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# Bridging the Financial Gap: The Impact of Financial Inclusion on Savings and Agricultural Investment in Malawi

**Mehedi HASAN[1], Md Abdul BARI[2]***

*[1]Graduate School of Advanced Science and Engineering, Hiroshima University, Japan*
*mehedihasanjony110@gmail.com*

*[2]Graduate School of Innovation and Practice for Smart Society (SMASO), Hiroshima University, Japan,*
**Corresponding author: Md Abdul Bari, nilim.eng.ku@gmail.com*

**Abstract:** Vulnerable farmers lack the financial resources to invest in crop production, and financial inclusion can be a financial mechanism useful for increasing their financial resources. However, the empirical evidence of the impact of financial inclusion on agriculture is inconclusive. Thus, this study explores the effects of financial inclusion on savings and agricultural investment for Malawian farmers. The study defines financial inclusion as having access to any type of bank account. As access to a bank account is self-selected, the instrumental variable (IV) approach is applied as the identification strategy to address self-selection bias. This study uses the dataset prepared by Brune et al. (2018), who provided random assistance to open bank accounts. The present study considers financial inclusion (access to a bank account) as the treatment variable and the assistance to open a bank account as the IV to estimate the local average treatment effect. The findings indicate that financial inclusion increases the total savings and agricultural investment of the farmers. This study provides policy implications for the promotion of financial inclusion as a policy tool for providing farmers with more financial resources to invest in crop farming.

**Keywords**: Bank Account, Financial Inclusion, Agriculture Investment, Saving, Farmers

## 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 (Dethier & Effenberger, 2020). Financial inclusion can be a financial mechanism for increasing farmers' financial resources (Moahid et al., 2023). This study thus aims to examine the impact of financial inclusion on farmer's total savings and agricultural investment.

Around 25% adults are without access to an account in a financial institution (Ezzahid & Elouaourti, 2021). Such financial exclusion does not allow farming households to have enough saving to invest more on agriculture, whereas financial inclusion enhances savings in formal banking channels (Moahid et al., 2023). Financially excluded farming households have to take informal loans with high interest rates to start the new harvest cycle, whereas financial inclusion provides access to saving and formal credit that can enhance agriculture investment (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). However, the empirical evidence of this impact of financial inclusion on agriculture is inconclusive. Therefore, this study explores the impact of financial inclusion on farmer welfare, reflected in the indicators of total savings, and agricultural investment. The study provides policy implications for promoting financial inclusion as a policy tool to provide farmers with more financial resources to invest in crop farming.

The choice to open a bank account is a nonrandom decision and is endogenous as a treatment variable. Any simple comparison between those having access to a bank account and those not having induces self-selection bias. To address this self-selection bias, an instrumental variable (IV) approach is used in this study, as this method corrects for noncompliance in a randomized control trial. This study uses the dataset prepared by Brune et al. (2018) who provided random assistance to open bank accounts. The original study examined the impact of facilitating savings on agricultural outcomes. In contrast, the present study considers the assistance to open a bank account as an IV and the access to a bank account as the treatment variable. While a Randomized Control Trial is the gold standard for estimating average treatment effect, the non-compliance reduces the validity of the estimation. The original study by Brune et al. (2018) estimated Intention to Treat (ITT) analysis which estimates only the average treatment effect of treatment assignment. However, exploring the treatment effect of treatment receipt is often the more crucial policy question. Moreover, ITT analysis fails to address treatment receipt contamination, and the IV approach can address the treatment receipt contamination through the estimation of the treatment effect for only compliers (Sussman & Hayward, 2010). The present study applies the IV approach to estimate the local average treatment effect of access to a bank account termed as financial inclusion. The present study contributes to the literature as an extension to the original study by Brune et al. (2018) in two ways. First, this study examines the impact of financial inclusion on total saving and agriculture investment. Second, this study examines the heterogeneous impact of financial inclusion based on whether the farmer has taken any loan. Three research questions of the study are:

**Q1:** Does financial inclusion increase total savings for farmers?
**Q2:** Does financial inclusion increase agriculture investment for farmers?
**Q3:** Is there any heterogeneity in the impact of financial inclusion based on having a loan or not having a loan?

This study explores the causal impact of access to a bank account on farmer savings and agriculture investment. The study has two major contributions. First, this study examines the causal impact of financial inclusion on saving and agriculture investment. Second, this study examines the heterogeneous impact of access to a bank based on loan status.

