VSLAs as economic drivers: Exploring linkages between capital available within women's savings groups and economic contribution to the Tanzanian economy

A LITERATURE REVIEW PREPARED FOR CARE TANZANIA

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Acknowledgements

This work was funded by CARE International through its office in Tanzania. We are thankful to the assistant country director-programmes, Gloria Cheche, for ensuring that insightful feedback on various drafts was provided by her team before producing the final draft. We also acknowledge and appreciate Craig Packer, the University of Minnesota distinguished McKnight professor for his magnificent editorial work performed on multiple drafts.

Executive Summary

Savings-led microfinance innovation aims to improve access to financial services in remote areas, especially among women. In the past decade, more and more researchers and practitioners have recognized and taken advantage of this informal financial service to help improve lives of the poor. A leading innovator in the field, CARE International, has spawned extensive household- and community-level benefits from its Village Savings and Loan Association (VSLA) programmes. With about 700,000 members in 28,000 groups in Tanzania, CARE is seeking to measure the potential contribution of VSLAs on the growth of the Tanzanian national economy, starting with this literature review.

Microlevel impacts of savings-led microfinance

Randomized studies show a multitude of positive impacts from savings groups, including: improved resilience to shocks, food security and nutrition, asset accumulation, productive assets, income, children's education, empowerment of women and the disabled, social support, improved skills in financial management, leadership, and entrepreneurship. However, the magnitude of most household level impacts appears to vary from one context to another.

Performance of savings-led microfinance and potential impacts on economic growth

- Impacts can most clearly be linked directly to economic growth if profits from income-generating activities increase beyond basic-consumption levels.
- Savings from low performing groups may serve as *"quasi insurance"* by helping members become more resilient to economic shocks and less susceptible to poverty, but they can only be indirectly linked to economic growth.

Internal and external factors that influence performance of savings groups

Internal. Studies show that internal factors such as heterogeneity in income level, gender composition, and education can influence performance of the group. Other factors include group size, repayment rates, savings rates, and loan-fund utilization rate.

External. External factors that seem to influence performance of savings groups include: group formation facilitation, access to formal financial services, market environment, and access to business and financial trainings. Unstudied factors that can be inferred from other fields include infrastructure (availability of paved roads, markets, electricity, health centers, schools) and national policies and regulations.

Macrolevel impacts of credit-led microfinance

Different theoretical frameworks have been proposed to explain how microfinance can contribute to a country's economic growth and development, and multiple scholars have attempted to measure the impact using various economic models

The theoretical framework explaining how credit-led microfinance contributes to national growth and development

Scholars agree that economic growth arises from microfinance via two main transfer channels. First, a direct channel, by encouraging small-scale entrepreneurship, human development, and poverty reduction. Second, an ancillary or indirect transfer channel, that manifests in the form of improved financial intermediation (monetary circulation), and the generation of complementary and competitive relations between financial institutions.

- Microcredits help to lessen long-term poverty levels through improving technology in production and increasing income and equality. Accruing returns from self-employment can allow economies to achieve higher entrepreneurship productivity levels through improved average returns and higher savings rates.

Potential models for measuring saving-led microfinance impacts on the economy

The following four methods have been used to measure impacts of microfinance, but these approaches have only been studied in the context of credit-led microfinance.

Total factor productivity (TFP) models determine if access to microfinance is a significant factor in explaining productivity levels across a representative sample of small firms. The main assumption here is that productivity levels are related to overall macroeconomic performance.

Time-series approaches seek to measure the impacts of and capture causal linkages between selected variables. The method requires data points over several years.

Computable General Equilibrium (CGE) models fit real macroeconomic data to a set of equations that mimics the structure of the economy and the behavior of the agents or participants in the economy. The CGE models thus look at economies as complete systems of interlinked components.

Agent-Based Models (ABMs) consist of agents that interact with an environment. Agents are used to emulate social actors (i.e., individuals, households, firms, or governments) in a model of the real setting in which the actions take place.

Recommended approaches for measuring the impacts of savings-led microfinance on economic growth in Tanzania

Due to limited long-term data on savings groups, the authors recommend TFP and CGE models as appropriate methods for measuring economic growth that can be attributed to savings-led microfinance in Tanzania.

Merits and demerits of the TFP models

- The TFP approach only requires data from a single period, but surveys must be representative and include financial and socio-economic features of SMEs.
- TFP can illustrate how savings-led microfinance affects the productivity of SMEs but cannot measure impacts on overall economic growth.

Merits and demerits of the CGE models

- The CGE models directly measure the effect size of savings-led microfinance on a country's economy by comparing current economic growth to a counterfactual scenario that excludes savings-led microfinance.
- The CGE model can evaluate diverse hypothetical situations, thus allowing for robust checks of model results.
- However, CGE models are difficult to design and construct, thus requiring longer development time.

Examining potential relationships between microlevel impacts from savings-led microfinance and economic growth

As in the case of credit-led microfinance institutions, the mechanisms through which savings-led microfinance can contribute to economic growth will likely be direct or indirect.

Contribution through increasing savings (direct). Saving allows accumulation of fixed capital and helps technical innovation, which increases output and per capita income in the long-term.

Contribution through lending and creation of SMEs (direct). Savings-led microfinance may encourage SME growth in rural areas, which may in turn encourage local economic growth and development through the generation of new jobs and poverty-reduction opportunities.

Contribution through human capital accumulation (direct). Savings-led microfinance increase the stock of human capital by offering additional forms of assistance, such as specific training in financial and entrepreneurial issues or through participants' ability to educate their children.

Contribution through increased food security. Savings-led microfinance may affect growth by improving food security in rural communities, which can enhance long-term productivity.

Contribution through financial deepening. Savings-led microfinance can broaden access to funds, which can in turn provide more opportunities for investment and profits, particularly in rural and low-income communities where alternative financial services are scarce.

Contribution through risk mitigation. Savings-group products protect members against shocks such as illness or the death of a household member. In the long term, insurance products may encourage households to start engaging in higher risk but more profitable economic activities rather than in low risk and less profitable activities.

Conclusion and Recommendations

- Despite abundant evidence demonstrating numerous impacts of savings groups on participating households, no single study has attempted to determine whether these efforts significantly contribute to the growth of national economies.
- CARE could consider measuring the macro-level impacts of VSLAs with a nationally representative study using Total Factor Productivity or Computable General Equilibrium models, as outlined in this report.

- By employing the CGE model, CARE would be able to estimate the extent to which VSLAs (including self-managed and savings groups facilitated by other organizations) have spread in Tanzania and to identify groups that have performed best in terms of capital formation and returns from agricultural and SME investments.
    - This understanding is critical for assessing whether group members' capital formation and overall impacts from their economic activities can stimulate the larger economy.

Introduction

Microfinance has been a major innovation for connecting poor people to formal financial services. Pioneered by Muhammad Yunus as microcredit through the Grameen Bank in Bangladesh in the 70s, the model has been widely replicated. Credit-led microfinance institutions often provide services to individuals or groups who might otherwise lack access to the formal credit market. Unlike traditional bank services, credit-led microfinance services seem to flourish in urban and peri-urban areas where small and medium enterprises largely operate (Allen & Panetta 2010, Daley-Harris, 2009; Demirguc-Kunt, Klapper, & Singer, 2017). Like traditional banks, however, these financial services have also failed to reach the most remote places where largest populations of poor and ultra-poor households are found[1]. As argued by some, the financial gaps observed in rural areas are largely due to high transaction costs involved in serving such areas in relation to loan sizes desired by poor households (Allen & Panetta, 2010).

In effort to further improve access to financial services in remote areas, especially among women, savings-led microfinance models were introduced. Over the years, contextualized savings groups have been implemented in several countries in Africa, Asia, and Latin America. In Africa, savings groups have been designed to emulate traditional rotating savings and credit association (ROSCAs), a model that was first implemented in 1991 in Niger by CARE International (Allen & Panetta, 2010)[2]. In Tanzania, CARE has formed and/or supported over 28,000 village savings and loan associations (VSLA), which currently comprise over 50% of the country's NGO-formed and -supported groups. By 2025, CARE Tanzania seeks to increase savings groups members to about 8 million people.

To maximize the impacts of savings groups on the lives of the poor, CARE has been working with formal financial institutions to link mature VSLAs to formal financial institutions. CARE advises formal financial service providers on inclusive finance and rural community needs, so as to help the rural poor, especially women. Through its financial inclusion programmes, CARE Tanzania helps poor rural women access formal financial services, increase their capacity, voice their opinions, and influence household spending and saving. To assess the VSLAs' potential to contribute to Tanzania's national economy, CARE aims to develop an extrapolated economic analysis by reviewing the capital and investments made by savings groups and their members. This review is a first step to this understanding.

We summarize the literature on microlevel impacts of savings groups[3] and explore how these impacts can be linked to macroeconomic impacts of microfinance. While many evaluation studies reveal a variety of positive economic impacts at household and local levels, to our knowledge, none have attempted to understand the impacts at a national scale.

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[1] Demirguc-Kunt and Klapper (2012) report that over 80% of poor people in developing countries still lack access to formal banking up to date.

[2] In Niger, these savings groups were referred to as accumulating savings and credit association (ASCA)— (Allen & Panetta, 2010).

[3] We include literature on various types of savings groups, including VSLAs, savings for change, community-based savings groups, and others.

Organization of the literature review. In the first section, we present a brief overview of the savings groups. Second section presents evidence from Randomized Controlled Trials (RCTs) on the impacts of savings-led microfinance on the lives of poor people and explore the hypothesized pathways through which positive changes happen. Third section explores the performance of savings groups and their potential to contribute to economic growth and examines internal and external factors that have influence on their performance. Section four explores the macro-level impacts of savings-led microfinance. Since studies at macro level are yet to be implemented, however, we draw from *credit*-led microfinance literature[4]. Section five describes how economic models can be adapted to potentially measure economic growth from savings groups. Section six examines potential relationships between microlevel impacts of savings groups and economic growth. In the final section, we conclude and provide recommendations on how CARE can move forward in attempt to measure economic growth rising from savings groups.

Literature Review

I. Overview of savings groups

Savings groups primarily capitalize on an individual's ability to save money in a local setting (Allen & Panetta, 2010), thereby overcoming the rampant financial exclusion observed in many developing nations[5]. Individual participants create "pooled funds" that serve as a source of loans restricted to group members. The loan is paid back with a relatively small interest (mostly between 5% and 10%) compared to formal financial institutions. At the end of the cycle (8-12 months), the total plus interest is shared among group members in proportion to their personal savings—see Allen and Panetta (2010) for a full description.

Proponents argue that this service helps rural members manage their seasonal funds and thus smooth consumption in times of hunger (Allen & Panetta, 2010; Brannen, 2010; Jahns-Harms, 2017). Moreover, due to the difficulties in accessing formal financial institutions, most rural people prefer savings-led microfinance services (Allen & Panetta, 2010). In addition, savings groups have been found to increase income and food security, enhance social capital, improve gender relations, and empower women (as discussed in the next sections). Thus, efforts to promote savings groups are being implemented globally by non-governmental organizations, such as Oxfam, Catholic Relief Services (CRS), Aga Khan Foundation, Plan International, and World Vision. According to VSL Associates, this model has spread to over 44 countries in Africa, Asia and Latin America, and includes more than 6 million active participants worldwide[6].

[4] We use the microcredit literature to understand these mechanisms because, to our knowledge, impacts of savings groups have not yet been analyzed at the macrolevel.
[5] In a mid-term report by Micro-Credit Ratings International Limited, over 70% of individuals in some parts of African countries lack access to any form of formal financial services.
[6] Figures are based on information on the www.vsla.net web-site, accessed on July 10th 2018.

II. Microlevel impacts of savings-led microfinance

Multiple studies have shown positive impacts of savings groups on improved resilience to shocks, food security and nutrition, asset accumulation, productive assets, income, children's education, women empowerment, social support, improved skills in financial management, leadership, and entrepreneurship. In a recent study by Bjorvatn and Tungodden (2018), savings groups were also found to empower the disabled. Savings-led microfinance studies have attempted to explain the linkages between participation in savings groups and poverty alleviation. Basing on studies by Rutherford and Arora (2009), Collins et al. (2009), Stewart et al. (2010), Dupas and Robinson (2009), and Rutherford (2000), Steinert et al. (2017) attempt to explain these mechanisms in three main ways.

First, by participating in savings groups, cumulative funds are created which become a source of *"opportunity investments"* for group members. Money acquired from the end-of-cycle share-outs can be used to pay for investments such as productive assets, house repairs, children's education, quality foods or health care. Steinert et al. (2017) proposes that the household's ability to pay for these assets and services can have positive impacts on poverty-related outcomes such as "business profits, higher quality of education, nutrition, and health, as well as improved housing quality and asset portfolios" (p. 5).

Second, savings can take the form of a *quasi-insurance* in times of unforeseen economic shocks and adverse events (Steinert et al., 2017). Hulme et al. (2015), Pande et al. (2012), Dupas and Robinson (2009), Churchill (2002), Barnes, Gaile and Kimbombo (2001), and Jacoby and Skoufias (1997) provided evidence that shocks such as illness or death of a household member may eliminate critical income and impose heavy expenses on medical or funeral costs. Thus savings "can facilitate consumption smoothing by providing a buffer against emergencies and reducing alternative coping mechanisms such as fire sales of high-return assets" (Steinert et al. 2017, p. 5). Additionally, the authors argue that availability of savings during shocks prevents loss in food intake, reduces dependency on borrowing at disproportionally high interest rates, and prevents removal of children from school. Consequently, savings can increase resilience to economic shocks as well as reduce susceptibility to poverty (Klasen, Lechtenfeld & Povel, 2015).

