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Effectiveness of pro-poor interventions on wealth accumulation and household engagement in income generation in Malawi

Wisdom R. Mgomezulu [a,b,*], Moses M.N. Chitete [c]

[a] Lilongwe University of Agriculture and Natural Resources, P.O. Box 219, Lilongwe, Malawi
[b] Malawi University of Business and Applied Sciences, Department of Business Management, P/Bag 303, Blantyre 3, Malawi
[c] University of Livingstonia, P.O Box 113, Mzuzu, Malawi

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ABSTRACT

The purpose of this study was to evaluate the effectiveness of pro poor interventions with a special focus on wealth accumulation and diversity in income generating programs. The study used a Recursive Bivariate Probit model. The study used secondary data gathered by the Local Development Fund (LDF) in 2020 which drew a sample of 1396 households (868 beneficiaries, 528 non-beneficiaries). The study finds that participation in Livelihoods and Skills Development (LSD) programs significantly improved household asset accumulation by 14.8% and petty trading by 31.8%. Participation in Public Works Program (PWP) significantly improved asset accumulation by 17.7%. The study therefore concludes that the LSD program is more effective in helping households accumulate assets and engage in trade activities that result in improvement of income. Since the study demonstrates that the LSD program is more successful in assisting households to accumulate assets and participate in trade activities, the government should consider implementing a graduation model that extends the LSD's financial trainings to PWP and Social Cash Transfer (SCT) groups.

Introduction

Malawi is a country in Sub-Saharan Africa with a population of close to 20 million (Worldometer, 2023). A majority 80 percent of the population lives in rural areas and more than 50.7 percent of the population have annual incomes which are below the poverty line. This population consists of the (1) moderately poor class who mostly require employment, skills building, capital, productive assets and protection from assets depletion; and (2) the lower poor class which consists of the extremely poor that need survival, employment and productive assets to move them out of poverty. To carter for all these groups and ensure that the gains they receive from pro-poor interventions are sustainable, the government of Malawi introduced the three subcomponents of Public Works Programme (PWP); Social Cash Transfer (SCT) Programme, Village Savings and Loans for skill development to improve asset accumulation and household participation in income generating activities for sustainable livelihoods. Pro-poor interventions can be defined as social support interventions or programs that facilitate the graduation of poor and ultra-poor people out of poverty and minimizing their vulnerability to shocks that make them fall into poverty (World Bank, 2013).

Malawi has a high rate of poverty and vulnerability, and the Malawian government is aware that many people in Malawi require social support (social protection) in order to achieve their basic needs and reduce their risk of exposure. Based on this acknowledgment, Malawi has undertaken an ambitious plan for social and economic growth, taking steps to expand social protection as one of its main focuses. The *National Social Support Policy of 2012* outlines Malawi's strategy in the field of protection and is operationalized through *Malawi National Social Support Programme (MNSSP)*.

The first MNSSP operationalized the NSSP between 2013 and 2016. Following an extensive review, the follow-on *Malawi National Social Support Programme II (MNSSP II)* was designed to operationalize the policy from the 2018–2023 (Government of Malawi, 2017). The new programme confirms government's commitment to delivering social support by providing income and consumption transfers to the poor and food insecure, protecting the vulnerable from against livelihood risks, and enhancing the social status and rights of the marginalized, with the overall objective of reducing ultra (extreme) poverty as well as the economic and social vulnerability of poor and marginalized groups (Government of Malawi, 2017). The overall mission of the MNSSP II is "to provide and promote productivity-enhancing interventions and

* Corresponding author.
E-mail addresses: wmgomezulu@luanar.ac.mw (W.R. Mgomezulu), mchitete@unilia.ac.mw (M.M.N. Chitete).

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welfare support to the poor and vulnerable thereby facilitating the movement of people out of poverty and reducing the vulnerability of those in danger of falling into poverty". To achieve this, the MNSSP II operates on a number of sub themes which include (1) to provide welfare support to those who are unable to construct viable livelihoods; (2) to protect the assets and improve the resilience of poor and vulnerable households; (3) to improve the productive capacity and asset base of poor and vulnerable households for them to move above the poverty line; and (4) to establish coherent and progressive social support synergies by ensuring strong positive linkages to influence economic and social policies and disaster risk reduction. It is to that extent that the three sub-components of SCT, PWP and LSD (through village savings and loans) have been priories and implemented throughout the country.

To start with the Social Cash Transfer (SCT) program, the program involves issuing out cash to ultra-poor households with an aim of improving their consumption, savings and asset accumulation. On average, beneficiary households receive MKW 4000 a month which they get bi-monthly as MWK 8000 ($1 = MWK 750 in 2018) (Reserve Bank of Malawi, 2018). The money is expected to increase by MWK 1000 a month if there are school going children in the household. However, different stakeholders through Key informant Interviews have revealed that the money received is mostly not enough for the beneficiaries to save and accumulate assets. In agreement to this, the World Bank Malawi Safety Nets report of 2013 (World Bank, 2013) elaborates more on the need and importance of the Social Cash Transfer Programme in alleviating poverty. The report argues that Malawi Government's efforts to reduce poverty (ultra and moderately poor households) have over the past decade focused on the Social Cash Transfers programme. Nevertheless, among the social safety nets, social protection investments in direct cash transfers have been comparatively small such that the current expenditure on SCTs does not adequately cover the vulnerable people's needs.