### *1.1. Conceptual framework*

Low investment in agriculture is a key barrier to high agricultural production (Mejeha et al., 2007). Access to a bank account may promote agricultural investment because the access to a bank account is supposed to enhance the possibility of saving. To enhance production, farmers need to invest enough. If farmers can save enough, they do not need

informal credit to invest enough in agriculture (Moahid et al., 2023). Lack of savings often forces farming households to take informal credit which actually increases the cost of agriculture because of high interest rate. This study conceptualizes that assistance to open a bank account increases access to a bank account. Then access to a bank will enhance saving of the farmers and thus promote investment in agriculture. Figure 1 captures the conceptual framework:

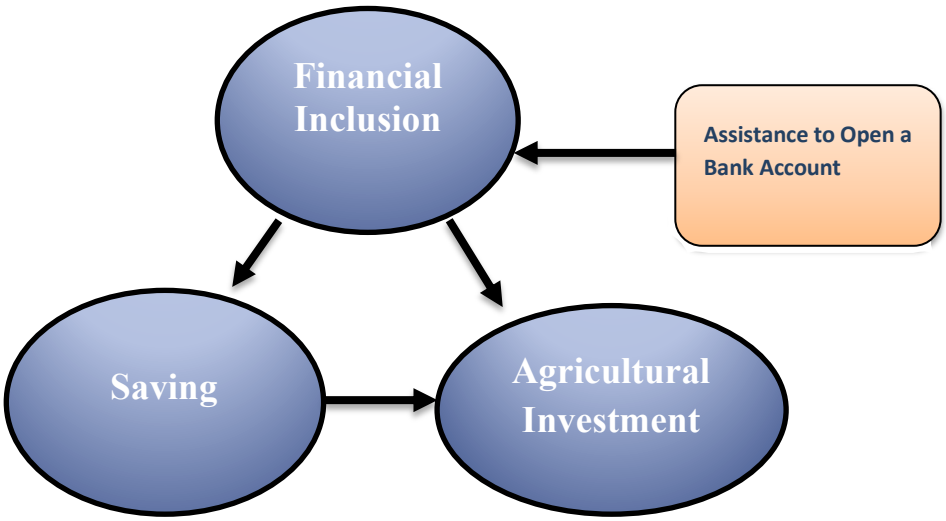


Figure 1. The Conceptual Framework

### *1.2. 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. While these studies offer significant contributions, correlation does not imply causation (Nogueira et al., 2022).

Some studies (Moahid et al., 2023; Gershon et al., 2020; Nakano & Magezi, 2020; Thanh et al., 2019 and Hossain et al., 2020) have applied causal analysis but the findings are mixed and inconclusive. 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. Similarly, Gershon et al. (2020) argued that access to credit significantly increases agricultural production. Some studies suggest that financial inclusion, such as the usage of microcredit, does not have any significant effect on agricultural productivity. A significant causal analysis by Nakano and Magezi (2020) applied a randomized control trial to report that access to microcredit has no effect on agricultural production, revenue, or income. Similarly, based on a difference-in-differences (DiD), Thanh et al. (2019) argued that access to 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 access to a bank account on agricultural welfare. This study makes two key contributions: first, it examines the causal impact of financial inclusion on agricultural investment; second, it analyzes the heterogeneous impact of financial inclusion based on loan status.

## 2. Materials and Methods

### *2.1. Data Source and Experimental Design*

The sample in this study consists of 3150 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 assistance to open a banking account, while the control-assigned households received no assistance. Because the assistance to open a bank is expected to increase access to a bank account, the assistance is considered as an IV in the present study. The assistance to open a bank account 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.

### *2.2. Summary Statistics*

Table 1 reports the summary statistics of farmers based on access to a bank account. The table shows that 67.81% of the farmers do not have a bank account, while 32.19% of the farmers have a bank account. 7% percent of the farmers without a bank account are female, whereas 4% of the farmers with a bank account are female. Marital status is similar for the groups with and without a bank account. The average age of the farmers without a bank account is 44.57 years, whereas the average age of the farmers with a bank account is 45.97 years. The average household size of farmers without a bank account is 5.29, whereas the average household size of farmers with a bank account is 5.92. The average land area of farmers without a bank account is 4.53, whereas the average land area of farmers with a bank account is 4.98. The average asset index and livelihood index of farmers without a bank account are -0.16 and -0.05, respectively, while the average asset index and livelihood index of farmers with a bank account are 0.28 and 0.01.