Third, Steinert et al. (2017) suggest that allocating money for savings can offset various "*behavioural anomalies*" by disciplining participants to the idea that these funds are unavailable for other expenses (Stewart et al., 2010; Dupas & Robinson, 2009; Rutherford, 2000; Thaler, 1990). Steinert et al (2017) further argues that "such 'mental accounting' mechanisms can induce changes in consumption behaviour through decreasing the perceived immediate availability of cash" (p. 6). The change in the perception of immediate availability of funds can consequently help "time-inconsistent decision-making and the purchase of temptation goods become less likely (p. 6)[7]. Avoidance of such temptation spending can in turn help direct savings to future oriented expenditures such as health care, education, housing, or the accumulation of assets (Prina, 2015; Soman & Cheema, 2011; Bryan, Karlan & Nelson, 2010; Ambec & Treich, 2007; Prahalad & Hammond, 2002).

[7] Time-inconsistent decision making is a situation in which a decision-maker's preference changes over time.

Steinert et al.'s (2017) reasoning align with studies that have found improvements in various microeconomic indicators among participants in savings groups interventions. Using analysis from a cluster-randomized controlled trial implemented among farmers in Malawi, Ksoll et al. (2016) found that households who participated in village savings and loans associations (VSLAs) exhibited improved food security and nutrition, and income indicators—the treated households reported significant increase in the number of meals consumed per day, total household consumption rate, and the number of rooms in a dwelling. Ksoll et al. further notes that money obtained from savings share-outs and credits had a more direct impact on agricultural investments and output because participants spent savings on agricultural inputs such as fertilizer and irrigation. Consequently, sales of agricultural outputs[8], specifically maize, were much higher in treated households compared to the control group. While there was also an increased number of small businesses due to increased savings in treated groups, the effect was not significant and did not lead to a significant increase in the total income from such enterprises. Because the project had only been implemented for two years and the results included both the treatment and control groups, Ksoll et al. concluded that the findings were promising.

In another village-level cluster-randomized evaluation of a three-year project in Mali by Beaman et al. (2014), women in groups called savings for change[9] enjoyed a significant increase in food security, consumption smoothing, improved housing, livestock holdings, and cash savings (+30%). The treated group also experienced increased expenditure on child's education but not on the overall education outcome. The savings groups did not appear to have any impacts on investments in education, health or health expenditures, social capital, and female decision-making power, however. This contrasts with some studies (e.g., by Feigenberg, Field, & Pande, 2013) which observed increased social capital due to increased frequency of meetings among members of a group-based microcredit. Beaman et al. (2014) argue that the difference might be because the savings groups in their study "were entirely self-formed, so the formation of the groups may have relied on existing social capital without necessarily expanding it" (p. 20). Bundervoet (2012) observed large effects on household welfare by randomizing the timing of the provision of the savings group training.

In a recent study in Ghana, Malawi, and Uganda, Karlan et al. (2016) found that VSLAs conferred increased financial savings, improvements in household business outcomes and women's empowerment. Specifically, VSLAs led to increased number of businesses operated by households, number of months households operated a business, and number of households with at least one employee working at the business. The improved women's empowerment indicators included participation in household decision-making, control over business decisions, control over food expenses, and education expenses. These impacts declined during drought, however: the influence was largely restricted to households that were unaffected by drought. In contrast to several studies, there was no evidence that the program had any impacts on average consumption, income, household assets, and food security. With regard to consumption, the

[8] The authors did not find any increase in agricultural inputs, however.
[9] Savings for change is the name used for Oxfam's savings group model. The model caters to poor women who are largely illiterate and thus records of their transactions are completely based on memorization (See details in Allen & Panetta, 2010)

authors noted that the lack of evidence may have resulted from Karlan et al's (2016) survey technique: measurements were based on a 30-day recall prior to the interview. Thus, it is possible that they missed the consumption smoothing benefits in preceding months. Their consumption measure also differed from other studies by including both food and clothing—other studies did not include clothing in this measure (see Beaman et al., 2014). In summary, the authors report that the program "has an overall effect on business profits and also insulates members from adverse aggregate shocks on their economic activity more broadly" (Karlan et al., 2016, p. 5).

Bundervoet (2012) analyzed 77 savings groups in Burundi and found large positive impacts on household consumption and asset ownership three months after the end of the first cycle. Jahns-Harms (2017) also reported that participating in savings groups was associated with increased savings among poor households in El Salvador during a pronounced period of hunger in 2011: women farmers used savings from share-outs to buy food as a coping mechanism. Although limited by a small sample size, Jahns-Harms randomized study also found that participating in savings groups led to increased number of rooms in a dwelling.

Another significant study, a meta-analysis by Steinert et al.'s (2017) reveals that savings-led interventions (not exclusive to VSLA types) had significant intermediate and long-term impacts on poverty. Although the authors acknowledge that the effect sizes were small in magnitude[10], they also note that the observed impacts were similar to those reported in many other international development interventions. Intermediate impacts include total savings and increased number of small-scale enterprises, while longer term impacts include increased household expenditures, incomes, and improved food security. For most savings-led interventions, increased involvement in business due to savings groups only led to minor returns, however. Most studies included in their analysis did not reveal improvements in asset ownership and housing quality. Since some effects diminish over time, however, Steinert et al. (2017) recommends that program follow-up be undertaken.

A prior review of seven randomized study also revealed that while impacts from participation in savings groups were evident in most studies, they also varied between them (Gash & Odell, 2013). The authors suggested that the differences observed might have been due to differences in intervention implementation strategies[11]. Additionally, the differences might have also been due to the fact the savings groups operated differed between RCTs—most RCTs were implemented in less than a year of their operation while only a few had been implemented for more than one full cycle. Short-term operation of most groups might thus explain why some impacts were only observed to a small extent.

Despite the wide range of positive evidence, RCTs have only rarely been implemented, and thus it is difficult to conclude whether the impacts of savings groups can be generalized[12].

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[10] <*gpooled*=0.20

[11] Despite clearly prescribed process for initiating savings groups, differences have been observed between implementing partners (see Maliti & Leyaro, 2016)

[12] Based on a meta-analysis by Steinert et al. (2017), out of 27 papers, only about half focused on savings groups interventions similar to those implemented by CARE, Oxfam, and Catholic Relief Services (CRS)—some studies included interventions that focused on either account opening and/or financial literacy. Most of these papers were published in either peer review or grey literature between 2010 and 2018.

Moreover, most impacts of savings groups (SGs) have only been reported at either the household and or community level, and these effects likely vary by context, poverty levels of participants, and savings group designs, e.g., who is targeted and facilitating agency (Ksoll et al., 2013). As a result, reported impacts may differ between studies[13].

III. Performance of savings-led microfinance and potential impacts on economic growth

While the positive impacts from participating in savings groups are multitude, as discussed in section II, only some can potentially be linked directly to economic growth[14]. Following Steinert et al.'s (2017) first hypothesis, we might then argue that the cumulative savings made by members may act as *"opportunity investments"* which may be invested in income-generating activities, which if profitable, may eventually lead to growth of economic activities such as Micro and Small Enterprises (MSEs) and agriculture[15]. Increased profits from MSEs and agricultural activities, beyond consumption levels, might spillover to the larger economy and thus contribute to the nation's economic growth. On the one hand, one may then argue that highly performing savings groups with respect to MSEs and agricultural returns,[16] might exhibit higher likelihood of contributing to the macroeconomic impacts. On the other hand, savings from low performing groups may save as *"quasi-insurance,"* since these might only help members become more resilient to economic shocks and less susceptible to poverty.

With highly performing savings groups, the higher savings rates may create a larger pool of funds from which members can borrow more significant loans without need to ration loans. Consequently, members in these groups may be able to increase their per capita savings which might in turn provide a larger source of capital for their MSEs and agricultural investments. All else constant, if there is high demand for goods and services supplied by these MSEs and agricultural produce (and no market saturation)[17], members in highly performing savings groups would be in a position to accumulate larger profits from such investments. Continued engagement in MSEs and agricultural activities coupled with higher returns can thus lead to their further expansion and consequently to economic development.

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[13] Among different studies, and even among effective interventions, one economic or social benefit may be observed in one study but not in another.

[14] This does not mean that other microlevel impacts do not contribute to the growth of the economy, however. It simply means that they cannot easily be measured or that they only do so indirectly. Consequently, we only focus on those that can be measured directly at macrolevel.

[15] We focus on these two economic activities because savings groups interventions are largely implemented among poor people whose income largely depend on these activities.

[16] In previous research, performance of savings groups has been assessed by measuring positive changes financial management practices, total group savings, per capital savings, loan portfolios, loan repayment rates, income and or expenditure, food security and nutrition, ability to deal with shock, asset accumulation, profits from productive investments, employment from MSEs, and improvement in technical skills among savings groups participants or village members (see Anyango et al., 2007; Parida & Sinha., 2010). Highly performing groups also assumes there is good governance which contributes to good group discipline and thus high repayment rates.

[17] Other assumptions could be that members of savings groups are innovative and thus the goods and services supplied meet various demands in different communities. Additionally, that might have to controlled include government regulations, education and inflation, as they may also affect the growth and profitability of MSEs (Essays, UK., November 2013)

Understanding internal (factors that stem from the group themselves) and external factors that influence the performance of savings groups is thus critical for understanding what types of groups have potential to contribute to economic growth. The following sections briefly discuss these factors.

Internal factors

Most studied internal factors include heterogeneity in income level, gender composition, and education level[18]. Other factors include group size, repayment rates, savings rates, and loan fund utilization rates. In the discussion below, we only focus on factors that provide evidence in the savings groups or relevant settings.

Heterogeneity in income levels. All else constant, wealthier individuals are likely to save more, and thus groups with such members are expected to exhibit larger total savings and consequently funds available for loans, compared to groups with poorer individuals. Therefore, the savings per capita, which is mediated by the income levels of group members can help to explain the financial strength and economic condition of the savings group (Anyango et al., 2007). It is thus reasonable to argue that unlike other factors, a more homogeneous group comprised of individuals who are relatively wealthier may perform better than a homogeneous group with only poorer individuals. This implies that while homogeneity may be desirable in ensuring high group performance, as argued in collective action literature (e.g. Ostrom, 1990; Poteete & Ostrom, 2004), some studies have shown that some heterogeneity in factors such as income levels might be necessary for higher performance of the overall group and poorer members, as discussed below[19].

Burlando and Canidio (2015), for example, argue that low impact observed in some groups may be due to the limited savings created by poor people which affords only limited loans to their members. The authors test the effect of heterogeneity in income levels by including either a majority or minority of highly vulnerable households to a group on savings and borrowing rates of members. The authors theorized that savings and borrowing decisions of participants impose an externality (positive or negative) to other group members. To test their theory, they randomly allocated highly vulnerable households to two types of existing savings groups comprised of self-selected members—resulting groups comprised of either majority highly vulnerable households or minority vulnerable households. At the end of one cycle, the evaluation revealed that groups with a minority of vulnerable participants saved and borrowed 30% more than groups with majority vulnerable participants—vulnerable members in the majority group saved much less than vulnerable members in the minority groups. However, there was no effect on the non-vulnerable participants. The authors concluded that the results depended on whether every person who sought a loan could get it or not. They reasoned that,

> When there is no rationing, the supply of funds available exceeds the demand for loans, and every additional dollar saved reduces the return on savings for everyone else. This

[18] Since members in savings groups self-select themselves (with exception of randomized programmes), one can argue that the resulting groups naturally tend to be more homogenous and thus less heterogenous.
[19] This is not to say that homogenous groups in terms of relatively higher income do worse-off. On the contrary, evidence show otherwise (Anyango et al., 2007).

> negative externality causes the other members of the group to reduce their savings. An agent who increases her borrowing from the group, on the other hand, causes an increase in the equilibrium return on savings, which in turn increases savings by everyone else. However, when the group does not generate enough funds to satisfy the demand for loans, the sign of the externalities generated by an increase in savings or borrowing are reversed. In this case, additional contributions to the group create a positive externality on potential borrowers, because rationing is eased and more people are able to meet their borrowing needs, while additional demands for funds create a negative externality as they worsen rationing (p. 3)

While Burlando and Canidio's (2015) study is preliminary, it seems desirable to place highly vulnerable members in groups that would yield greater economic benefits, thus making the groups more heterogenous, provided that less vulnerable members are not impacted negatively. This type of model may be suitable in peri-urban areas where both ultra and less poor individuals live in close proximity. Burlando and Canidio (2015) further report that savings groups "created in areas in which most of the population is vulnerable may be more acutely unable to meet the demand for loans" (p. 4). They propose that the functioning of these groups can be improved by providing outside funds, as well as by changing the rules of functioning of the group to encourage early savings that can be lent repeatedly— a similar proposition was made by Beaman et al. (2014). More experiments of this type of savings groups model would have to be implemented, however, to provide more evidence on its practicality in other contexts.

Heterogeneity in gender composition. While most savings groups programmes mainly target women, some have included men as well. Among those that have included both gender, evidence show that proportion of male or female can affect the performance of the savings group. Groups with more female participants perform better than groups with more male participants. Similarly, groups composed exclusively of women tend to be sustainable than a group with mixed gender or exclusively male individuals (Parida & Sinha, 2010). In a study conducted in India, Parida and Sinha (2010) tested the performance of three different self-help groups (SHGs)[20] that had been linked to banks for about five years—one group comprised of female individuals only, the second comprised male individuals only, and the third comprised male and female. The authors found that variation in monthly and annual savings among the three groups. The average monthly and annual savings per member was much higher for only female groups compared to mixed and exclusive male groups. On average, each member saved $467.6 (female), $418.6 (male), and $380 (male and female mixed) in 2006. The loan recovery rate was also much higher for female groups compared to male and gender mixed groups. The authors argue that better financial management practices among female group might have contributed to their higher performance and sustainability. On the contrary, factors such as mismanagement of borrowed funds and lack of accountability towards expanding group activities among members contributed to lower performance of male SHGs (Parida & Sinha., 2010).

[20] The Self-self groups (SHG) evaluated in Parida and Sinha's (2015) study function more like VSLAs with the exception that they were linked to a formal financial system and others were connected to an SHG federation which provides services similar to the APEX organization in Zanzibar.