The Public Works Program (PWP) involves providing work to beneficiary households to construct and rehabilitate access roads in the rural areas. This involves grading roads to ensure that communities have access to facilities like markets, schools, health facilities etc. PWP beneficiaries are expected to work throughout the 24 days in a month and to be paid MWK600/day giving a total amount of MWK14, 400 per participant per cycle. Just like the SCTs, the PWP has faced a number of complaints including an outcry to increase the amount of money paid to the participants. Beegle et al. (2015) argued that the PWP operation as a pro-poor instrument, might have made notable impacts in as far as poverty alleviation is concerned in developing countries. However, the limited documented evidence of positive impact and PWP's developmental impacts can to a larger extent be contributed to stakeholders' dissatisfaction with the effectiveness of the instrument. For SCT, Mumtaz and Whiteford (2017) in their assessment of the Pakistan's social safety net program noted that the money received from SCT program is too little to combat household poverty and improve education and health which are the aims of the Pakistan's social safety net program. The authors find that money meant for improving health and education is used to meet other households needs as little cash is transferred due to the limitations of the program.

The LSD through Village Savings and Loans (VSL) group has on the other hand taken a different approach to ensure that households are resilient to possible shocks by accumulating assets and participating in different income generating activities. Beneficiary households or participants of the LSD form groups and contribute some portion of their income to the group which they are later obliged to acquire loans and start different small businesses. Unlike the VSL structures in Malawi, the LSD program provides different sets of trainings that include savings and financial management, business management including development of business plans and marketing and market research trainings. Nevertheless, sources of funds to save and join these VSL groups has always been problematic for most VSL beneficiaries (Thuysbaert, 2012). The participants are thus requested to meet their daily basic needs and at the same time have enough to save for different investments. It is hence for these reasons that an assessment of such pro-poor interventions is necessary to ascertain the effectiveness of the interventions considering the income and poverty status of the beneficiaries.

The Government of Malawi (GoM) established the Local Development Fund (LDF) in 2009 in accordance with the Public Finance Management Act of 2003. The objective of LDF remains to mobilize financial resources for equitable economic growth and development in order to reduce poverty and improve service delivery in line with the development aspirations of the country. To implement the Fourth Malawi Social Action Fund: Strengthening Safety Nets Systems Project (MASAF IV Project) from September 2014 to September 2020, the GoM obtained funds from the International Development Association (IDA) of the World Bank. In addition to strengthening Malawi's social safety net delivery infrastructure and program coordination, the Project Development Objective (PDO) aimed to increase household resilience among the poor. The GoM recognized the necessity of funding various initiatives with the goal of lifting households out of poverty by ensuring that they build wealth or assets and are involved in various income-generating activities.

MASAF IV Project has three components: (1) *Productive Safety Nets*; (2) *Systems and Capacity Building*; and (3) *Project Management*. The Productive Safety Nets Component focuses on three safety net sub-components/programs: (a) *Productive Community-Driven Public Works (PWP)* which extends transfers to poor households through participation in community-driven public works thereby creating assets and providing temporary employment; (b) *Livelihoods and Skills Development (LSD)* which provides grants for increasing household level incomes and assets through savings and investments in livelihood opportunities through Community Savings and Investment Promotion (COMSIP) and other groups; and (c) *Social Cash Transfer (SCT)* which finances cash transfers targeted to the poorest households and hence improving their livelihoods. It is for that reason that the current study sets out to assess the effectiveness of these pro-poor interventions by assessing their ability to achieve the objectives of helping households accumulate assets and engage in petty trading.

The current study contributes to literature in at least four relevant ways. Firstly, it adds to the growing but still limited body of research on pro-poor interventions in developing nations by offering new perspectives on potential policy directions and the ideal combination of pro-poor interventions while keeping in mind that the majority of developing nations are resource-constrained. Secondly, it offers evidence on the viability of scaling up the appropriate pro-poor interventions, which is important given the ongoing discussions over subsidies, cash transfers, and other social support initiatives that spend a significant amount of tax payers' money. Thirdly, it adds to the growing body of research on social support systems by offering the first-ever evidence for an evaluation of a number of pro-poor interventions in Malawi using a recent and novel data set collected from the recent MASAF IV project in 2020. Lastly, the current study adds to the growing literature on impact assessment that deals with controlling for unobserved heterogeneity through instrumental variable identification in a Recursive Bivariate Probit regression.

Materials and methods

Analysis of social support pro-poor interventions on home wealth development and household participation in revenue producing activities is the main objective of the current study. Basing on the utility maximization theorem, the study employs a Recursive Bivariate Probit model in an effort to take into account the direct effects of taking part in pro-poor actions. If the utility of participation ((U^{p})) exceeds the utility of non-participation, households are considered to participate in SCT, PWP, and LSD interventions (U^{np}). We do see the decision to participate (P), which is equal to 1 if the households become beneficiaries of the intervention and equal to 0 otherwise, as the utility of participation

cannot be observed.

This can be presented as follows (Wooldridge, 2015):

$$\begin{aligned} &P = 1 \text{ if } U^{p} > U^{np} > 0; \\ &P = 0 \text{ if } U^{np} > U^{p} > 0 \end{aligned} \quad (1)$$

Considering that utility cannot be observed and the model specification in Eq. (1), the participation decision can be formulated as a latent variable, expressed as:

$$P_h^* = \beta Z_h + \varepsilon_i, \text{ for } P = 1, P_h^* > 0 \quad (2)$$

Where P_h^* is 1 if the household was a participant and 0 if the household was a non-participant; Z_h is a vector of household and community determinants of participation in SCT, LSD and PWP programs; β is a vector of parameters to be estimated; and ε is a normally distributed error term with zero mean and constant variance.

