggests that the current non-member population would likely not experience the same welfare gains from VICOBA membership as the observed members. This is consistent with selection on unobservable characteristics, where individuals who self-select into the program possess traits that enable them to benefit more effectively from its services. Thus, the program's impact appears context-specific to those who choose to participate, highlighting the importance of member self-selection in driving the positive outcomes.

In general, the results show that VICOBA affects households' welfare through increased household incomes spent on basic consumptions, indicating that members increase their monthly income spent on household consumption which could be due to borrowing, profit from shares contribution or investment from the group, and hence are expected to have a better welfare compared to its counterfactual.

5.0 Conclusion, Policy Implication and Recommendations
5.1 Conclusion

This study examined the impact of Village Community Banks (VICOBA) on households' welfare status in Tanzania, citing Kilosa District as a case. An impact evaluation was done by employing Propensity Score Matching (PSM) and Endogenous Switching Regression (ESR) to reduce the effects of self-select bias due to both observable and unobservable covariates and ensure consistence of the results. In the first stage, the probit model indicates that marital status and number of household dependents are significantly associated with joining VICOBA, that married have a probability of joining VICOBA by 16 percent higher than those who are not married and an increase in the number of household dependents have higher probability of joining the program by 5 percent compared to their counterfactuals. The empirical results obtained from both estimation methods suggests rejecting the null hypotheses, revealing that VICOBA membership significantly contributes to improving welfare of the members of households. Although the magnitude of impacts is minimal considering level of investment, the positive results indicate evidence that if VICOBA is improved in practice, individual households' welfare can be higher than the findings observed. Therefore, this study provides robust quasi-experimental evidence that VICOBA membership has a statistically significant and positive effect on household welfare in rural Tanzania, as measured by increased monthly consumption expenditure. This finding underscores VICOBA's role as a viable community-based financial mechanism for improving living standards among participating households, and supports its continued integration into local development and financial inclusion strategies.

5.2 Policy Implication and Recommendations

Referring to findings of the study from literature to empirical results, it is vivid that financial institutions alone can't achieve welfare of the people in improving economic growth as well as poverty reduction as the countries and global goal. Microfinance subsector's broader change is required towards demand and access-based models that affect the majority in time, of which VICOBA is the lead community microfinance model to cover financial inclusion gap. It also implies that there is operational gap which means Government and development partners should pay more attention on integrating VICOBA not just improved financial practices but also the business development services to advance their occupational practices and other income generating activities that will help to reduce vulnerability of unbanked population to external shocks. There is a need to add effort on technical, expertise and financial assistance through integrating VICOBA activities in Local Government Authorities' development plans, this can provide easy and effective link between government's credit schemes and unbanked low-income segments of the population because the groups are clear and ease to manage (self-managed) and run financial services to members with low costs.

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