Heterogeneity in educational attainment. *E*ducation level of participants does not limit participation in savings groups, although it may affect the performance of the group. Literacy helps members to easily understand the content of matters such as group rules, financial transaction and record keeping—this may be particularly important if the savings group is linked to a formal financial institution such as a bank, as in Parida and Sinha (2015). Literate members can easily grasp the information provided in training programs delivered by banks and NGOs and thus can help savings groups' dependency on external agencies for record keeping (Parida & Sinha, 2015). Instead of having group members who are all illiterate, it may thus be desirable to have a few literate individuals among illiterate members—i.e., a more heterogeneous group with respect to education attainment may thus be more desirable than a homogeneous illiterate group.

Groups with highly educated individuals have proven to perform better in various dimensions that are key to economic growth, including higher savings and returns on savings. In a study that evaluated CARE's VSLAs in Zanzibar, 58% of group members (compared to 48% in the general population of Zanzibar) had some secondary level education (Anyango et al., 2007). The authors report that not only were the groups able to replicate at a much higher rate (without any assistance from external agencies after CARE left) and sustain their operations for several years, but also performed well in terms of savings and returns on investments[21]. Anyango et al. (2007) argue that the high performance observed was likely due to the highly educated members in most groups.

Savings rate, loan fund utilization and repayment rates. The weekly or monthly savings made by members determine the total savings of the group at the end of the cycle; thus, the larger the weekly savings made per member, the larger the group's savings, and thus the higher the performance.

While savings rates can be linked to economic status of members in the group, since relatively wealthier people are likely to set higher prices per share and able to purchase more shares per member, it is expected that groups with relatively wealthier members should perform better as argued in the previous section. Studies have shown, however, that other factors can also influence the rates at which members save. Burlando and Canidio (2015), for example, show that combining ultra-poor people with less poor people can improve the rate at which ultra-poor individuals save. Similarly, Kast, Meier, and Pomeranz (2012) show that low-income people can save more when peer pressure within their groups is used as a commitment device. Among self-help group members in Chile, Kast et al. (2012) report that deposits of participants who shared with their peers their individual saving goals saved 3.5 more times and their savings were almost twice as high as that of participants in the control group. Similarly, Salas (2014) reports from a study implemented in Colombia that participants in VSLAs who publicly shared their savings goals saved much more than individuals who only kept their savings goals privately. According to the authors, the average treatment effects of the *public-labeling* groups increased

[21] Most participants also reported additional improvements in food security and nutrition, housing quality, and household assets.

significantly by an average of 35% and savings goals were 8.5% more likely to be reached in comparison to the control groups.

High loan utilization rate can help increase both the group and individual total savings. The more loans are sought by group members the higher the chances that the group will yield higher returns on their savings, since each borrower must pay interest. Studies that show higher performance due higher returns on their savings also show that large proportions of the funds were borrowed by group members which increased their total savings (see Anyango et al., 2007).

While high loan utilization rate is necessary for increasing per capita and group savings, this can only be realized if each borrower pays back all the borrowed money per group's rules and regulations before share-outs[22]. To ensure high repayment rates, group formation rely on trust high trust placed on each member. Other groups impose other means such as penalty fees to enforce loan repayments (Parida & Sinha, 2010).

Group size. Unlike collective action literature which suggests that as the group becomes larger the odds of succeeding diminish (see Olson, 1965), evidence from savings groups suggest otherwise[23]. Theoretically, larger groups are expected to impose positive effects on savings groups because of the reduced cost of participating in the group as a result of improved group efficiency (Oliver & Marwell, 1988). Moreover, since loan funds are created by weekly or monthly savings made by individual members of the group, the size of the available loan fund is dictated by the size of the group (Allen & Panetta, 2010). As shown in Burlando and Canidio (2015), this is especially the case for groups comprised of low-balance individuals who can only afford very small savings each week. Experts thus propose that groups compose 25-30 to improve their loan fund and consequently their performance (Allen & Panetta, 2010). No study has specifically looked at how group size affect performance of the group, however.

External factors that influence performance of savings groups

External factors can be viewed as factors that can contribute to the performance of savings groups, yet members have little or no control over. Very few studies that focus on how external factors influence the performance of savings groups have been implemented. The factors discussed below include: group formation facilitation model, access to formal financial services, access to business and financial education, and policies, regulations, and trade environment. Other factors not yet studied in the savings-led microfinance field, but can be inferred from other fields, include infrastructure—e.g., availability of paved roads, markets, availability of electricity, health centers, schools.

Group formation facilitation model. A number of studies have looked at how group formation facilitation model used (organic, franchise, NGO) affect the performance of the created groups and have concluded that groups formed by well-trained NGO agents perform better than those

[22] Repayment rates are expected to be high among homogeneous groups since trust among members is likely to be higher too. This, however, may not be necessary as long as differences among members arise from important factors such as income and education levels.

[23] This is not surprising since members in savings groups tend to self-select themselves, a factor that reduces heterogeneity in many ways.

formed in an organic manner.[24] While savings groups can be self-reliant, Beaman et al., (2014) ague that "a sustained role of the NGO is necessary for the program's benefits to expand" (p.7). "Savings for change" (SfC) groups performed poorly in cases where there was little involvement by the NGO. To test two models of replication, NGO and organic, the authors randomly provided intensive structured training of replicating agents (equivalent to CARE's village agents) to one set and less structured and less intensive training to the other. The intensive training produced stronger impacts due to greater skills gained by replicating agents. This finding is in line with CARES's PkW project mid-term evaluation report by Maliti and Leyaro (2016). Maliti and Leyaro found that lack of proper training by CARE's partner organizations and Franchisees contributed to incompetent village agents and community-based trainers respectively. Consequently, group performance was much lower than desired. The low performance franchise model relied on a market-based approach where the CBTs were supposed to be compensated by the savings group members for forming and facilitating the VSLA groups. In contrast, Greaney, Kaboski, and Van Leemput (2013) found that requiring the savings group members to pay the trainers for their services increased the quality of the savings groups. Karlan et al. (2016) argue that the higher impact observed in Greaney et al. (2013) was likely due to trainers disproportionately selecting more business-oriented group members.

Another franchise-based model that has been tested by CARE is reported in Anyango et al. (2007) and Brannen (2010). The model can be viewed as a combination of the NGO and the franchise models. The trainers in this model were first fully trained and supported by CARE for a period of one year or an equivalence of one cycle. After completion of one cycle, the trainers formed an organization of savings groups replicating agents (in Anyango et al. (2007), they refer to the organization as the JOCDO). The trainers in the JOCDO organization continued to form new savings groups and to provide additional support services to existing groups. Trainers in the JOCDO organization only provided services to groups that pay a registration fee and a small fee for every session of training. This replication can be considered as organic in the sense that CARE was no longer involved in paying the trainers. Reported challenges with this model include failure of most savings groups to subscribe to the organization—for example, Anyango et al. (2007) reports that in 2006 (four years after CARE had left), only 35% of the trained groups joined JOCDO. Low subscription lead to minimal resources for JOCDO to carry out training activities for both new and existing groups—consequently, many groups reported that the overall curricula was not completed in many cases. Despite this challenge, however, Anyango et al. (2007) report that the number of groups continued to grow at an annual rate of 37.5%. The authors, however, note that the high replication observed may have been due to the fact the intervention was being implemented among better educated and relatively well-off individuals, a factor that might have contributed to the higher performance of groups created under this franchise model.

[24] Organic replication involves formation of savings groups by individuals who have been members of other savings groups. Individuals who participate in replicating groups do not receive any structured training on how to form and train new groups; therefore, they rely on the knowledge gained from an NGO agent during participation in a savings group.
Franchise-based replicating models rely on the assumption that savings groups members can pay for services such as training of groups on operation or financial management, and thus, NGOs are not expected to pay facilitators involved in this model.

Access to formal financial services. If we consider lack of formal saving products as a factor affecting savings rates in most rural parts of developing nations, as shown in empirical research (see Dupas & Robinson, 2013; Kast, Meier, & Pomeranz, 2018), then we can argue that lack of formal savings products is one of the external factor reducing performance of savings groups. Transaction costs such as fees associated with opening a bank account, minimum balance requirements, withdrawal fees, and transportation costs in terms of time and money have all been described as transactions costs that may encourage or discourage a participant to use formal savings products (Karlan, Ratan, & Zinman, 2014).

Monetary costs, such as costs for accessing and using a formal financial service, can act as a barrier among most poor people—because the proportion of the costs in relation to the poor person's savings tend to be high (Karlan et al., 2014). Subsidizing such costs has proven to increase access and usage of bank accounts in various contexts, and in some cases incomes. A study by Dupas and Robinson (2013), for example, found that removing opening costs led to increased uptake of bank accounts (41% became active users), business investment levels business (38-56%), and expenditures among market-vendors (by 37%) in Kenya. The authors did not observe any significant impacts among bicycle tax drivers, however. Similarly, a study by Prina (2013) shows that among households in Nepal who were offered a free savings account (i.e., with no opening, maintenance, and withdrawal fees), 80% opened and used the account regularly. Further, access to these savings accounts led to significant accumulation of wealth—monetary assets (by 25%) and total assets (by 12%). Further, Prina reports that households with access to savings accounts increased their expenditure on education by 33–40 percent[25] and that coping with health shocks among such households was highly improved[26].

Despite subsidizing the bank accounts, some studies have shown that take up and usage rates can be quite low (Dupas et al., 2018). In a study by Dupas et al. (2012, as cited in Karlan et al., 2014), among randomly assigned individuals to receive vouchers for covering opening fees and minimum balance amounts, 60% opened bank accounts but only a few (18%) made two or more deposits within the year the accounts were opened. Similarly, a study by Schaner (2013, as cited in Karlan et al., 2014) shows that only 7% of couples who opened accounts continued to use them in the third year despite the high subsidies provided. Karlan et al. (2014) suggests that limited usage of accounts could be a result of "heterogeneity in valuation (stemming from heterogeneity in impacts), or to heterogeneity in other constraints" (p. 41). These other constraints can include risk of embezzlement, unreliable services, and high ongoing transaction fees (Dupas et al., 2012, as cited in Karlan et al., 2014). Other studies argue that heterogeneous responses to reductions in transaction fees may be driven by intra-household bargaining issues (Schaner, 2017.

Other studies have examined impacts resulting from changes in magnitudes of marginal yields on savings balances, e.g., Schaner (2013, as cited in Karlan et al., 2014). The author examined account usage and suitability due to changes in marginal yields by randomly assigning individuals who showed interest in opening bank accounts to different annual rates of return:

[25] E.g., on school fees, textbooks, school uniforms, and school supplies.
[26] Among households who experienced health shocks in the past month, those who had access to the formal savings accounts (the treatment group) maintained a higher weekly income compared to those in the comparison group.

0%, 4%, 12%, 20%. Each couple could open up to three bank savings accounts—one for the husband, another for the wife, and a joint account. The subsidies were provided for six months. Within the first six months of treatment, the author found that those who were receiving a 20% interest rate had used their accounts by 8.6 percentages points more than the comparison group. Over the long-term[27], the 20% interest group reported a 22% higher income than the comparison group. The author suggests that the mechanism through which the impact is variable can be explained by improvement in the importance of saving, which led to improved mental accounting as well as improved entrepreneurship. Improved entrepreneurship consequently contributed to higher income. While these results are promising, Karlan et al. (2014) suggests that more research in this area is necessary to understand whether the results can replicate in other contexts (e.g., single account ownership per spouse) and to understand the mechanisms driving the results.

Other non-monetary factors such as long distance to the bank have also been found to deter people from using formal savings products. The few studies that have examined how reduced distance and other more convenient ways of accessing formal savings products reveal increased bank service usage as a result although the uptakes were relatively low (see Ashraf, 2009; Flory, 2011). This shows that reducing distance alone cannot improve usage of formal bank products. Other factors discussed by Karlan et al. (2014) include trust and regulatory barriers—poor people must trust financial providers if they are to entrust them with their money. Mid-term study conducted in Tanzania revealed that people were worried about what would happen to their money if they deposited it in their bank accounts via a mobile device while others were wary of being tricked since they were illiterate. Dupas et al. (2012, as cited in Karlan et al., 2014) also reports from a study conducted in Western Kenya that despite a high bank account take up rate, usage rates were very low. Qualitative findings further revealed that among clients who did not use formal bank accounts, 15–37 percent cited trust as a concern while 7–24 percent reported risk of embezzlement by the bank as a concern. On the contrary, in a study conducted in Mexico, Djankov et al. (2008, as cited in Karlan et al., 2014) reports that the main reason for not saving in the formal bank accounts was lack of enough funds and only 2% reported trust as a concern.

Policies, regulations, and trade environment. Availability of markets for goods and services is critical for the success of microbusinesses beyond subsistence levels (Shiferaw, Obare, & Muricho, 2008, February). Engagement in MSEs alone thus does not guarantee higher performance of the group and its members. Market failures due to asymmetric information or high transaction costs, are common in most rural areas. If there are no market institutions to provide support, "rural markets tend to be thin and imperfect, leading to high marketing and transaction costs" (Shiferaw et al., 2008, p. 1).

National policies and regulations favorable to microfinance are thus necessary for improving performance of savings groups. If formulated and implemented carefully, policies and regulations such as the Tanzanian Small and Medium Enterprise Development Policy of 2002 can

[27] Two and half years after removing the subsidies.

help improve markets in rural areas, and consequently performance of savings groups and their members.

The current business environment in Tanzania is not favorable to producers as the country still experiences high trade deficits yearly (Ngasongwa, 2002). Ngasongwa points out some of the factors contributing to unfavorable trade environment in Tanzania,[28] including: "poor infrastructure, corruption, legal and regulatory issues, and bureaucratic tendencies" are some of the hindrances lack of favorable business climate, citing lack of finance, bureaucratic institutions, corruption, poor infrastructure. While we only provide a brief highlight here, many other factors not discussed here do contribute to performance of production and markets in rural areas.

Access to business trainings and financial education. Micro entrepreneurship is one of the key sectors of economic development in Tanzania because a large proportion of households rely on informal employment (Ngasongwa, 2008). Not surprising, credit-led microfinance target small business owners for its clients. Similarly, most practitioners and donors suppose that participating in savings groups would create a capital base which would eventually be invested in small enterprises.