Considering Eq. (2), the outcome equation of household wealth/asset category (asset accumulation) and income generating activities (petty trading) can be expressed in a probit model in which participation in pro-poor intervention is again included as dummy variable along other covariates making participation in pro-poor interventions an endogenous variable: This is specified as below.

$$Y_h = \theta P_h + \eta X_h + \varepsilon_h, \quad (3)$$

where Y_h is equal to 1 for outcome variables of asset accumulation and petty trading; P_h is the pro-poor intervention participation dummy for each of the PWP, SCT and LSD; X_h is a vector of determinants affecting participation in pro-poor interventions, such as household characteristics and project-related factors; θ and η are coefficients to be estimated; and ε is the error term which is robust to heteroscedasticity.

The current study adopts the Recursive Bivariate Probit model in assessing the effectiveness of pro-poor interventions because (1) participation in pro-poor interventions in most cases and the current MASAF IV project occurs in a non-random fashion; and (2) households self-selected themselves into savings groups and public works given their individual utility functions. This provides high levels of biasness in the estimation of the impact of pro-poor interventions. In most intervention areas of the MASAF IV, a number of households and villages still desire to become beneficiaries of SCTs due to their financial status. To that effect, a lot of unobserved factors can influence the estimated impact of the pro-poor interventions. Even though there are a number of observable factors we can manage to control for, we are however apprehensive about factors that could not be measured and observable, such as relationship with social protection committee members who decide on the final selection, personal motivation and entrepreneurial ability of the households.

To control for these, the current study employs a number of recursive bivariate probit (RBP) models to account for endogeneity, at the same time simultaneously controlling for selection bias in the selection of beneficiary households (Li et al., 2019). Unlike a stepwise estimation or other impact models like Propensity Score Matching and Endogenous Switching Regression models, the recursive bivariate probit model jointly estimates the selection (participation in pro-poor interventions) and outcome equations (wealth accumulation and participation in income generating activities like petty trading), hence controlling for possible endogeneity bias. Thus the error terms ε have a bivariate normal distribution, which are expressed as:

$$\sigma = \left(\frac{1\rho}{\rho 1}\right) \quad (4)$$

Where ρ is the correlation coefficient of the unobserved explanatory variables in the systems of equations as expressed by Wooldridge (2015) and Amadu et al. (2020). Abdulai (2016) however pointed out that a significant ρ implies that the error terms in the selection and outcome equations are correlated showing the presence of unobserved heterogeneity hence the need for using the RBP.

In order to estimate the impact of these interventions (PWP, SCT and LSD) on household wealth accumulation and participation in petty trading, we need to estimate the marginal effects (ME) of participation given a set of explanatory variables, and the average treatment effects on the treated (ATT) based on the specified Eqs. (2) and (3). This can be specified as follows:

$$ME = Exp[(Y_i)|P_h > 1] \quad (5)$$

$$ATT = E\{[(Y_i = 1)|P_h = 1] - [(Y_i = 0)|P_h = 1]\} \quad (6)$$

Where $Exp[(Y_i)|P_h > 1]$ represents wealth/asset accumulation and participation in petty trading indicators conditional on project participation; $E[(Y_i = 1)|P_h = 1]$ represents the expected probability of wealth and IGAs indicators for beneficiaries; and $[(Y_i = 0)|P_h = 1]$ is the expected probability of the non-beneficiaries.

Endogeneity bias and identification of instrumental variables

The concept of endogeneity has gained popularity in recent impact studies as there exist a risk of introducing bias in the estimation of the impact. To that effect, there is need to account for endogeneity and self-selection in the estimation of the ATT. To avoid misidentification of the specified RBP model, there exist a need to include at least one variable in the participation equation in Z_h which will not be included in the outcome equation in X_h that is correlated with the explanatory variables but not correlated with the error terms, ε. Through testing different instruments, the study identified the variable distance to extension worker as the best fit instrumental variable. Thus we safely find out that distance to the extension worker is highly correlated to individual household project participation and at the same time not correlated with the error term. This follows earlier works of Kubitza and Krishna (2020) who pointed out that higher-level events like participation in most cases affect outcome variable of interests. Hernandez and Reardon (2012) also used distance to the market and extension worker as the instrumental variables indexing participation. To validate the Instrumental variable, we use the zero-first-stage test (Wooldridge, 2015; Angrist et al., 2010; Amadu et al., 2020a), which expresses the effect of the instrumental variable on the treatment variable being zero for a subsample, a necessity to satisfy the exclusion restriction.

The asset/wealth index

The asset index is used as a proxy for measuring long-run standard of living and wealth of the household [National Statistical Office (NSO), 2018]. The study provides the asset status index for each subcomponent/program of PWP, SCT and LSD and for non-beneficiary households. The study determined the asset index using *Principal Components Analysis (PCA)*. The asset index is based on data from household ownership of productive assets (agricultural tools and equipment) and personal assets (e.g., bed, radio, TV, bicycle). The following procedure was used. The index involves (1) assigning each asset a weight (factor score) generated through Principal Components Analysis (PCA); (2) standardizing the resulting asset scores in relation to standard normal distribution with a mean of zero and deviation of one; (3) assigning each household a score for each asset and the scores are summed up for each household; (4) ranking Individual households according to total score of the household in which they reside; and (5) sub-dividing the ranks into asset thresholds of those with low, medium and high level of assets. However, we focus on high asset accumulation as the outcome variable for participation in the interventions, which we label asset accumulation.

