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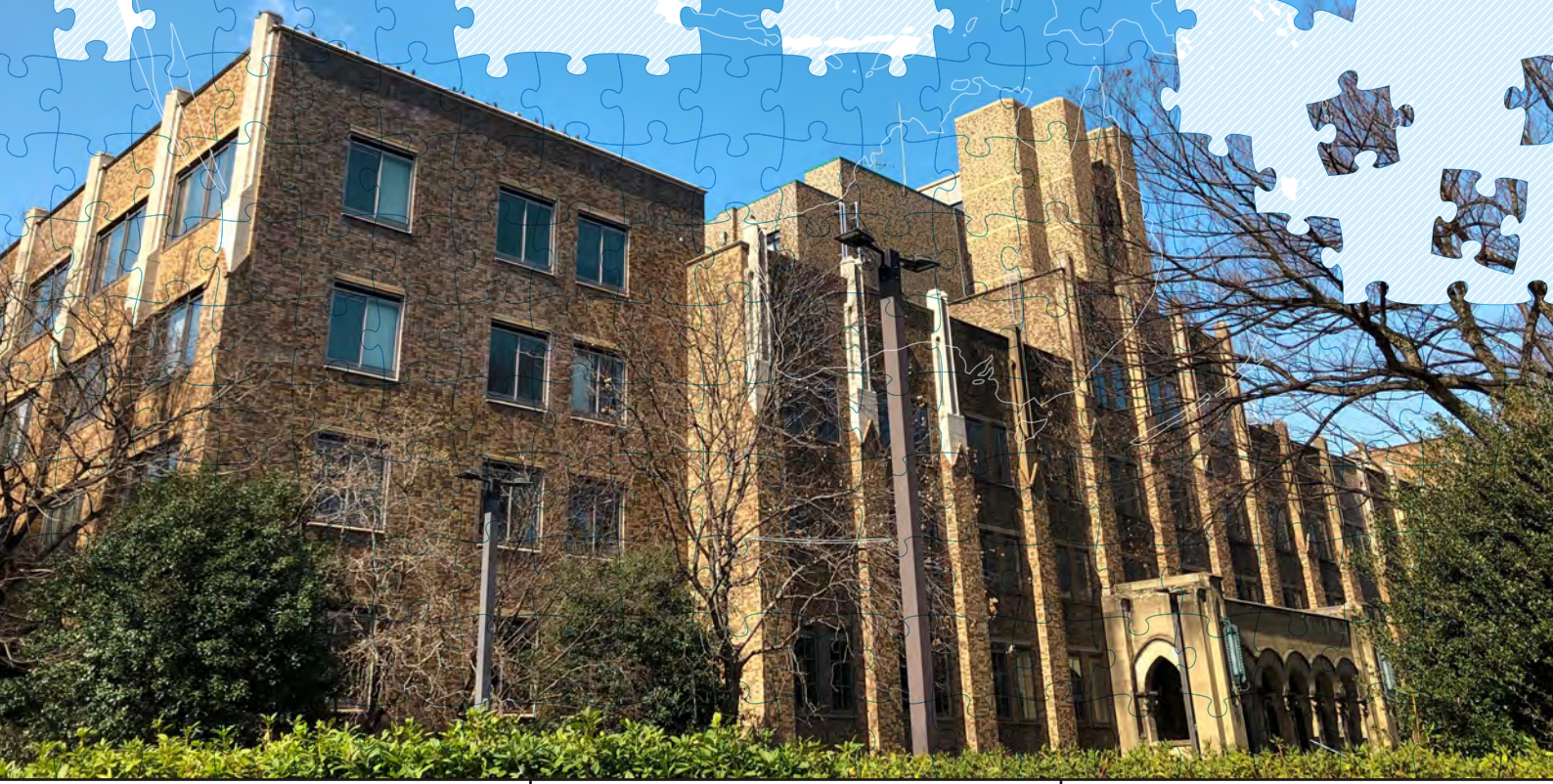

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Can Saving through the Formal Banking Channel Promote Welfare for Malawian Farmers? Evidence Based on an Encouragement Design