To perform well in any business, however, one must have some business skills and be financially literate, however (Karlan & Valdivia, 2011)[29]. Lack of business skills and limited financial literacy can significantly prevent micro businesses operated by savings groups members from performing well. As advised by Maliti and Leyaro (2016), more customized and focused training should be offered to those who wish to engage in small businesses, to improve their business and financial skills. Only then, ca we expect larger and long-term positive effects from MSEs and agricultural investments made by savings groups members, whether it is in rural or urban areas.

Infrastructure (e.g., availability of markets, paved roads, electricity, water, health centers, schools). While there is limited research on how infrastructure such as market place or quality of the market infrastructure contributes to performance of the group and its members, it is reasonable to argue that these can have a significant impact, as presented in Ngasongwa (2008) with respect to MSEs. Availability of nearby market places with good facilities can facilitate easier operation of MSEs due to reduced costs of operation (Khandker, Bakht, & Koolwal, 2009).

In most rural areas of Tanzania, however, most women can only attend market places on a weekly basis because they are located too far from their homes. In this case, one may argue that savings groups in urban and per-urban areas are likely to sell their goods and services daily because of nearby markets. Consequently, such groups are likely to make more profits and thus perform way better than savings groups in rural areas.

Availability of infrastructure such as paved roads is likely to affect savings groups performance in a positive way. Just like with availability of market places, paved roads reduce

[28] For example, in 2002, trade deficit stood at 11.8%

[29] Karlan and Valdivia (2011) identify the following as practices that might help an entrepreneur to be successful: "separate money between business and household, reinvest profits in the business, maintain records of sales and expenses, and think proactively about new markets and opportunities for profits" (p. 18)

transportation costs and thus can encourage more engagement in MSEs among savings groups members (BIDS, 2004). Improved roads tend to lead to easier access to markets and technology and can facilitate expansion of farm and nonfarm production through increased availability and reduction of input costs (Binswanger, Khandker, & Rosenzweig, 1993; BIDS, 2004; Levy, 1996). Improved also tend to improve growth of rural businesses (Lokshin & Yemtsov, 2005). Availability of paved roads can also increase investments by non-locals in the area, which would further boost markets for local goods (Ngasongwa, 2008). Khandker et al. (2009), for example, report significant positive impacts on "household per capita consumption (a measure of household welfare), labor supply, school participation rate of boys and girls among school age children, aggregate crop output and price indices, agricultural wages, fertilizer prices, and household transport expenses" (p. 18). The various positive impacts can all have a wide range of positive feedback effects on MSEs.

With electricity, one can diversify their businesses and operate for longer hours, and thus earn more profits from their investments (Kooijman-van Dijk, & Clancy, 2010). Having a nearby health center can reduce travel costs for women, and thus help invest most of their time in productive activities.

Summary of types of groups that are likely to contribute to economic growth

Following the discussion above, we argue that the highly performing savings groups are likely to comprise of more members who earn relatively higher incomes[30], highly educated or literate, economically active, and women. Additionally, highly performing groups are likely to sell the group's shares at relatively higher price, utilize their loan fund more frequently, and exhibit high loan recovery rate. Additional features that can help savings groups perform well can also be derived from features of early adopters per Beaman et al. (2014). In addition to being relatively wealthier and economically active, Beaman et al., finds that individuals who belong to traditional ROSCAs, previously accessed a loan, socially integrated or have higher social ties, and engage in communal actions, are usually the first to join savings groups[31]. While there is no empirical research that examines how these factors affect performance of the groups, it is reasonable to suggest that they can contribute positively.

In addition to internal factors, there are many external factors that might influence the performance of savings groups. As discussed above, we argue that a group and its members that are likely to perform well and thus contribute to economic growth are those formed by NGO agents, if most members are non-entrepreneur. Additionally, savings group members must have access to formal financial services, business and financial education, and good infrastructure.

[30] Possibly above poverty line.

[31] In a review of three RCTs implemented in Ghana, Uganda, and Mali, Gash and Odell (2013) made a similar conclusion about who is likely to join a savings group. Additionally, Gash and Odell found that adopters had more experience managing finances, were more literate, were relatively older, and came from larger households. The authors further report that indepth interviews show that less socially integrated or marginalized women tend to join savings groups much later after they have understood the program and have gained trust in how the groups operate. Similarly, Anyango et al. (2007) found that village agents were able to replicate groups organically (after CARE left), it was mostly relatively wealthier and more educated individuals who joined—among VSLAs of women, for example, 58% had some secondary-level of education (compared to 48% in the population) while 53% of men had some secondary-level education (compared to 53% in the population). Parida and Sinha (2010) also show that literate individuals (both men and women) outnumbered illiterate members in self-help groups and that participants in were more economically active.

Furthermore, policies, regulations, and trade environment must be favorable to rural environments. While not all factors have been studied in the contexts of savings groups, they can be understood from other fields.

IV. Macrolevel impacts of credit-led microfinance

The debate regarding the macroeconomic benefits of microfinance has centered on trying to answer how and to what extent microfinance can boost economic growth and development within a country. These questions have become relevant due to the spread of microfinance and the increasing difficulty of ignoring its possible influence on the overall economy[32]. We first present a theoretical framework explaining how credit-led microfinance contributes to growth and development.

The theoretical framework explaining how credit-led microfinance contributes to national growth and development

Different theoretical frameworks have been proposed to explain how microfinance may encourage a country's overall economic growth and development. One main obstacle to achieve this goal, however, is that the causal relationship between finance and growth is not necessarily straightforward. Arestis and Demetriades (1997), for example, found substantial variation in the causal relationship between financial development and economic growth across countries, but also that these relationships may exhibit substantial variation in the long-term[33]. Where positive, credit-led microfinance appears to contribute to economic growth through the following: first, directly encouraging small entrepreneurship, and, second, indirectly promoting human development, poverty reduction, and financial intermediation (Maksudova, 2010). Related to the first factor, increasing the savings from self-employment enhances the level of productivity from entrepreneurship (Ahlin & Jiang, 2005). These mechanisms are described further below.

Maksudova (2010) proposes the existence of two transfer channels from microfinance to economic growth. First, a primary channel, through which microfinance directly affects the rate

[32] Above poverty line.

[32] In a review of three RCTs implemented in Ghana, Uganda, and Mali, Gash and Odell (2013) made a similar conclusion about who is likely to join a savings group. Additionally, Gash and Odell found that adopters had more experience managing finances, were more literate, were relatively older, and came from larger households. The authors further report that indepth interviews show that less socially integrated or marginalized women tend to join savings groups much later after they have understood the program and have gained trust in how the groups operate. Similarly, Anyango et al. (2007) found that village agents were able to replicate groups organically (after CARE left), it was mostly relatively wealthier and more educated individuals who joined—among VSLAs of women, for example, 58% had some secondary-level of education (compared to 48% in the population) while 53% of men had some secondary-level education (compared to 53% in the population). Parida and Sinha (2010) also show that literate individuals (both men and women) outnumbered illiterate members in self-help groups and that participants in were more economically active.

[32] In 1997, there were only 618 micro-credit institutions totaling around 13 million clients (Buera et al., 2017), whereas the 2016 Microcredit Summit Campaign reported 3,098 micro-credit institutions with a portfolio of 211 million clients.

[33] Doçi (2017) provides an example of the opposite relationship by analyzing the impact of macroeconomic variables on the loan portfolio held by MFI in Albania during 1999-2014. While the rate of growth in GDP and total number of customers had a positive effect on the average yield of the gross loan portfolio, inflation and interest rates had negative impacts.

of economic growth by encouraging small-scale entrepreneurship, as well as enhancing human development and poverty reduction. Second, an ancillary or indirect transfer channel involves the effect of microfinance on economic growth via improved financial intermediation (monetary circulation) in the economy, thereby enhancing the financial sector through complementary/competitive relations between commercial banks. To confirm these transfer channels, Maksudova looked for "granger"-causality[34] links among selected instrumental variables of microfinance, growth, and financial development[35] in a dynamic panel built around information from 1,433 MFIs pooled into 102 countries over the period 1999-2014.

The results presented by Maksudova (2010) give evidence for both the direct and indirect channels: the average size of the loan portfolio held by MFIs had a positive and significant impact on economic growth rate and the associated money supply (M2). However, the link between microfinance and other credit institutions was more ambiguous. The parameter that quantified the average interaction size between the loan portfolio held by MFIs and the ratio of credit to GDP for commercial banks appeared to be significant and negative, suggesting an elevated degree of competition among both types of financial institutions, but this effect vanished when the total effect of microfinance was controlled within the model.

Maksudova (2010) also finds that the country's level of development, medium or low-income, has no influence on microfinance performance, although it can restrict the transfer mechanisms through which the impacts may be caused. For example, the author noted that while benefits from microfinance are more rapidly absorbed in low-income level countries, it is generally not possible to find evidence of indirect channels in these countries, possibly because of the lower degree of integration between microfinance and the main financial systems.

Ahlin and Jiang (2005) adapted the occupational choice model of Banerjee and Newman (1993) to understand the long-term effects of microfinance, organized around three technologies of production ranked by productivity and scale: subsistence, self-employment, and entrepreneurship. Ahlin and Jiang (2005) depict microcredit as a pure, albeit limited, improvement to the credit market that allows low-income individuals to access credit. In such a context, microcredit creates self-employment opportunities for individuals who otherwise would be forced to work for low wages or subsist. As their model shows, however, microcredit is not a panacea for development. For instance, microcredit's contribution to development may be reduced considerably in more advanced economies, where wages are higher and less risky than profits from self-employment. Ahlin and Jiang thus suggest that microfinance may sometimes have negative effects on outputs and income per-capita. This finding is analogous to Matsuyama (2005) who argues that improvements in the credit market can potentially lower long-run efficiency by facilitating access to non-innovative entrepreneurial technologies.

[34] This technique was proposed originally by Granger (1969) and it can help determine the direction of the link between two correlated variables and whether feedbacks take place.

[35] The considered variables are average size of the loan portfolio and total number of active borrowers of MFIs (microfinance indicators), Liquid Liabilities (M3), Money plus Quasi-Money (M2) and the rate of growth of real GDP (macroeconomic indicators), Private Credit as a ratio of GDP, Bank Concentration, Net Interest Margin, Number of ATMs per 100 000 habitants, Number of ATMs per 100 000 km^2, Number of Bank branches per 100000 habitants, and Number of Bank branches per 100000 km^2 (banking indicators).

After considering multiple hypothetical scenarios, however, Ahlin and Jiang (2005) find that microcredit most generally helps to lessen long-term poverty. By spreading the use of more efficient technologies, and increasing wages and equality, their model highlights that accruing returns from normal self-employment can advance economies toward entrepreneurship productivity. This process, which they call "saving graduation," is both a consequence of microcredit and a necessary condition for attaining long-term development.

Saving graduation is mainly driven by two key factors: a) the average return from self-employment and b) the savings rate. For policy making purposes, Ahlin and Jiang (2005) argue that microcredit institutions are in a unique situation to encourage savings. Because higher financial costs can act as a flat-rate tax on savings, micro-credit institutions could reduce this tax and raise savings. From the perspective of development, the model concludes that micro-lending and micro-saving must be understood as complementary activities.

Potential models for measuring saving-led microfinance impacts on the economy

To date, a large part of the empirical literature on microfinance has focused on evaluating household-level impacts (see Armendariz & Murdoch, 2005; Cull & Murdoch, 2017). In this section, we summarize four main empirical approaches for measuring the impact of micro-credit on economic growth and outline their applicability to the case of savings-led microfinance.

Total Factor Productivity (TFP)

Khalily and Khaleque (2013) used Total Factor Productivity (TFP) to measure the impact of credit on Bangladesh's Small and Medium Enterprises (SMEs). Conceptually, TPF is defined as the portion of a firm's output that cannot be explained by the traditionally measured number of inputs utilized in production. Therefore, its level is determined by how efficiently and intensely production inputs are being employed[36]. Starting from this basic idea, Khalily et al. (2013) evaluate the impact of microfinance in two stages. First, they use the available information on capital, labor, and costs to predict expected output levels. Second, they assess the difference between predicted and observed outputs in terms of access to credit and other relevant variables (p.24).

The main advantages from TFP come from its relative simplicity and flexibility. For example, the technique only requires information over a single time period for total sales, wages, and investment committed by each firm. Although formal accounting records are not readily available from most SMEs or their associated microfinance institutions, such data could be obtained relatively quickly through direct interviews of the SME owners[37]. Correspondingly, even though Khalily and Khaleque's (2013) research only measured credit-led microfinance effects on SME productivity, similar measures could be employed for savings-led microfinance—individuals or households can be introduced in the model as production units. In this context, Pagano (1993) offers a useful theoretical framework based on Romer's (1986) endogenous AK growth model that highlights the relationship between savings and economic growth. While

[36] This level or amount is commonly referred to as the Solow's residual in the literature on economic growth.
[37] The expectation that the information can be obtained relatively quickly is because it is only required for one period. However, it must be understood that the time required to accomplish this task also depends on other factors.

Kalily and Khaleque only incorporate age and size of firms, type of ownership, and location, as factors affecting firm's TFP, the literature suggests that other factors related to human resource development and management, e.g., food security and education attainment, may also be considered (Jajri, 2007).

On the negative side, when applied at the level of firms, as in Kalily et al. (2013) work, the findings cannot be interpreted as reflecting the overall economy. Therefore, while this analysis can provide insights regarding the links between microfinance and growth, it cannot provide a comprehensive perspective of savings-led microfinance impacts on macroeconomics. TPF analysis also requires a large sample of SMEs, including those with and without access to microfinance. Therefore, to compare saving-led microfinance effects on productivity, not only is it necessary to collect data from group members, but also from non-participants.

Time-series approaches

Cross-sectional studies generally fail to capture causal links between variables whereas time series analysis can more clearly infer causation. All times-series analysis methods assume that data points respond to some internal statistical characteristic that can be measured—such as trends, seasonal variations, or correlations. Therefore, time-series analysis is most helpful in testing a statistical property in the data. Uddin at al. (2013) and Sultan and Masih (2016) focused on estimations using Auto-Regressive Distributive Lag (ARDL) method, which has the advantage of not requiring the cointegration of the variables[38] and is robust to small sample study size[39]. Both studies included the real GDP, microfinance loans and advances as a proxy for microfinance outreach, exports of goods and services as a percentage of GDP, inflation, exchange rate, and interest rate. The last three variables are used as controls.