Table 1
Sample Sizes for the Household Survey.

District	Productive safety net subcomponent/ programme				Non-beneficiaries	All
	PWP	LSD/ COMSIP	SCT	Project beneficiaries		
Karonga	53	48	0	101	67	168
NkhataBay	51	51	55	157	98	255
Mchinji	39	52	0	91	52	143
Dedza	42	36	50	128	93	221
Balaka	77	4	0	81	53	134
Zomba	61	49	0	110	47	157
Mulanje	52	43	0	95	61	156
Chikhwawa	57	48	0	105	57	162
Total	**432**	**331**	**105**	**868**	**528**	**1396**

Data

The study used secondary data collected by the Local Development Fund (LDF) in 2020 through the funding of the World Bank and the International Development Association (IDA). A Household Survey was conducted at community level, using a pretested structured and semi structured questionnaires, mainly to generate quantitative and qualitative information required for the study. The Household Survey involved interviewing both beneficiary and non-beneficiary households to enable comparison of project indicators between the two groups (*with-without scenario*) and establishment of the control/counterfactuals for assessment of Project impact on the outcomes. The Survey covered all the eight districts where the MASAF IV Project was implemented. These districts were: *Karonga* and *Nkhata Bay* in the Northern Region; *Mchinji* and *Dedza* in the Central Region; and *Balaka*, *Zomba*, *Mulanje* and *Chikwawa* in the Southern Region. Simple random sampling was used to randomly sample the beneficiary and non-beneficiary households. The Survey interviewed a total of 1,396 sample households (868 beneficiaries, 528 non-beneficiaries). Table 1 gives the sample sizes for the Survey by programme and district.

Results

Before we present the results of the participation and impact of the pro-poor social support interventions, we firstly provide a brief description of the characteristics of the study respondents through some descriptive statistics. We further show the key differences between the beneficiary and non-beneficiary households. The chapter then concludes with regression results of determinants of participation in pro-poor interventions and the welfare effects or impacts of participation in different programs.

Descriptive statistics

The descriptive statistics are summarized in Table 2. In this section, only key descriptive statistics are discussed and those characteristics that portray significant differences are explained.

From the computed descriptive statistics, beneficiary and non-beneficiary households were similar in terms of household composition and characteristics. Almost 69 percent of the sampled beneficiaries and non-beneficiary households were male headed households. This is in line with the findings of World Bank (2016) where a majority of the households in Malawi are male headed households. Another similarity dwelt in marital status with a majority 65.43 and 65.21 percent of the beneficiary and non-beneficiary households respectively were married. On average, both beneficiary and non-beneficiary households had 6 members. Key household characteristics differences were noted on age as beneficiaries (48.8 years) were significantly older than non-beneficiaries (43.3 years). It should be noted that the social support pro-poor interventions mainly support the elderly, which is the case with SCT program (61.5 years). Average income was also significantly different between beneficiary (MWK 49377.08) and non-beneficiary (MWK 26507.62) households.

On average, beneficiary households owned more productive assets than their counterparts showing that they were more involved in productive activities. Significant difference existed in ownership of hand hoes (96% beneficiary, 92% non-beneficiary), Panga Knives (66% beneficiary, 54% non-beneficiary), Watering cans for irrigation (31% beneficiary, 15% non-beneficiary) and Kraals (40% beneficiary, 24% non-beneficiary). Computing the wealth index showed that asset accumulation was higher among beneficiary (24.69%) than non-beneficiary (11.07%). In fact, the percentages were higher for non-beneficiary households in low asset level (54.39%) than beneficiary households (31.17%) in the same asset bracket. In terms of income generating activities, more households were engaged in farming (69.32% beneficiary, 56.02% non-beneficiary), piece work (52.02% beneficiary, 62.95% non-beneficiary). However, a smaller percentage of the respondents were engaged in small businesses with a higher percentage observed in beneficiary (28.95%) households than their counterparts (19.09%). The LSD program, which focuses on village savings and loan organizations and business trainings, benefited a greater percentage (37.46%) of people who were involved in small businesses. Seventy-three percent of LSD beneficiaries who needed business training in financial and business management obtained it in their VSL groups, which is a majority. For the purpose of simplicity, we select two important outcome variables of petty trading under Income Generating Activities (IGAs) and High asset accumulation under the wealth or asset index. These are selected because the whole purpose of the interventions is to boost small businesses and also allow households to accumulate assets. The RBP hence uses these two outcome variables for each of the three interventions.

Determinants of participation in PWP, LSD and SCT programs

Table 3 present results of the first equation in the RBP model which is the selection equation of determinants of participation in PWP, LSD and SCT projects. The overall model was significant at 1 percent with a p-value > chi2 of 0.000. The selection model results show that age was an important factor in explaining participation in PWP and SCT projects. Since PWP requires households in the active working age group, an increase in age decreased the probability of participating in PWP (p-value < 0.01). On the other, the SCT mostly targets the elderly hence an increase in age increased the probability of participating in SCT (p-value < 0.01). Again, with SCT focusing much on elderly women, being male reduced the probability of participating in SCT at 1 percent significance level. Since most of these elderly women targeted are not married, being married reduced the probability of participation in SCT (p-value $<$ 0.01). Income reduced the probability of participating in PWP as PWP focusses on households with labour and no income, but increased the probability of participating in LSD as households with certain level of income asked to save and invest (p-value < 0.1). Ownership of assets like a kraal increased the probability of participating in LSD (p-value $<$ 0.05). Education was another important determinant of participation and was positive and significant for LSD (p-value < 0.1) for households that attended secondary school education (Form 1–4) as they can best be trained and understand business models and business plans. Those that attended informal adult literacy education had a higher chance participating in PWP and SCT (p-value < 0.1). Lastly, business trainings increased the probability of participation in LSD by 12.6 percent holding other factors constant (see Tables 4 and 5).