Table 1. Summary statistics: Based on Having Any Bank Account

| | Mean | Standard Deviation | Number of Observations |
|---|---|---|---|
| **Farmers without A Bank Account** | | | |
| 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 A Bank Account** | | | |
| 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 |

### *2.3. Methodology*

The choice to open a bank account is a non-random decision, such that the indicator of access to a bank account is self-selected. Thus, the comparison of farmers with a bank account and farmers without a bank account entails confounding issues. Confounders are variables that have an impact on both the treatment receipt and the treatment outcome (Greenland, 2014), creating bias in the estimation of causal effects (VanderWeele, 2008). Therefore, an IV approach 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 assistance to open a bank account acts as encouragement, or the IV to estimate the local average treatment effect. The offer of a bank account is random; thus, it fulfills the exogeneity condition of IVs. The offer is also expected to increase the usage of a bank account, 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, a 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 access to a bank account as a binary variable and equals 1 if the household has a bank account and 0 otherwise. $\boldsymbol{O_i}$ refers to the assistance to open a bank account as an IV and equals 1 if a farmer received the assistance to open a bank 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 access to a bank account, and $\widehat{\boldsymbol{F}}_{\boldsymbol{i}}$ is the predicted a bank account. Thus, $\boldsymbol{\varphi}_c$ is the main treatment effect of access to a bank account. There are three types of units in IV setup. Local average treatment effect captures the average treatment effect of only compliers. In the context of IV estimation, compliers are the units of which treatment assignment determines treatment receipt (Schochet, 2022). Whereas the non-compliers are the units of which treatment receipt is pre-determined. If the non-complier is an always taker (Jo et al., 2017), the unit receives treatment whether assigned or not. In contrast, if the non-complier is a never taker, the unit does not receive treatment whether assigned or not.

## 3. Results and Analysis

### *3.1. Main Results*

Table 2 reports that the assistance to open a bank account has a significant positive impact on access to a bank account at the 1% significance level. The assistance increases the access to bank accounts by around 9.67 percentage points. The first-stage result also affirms the relevance of the invitation as an IV. In other words, invitation as an instrumental variable increases access to a bank account.

Table 2. Impact of Assistance on Access to a Bank Account

| VARIABLES | (1)<br>Access to a Bank Account |
|---|---|
| **Assistance to open a bank account** | 0.09*** |
| | (0.02) |

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

Figure 2 represents the coefficients of the impact of access to a bank account on total saving, and agriculture investment. All the coefficients are statistically different from 0, signifying that access to a bank account increases total savings and agricultural investment significantly.

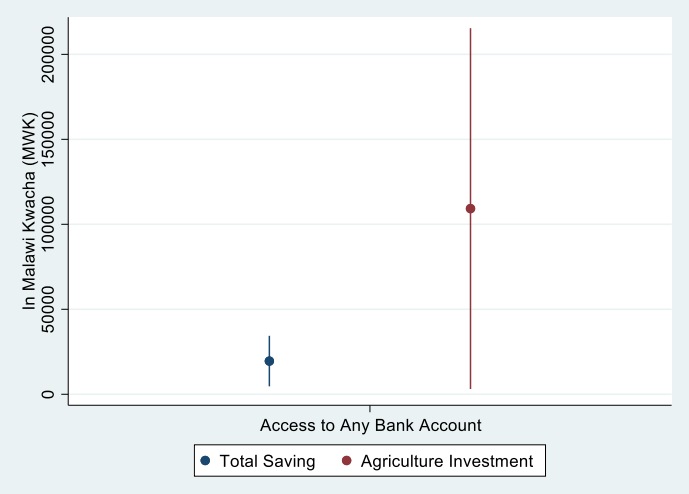


Figure 2. Coefficient of the Impact of Access to a Bank Account

Table 3 reports the impact of access to an account in a formal banking channel on farmer welfare measured through two outcomes: total savings and agricultural investment. The results show that access to a bank account increases total savings by 19,533.78 Malawi Kwacha (MWK) (1 USD= MWK 153.23 in 2010) and agricultural investment by 109,250.35 MWK. The results suggest that a bank account has a statistically significant effect on total savings and agricultural investment. The result shows a big impact but the larger standard error needs to be considered as it is usual in IV estimation (Schultz 1930).

Table 3. Impact of Access to a Bank Account on total saving and agriculture investment

| VARIABLES | (1)<br>Total Savings | (2)<br>Agricultural Investment |
|---|---|---|
| **Access to Any bank account** | 19,533.78***<br>(7,575.75) | 109,250.35**<br>(54,135.91) |

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

### *3.2. Specification Tests*

*A. Weak Identification Test*

A weak instrument test was performed, and according to Doko and Dufour (2008), an F-statistic below 10 indicates a weak instrument. The test results revealed an F-statistic of 15.79, suggesting that the instrument was not weak.