Since data points are indexed to time, it is possible that sufficient information may not exist for a given variable, making time-series analysis more difficult. Availability of data depends on the start period of data collection and the frequency of this process. For example, Uddin et al. (2013) use quarterly observations for the period 1975 – 2011, while Sultan et al. (2016) employ annual data for the period 1983 – 2013. Thus, the former considers a total of 144 observations while the latter only uses 30 data points.

General Equilibrium Models

Use of Computable General Equilibrium (CGE) models started with Arrow and Debreu (1954). Recently, Raihan et al. (2017) demonstrated the applicability of these types of models to directly study the macroeconomic impacts of credit-led microfinance in Bangladesh[40]. CGE models fit real macroeconomic data to a set of equations that mimics the structure of the economy and the behavior of the agents. In this manner, CGE models build an analytical framework to look at the economy as a complete system of interlinked components. This framework can simulate policy

[38] Two or more time-series variables are cointegrated if they show the same long-run path—i.e., if they exhibit the same order of integration, but their linear combination has a lower order of integration.
[39] The ADRL approach first tests for a long-run relation between variables via an unrestricted Vector Error Corrected Model (VECM) that treats each variable in turn as dependent then testing whether the relationship is absent. Second, long-run coefficients and adjustment coefficients are estimated in the error-correction model.
[40] Raihan et al. (2017) uses the PEP standard computable general equilibrium model from Decaluwé et al. (2009). This model is available at the https://www.pep-net.org/pep-1-1-single-country-static-version.

changes or economic shocks and trace their effect on key macroeconomic variables. Measuring a policy or economic shock using a CGE model involves comparing the economy equilibrium before and after the policy change, or after an exogenous shock has occurred. The first of these is the baseline scenario that is generated by fitting the model equations and parameters to the base year economic data. The simulated conditions after the hypothetical shock is called the counterfactual scenario. This is obtained by relaxing some assumptions in the baseline.

Generally, the core data necessary to construct a CGE model comes from the Social Accounting Matrix (SAM), which reflects the flows of all economic transactions in the economy for a year[41]. However, additional information such as household surveys may be necessary to build more complex scenarios. Also, in the case of dynamic CGE models, data from multiple periods is necessary to account for changes in the macroeconomic variables.

Raihan et al. (2017) incorporated microfinance into a static CGE model by distinguishing between MFI and non-MFI capital. They combined information from household surveys on MFI-loan usage with data on MFI loan disbursement and investment at the national level starting in 2012. For savings-led microfinance, a similar approach could be used to separate MFI and non-MFI savings of households by employing available information at the national level from public sources. Alternatively, the savings rate could also be modeled as a restriction on the amount of MFI capital available for investment. Then, as in Raihan et al. (2017), a counterfactual scenario could be generated by withdrawing MFI savings from the system and measuring changes from the baseline.

The main challenge with CGE models comes from their complexity. For example, the CGE model used by Raihan et al. (2017) considered a total of 23 equations separated into: production, income, demand, producer supplies and international trade, price indexes, Gross Domestic, and Equilibrium, blocks. Their model can be considered a simplification, as more disaggregation is generally desired for the CGE models. For example, Kaliba (2006) computed a static CGE model for Tanzania considering 43 different economic activities with the purpose to determine optimal tariff rates. Finally, another restriction of CGE models is that they are built as deterministic mathematical models—i.e., a CGE model represents an accounting model, thus one cannot include an error term to account for effects due to random variations[42]. Consequently, the model cannot be validated using statistical techniques such as confidence intervals.

Agent-based models (ABMs)

ABMs are a class of computational models that consist of agents that interact with an environment. Agents are used to emulate social actors – i.e., individuals, households, firms, governments, etc. – in a model of the real setting in which the actions take place. Rashid et al. (2011) used ABMs to study the long-term impacts of microfinance within the context of a hypothetical economy. Likewise, Lee et al. (2015) employed ABMs together with concepts from network theory to map credit risk in microfinance, and Bourhime and Tkiouat (2018) used an

[41] The SAM is produced from the Input-Output tables and the National Accounts, complemented with additional data on taxes, income and expenditure.
[42] In contrast, a model that includes an error term is said to be a stochastic mathematical model.

ABM to evaluate microfinance repayment process within a dual system with Islamic interest-free group loans.

Rashid et al.'s (2011) study shared many of the features and conclusions from Ahlin and Jiang (2005) and reached an optimistic set of conclusions regarding the possibilities of microfinance to enhance growth and development. Rashid et al.'s (2011) study produced an important practical framework for pre-policy-implementation testing of the effects of microfinance. More specifically, the main goal of their model was to evaluate the potential impact of microfinance on the income of the poor and the repayment ratio of microcredits over time[43].

Rashid et al. (2011) considered five classes of agents: the poorest segment of the population, the rest of the population, the micro-financial institution (MFI), the local money lenders, and the raw material suppliers. Interactions among these agents included borrowing, repaying, manufacturing and dealing. Each poor individual was initially defined by sex, wealth, and productivity. Only one MFI was allowed to exist in the virtual economy while four local money lenders supplied smaller loans at higher interest rates. Similarly, four suppliers of raw materials existed within the economy. Initial parameters sought to reflect low developed economies (LDCs)[44]. Poor individuals could apply for microcredits individually or in groups. If certain conditions were not met, they could also apply for a loan from one of the local moneylenders but with less favorable terms than offered by the MFI. Access to credit allowed individuals to acquire raw material from the supplier to begin producing goods. Sales allowed the poor individuals to repay their credits to the MFI or the money lenders.

Rashid et al. (2011) assumed different initial conditions, but every simulation supported the conclusion that micro-credit could promote growth. For example, the average wealth level of the poor increased and maintained higher rates of growth following an initial decline, as start-up time was required to make products and obtain profits from the microenterprise. The model also predicted an encouraging repayment rate (between 90% and 99%), thus, suggesting a very low probability of failure in the repayment of microloans. Rashid et al.'s (2011) model thus led to two main conclusions: positive effects of micro-credit would be enhanced by increasing the amount of loanable funds held by the MFI and reducing interest rates.

Although ABM's are potentially powerful tools for assessing alternative intervention strategies, results from these models are only useful insofar that the agents are set to behave in a realistic manner (Gilbert, 2007). Thus, ABMs can only be considered illustrative at best.

[43] This ratio is the opposite of the overdue or late payment ratio.
[44] Together with the parameters for the normal distributions that are used to draw values for the poor individuals, these initial settings also include values associated with the conditions of loans (amount and interest rate), as well as relative prices of raw materials and goods sold within the virtual economy.

V. Methodological approaches for measuring savings-led microfinance impact on the Tanzanian economy

While the methods discussed above have been used to analyze the macroeconomic effects of microfinance with some success, their suitability in the Tanzanian case remains unproven. It is, however, safe to argue that some methods may provide a better understanding than others.

On the face value, it may appear that time-series based approaches are the most direct method to observe the relationship between savings-led microfinance and economic growth. In the Tanzanian case, however, such methods might be restricted by limited availability of relevant historical data[45]. Likewise, the implementation of ABMs may also present some significant limitations. The simulation of ABMs is useful for understanding the economic and social dynamics of savings-led microfinance, yet they cannot be used to answer questions about aggregate impacts of these institutions on the economy.

The last two models, the Total Factor Productivity (TPF) and Computable General Equilibrium (CGE) model, appear to be the most feasible for studying the impacts of savings-led microfinance on the Tanzanian economy because both models do not require time-series information. The data required for their application may thus be easier to collect. Moreover, both the TPF and CGE approaches may offer higher flexibility and scope in answering the question about microfinance impacts. In this section, we describe further the TPF and the CGE as well as describe how the two methods would be adapted when evaluating the impacts of savings-led microfinance on the Tanzanian economy.

A TPF model for Tanzanian SMEs

The TPF method provides a rather simple approach for understanding productivity in the economy. Since mainstream economic theories generally accept that macroeconomic performance is largely influenced by productivity levels, this type of analysis can be useful for gaining deeper insights on the relationship between savings-led microfinance and economic growth.

Empirical approach. The procedure for applying the TPF analysis may be divided mainly into two stages. The first step requires measuring the deviations between observed and predicted output across production units[46]. This difference is known as the Total Factor Productivity (TPF) or Solow's residual, and may be understood as excess productivity that is not explained directly by common factors of production such as capital and labor. The second phase of the TPF approach requires finding which socio-economic variables can better explain this gap.

[45] The lack of historical data on savings groups in Tanzania may be explained mainly by two reasons. First, the relative short span of time during which savings groups have been operating in Tanzania. Second, the seemingly inexistence of complementary macroeconomic data that may be used for this type of study. Regarding the first reason, it should be noted that CARE's 10-year program *Access Africa* for scaling up the number of VSLAs in the region commenced in 2008, while *Access Africa*'s first project in Tanzania, *Save Up*, has been operational only for the past eight years. Consequently, the amount of historical information that may be collected for savings groups in Tanzania may be relatively small even in the best case. On the other hand, another potential problem to deal with is the lack of complementary macroeconomic information for Tanzania that may be integrated with information on savings groups.
[46] For example, these may be countries or MSEs.

In practice, the TPF method starts by choosing an adequate specification for the technology used by firms. In general, a frequent choice is the Cobb-Douglas function (see Cole et al., 2006; Gehringer et al., 2013; Balcerzak et al., 2016; Nguyen et al., 2017)[47]. Employing this specification, the observed output level, Q_i, of the *i-th* production unit indexed $i = 1, 2, \ldots, N$ may be described as a mixture of capital, K_i, and labor, L_i, that satisfies the relation:

$$Q_i = c\left(K_i^{\alpha} L_i^{\beta}\right). \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (1)$$

In equation (1), the parameters α and β represent the elasticities of substitutions of capital and labor, respectively. Thus, they quantify the responsiveness of Q_i to changes in the amount of K_i and L_i being used in production. Besides, the constant c is a neutral factor-shifter that accounts for average technology in production (Syverson, 2011). Using the logarithm function, equation (1) may be rewritten as a linear model to estimate its parameters:

$$\ln Q_i = \ln c + \alpha \ln K_i + \beta \ln L_i + e_i \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (2)$$

In equation (2), the term e is a well-behaved error with zero mean and constant variance. Calling $\hat{\alpha}$ and $\hat{\beta}$ the estimated values for the elasticities of capital and labor, the predicted output of the *i-th* production unit may be defined then as[48]:

$$\ln \hat{Q}_i = \hat{\alpha} \ln K_i + \hat{\beta} \ln L_i \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (3)$$

Combining this latter definition with equation (2), it is possible then to finally compute the TPF for the *i-th* production unit as:

$$TPF_i = \ln Q_i - \ln \hat{Q}_i = \ln \hat{c} + \hat{e}_i \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (4)$$

Respectively, in equation 4, $\hat{c}$ and $\hat{e}_i$ represent the estimated values of c and e_i. Equation (4) implies that the TPF or Solow's residual of the *i-th* production unit may be computed as the sum of two terms. The first term is a common component that measures the average technology for all production units being considered. The second, is an idiosyncratic component to each one of them. Because of this latter element, the magnitude of the TPF_i may be similar but not equal across different production units.

Having measured the TPF or Solow's residual for all the production units, the second stage of the TPF approach involves finding which socio-economic factors explain the magnitude of this gap, i.e.- identifying a group of variables that explains a larger amount of the output that may not be attributable directly to capital and labor. To achieve this goal, the second phase of the

[47] Other possible choices are the Leontief production function, which are used whenever inputs must be combined in fixed proportions and the Constant Elasticity of Substitution (CES) production function, the generalization of the Cobb-Douglas production function.

[48] As nomenclature convention for this text, the caret symbol (^) is used to identify the quantity of a variable. Thus, for example, $\hat{\phi}$ represents the value of the variable named ϕ.

TPF approach in thus involves, first, defining a set of $j = 1, 2, ..., J$ variables x_j, and then estimating the parameters of a linear model with the overall structure:

$$TPF_i = \delta_0 + \delta_1 x_{1,i} + \delta_2 x_{2,i} + ... + \delta_j x_{j,i} + \varepsilon_i \text{. ..... (5)}$$

In this last equation, TPF is the variable to be explained, $\left\{ x_{0,i}, x_{1,i}, x_{2,i}, ..., x_{j,i} \right\}_{i=1}^{N}$ is a matrix with data for the $j = 1, 2, ..., J$ socio-economic explanatory variables and $i = 1, 2, ..., N$ production units in the sample. $\left(\delta_1, \delta_2, ..., \delta_j \right)$ is a vector of $j = 1, 2, ..., J$ coefficients that need to be estimated, and ε_i is the well-behave error term. Using equation (5), then the effect of the *j-th* socio-economic variable x_j on the size of TPF may be inferred using the value of its associated coefficient δ_j. For example, if $\hat{\delta}_j$ is statistically significative, it can be expected that the variable x_j affect the TPF in the amount proportional of $\hat{\delta}_j$. On contrary, if $\hat{\delta}_j$ is not statistically significant, then the variable x_j has no influence on TPF. The TPF analysis approach ends when the impact of every variable x_j on TPF is established using equation (5).

In general, the literature does not give a unique set of socio-economic variables to consider for x_j, as it recognizes that there may be specific circumstances in every case that can affect the relative importance of each variable. However, the literature suggests that variables that influence productivity may come from one of five main categories of factors—a) the degree of innovation in the production unit, b) average level of education attained by workers and owners of a production units, c) degree of market efficiency in the economy, d) stock of physical infrastructure used for production, and d) level of institutional development in the economy (Kim & Loayza, 2017)[49]. As an example of the variables commonly used to explain productivity levels, Table 1 summarizes several recent studies on this subject.