Determinants of asset accumulation and participation in petty trading

Next was to estimate the effect of participation in the different interventions on asset accumulation and engagement in petty trading. We first test the null hypothesis of zero correlation among the error terms (rho = 0), a necessity for the RBP model. We reject the null hypothesis at

Table 2
Descriptive Statistics of Beneficiary and Non-beneficiary Households.

Variable	PWP (n = 432)	LSD (n = 331)	SCT (n = 105)	Beneficiary (n = 868)	Control (n = 528)	P-value
Continuous						
Age (years)	47.3	46.8	61.5	48.8	43.3	0.000***
	(14.5)	(14.5)	(14.6)	(15.6)	(16.1)	
Gender (Male = 1)	0.745	0.715	0.39	0.691	0.693	0.899
	(0.436)	(0.452)	(0.49)	(0.462)	(0.461)	
Household size	5.8	5.8	5.8	5.8	5.5	0.007***
	(2.4)	(2.1)	(2.3)	(2.3)	(2.2)	
Income (Mwk)	38366.25	73623.29	17775.26	49377.08	26507.62	0.001***
	(94416)	(195193.3)	(58652.58)	(140612.3)	(90927.99)	
Binary						
Access to portable water (1 = yes)	0.16	0.05	0.26	0.14	0.1	0.06*
	(0.38)	(0.22)	(0.44)	(0.34)	(0.3)	
Productive Asset ownership						
Hoe (1 = yes)	0.97	0.97	0.90	0.96	0.92	0.00***
	(0.16)	(0.17)	(0.31)	(0.19)	(0.28)	
Plough (1 = yes)	0.03	0.05	0.01	0.03	0.02	0.293
	(0.18)	(0.21)	(0.1)	(0.18)	(0.15)	
Oxcart (1 = yes)	0.01	0.02	0.0	0.01	0.01	0.368
	(0.1)	(0.13)	(0.0)	(0.1)	(0.1)	
Panga Knife (1 = yes)	0.64	0.74	0.47	0.66	0.54	0.000***
	(0.48)	(0.44)	(0.5)	(0.47)	(0.5)	
Watering can (1 = yes)	0.27	0.38	0.21	0.31	0.15	0.000***
	(0.45)	(0.49)	(0.41)	(0.46)	(0.36)	
Kraal (1 = yes)	0.34	0.5	0.31	0.4	0.24	0.000***
	(0.48)	(0.5)	(0.47)	(0.49)	(0.43)	
Business Training (1 = yes)	0.121	0.734	0.024	0.684	0.221	0.000***
IGAs						
Farming	64.35	75.23	71.43	69.32	56.06	0.000***
Fishing	4.86	5.74	1.9	4.84	5.10	0.828
Piece Work	61.57	41.99	44.76	52.02	62.95	0.000***
Petty Trading	22.92	37.46	26.67	28.95	19.09	0.000***
Categorical	%	%	%	%	%	
Wealth/Asset Accumulation						
Low	31.86	21.83	53.33	31.17	54.39	0.000***
Medium	47.21	42.25	37.14	44.13	34.54	0.000***
High	20.93	35.92	9.52	24.69	11.07	0.000***
Marital Status						
Single	1.85	1.82	3.85	2.08	1.90	0.747
Married	70.6	68.48	34.62	65.43	65.21	0.738
Polygamist	1.85	1.52	5.77	2.20	2.47	0.749
Widow/widower	18.29	16.67	42.31	20.58	18.63	0.741
Divorced	4.17	4.85	10.58	5.20	7.03	0.744
Separated	3.24	6.67	2.88	4.51	4.75	0.699
Education level						
None	13.55	10.94	25.0	13.95	16.29	0.053*
Adult Literacy	4.91	1.82	6.73	3.95	2.65	0.061*
Std 1–4	20.56	17.02	34.62	20.93	17.61	0.051*
Std 5–8	42.06	41.64	30.77	40.58	38.07	0.055*
Form 1–2	11.21	16.11	2.88	11.98	12.31	0.052*
Form 3–4	7.01	11.55	0.00	7.91	12.5	0.049**
Tertiary	0.7	0.91	0.00	0.7	0.57	0.052*
Instrument						
Distance to ext worker (mins)	7.4	4.5	2.05	5.8	4.6	0.001***
	(20.2)	(5.0)	(2.0)	(15.2)	(9.0)	

Parentheses is standard deviation. ***significance at the 1%-level; **significance at the 5%-level; *significance at the 1%-level.

Table 3
Recursive bivariate probit model for each of the selection models.