*B. Endogeneity Test*

Endogeneity tests indicate that the treatment variable is endogenous, highlighting the necessity of using an instrumental variable (Doko & Dufour, 2008). The null hypothesis of the test posits that the treatment variables are not endogenous. With a p-value below 0.05, the test confirmed the endogeneity of access to a bank account.

### *3.3. Heterogeneous Analysis*

The study considers the farmers with loans and the farmers without loans to estimate the heterogeneous analysis. The heterogeneous analysis presented in Table 4 shows that access to a bank account has a significant positive impact on total savings and agriculture investment for only the farmers with loans. However, access to a bank account does not have any significant impact on impact on total savings and agriculture investment for the farmers without loans.

Table 4. Heterogeneous Impact of access to a bank account based on loan receipt

| VARIABLES | **Farmers with Loan**<br>Total Saving | **Farmers without Loan**<br>Total Saving | **Farmers with Loan**<br>Agriculture Investment | **Farmers without Loan**<br>Agriculture Investment |
|---|---|---|---|---|
| **Access to Any bank account** | 11,668.81**<br>(4,676.47) | -49,350.73<br>(81,190.16) | 93,691.46***<br>(31,779.77) | -228,211.92<br>(411,229.65) |

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

Figure 3 represents the coefficients of the heterogeneous impact of access to a bank account on total savings and agriculture investment. All the coefficients of the farmers with access to a bank account and loan are statistically different from 0, signifying that access to a bank account along with a loan increases total savings and agricultural investment significantly. However, the coefficients of the farmers with access to a bank account and without loans are not statistically significant.

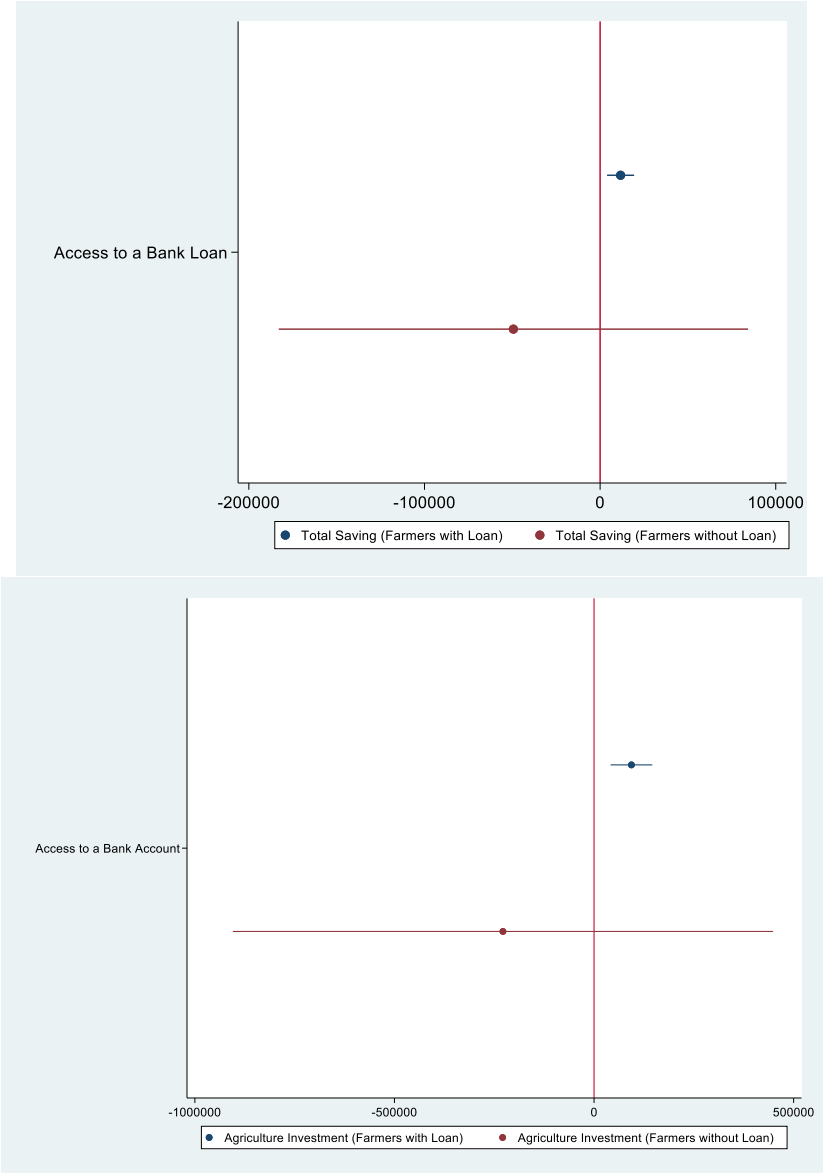


Figure 3. Coefficient of the Heterogeneous Impact of Access to a Bank Account

### *3.3. Balance Check*

Table 5 reports balance checks for baseline covariates based on the receipt of assistance. The result shows that no pretreatment covariates were significantly different between the assisted and non-assisted households. The balancing test result manifests that the assistance to receive the harvest proceeds through a new bank account was randomly assigned. In other words, the balance check demonstrates that the invitation fulfills the homogeneity condition as an IV.