[49] Specifically, in this context the idea of innovation refers to the ability of micro business owners to incorporate new ideas, tools, or methodologies into production. Likewise, market efficiency refers to the existence of information symmetry among agents.

Table 1: Summary of variables used in recent studies on determinants of productivity.

Authors	Sample	Variables considered
Cole et al. (2006)	Effect of health on productivity for 52 countries.	**Indicators of health:** undernourishment or malnutrition, the incidence of malaria, access to safe water. **Other Determinants of TFP:** trade openness, share of agricultural value added, and inflation rate.
Conradie et al. (2009) (*)	Farms located in the Karoo districts of Western Cape during 1952-2002.	**Economic changes:** changes in farm management, change in economic conditions, commodities price dynamics. **Social change:** land use changes, change in farm labor relations. **Environmental change:** changes in predator management.
Mateev et al. (2010)	Productivity growth among 650 firms located in six economies in transition.	Leverage, liquidity, assets, number of regular employees, the age of the firm, type of ownership.
Gehringer et al. (2013)	Panel of 17 European countries between 1995-2007.	The ratio of exports to GDP, percentage of the population with secondary education as a proxy of human capital, expenditure in research and development (R&D), and the level of contributions from Structural and Cohesion Funds maintained by the EU.
Conradie et al. (2013) (*)	A sample of 34 wool and mutton farms in South Africa in 2012.	Irrigated area, farmer education, rainfall records, farm size, the percentage of mountains, farmer age, family history in the land.
Gonçalves et al. (2016)	A yearly average of 18,000 Portuguese firms in 2010-2014.	Age of the firm, size of the debt held by the firm, openness to international trade, investment in training.
Balcerzak et al. (2016)	A total of 24 European countries during 2000-2010.	**Institutional variables:** Administrative requirements for entrepreneurs, Bureaucracy costs for entrepreneurs, The cost of starting business, Extra payments / bribes / favoritism, Judicial Independence, Impartial courts, Integrity of the legal system, Protection of property rights, Mean tariff rate – Revenue from trade taxes (% of trade sector), Standard deviation of tariff rates, Non-tariff trade barriers, Compliance costs of importing and exporting, Regulatory trade barriers, Foreign ownership/investment restrictions, Capital controls, Controls of the movement of capital and people, Hiring regulations and minimum wage, Hiring and firing regulations, Centralized collective bargaining, Private sector credit, Interest rate controls/negative real interest rates.
Nguyen et al. (2017).	Degree of success among manufacturing SMEs in Vietnam.	Propensity to innovation, participation in international trade, geographical location, degree of competition, access to financial support, age of the owner, sex of the owner, attained level of education of the owner, previous entrepreneurial experience of the owner.

Prepared by: the authors (2018)

Implementation of the TPF approach in Tanzania. Implementing the TPF approach in Tanzania to measure the impact of savings-led microfinance on productivity requires attaining two main goals. First, build a database with relevant financial and socio-economic information regarding the production units to be included in the analysis. Second, perform the two stages of statistical analysis previously described on the collected data. Following these general goals, Table 2 then

details the overall steps that would be required to complete the TPF analysis in the context of Tanzania.

Table 2: General procedure for applying the TPF approach in Tanzania.

Goal.	Steps	Sub-steps
1. Build a database with financial and socio-economic information for the production units.	1.1. Seek available sources for microdata regarding entrepreneurship and microfinance support in Tanzania.	1.1.1. Determine available sources of microdata regarding rural and urban entrepreneurship and microfinance activities in Tanzania.
		1.1.2. Alternatively, if no other source is available, develop surveys and interviews to gather the necessary financial and socio-economic data directly from entrepreneurs.
	1.2. Parallel with the previous step, organize the database, selecting during this process those socio-economic variables that you want to include in the study.	1.2.1. Organize financial information regarding capital, labor, and output levels, from production units. During this same step, select the economic and social explanatory variables that will be incorporated into the study as potential determinants of productivity levels among production units following the overall criteria found in the literature.
2. Perform statistical analyses in the TPF approach.	2.1. Compute the gap between observed and predicted output for each production unit.	2.1.1. Select a specification for the production technology being used by production units. A common and simpler choice is the Cobb-Douglas specification.
		2.1.2. Estimate the parameters of production technology specification using production unit's data regarding: output, capital and labor, being used by production units during production. For the Cobb-Douglas function, these parameters would be the elasticities of substitution of capital and labor.
		2.1.3. Substitute the estimates obtained for the parameters into the production technology specification and compute the *predicted output* for each production unit in the sample using their levels of capital and labor.
		2.1.4. Subtract the *predicted output* from the *observed output* as in equation (4) to obtain the part of the output that is not explained by capital and labor, i.e.- the TPF or Solow's residual of each production unit in the sample.
	2.2. Identify which socio-economic variables that explicate the output gap.	2.2.1. Apply the simple linear regression model proposed in equation (5) to measure the effect of those socio-economic variables that were selected on the magnitude of TPF.
		2.2.2. Finally, analyze the magnitude as well as statistical significance of the coefficients of the regression.

Prepared by: the authors (2018)

To implement the TPF in Tanzania a first requirement would be choosing the production unit level on which the study would be focused. In this context, one advantage of the TPF approach is that its basic procedure may be extrapolated regardless of the size of production units being considered. Thus, this method is suitable even for studying productivity levels in the case of micro and small enterprises (MSEs) and small farms (FS), which is expected to comprise a larger share of savings-led microfinance users in Tanzania.

Just as for larger production units, the basic financial information required from MSEs and FSs include their capital, labor, and output levels. Likewise, the TPF method requires information on the production units' specific socio-economic features. This later information is needed to account for heterogeneity among production units, that may explain the degree of variability observed in the values of the TPF or Solow's residual across production units. Following the literature available, many different socio-economic variables may be considered as potential determinants of productivity. As an example, Table 3 shows a selection of financial and socio-economic variables that may be useful in analyzing the effect of savings-led microfinance on productivity levels of MSEs and FSs in Tanzania.

Table 3: Selection of variables to explain productivity of Tanzanian MSEs and SFs.

Variable.	Class	Description.
Capital	Financial	Total amount of productive physical assets held by the production unit.
Labor	Financial	Total wages bill of the production unit.
Output	Financial	Real revenue from sales received by the production unit.
Economic activity	Socio-economic	Value identifying if the MSE is dedicated to farming, manufacturing or retail, etc.
Age	Socio-economic	Total number of years since establishment of the production unit.
Size	Socio-economic	The number of full-time regular employees hired by the production unit.
Innovation	Socio-economic	Dummy showing if the MSE has introduced any innovation into production during a certain period.
Trade	Socio-economic	Dummy representing if the MSE trade outside its main geographical location.
Type of enterprise	Socio-economic	Dummy identifying if the MSE is a household enterprise.
Location	Socio-economic	Dummy representing if the MSE is in a rural or urban area, and/or in a certain region within the country.
Microfinance support	Socio-economic	Dummy representing if the enterprise has received microfinance support of any type.
Savings-led microfinance support.	Socio-economic	Dummy representing if the enterprise has received savings-led microfinance support.
Bribe	Socio-economic	Dummy variable identifying if the enterprise has been forced to pay bribes.
Age of the entrepreneur	Socio-economic	Age of the owner of the MSE.
Malnourishment	Socio-economic	Dummy variable representing if the entrepreneur shows malnutrition.
Sex of the entrepreneur	Socio-economic	Dummy representing if the entrepreneur is male or female.
Business experience	Socio-economic	Dummy representing if the entrepreneur has previous entrepreneurial experience.

Education Level	Socio-economic	Level education of the entrepreneur.

Prepared by: the authors (2018) using Nguyen et al. (2017), Balcerzak et al. (2016) and Cole et al. (2006).

In this context, the collection of the financial and socio-economic data needed to apply the TPF approach in Tanzania may be restricted by the lack of available sources of information of MSEs and SFs. In this situation, the use of surveys for production units over a representative sample will be necessary to obtain the information needed directly. Assuming that all the information required is available, the statistical measurement of the TPF or Solow's residual in the case of Tanzania is straighforward. To study the impact of savings-led microfinance on productitivy levels among production units, a variable sg_i will be introduced to identify if the production unit has used saving-led microfinance services. In such case, equation (5) may be rewritten as:

$$TFP_i = \delta_0 + \delta_j X_{i\times j} + \delta_k sg_i + e_i \text{. .... (5.1)}$$

The term δ_0 is the intercept of the line, and e_i is the error term. At the same time, $X_{i\times j}$ contains information on a set of $j = 1,2,3,..,J$ selected socio-economic variables for $i = 1,2,3,..,N$ production units under study, and which can be thought of as explanatory variables for TPF. Finally, δ_j is a vector of $j = 1,2,3,..,J$ coefficients, each one of them linked to a specific variable included in $X_{i\times j}$.

The coefficient δ_k, in this case, measures the effect of savings-led microfinance on productivity. A positive and statistically significant value for the parameter δ_1 would imply that access to saving-led microfinance can improve productivity among MSEs while a negative value would lead to the opposite conclusion.

Model strengths and limitations. One advantage of the TPF method is that it only requires cross-sectional data or data from a asingle year. Consequently, if resources are available, this type of analysis can be carried out without waiting an extended period to gather essential information. Therefore, from a more general perspective, the TPF methodology may be a useful methodology for understanding the relationship between savings-led microfinance and productivity levels registered in the economy.

A critical limitation of the TPF approach is that it requires a significant amount of data, and gathering it may be costly if it is not readily available[50]. Moreover the data must be representative, and thus must include information for micro and small enterprises (MSEs) with

[50] There are various approaches to determine the required sample size. With no preliminary information on the statistical features of the data, it is commonly accepted that at a 95% confidence level, which means that there is only a 5% chance that results may differ from the population average, a good estimate of the margin of error is given by $1/\sqrt{N}$ (Niles, 2006). Therefore, achieving an error margin no larger than 1% it would need *N = 10.000*, while for a still tolerable error margin of 3% or 5%, the sample sizes would decrease to *N*=1,050 and *N=400 respectively*.

and without access to savings-led microfinance services, which may increase the overall difficulty of collecting the required information. Since not everyone owns MSEs, individuals who operate micro enterprises would have to be identified first to create a sampling frame from which the sample would be determined following an appropriate method. Finally, concerning its adequacy to study macroeconomic impacts of savings-led microfinance in Tanzania, the most significant drawback is its inability to offer a direct measure of the size of effects, as it only measures productivity.

A CGE model for Tanzanian savings–led microfinance.

The CGE approach is a powerful tool for economic macroeconomic analysis. However, the choice of a suitable theoretical framework to model an economy that includes savings-led microfinance may present a challenge. Initially, one can argue that the choice of a specific framework to attain this goal may require accepting a trade-off between its degree of detail and computational tractability[51]. Additionally, in the context of Tanzania, isolating the financial cash streams coming and going from the savings-led microfinance economic sub-sector from the rest of the national economy presents another challenge.

Empirical approach. Following Francois et al. (1997), the procedure for designing and estimating a CGE model may take four steps. The first step involves selecting an adequate theoretical framework to serve as reference for designing the CGE mathematical specification.

The CGE model's main purpose is to represent the economic interactions among agents present in the economy. Consequently, the core of every CGE model is some expansion of the circular flow of income and spending economic model, which describes these interactions as continuous and recurrent inflows and outflows of money and goods. In the simpler scenario, the circular flow of income and spending takes the form of the "1-2-3 model". The name of this model comes from the fact that it considers a single economy, two producing sectors, and three goods[52]. The "1-2-3 model" is shown in Figure 1 as an example for the construction of a CGE model[53].

[51] For example, the household sector can be disaggregated into rural and urban households. At the same time, small businesses can be divided into groups according to their economic activity. Such disaggregation increase detail, but considerably increases the difficulty of solving the model.

[52] We do acknowledge that the economic flows are much more complex than the two-sector model presented in the example above—other sectors such as the government, financial sector, and the rest of the world do create important flows which all affect the economy.

[53] In this model, domestic businesses produce two goods. First, an export good that is sold to foreigners (i.e., goods not demanded by local households), and second, a domestic good which is only demanded domestically. The third good is an import, which is not produced locally (Francois et al., 1997). Being a small economy in the world markets, prices of imports and exports are assumed to be fixed. For further simplification, this model omits the existence of a factor market for capital and labor, implying that total income is already given to households as wages and salaries.

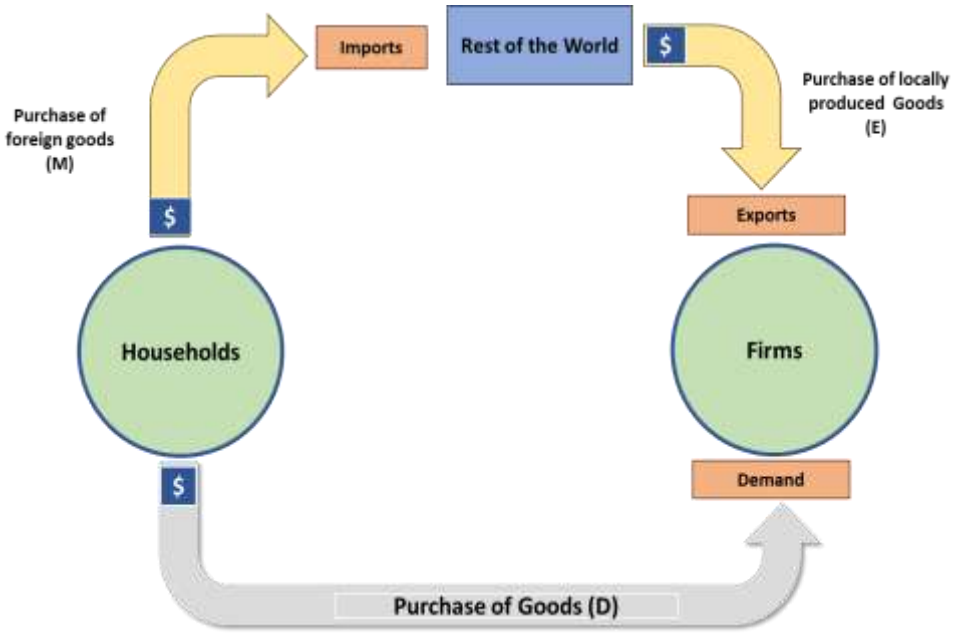

Figure 1: Circular Flow of Income and Spending in the "1-2-3 model" (Source: own collection.)