Variable	PWP (marginal effect)	LSD (marginal effect)	SCT (marginal effect)
Age (years)	−0.006***	−0.0001	0.006***
	(0.001)	(0.002)	(0.001)
Age square	0.01	0.001	0.01
	(0.113)	(0.213)	(0.111)
Gender (Male = 1)	0.111	−0.026	−0.281***
	(0.132)	(0.128)	(0.080)
Household size	−0.005	0.014	−0.003
	(0.015)	(0.014)	(0.006)
Log Income	−0.027*	0.034*	−0.007
	(0.014)	(0.017)	(0.006)
Access to portable water (1 = yes)	0.177**	−0.242**	0.046
	(0.088)	(0.108)	(0.045)
Productive Asset ownership			
Hoe (1 = yes)	0.079	−0.133	0.058
	(0.186)	(0.213)	(0.104)
Plough (1 = yes)	−0.015	0.044	
	(0.151)	(0.133)	
Oxcart (1 = yes)	−0.012	0.115	
	(0.142)	(0.161)	
Panga Knife (1 = yes)	−0.094	0.116	−0.048
	(0.075)	(0.076)	(0.047)
Watering can (1 = yes)	−0.068	0.042	0.045
	(0.063)	(0.061)	(0.037)
Kraal (1 = yes)	−0.067	0.114**	−0.060
	(−0.028)	(0.056)	(0.043)
Marital Status			
Married (1 = yes)	−0.028	0.134	−0.106***
	(0.196)	(0.215)	(0.006)
Education level			
None ®			
Adult Literacy	0.018***	−0.133	0.130**
	(0.005)	(0.208)	(0.078)
Std 1–4	0.073	−0.052	−0.053
	(0.101)	(0.108)	(0.052)
Std 5–8	−0.046	0.056	−0.050
	(0.089)	(0.087)	(0.050)
Form 1–2	−0.189*	0.184*	−0.021
	(0.112)	(0.103)	(0.062)
Form 3–4	−0.216*	0.212*	
	(0.117)	(0.113)	
Business Training (1 = yes)	0.231	0.126***	0.003
	(0.342)	(0.001)	(0.121)
Instrument			
Distance to extension worker (mins)	0.116***	0.115***	−0.029***
	(0.007)	(0.005)	(0.009)

Parentheses are standard errors. ***significance at the 1%-level; **significance at the 5%-level; *significance at the 1%-level.

1%-significance level for all the six equations through the Wald test, suggesting that unobserved or confounding factors co-determine participation and outcome variables of asset accumulation and petty trading. To solve for that, the RBP model with an instrument variable was indeed required to control for endogeneity.

We estimate the outcome equation and we find significant and positive participation effect of PWP on asset accumulation and LSD on asset accumulation and petty trading. Thus participation in PWP increases the probability of accumulating assets or wealth by 37.7% significant at 1%. Likewise, participation in LSD increases the probability of accumulating assets by 14.8% and engagement in petty trading by 31.8 percent significant at 1%. Nevertheless, participation in SCT was found to not significantly influence asset accumulation and engagement in petty trading. Thus the LSD program is more effective in helping households accumulate assets and engage in trading activities that bring income.

Age of the household head was another factor that was discovered to have an impact on the outcome variables. For PWP, it had a favorable impact on asset accumulation while having a negative impact on petty trading; and for SCT, it had a negative impact on both asset accumulation and petty trading. Additionally, for LSD, gender had a negative impact on asset accumulation and petty trading while having a good impact for SCT. Again, household size had a negative impact on asset accumulation for PWP, whereas for all three programs, household income had a favorable impact on both asset accumulation and petty trading. Education was also discovered to be a significant determinant, as higher level secondary education enhanced both asset accumulation and petty trading for LSD participants while adult literacy increased asset accumulation for PWP. Lastly, receiving business training also increased LSD beneficiaries' asset accumulation by 32.5% and engagement in petty trading by 21.1%.

Average treatment effects of project participation on outcome variables

We go further to estimate the average treatment effect of the treated (ATT) to determine the impact of participation in different social support programs on the outcome variable. We use the Kernel matching to match participants and non-participants and we observe that participating in PWP has positive and significant impact on asset accumulation while participation in LSD programs has a significant and positive average treatment effect on both asset accumulation and engagement in petty trading. Following Khandker et al. (2010), the Kernel matching algorithm of bandwidth 0.1 was used to match beneficiaries and non-beneficiaries as it provided the best weighted scores in a smaller vicinity as compared to other algorithms like nearest neighbor and caliper matching. The ATT for participation in SCT program was however not significant for both asset accumulation and petty trading.

Robustness of the instrument

To prove the robustness of the instrument, we conducted a zero first-stage test for assessing the admissibility of the instrument, distance to the extension worker. The results show that the choice of the instrument was right as none of the outcome variables of petty trading and asset accumulation enters significantly into the model with distance to the extension worker as the only key determinant. We therefore conclude that there exist no correlation with the instrument with outcome variables, necessitating its inclusion in selection model but not in the outcome equation (see Table 6 in Appendix). Thus distance to the extension office solves the endogeneity bias caused by the inclusion of participation variable as a covariate in the RBP model.

Discussion

The results presented the factors affecting participation in three social support programs namely PWP, LSD and SCT. Significant factors found to affect participation in PWP were age and income. With age, PWP recruits beneficiaries in the active age group as it involves rehabilitation of access roads in the villages. Thus older household heads had a lower probability of participating in the program. Again, these beneficiaries are mostly income constrained but do have the labour force to carry out the public works. As such, households with higher levels of income had a lower chance of participating the program. For LSD, income was a relevant determinant as households are required to form groups and save. As such, those with higher levels of income had a higher probability of participating in LSD program. Ownership of assets like a kraal increased the probability of participating in LSD as this also provided the households with the much needed productive assets to start a business. The aim of the savings under LSD is mainly to enable the households to invest in different activities. Education was another important determinant of participation for LSD as the program not only involves savings but also training these households in different business

Table 4
Recursive bivariate probit model results of outcome variables.