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Abstract: Vulnerable farmers lack the financial resources to invest in crop production, and formal savings can be a financial mechanism useful for increasing their financial resources. Moreover, a lack of financial literacy often results in the waste of harvest proceeds, while if harvest proceeds can be saved through formal banking channels, farmers can invest more in the next harvest and thus may produce more crops. However, the empirical evidence of such an impact is limited. Thus, this study explores the impact of saving through formal banking channels on the welfare of Malawian farmers. As the formal savings decision is not random but self-selected, a randomized encouragement design is applied as the identification strategy, in which individuals are invited to receive their harvest proceeds through a formal savings account as the encouragement or instrumental variable (IV) to estimate the local average treatment effect. The findings indicate that formal savings increase total savings, agricultural investment, crop production, and crop sales. This study provides policy implications for targeting formal savings

as a policy tool for providing farmers with more financial resources to invest in crop farming and enhancing farmer welfare.

Keywords: Formal Banking, Saving, Harvest Proceed, Production, Crop Sale

1. Introduction:

Agricultural production is considered a key policy tool to combat poverty, as every 1% increase in agricultural production results in a 0.61% decrease in the number of extremely poor households globally (Liliane & Charles, 2020). Agricultural production is dependent on three factors: technological, biological and environmental conditions (Liliane & Charles, 2020). Agricultural investment can improve technological and biological factors related to agricultural production (Sakhno et al., 2019). In addition, increasing investments in agriculture can counterbalance the adverse effects of climate change (Mason-D'Croz et al., 2019). However, access to financing is a major obstacle for vulnerable farmers in developing countries seeking to invest in agriculture (Atakli & Agbenyo, 2020). Farmers' lack of financial resources to invest in agriculture keeps production low in developing countries (Johansson et al., 2020). Saving through formal banking channels can be a financial mechanism for increasing farmers' financial resources (Moahid et al., 2023). This study thus aims to examine the impact of formal savings on farmer welfare from the perspective of four outcomes: total savings, agricultural investment, crop production, and crop sales.

Harvest proceeds, the main source of income for any farmer, are used mostly for present consumption by vulnerable farmers, whereas well-off farmers keep a portion of the harvest proceeds as savings (Moahid et al., 2023). Later, vulnerable households have to take informal loans with high interest rates to start the new harvest cycle, whereas well-off farmers can use

savings (Charles & Mori, 2016). In addition, a lack of financial knowledge often results in the waste of harvest proceeds among farming households (Mpaata et al., 2023). If the savings of harvest proceeds can be used in the next year's pre-harvesting season, farmers will invest more in crop farming and produce more crops. However, the empirical evidence of this theoretical impact is limited. Therefore, this study explores the impact of formal savings on farmer welfare, reflected in the indicators of total savings, agricultural investment, crop production and crop sales. The study provides policy implications for targeting formal savings as a policy tool to provide farmers with more financial resources to invest in crop farming and improve farmer welfare.

The choice to engage in formal saving is a nonrandom decision and is endogenous as a treatment variable. The mere comparison between those who use formal savings channels and those who do not induces self-selection bias. To address this self-selection bias, a randomized encouragement design is used in this study, as this method corrects for noncompliance in a randomized control trial. First, the impacts of formal savings on four indicators of welfare, namely, total savings, agricultural investment, crop production and crop sales, are estimated. Second, the heterogeneous impacts of formal savings are measured.

2. Literature Review:

Many previous studies (Afrin et al., 2017; Abu & Haruna, 2017; Farooq et al., 2023; Fowowe et al., 2020; Hu et al., 2021; Xu & Wang, 2023; An et al., 2023; Atakli & Agbenyo, 2020; Adegbite & Machethe, 2020) have explored the correlation between financial inclusion and agricultural outcomes. Afrin et al. (2017) argued that financial inclusion is associated with the technical efficiency of paddy farmers. Abu and Haruna (2017) explored the correlation between financial

inclusion and agricultural commercialization. Farooq et al. (2023) explored the correlation between financial inclusion and agricultural growth via simple before and after data. Similarly, Fowowe et al. (2020) examined the correlation between financial inclusion and agricultural productivity. Furthermore, An et al. (2023) applied the entropy method to examine the associations among agricultural insurance, digital financial inclusion and agricultural output.