After an adequate theoretical framework has been selected, the next step in producing a CGE model requires specifying a system of equations linking all the transactions and / or financial flows that were identified. Although the number of equations used to specify the CGE model can vary a great deal, each equation can be categorized in one of the four primary groups: economic and financial flows, pricing rules, market equilibrium conditions, and economic and accounting identities (Francois et al., 1997). A secondary goal to achieve in the second step is to distinguish between variables and constant parameters when specifying the model. Furthermore, each parameter should be identified as endogenous or exogenous, depending on whether its magnitude is determined inside or outside the economy being modeled (Francois et al., 1997). For example, international prices of commodities, such agricultural goods or oil, are determined by external factors of the economy that is being modeled, and for this reason should be treated as exogenous parameters. In contrast, the exchange rate as well as the wages paid to workers in the industry, tend to depend on internal factors, and may be considered as endogenous. In practice, the process of separating between variables and parameters, and then identifying the nature of the later is critical for performing later steps—i.e., calibrating and finding the solution of the CGE model.

Below, Table 4 shows the system of equations for the CGE model that would correspond to the "1-2-3 model" used as example. In this case, the quantity of export goods is identified by E. Likewise, the quantity of domestic goods sold locally is given by D, and the quantity of imported goods from the rest of world is M.

Table 4: CGE specification for the "1-2-3 model"

Flows	Prices
$X = G\left(E, D^s, \Omega\right)$	$P^m = R \cdot pw^m$
$Q^s = F\left(M, D^d, \sigma\right)$	$P^e = R \cdot pw^e$
$Q^d = Y / P^q$	$P^x = \mathrm{g}_1\left(P^e, P^d\right)$
$E / D^s = g_2\left(P^e, P^d\right)$	$P^q = f_1\left(P^m, P^d\right)$
$M / D^d = f_2\left(P^m, P^d\right)$	$R \equiv 1$
$Y = P^x \cdot X + R \cdot B$	
Identities	**Equilibrium conditions**
$P^x \cdot \bar{X} \equiv P^e \cdot E + P^d \cdot D^s$	$D^d - D^s = 0$
$P^q \cdot Q^s \equiv P^m \cdot M + P^d \cdot D^d$	$Q^d - Q^s = 0$
$Y \equiv P^q \cdot D^d$	$pw^m \cdot M - pw^e \cdot E = B$

Endogenous variables:	
E : Export good	P^d : Domestic Price of domestic good
M : Import good	P^x : Price of aggregate output
D^s : Supply of domestic good	P^q : Price of composite good
D^d : Demand for domestic good	R : Exchange rate
Q^s : Supply of composite good	
Q^d : Demand for composite good	Exogenous variables:
Y : Total income	pw^e : World price of export good.
X : Total output	pw^m : World price of import good.
P^e : Domestic price of export good	B : Balance of trade.
P^m : Domestic price of import good	σ : Import substitution elasticity.
	Ω : Export transformation elasticity.

Source: Francois et al. (1997).

For computational simplicity, the two last items are added into a composite good, Q, which measures aggregate domestic spending or absorption level in the economy. Among the set of identities, the last one imposes the condition that in the equilibrium, Q must equal total income Y, whose amount is assumed to be fixed. Finally, Y must also be equal to the sum of total aggregated output (GDP), which is identified in this case as X, and the external trade balance quantified in domestic currency, $\left(RB\right)$. The lower part of the table lists all the endogenous and exogenous variables that are being used to specify the simpler "1-2-3 model".

After producing a mathematical specification of the CGE model, the next step is to calibrate the model. The basic procedure for calibrating a CGE model involves using real information to adjust the magnitude of its parameters. For example, the calibration of the CGE specification for the "1-2-3 model" shown in Table 4 would need a set values for the exogenous variables. In practice, diverse sources of information may be used to calibrate a CGE model. Probably the most relevant source comes from the country's Social Accounting Matrix (SAM) [54], which provides an organized display of all transferences occurring among various agents within the local economy and the rest of the world.

Finally, once the calibration is completed, the last stage is finding its solution using mathematical optimization. To that end, a CGE model must be rewritten as a programming problem that can be computed using numerical methods.

Table 5 displays the specification for the optimization problem that would correspond to the "1-2-3 model". Using this specification, a solution for it would be a set of values: M, E, D^s, and D^d, that maximizes the absorption *Q*, while satisfying all the required equilibrium conditions. These later features guarantee the theoretical and accounting consistency of the model (Gillig et al., 2002). For the "1-2-3 model" the number of conditions to satisfy are three. The first condition requires that total spending not exceed total output in the economy (technology). The second imposes the condition that imports must not exceed exports (trade balance), and finally, the last condition requires that total demand and total supply be equal (domestic supply and demand).

[54] The data required for calibrating a CGE model may come from many different sources. Some examples are: household surveys, supply-use tables, national accounts, state budgets, and balance of payments. Likewise, databases containing macroeconomic or aggregate information may be useful for calibrating the CGE model. Usually, the SAM is described in the literature as a comprehensive accounting framework following Leontief's (1951) input-output (I-O) table model.

Table 5: A CGE model as a programming problem

$\max Q = F\left(M, D^d, \sigma\right)$ (absorption)

with respect to: M, E, D^d, D^s

subject to: Relative Price:

$G\left(E, D^s, \Omega\right) \le \bar{X}$ (technology) $\lambda^x = P^x / P^q$

$pw^m \cdot M \le pw^e \cdot E + \bar{B}$ (trade balance) $\lambda^b = R / P^q$

$D^d \le D^s$ (domestic supply and demand) $\lambda^d = P^d / P^q$

Source: Francois et al. (1997).

The results of the CGE model are generally validated by comparing them against the real observed data. If the CGE model has been designed and calibrated adequately, then the values it predicts for all the economic variables should mirror the values observed in the real world. Using this factual scenario of the economy, other hypothetical scenarios may then be identified and analyzed by introducing modifications in the parameters of the CGE model. This later feature is usually regarded as an important benefit of the CGE approach (Gillig et al., 2002).

Implementing the CGE model in Tanzania. Producing a CGE model is not a linear process, and in most cases, it will require some level of trial and error during its execution. Nevertheless, the procedure for applying the CGE model approach to study savings-led microfinance in Tanzania may be divided into five stages. Respectively, these are described in Table 6.

Table 5: A CEG model for Tanzanian savings-led microfinance.

Goal.	Steps
1. Collect the necessary economic information.	**1.1. Identify a Social Accounting Matrix (SAM) for Tanzania.** The main source of data for building a CGE comes from a nation's SAM. This accounting tool shows all the financial inflows and outflows from agents participating in the economy at an aggregate level. The data contained in the SAM provides the basic structure for building a CGE model. In the case of Tanzania, the required SAM would be preferably for a recent year, i.e.- post the implementation of savings-led microfinance in Tanzania, as this would imply the amounts reflected in the SAM may be also capturing the effect of savings-led microfinance in the national economy. **1.2. Gather complementary information.** Together with the SAM, supplementary information is necessary for calibrating the parameters of the CGE model. Overall, the exact nature and sources of these data can vary considerably. Some examples of the type of data that may be used to complement the SAM include household

	surveys or databases containing macroeconomic information. To analyze savings-led microfinance effect of Tanzanian economy, an added goal for this data would be to describe origins and uses of resources by microfinance institutions located in Tanzania as close as possible to that found in the SAM.
2. Choose the design and/or theoretical framework for building the CGE model.	**2.1. Setting the scope and dimensions of the CGE model.** Based on the goals being pursued and the data that is available, the basic scope of the CGE model should be defined at this point, including the classification that will be used for: geographical regions, households, economic activities, and government. **2.2. Defining the behavior of agents.** This step involves setting the *choice problem* faced by agents, which in turn defines their overall behavior in the economy. For example, MSEs may have to choose from multiple inputs during production. Likewise, households may have to decide how much of their income they want to use for consumption and saving, and government institutions must also distribute their revenue from taxes by buying different goods and services. **2.3. Including savings-led microfinance in the model.** In parallel with the previous two objectives, in the context of Tanzania, an additional step requires deciding how savings-led microfinance will be incorporated into the CGE model. Various options may exists depending on the theoretical approach that is being used to build the model and the characteristics of the information available. Whether the case, the inclusion of savings-led microfinance into the CGE model must be done in line with the theoretical and accounting perspective.
3. Writing the CGE model as a solvable system of equations.	**3.1. Define the notation system that will be used.** This step sets the initial requirement for designing the mathematical specification of the CGE model. It involves choosing and listing the set of figures and/or symbols that will be used to represent the different objects in the CGE model. These objects include all the variables and parameters in the equations. **3.2. Specify the equations of the model.** Along defining the notation system that will be used for the model, this step requires writing the CGE model as a system of equations, including: economic and financial flows, prices, equilibrium conditions, and other economic and accounting identities. Likewise, these may also be classified into two main groups, demand and supply equations and agents' behavioral equations. **3.3. Separate exogenous and endogenous variables.** Parameters whose values are determined outside the model and requires to be calibrated should be identified and separated from other endogenous variables.
4. Calibrate the CGE model's equations.	**4.1. Set the parameters of the equations using the data available.** To calibrate the CGE model, all the parameters in the equations must be adjusted so that the model solution can replicate the baseline scenario.
5. Model application	**5.1. Programming the model**. To solve the CGE model, its system of equations must be written in terms of a mathematical optimization problem employing a modeling language. One approach to achieve this goal is coding the CGE model with a programming language such as: C, Pascal, Fortran, or Python. However, this

	approach may be also the most difficult as it requires programing an original solving algorithm. Instead, an easier alternative is to write the model in a spreadsheet like Excel and use Solver to find the solution. Likewise, another option is to write the model in a higher-level language, using a mathematical programing tool such as: SAS, GAUSS, MATLAB, or GAMS. These programs allow presenting the model in simpler algebraic terms using a consistent mathematical representation of the equations. **5.2. Replicate the baseline scenario.** This step requires finding the CGE model solution for the baseline scenario using mathematical optimization. In the case of Tanzania, the baseline scenario corresponds to the real world scenario which describes the economy, including the effect of savings-led microfinance. **5.3. Create and solve the counterfactual scenario.** The final step requires adjusting the CGE model for a hypothetical or counterfactual scenario. This scenario is produced by withdrawing the savings-led microfinance. The results from this second scenario may then be compared with those found previously for the baseline scenario. The difference between the baseline and counterfactual scenarios would be interpreted as the overall effect of savings-led microfinance on the Tanzanian economy.

Prepared by: the authors (2018)

Considering the use of a CGE model to study the macroeconomic effects of savings-led microfinance in Tanzania may mean addressing two main challenges associated with the practical application of the model. The first is the difficulty of choosing a suitable theoretical framework to incorporate savings-led microfinance. The second, is the difficulty of finding the information necessary to carry out this methodological approach for the Tanzanian economy. Regarding the first issue, the "1-2-3 model" can thus only be considered as a reference, as it lacks the ability to reflect the effects of savings-led microfinance in the economy. For this reason, an alternative framework would have to be formulated for Tanzania. Formulation of new theoretical framework may be time consuming, as it would require exploring various alternatives available in the economic theory and contrast them against available data. A suitable alternative would then be selected—the selected framework should ensure theoretical and accounting consistency without considerably compromising the computational capability of the model.

Following the example set by Raihan et al. (2017) for credits-led microfinance, one likely solution to the problem of choosing an adequate theoretical framework is incorporating savings-led microfinance as part of the Tanzanian financial sector and as a sub-sector of the larger capital market of the country. In that case, the economic behavior of savings-led microfinance institutions would be determined mainly by their ability to turn household's savings into productive investments by supplying loans to micro and small enterprises[55]. The circular flow of income and expenses that would be associated with such specific framework is depicted in Figure 2. In addition to households, business and external sectors included in the "1-2-3 model", this modified framework incorporates the government and financial sectors. Including the

[55] The authors study macroeconomic effects of credit-led microfinance in Bangladesh. Like in Raihan et al. (2017), the main hypothesis tested in Figure 2 is that only credits used for capital accumulation have a long-term impact on income and growth.

government is necessary because changes in fiscal policy (i.e. taxes and subsidies), may impact savings-led microfinance. The financial sector is essential because it provides a way for identifying financial streams related to savings and investments, a part of which must pass through savings-led microfinance institutions. Furthermore, in comparison to the simpler "1-2-3 model", the theoretical framework displayed in Figure 2 assumes that income is not necessarily fixed. Therefore, the framework also allows for transfers that may be associated with the existence of a labor/inputs market as an added layer of detail and complexity.