	PWP (marginal effects)		LSD (marginal effects)		SCT (marginal effects)	
Variable	Asset accumulation	Petty trading	Asset accumulation	Petty trading	Asset accumulation	Petty trading
Participation	0.177***	0.093	0.148***	0.318***	−0.314	−0.284
	(0.012)	(0.031)	(0.01)	(0.001)	(0.321)	(0.192)
Age (years)	0.019*	−0.114**	−0.010	−0.001	−0.012*	−0.0109*
	(0.010)	(0.022)	(0.006)	(0.012)	(0.004)	(0.006)
Age square	0.13	0.21	0.11	0.10	0.154	0.113
	(0.23)	(0.464)	(0.101)	(0.121)	(0.226)	(0.224)
Gender (Male = 1)	0.538	−0.453	−0.549***	−0.314***	0.311**	−0.541
	(0.897)	(0.740)	(0.011)	(0.001)	(0.012)	(0.402)
Household size	−0.137**	0.053	0.060	0.071	0.110	0.060
	(0.070)	(0.067)	(0.042)	(0.122)	(0.142)	(0.042)
Log Income	0.185***	0.686**	0.109**	0.149**	0.114**	0.106**
	(0.071)	(0.153)	(0.047)	(0.037)	(0.066)	(0.046)
Access to portable water (1 = yes)	0.229	−0.002	−0.143	−0.165	−0.218	−0.119
	(0.475)	(0.732)	(0.280)	(0.311)	(0.210)	(0.276)
Marital Status						
Married (1 = yes)	0.438	−0.948	−0.996	−0.139	−0.782	−0.992
	(0.976)	(0.830)	(0.682)	(0.512)	(0.581)	(0.680)
Education level						
None ®						
Adult Literacy	0.544***	−0.045	−0.049	−0.051	−0.149	−0.049
	(0.054)	(0.665)	(0.677)	(0.176)	(0.281)	(0.681)
Std 1–4	0.548	0.508*	0.469	0.469	0.382	0.482
	(0.624)	(0.307)	(0.312)	(0.312)	(0.216)	(0.311)
Std 5–8	0.497	0.276	0.347	0.140	0.138	0.338
	(0.595)	(0.509)	(0.274)	(0.204)	(0.164)	(0.274)
Form 1–2	0.348	0.019	0.190	0.109	0.181	0.161
	(0.644)	(0.906)	(0.335)	(0.205)	(0.233)	(0.113)
Form 3–4	0.221	−0.313	0.142**	0.182**	−0.004	−0.174
	(0.680)	(0.834)	(0.076)	(0.056)	(0.01)	(0.111)
Business Training (1 = yes)	0.004	0.116	0.325***	0.211**	0.101	0.002
	(0.311)	(0.543)	(0.013)	(0.013)	(0.372)	(0.671)
Diagnosis						
Log pseudolikelihood	−3869.12	−3079.82	−3470.01	−3651.21	−3941.11	−3796.12
Rho	−0.82***	−0.71***	−0.75***	−0.79***	−0.88***	−0.80***
wald test rho = 0 chi2(1)	16.4	11.9	13.94	14.54	16.23	15.41
Prob > chi2	0.000	0.000	0.000	0.000	0.000	0.000

Parentheses are standard errors. ***significance at the 1%-level; **significance at the 5%-level; *significance at the 1%-level.

Table 5
Average treatment effect of participation in social support programs.

Programs	PWP		LSD		SCT	
Outcome Variables	Asset accumulation	Petty trading	Asset accumulation	Petty trading	Asset accumulation	Petty trading
Matching Estimator	ATT	ATT	ATT	ATT	ATT	ATT
	(S.E)	(S.E)	(S.E)	(S.E)	(S.E)	(S.E)
Kernel	0.229***	0.124	0.071**	0.231***	0.035	0.105
	(0.034)	(0.221)	(0.031)	(0.012)	(0.121)	(0.146)

Parentheses are standard errors. ***significance at the 1%-level; **significance at the 5%-level; *significance at the 1%-level.

ventures. Educated household heads were more eager to participate and understand the trainings. For SCT, the program mainly targeted older household heads and who were females. This explains why age and gender were the most significant determinants of the SCT program. We further find that gender and education of the household heads plays an important role not only in participation but also in improving the livelihoods of the beneficiaries. More educated household heads were found to be participating more in LSD program and also be able to accumulate assets and engage in petty trading. As earlier argued, LSD beneficiaries receive a number of trainings including business and financial management trainings. Thus formal education plays a role in the understanding of those trainings and hence improvement in their livelihoods. With regards to gender, women headed households were found to participate more in SCT programs (see Table 7).

With regards to effect of participation in these programs on outcome variables of asset accumulation and engagement in petty trading or small businesses, we found that participation in PWP increases the probability of accumulating assets or wealth by 37.7%. Likewise, participation in LSD increases the probability of accumulating assets by 14.8% and engagement in petty trading by 31.8%. The whole aim and purpose of these social support programs is to provide households with a certain level of income that allows them to invest in different income generating activities and also accumulate assets that make them resilient to shocks. We however find that those engaged in PWP and LSD are more able to fulfil the objectives of the MNSSP II than those engaged in SCT program.

Table 6
Zero first-stage test for assessing instrument admissibility.