Few studies (Hu et al., 2021; Xu & Wang, 2023) have attempted to explore geographical heterogeneity with regard to the association between financial inclusion and agricultural productivity. Hu et al. (2021) explored the correlation between the financial inclusion index and total agricultural productivity with consideration of geographical heterogeneity. Moreover, Xu and Wang (2023) argued that digital financial inclusion is associated with agricultural output and presents broad geographical heterogeneity. Some studies (Atakli & Agbenyo, 2020; Adegbite & Machethe, 2020) have explored the connection between agricultural productivity and the gender gap in financial inclusion. Atakli and Agbenyo (2020) explored the linkages among gender, financial inclusion and agricultural productivity. Adegbite and Machethe (2020) explored the negative correlation between agricultural productivity and the gender gap in financial inclusion. While these studies offer significant contributions, correlation does not imply causation (Ksir and Hart, 2016).

Some studies have applied causal approaches that lack internal validity, such as propensity score matching, to estimate the causal impact of financial inclusion on agricultural outcomes. Moahid et al. (2023) and Gershon et al. (2020) applied propensity score matching to examine the impact of credit access on agricultural input investment and agricultural production, respectively. Moahid et al. (2023) argued that disaster-affected households increase agricultural input

investment if they receive access to credit. However, Gershon et al. (2020) argued that access to credit significantly increases agricultural production.

Very few studies have explored the causal impact of financial inclusion on agricultural outcomes, and the findings are inconclusive. Some studies suggest that financial inclusion, such as the usage of microcredit, does not have a significant effect on agricultural productivity. Nakano and Magezi (2020) applied a randomized control trial and reported that microcredit has no effect on agricultural production, revenue or income. Similarly, based on a difference-in-differences (DiD), Thanh et al. (2019) argued that microfinance has no effect on agricultural productivity. Furthermore, Hossain et al. (2020) argued that agricultural microcredit does not have a conclusive impact on agricultural welfare unless other constraints are removed.

Thus, there is considerable room for rigorous studies to estimate the causal impact of financial inclusion in terms of formal savings on agricultural welfare. This study makes two contributions to the literature. First, it explores the causal impact of formal savings on farmer welfare. Second, it addresses the heterogeneous impacts of formal savings.

3. Materials and Methods:

3.1 Data Source and Experimental Design

The sample in this study consists of 2835 Malawian tobacco farmers who sell their crops on an auction floor through their respective clubs. The harvest sale proceeds are later provided to the farmers in cash. In the experimental design, the treatment-assigned farmers were offered the opportunity to receive the sale proceeds through a formal banking channel, while the control-assigned households received their sales proceeds in cash. Because the offer to receive sales proceeds through the formal banking channel is expected to increase the formal savings of the

proceeds, the offer is considered to reflect an encouragement design in the present study. The timing of the experiment was determined with reference to the Malawian agricultural season. The offer to receive the sale proceeds through the formal banking channel was given in May 2009, just before the 2009 harvest season from July to September 2009. The next planting season started in November and December 2009. The outcomes were evaluated based on the 2010 harvest season from July to September 2010.

3.2 Summary Statistics

Table 1 reports the summary statistics of farmers regarding their engagement in formal savings after receiving the offer. The table shows that 67.81% of the farmers do not have formal savings, while 32.19% of the farmers have formal savings. Seven percent of the farmers without formal savings are female, whereas 4% of the farmers with formal savings are female. Marital status is similar for the groups with and without formal savings. The average age of the farmers without formal savings is 44.57 years, whereas the average age of the farmers with formal savings is 45.97 years. The average household size of farmers without formal savings is 5.29, whereas the average household size of farmers with formal savings is 5.92. The average land area of farmers without formal savings is 4.53, whereas the average land area of farmers with formal savings is 4.98. The average asset index and livelihood index of farmers without formal savings are -0.16 and -0.05, respectively, while the average asset index and livelihood index of farmers with formal savings are 0.28 and 0.01.