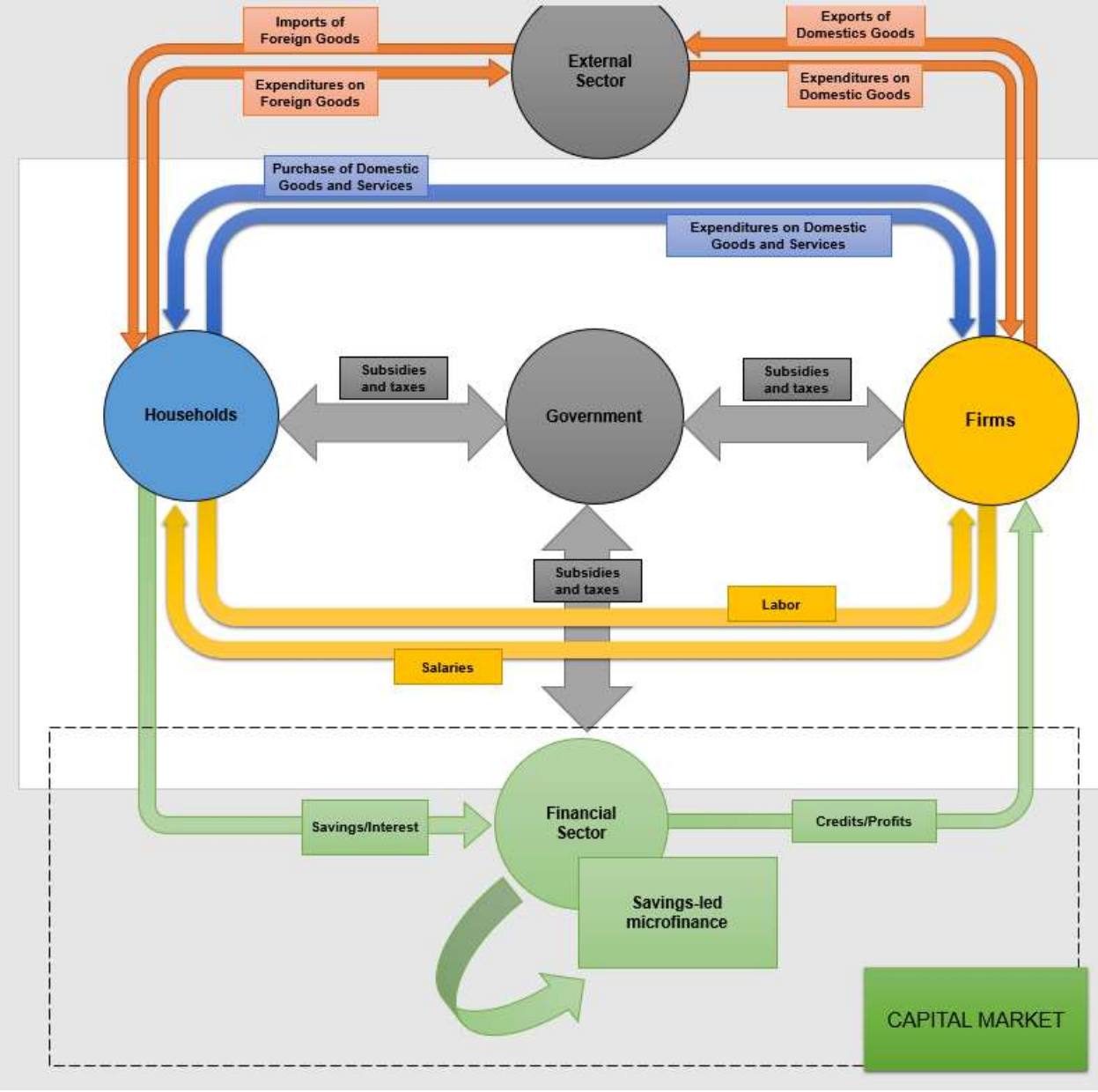

Figure 2: Circular Flow of Income and Spending for savings-led microfinance (Source: own collection).

As pointed out above, one of the challenges of implementing a CGE model is finding necessary data. The choice of a specific framework for building a CGE model may thus also depend on the availability of this data. The two primary types of data required include: a) the country's SAM, and b) all additional corresponding micro and macro-economic information to be used for calibrating the parameters of the equations contained in the model. In the case of Tanzania, one additional function for this complementary data would be describing the origins and uses of financial resources held by savings-led microfinance institutions in the country.

SAM datasets for Tanzania were produced by the International Food Policy Research Institute (IFPRI) and have been made publicly available for the years 2009 and 2015.[56]. One significant limitation of the IFPRI's SAM dataset design for Tanzania is that it does not include microfinance as a different economic activity. Consequently, savings-led microfinance must be incorporated in the model using complementary information collected from other relevant sources.

In general, the sources and nature of the data used to supplement the construction of a CGE model may vary considerably. Aggregate data as that contained in the Savings Groups Information Exchange database (savix.org) or CARE linkups reports may be useful for the calibration of the CGE model, as they provided significant information on the average behavior of the agents in the economy. Similarly, most necessary information for macroeconomic variables, such as GDP, trade balance, rate of exchange, inflation, etc., may be accessed through the Ministry of Finance and Planning of Tanzania. Therefore, the main challenge related to data would be collecting information on savings-led microfinance. This problem can partly be addressed by using data from the Tanzanian National Panel Survey (TNPS), accessed through the country's National Bureau of Statistics. The TNPS contains partial data regarding Assistance and Groups including savings-led microfinance for the year 2012-13 (5045 cases reported) and 2014-15 (3358 cases reported). Initially, these micro databases may offer an adequate base for further developing a CGE model for Tanzania. The data may provide a base from which to extrapolate the necessary information regarding origins and uses of resources by savings-led microfinance in Tanzania[57]. To attain more precision, this information can be supplemented with additional information gathered using surveys.

Model strengths and limitations. The main advantage of the CGE method comes from its ability to directly answer the question regarding the effect of savings-led microfinance on the economy. This model makes possible measuring this effect by allowing for the evaluation of a counterfactual scenario with no savings-led microfinance and its comparison with a baseline scenario. Another important benefit of the CGE model is that it can enable observing how the impact of savings-led microfinance might change under different hypothetical conditions. For example, using the CGE model, it would be relatively easy to measure the impact of policy

[56] The classification used by IFPRI is known as the Nexus structure and it main characteristic is to classify the economy using 63 production sectors, 67 commodity markets, and 15 households' classes (Randriamamonjy and Thurlow, 2017). Likewise, the Nexus structure also disaggregates capital flows into four main categories, while labor is disaggregated across rural and urban areas and into four education-based categories.

[57] The most recent version of these surveys corresponds to 2016 and can be retrieved from the microdata section of the official website of the World Bank: http://microdata.worldbank.org/index.php/home.

changes (i.e., fiscal or monetary) or the occurrence of unexpected exogenous shocks (i.e., natural disasters) on savings-led microfinance.

On the downside, one significant limitation is that the CGE model can exhibit considerable mathematical complexity and its development may involve substantial computational costs. Furthermore, in the specific case of answering the proposed question regarding the impact of savings-led microfinance on the Tanzanian economy, an additional difficulty may come from the fact that no specific CGE model for savings-led microfinance has been developed in the literature. Consequently, to achieve the proposed goal, an existing CGE model must be adjusted and then further modified to incorporate this financial sub-sector in a manner that is consistent both in theoretically and accounting terms (Gillig et al., 2002). Furthermore, application of the CGE model may be challenged by the difficulty of accessing all the information necessary for the Tanzanian economy. Specifically, the problem relates to finding enough information on the sources and uses of resources by savings-led microfinance institutions located in Tanzania.

VI. Examining potential relationships between microlevel impacts from savings-led microfinance and economic growth

Based on micro level evidence, we can reasonably assume that when sufficiently extended, saving-led microfinance will contribute to long-term economic growth and development both at the regional and national levels. As in the case of credit-led microfinance institutions, the mechanisms which savings-led microfinance can contribute to economic growth will likely be direct or indirect. Savings-led microfinance can promote initial asset accumulation and investment, thereby providing mechanisms to improve food security and human development, increase financial intermediation, and reduce financial risk. In the following sub-sections, we review some of the pathways through which savings-led microfinance can influence growth and development.

Contribution through increasing savings

Saving allows accumulation of fixed capital and helps technical innovation, which increases output and per capita income in the long-term (Jagadeesh, 2015). Historical evidence suggests that the lack of sufficient savings has been a major barrier for economic development in many countries, while sustained capital accumulation resulting from high savings is a common feature of developed economies (Jagadeesh, 2015). Despite the constraint of savings-led microfinance activities to small geographical areas, they can have important impacts on overall economic growth when added together across an entire country.

Savings-led microfinance can make saving more attractive by reducing the economic costs (Ahling et al., 2017). The imposition of compulsory saving requires participants to commit part of their income until reaching a minimum amount of loanable funds. Interest from loan repayments increases the size of the fund thus favoring quick asset accumulation and investment, since a larger pool of savings is also related to expanded access to credit (Ksoll et al., 2016). Savings-led microfinance also inspires financial-discipline habits such that participants

may continue to save even after the program facilitating micro- savings ends. In certain cases, savings-led microfinance can even become commitment devices for participants who exhibit time-inconsistent preferences or show self-control problems (Ksoll et al., 2016).

Contribution through lending and creation of SMEs

Small and Medium Enterprises (SMEs) can be a major driving force behind growth, job creation, and poverty reduction in many developing countries (Kisaka et al., 2014). However, limited access to formal financial services remains a significant constraint for SMEs (Kisaka et al., 2014), particularly for less accessible SMEs located within remoted areas. According to Sibomana et al. (2016) financial support in Africa tends to be much more concentrated around urban areas, which contributes to substantial financial challenges in rural SMEs.

In this context, savings-led microfinance may have a significant role in encouraging capital accumulation and SME growth in rural areas. The capital and interest generated from previous loans are used to raise the institution's lending capability, which in turn allows participants to take gradually larger loans to scale-up their business activities (Polain et al., 2014; Sibomana et al., 2016). Along with direct impacts on program participants, capital accumulation can encourage local economic growth and development through the generation of new jobs and poverty-reduction opportunities. Although the need to repay interest has an immediate effect of reducing participant financial profits, interest rates also function as a market mechanism to guarantee a better allocation of resources toward more profitable activities (Polain et al., 2014). Thus, unlike purely subsidized microfinance institutions, savings-led microfinance institutions would be expected to exhibit a higher proportion of its loan portfolios directed toward entrepreneurial investment instead of consumption.

Contribution through increased food security

While food security is usually presented as a derived consequence of economic growth, the opposite is also true. Countries with high poverty and poor nutritional outcomes face significant restrictions in human capital development, an attribute necessary for achieving sustainable economic growth (Torero, 2014). High levels of food insecurities can also reduce growth by causing national and regional governments to redirect a greater portion of resources from long-term investments to maintain short-term social expenditure programs. Regarding this, some studies suggest that savings-led microfinance may affect growth by improving food security in rural communities (Brunie et al., 2014). Similarly, Chowdhury (2009) suggests that if "consumption smoothing means parents can send their children to school, or buy essential medications, and maintain nutritional in-takes of their children then microfinance is likely to have positive long-term impacts on productivity" (p. 8). Besides smoothing consumption across time and protecting against shocks, savings programs can contribute to growth by allowing participants to access loans for investing in livestock, cultivating land, or producing a larger variety of products (Brunie et al., 2014).

Contribution through financial deepening

If sufficiently integrated within the financial system, microfinance can contribute to economic growth through financial deepening[58]. In this context, the main contribution of microfinance comes from its ability to broaden access to funds, which in turn can provide more opportunities for investment and profit particularly in rural and low-income communities. Savings-led microfinance may be better positioned to achieve this goal, because the demand for savings among the poor may exceed that for credit (Woller et al., 2001). The relative importance of savings to induce financial inclusion is mostly explained by the concept of risk aversion. Borrowing can be dangerous to people who face social and economic costs from defaulting on their payments. In contrast, saving can provide a potentially low-risk way to develop assets. Since credit providers tend to limit their loans to those whose financial viability can be verified, many poor people must rely on savings to start their businesses. Savings products can be used as devices to smooth consumption or to access future lump-sums of money that can pay for certain lifecycle events (Brannen, 2010).

Contribution through risk mitigation

Most savings-led microfinance programs offer simple products for insurance to their participants. The exact nature and conditions are not standard, as they are set in advance to satisfy the needs and preferences of the participants. However, these products generally involve some sort of financial protection against unexpected expenses or income fluctuations that may arise from specific events such as illness or the death of a household member (see Allen & Panetta, 2010).

In terms of their impacts on growth, one important consequence from insurance products is that they may encourage households to abandon their involvement in low risk-and less profitable activities. As households choose activities with a higher risk profile, they can also benefit from a higher expected return. Insurance products can, therefore, lead to potentially higher income and consumption levels. In the long run, this strategy can benefit the participants even when the insurance itself does not pay out (Ksoll et al., 2016).

Contribution through human capital accumulation

Human capital combines the knowledge, habits, social conduct, and personal attributes that can be used in the creation of economic value. Modern economic theory recognizes that human capital plays a significant role to promote economic growth (Goldin, 2016). Saving-led microfinance may contribute toward increasing the stock of human capital by offering additional forms of assistance, such as specific training in financial and entrepreneurial issues (Woller et al., 2001). Some studies suggest that saving-led microfinance can have a direct effect by developing better work ethics and habits among participants (Sibomana et al., 2016). Likewise, savings-led microfinance can improve levels of education because children from participating households are often more likely to go to school and stay in school longer (Brannen, 2010).

[58] Financial deepening can be defined as "the creation of a separate system of "sustainable" financial intermediation to serve clients who either are not served or are underserved by the formal financial system" (Woller et al., 2001, p. 275).

Conclusion and Recommendations

Although there is abundant evidence demonstrating the profound impacts of savings groups on participating households, no attempts have yet been made to determine whether these efforts significantly contribute to the growth of national economies, probably due to the informal and relatively small-scale nature of such interventions. Nevertheless, there is reason to believe that impacts from savings-led microfinance projects could equal or even exceed those of micro-credit programs, whose large-scale economic benefits have consistently been inferred from statistical and simulation models. As more VSLAs develop ties with formal banks, measuring their impacts will become less complex. CARE could consider measuring the macro-level impacts of VSLAs with a nationally representative study that employs either the Total Factor Productivity or the Computable General Equilibrium models, as outlined in this report.

Since only direct impacts of VSLAs on economic growth can be measured, CARE would benefit from first understanding to what extent the VSLAs (including self-managed and savings groups facilitated by other organizations) have spread in Tanzania. This can be achieved by implementing a nationally representative study to determine the proportion of adults—within a certain income category—in urban and rural areas who participate in the innovation. Such research would also help determine the proportion of highly performing groups in terms of capital formations and returns on agricultural and MSEs investments. This would be critical for determining whether savings groups can potentially contribute to the larger economy. This might be necessary especially if CARE chooses to implement the CGE model to estimate the effects of VSLAs on growth. In microfinance studies, the CGE model has largely been applied to Bangladesh's microcredit context where a significant portion of rural population has access to its services. Understanding the proportion of members with access to savings groups in Tanzania would thus help determine if the penetration rate is comparable to Bangladesh.

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