Table 5. Balance Check

| | Received Assistance | No Assistance | Difference |
|---|---|---|---|
| Schooling Years | 5.47 | 5.31 | -0.16 |
| | [3.55] | [3.36] | (0.18) |
| Household Size | 5.79 | 5.81 | 0.02 |
| | [1.99] | [2.01] | (0.10) |
| Asset Index | -0.01 | -0.11 | -0.10 |
| | [1.90] | [1.62] | (0.10) |
| Livestock Index | -0.04 | 0.03 | 0.07 |
| | [1.13] | [1.24] | (0.06) |
| Land Ownership in Acres | 4.67 | 4.67 | -0.00 |
| | [2.14] | [2.14] | (0.11) |
| Amount of Saving at Home | 1226.24 | 1356.65 | 130.41 |
| | [3845.81] | [4200.64] | (203.36) |
| Observations | 2726 | 424 | 3150 |

SD in square brackets. SE in parenthesis. * p<0.10 ** p<0.05 *** p<0.01

## 4. Conclusion and Policy Implications

The findings indicate that access to a bank account increases total savings and agricultural investment. The findings of the study are consistent with many studies (Hu et al., 2021; Xu & Wang, 2023; Atakli & Agbenyo, 2020; Adegbite & Machethe, 2020) arguing that financial inclusion is connected with agriculture productivity. This study provides policy implications for targeting financial inclusion as a policy tool to provide farmers with more financial resources to invest in crop farming and increase farmer welfare.

The income from harvests, which is the primary source of earnings for farmers, is often spent immediately by vulnerable farmers to meet their daily needs, while wealthier farmers tend to save a portion of their harvest income (Moahid et al., 2023). As a result, vulnerable households frequently resort to high-interest informal loans to fund the next planting season, while wealthier farmers can rely on their savings (Charles & Mori, 2016). Furthermore, limited financial literacy often leads to mismanagement or waste of harvest income among farming families (Mpaata et al., 2023). Access to a bank account can promote total savings and agricultural investment. Access to a bank account can significantly promote both total savings and agricultural investment through several key channels. First, it facilitates formal saving by providing a secure and accessible way for individuals to deposit and manage their funds, reducing reliance on informal saving methods that may be less reliable (Anderloni & Carluccio, 2007). Second, having access to a bank account often increases financial literacy (Bari et al., 2024). As individuals engage with financial institutions, they become more familiar with concepts like budgeting, interest rates, and investment options, which can help them, make better financial decisions. Third, access to a bank account enhances the ability to obtain formal credit (Anderloni & Carluccio, 2007). Assouto and Houngbeme (2023) argue that access to formal credit enhances agricultural investment. This is particularly important in agricultural sectors, where farmers often require loans to invest in inputs, improve productivity, and mitigate risks. A bank account acts as a gateway to credit facilities, making it easier for farmers to access loans under more favorable terms compared to informal lending sources (Bari et al., 2024).

The impact of access to a bank account on total savings is understandable in the sense that access to a bank account encourages people to save more. The finding is consistent with Steinert (2018) who claims that access to a bank account enhances savings. Moreover,

one of the channels through which access to a bank account can promote saving is increasing financial literacy. The studies conducted by Murendo and Mutsonziwa (2017) as well as Morgan and Long (2020) argue that financial literacy promotes saving behavior. The present study explores that access to a bank account enhances agriculture investment and the findings can be compared with that of Prina (2015) who applied field experiments to conclude that access to a bank account increases household investment in health and human capital.

The study provides an answer to a key policy question of whether promoting financial inclusion for farming households is effective enough to ensure welfare for farming households. The heterogeneous analysis suggests that access to a bank account along with a loan increases total savings and agriculture investments, whereas access to a bank account without a loan has no significant impact on total savings or agriculture investments.

The study has certain limitations that need to be considered. First, the study provides an IV estimation that estimates only the local average treatment effect. Local average treatment effect measures the average treatment effect of compliers only. Second, the study has limited external validity as the study focuses on farming households from Malawi only.

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**Data Availability Statement:** The data that support the findings of this study are available from the corresponding author, upon reasonable request.

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