Outcome variable	Variables/model diagnostics	Coefficient	Std. Error	P-value
Asset Accumulation	Distance to the extension office (mins)	0.078	0.120	0.514
	Constant	0.043	0.017	0.016
	Log likelihood	226.62		
	LR Chi2	1.18		
	Pseudo R2	0.003		
Petty trading	Distance to the extension office (mins)	−0.004	0.007	0.523
	Constant	−0.917	0.089	0.000
	Log likelihood	−448.33		
	LR Chi2	0.47		
	Pseudo R2	0.0005		

Table 7
Ramsey RESET Test for Omitted Variables and Breusch Pagan Test for Heteroscedasticity.

H0:	model has no omitted variables
F(3,260)	1.25
P-value	0.223
H0:	Constant variance
Chi2	2.45
p-value	0.325

We thus concur with World Bank (2013) who found that social protection investments in direct cash transfers have been comparatively small, restricting vulnerable households to save and invest in small business as they cannot meet their daily basic needs with the money received. Indeed It is very hard for an ultra-poor household whose consumption expenditure is below the consumption poverty line to get out of poverty if current income is less than the minimum required consumption expenditure in a society; as such, the household gets trapped in poverty (Todaro & Smith, 2012 p. 579), further failing to save and invest. WFP (2018) also found that direct cash transfers often times provide little than what is required to meet ones basic needs. The authors hence introduced a concept of Minimum Expenditure Basket which is what a household requires to meet its basic needs on a regular basis and its average cost. As such, there exist a need to understand the minimum requirements of these vulnerable SCT households before a transfer amount is reached. Most Key informants argued that the amount issued out is very little (MWK 4000 or $5.3 dollars a month per single beneficiary). This hence results into SCT beneficiaries to be trapped in a cycle of receiving cash transfers without being able to graduate and become self-dependent.

Conclusions and recommendations

The main purpose of this study was to evaluate the effectiveness of pro poor interventions with a special focus on wealth accumulation and diversity in income generating programs. In order to evaluate the effectiveness of pro-poor interventions, the current study used the Recursive Bivariate Probit model. The motivation for use of the Recursive Bivariate Probit model rested on two important reasons: (1) participation in pro-poor interventions and the current MASAF IV project occurs/occurred non-randomly in most cases; and (2) households self-selected into savings groups and public works, given their individual utility functions. This offers significant degrees of bias in the estimation of the effects of pro-poor programs. Due to their financial situation, many households and communities in the majority of the MASAF IV intervention regions still want to receive SCTs. The predicted impact of the pro-poor actions can thus be influenced by a variety of unobserved heterogeneity. We are concerned about factors that cannot be measured or observed, such as a household's relationship with the members of the social protection committee who make the final selection, their own motivation, and their capacity for entrepreneurship, even though there are many observable factors that we can manage to control for. This study adds to the increasing body of research on social support programs by offering the first-ever evidence for an evaluation of a number of pro-poor initiatives in Malawi using a new data set that was gathered for the MASAF IV project in 2018. This is the first study that contributes to the expanding body of work on impact assessment, discussing in detail how to account for the unobserved heterogeneity through the identification of instrumental variables in a recursive bivariate probit regression.

The results of the study show that beneficiary households typically held more productive assets than their peers, indicating that they were more actively engaged in productive activities. The wealth index calculation revealed that beneficiary asset accumulation was larger than non-beneficiary asset accumulation.

According to the results of the selection model, age played a significant role in predicting participation in PWP and SCT initiatives. The likelihood of participation in PWP dropped as one became older because PWP needs households with members who are actively employed. On the other hand, as the SCT primarily focuses on the elderly, age increased the likelihood of participation in the SCT. Having a male gender decreased the likelihood of participating in SCT because SCT focuses a lot on elderly women. Being married decreased the likelihood of taking part in SCT because the majority of these elderly women targeted are single.

Income raised the likelihood of participating in LSD because households with a particular level of income were requested to save and invest, but it decreased the likelihood of participating in PWP since PWP concentrates on households with labor but no income. The likelihood of taking part in LSD increased when one had assets like kraals. Education was a significant and positive determinant of LSD for households that attended secondary school education (Form 1–4) as they can be best trained and understand business models and business plans. Attending informal adult literacy classes increased the likelihood of engaging in PWP and SCT. Finally, business trainings raised the probability of participation in LSD.

The likelihood of accumulating wealth or assets increases with participation in PWP. The likelihood of amassing assets and engaging in petty trading also rises with participation in LSD. It was further discovered that taking part in SCT had no appreciable impact on the development of assets or petty trading. Thus, the LSD program is more successful in assisting households to amass assets and participate in trade activities that generate revenue.

It was further discovered that involvement in LSD programs had a large and positive average treatment effect on both asset accumulation and petty trading, participation in PWP has only a positive and marginally significant influence on asset acquisition. However, neither asset accumulation nor small-scale trading were significantly impacted by the ATT for SCT program participation.

Since the study finds that LSD program is more effective in helping households accumulate assets and engage in trade activities, government should therefore consider extending the wealth accumulation model of LSD to the PWP and SCT groups. This will ensure that beneficiaries in the PWP and SCT graduate to a new level of wealth status. The culture of savings and financial management should be nurtured in the PWP and SCT participants through trainings, hence speed up the graduation of participants in the said groups. This will lead to enhanced scaling up of the programs, hence achieve effectiveness of the pro-poor interventions.

CRediT authorship contribution statement

Wisdom R. Mgomezulu: Conceptualization, Methodology, Writing – review & editing, Visualization, Supervision, Validation. **Moses M.N. Chitete:** Conceptualization, Formal analysis, Writing – original draft.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Appendix

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