Table 1: Summary statistics: Based on Having Formal Savings

	Mean	Standard Deviation	Number of Observations
Farmers without Formal Savings			

Gender (Female=1; %)	0.07	0.26	2136
Marital Status (Married=1; %)	0.95	0.22	2136
Age in Years	44.57	13.70	2136
Schooling Years	5.29	3.55	2136
Household Size	5.73	2.01	2136
Asset Index	-0.16	1.74	2136
Livelihood Index	-0.05	1.13	2136
Land in Acre	4.53	2.07	2136
Farmers with Formal Savings			
Gender (Female=1; %)	0.04	0.21	1014
Marital Status (Married=1; %)	0.96	0.19	1014
Age in Years	45.97	13.36	1014
Schooling Years	5.78	3.47	1014
Household Size	5.92	1.96	1014
Asset Index	0.28	2.06	1014
Livelihood Index	0.01	1.19	1014
Land in Acre	4.98	2.25	1014

3.3 Methodology:

The choice to engage in formal savings is a nonrandom decision, such that the indicator of engagement in formal savings is self-selected. Thus, the comparison of farmers with formal savings and farmers without formal savings entails confounding issues. Confounders are variables that have an impact on both the treatment receipt and the treatment outcome (Greenland, 2014), which creates bias in the estimation of causal effects (VanderWeele, 2008). Therefore, a randomized encouragement design is employed in this study as the identification strategy, in which the local average treatment effect is estimated via an IV; this is a method for controlling for unmeasured confounding (Baiocchi et al., 2014).

The offer to receive the harvest proceeds through a formal savings account acts as encouragement, or the IV to estimate the local average treatment effect. The offer of formal savings is random; thus, it fulfills the exogeneity condition of IVs. The offer is also expected to increase the usage of formal savings, which satisfies the relevance condition of IVs. Finally, it has no direct impact on agricultural production, which satisfies the exclusion restriction condition.

Following the IV estimation, two-stage least squares estimation is undertaken. The equation below is applied to the first-stage estimation to predict the treatment variable:

$$\boldsymbol{F_i = a_0 + \nu O_i + \mu_i}$$

Here, $\boldsymbol{F}_i$ refers to formal savings as a binary variable and equals 1 if the household saves via a formal account and 0 otherwise. $\boldsymbol{O_i}$ refers to the offer of formal savings as an IV and equals 1 if a farmer is given the offer to receive proceeds through a formal savings account and 0 otherwise.

The predicted $\boldsymbol{F}_i$ is estimated in the first-stage regression, and afterward, the following second-stage estimation equation is used to estimate the local average treatment effect:

$$\boldsymbol{P_i = \beta_0 + \varphi_c \widehat{F}_i + \varepsilon_i}$$

where $\boldsymbol{P}_i$ refers to the outcome variables. $\boldsymbol{\varphi_c}$ captures the local average treatment effect of formal savings, and $\boldsymbol{\widehat{F}_i}$ is the predicted formal savings. Thus, $\boldsymbol{\varphi_c}$ is the main treatment effect of formal savings.

4. Results and Analysis

4.1 Main Results

Table 3 reports the impact of saving through the formal banking channel on farmer welfare measured through four outcomes: total savings, agricultural investment, crop production, and crop sales. The results show that formal savings increase total savings by 19,533.78 Malawi

Kwacha (MWK) (1 USD= MWK 153.23 in 2010), agricultural investment by 109,250.35 MWK, crop production by 270,805.10 MWK, and crop sales by 219,191.61 MWK. The results suggest that formal savings has a statistically significant effect on all four outcomes.

Table 3: Impact of Formal Savings on Different Outcomes in Malawi Kwacha (MWK)

	(1)	(2)	(3)	(4)
VARIABLES	**Total Savings**	**Agricultural Investment**	**Total Production**	**Total Sales**
Formal Savings Account	19,533.78***	109,250.35**	270,805.10**	219,191.61**
	(7,575.75)	(54,135.91)	(124,393.63)	(100,533.42)

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

5. Discussion and Conclusion

The findings indicate that formal savings increase total savings, agricultural investment, crop production, and crop sales. This study provides policy implications for targeting formal savings as a policy tool to provide farmers with more financial resources to invest in crop farming and increase farmer welfare.

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