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The relationship between social capital and saving in Tanzania

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Abstract

It is generally agreed that the poor in the developing world would benefit from increased saving (Dupas & Robinson, 2013b; Karlan et al., 2017; Steinert et al., 2018), and in this paper we investigate how social capital may be an important factor connected to the savings decision in the context of Tanzania. Previous literature suggests that social capital, in the form of local social networks, can help people to commit to saving and gain financial knowledge, but also discourage saving due to confidence in that the network will help out if one ends up in unexpected financial trouble, and also through the social expectation that any excess income or resource is to be shared within the family, or network. We estimate the overall relation between saving and the quality, as well as density, of the local social network. We do this for both formal and informal types of saving. We measure savings behavior by a binomial telling if a person has saved or not in the past 12 months. The data used is from the Financial Sector Deepening Trust in Tanzania, which also gives a unique possibility to look at cognitive skills and social capital in a joint manner related to saving.

By developing a Linear Probability Model, a generally positive, but weak, link between social capital and saving is found. Since cross-sectional data is used, making causal claims is difficult. Nevertheless, based on the econometric analysis, we claim that social capital is not very important for saving. Social capital could have a modest positive effect on saving if it came along with increased skills.

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Contents

1 Introduction

It is widely agreed that the poor in the developing world would benefit from increased savings (Dupas & Robinson, 2013b; Karlan et al., 2017; Steinert et al., 2018). If the poor managed to save more they would be better prepared to handle different types of shocks and would have better possibilities to invest in their livelihoods as well as education and housing, for example. Tanzania is a typical developing country, with 49,4% of citizens living below the international poverty line of $1.9 per day (The World Bank, 2020). Larger savings among the poor could help the country and its people in their effort to reduce poverty.

For people living in absolute poverty saving may seem impossible, but in recent decades this assumption has been proven wrong. Evidence suggests that the poor may simply lack access to saving services, and also be subject to temptations and behavioral biases to an arguably larger extent than the rich (Banerjee & Mullainathan, 2010). Despite these difficulties, the poor have sophisticated strategies to put money aside (Banerjee & Duflo, 2011).

The fact that the poor often lack access to a bank account, in which they can safely put away their money and make transactions, is starting to change. Financial inclusion for the poor, i.e. participation in the formal financial system, has been identified as an important goal and building block for development (The World Bank, 2015). It is believed that the poor would benefit from being included in the formal financial system, as they then would have the possibility to receive interest for their savings, make transactions and obtain credit. Financial inclusion has been linked to both human development and economic growth (Dupas & Robinson, 2013a; Sarma & Pais, 2011). Formally deposited money can also be used more efficiently than when it is passively saved under the mattress and thus spur general growth, as the money can be lent out (Dupas & Robinson, 2013a; The World Bank, 2015).

Formal financial inclusion in Sub-Saharan Africa has accelerated during the last decade thanks to the so called Fintech revolution and the development of mobile money. Mobile money allows for depositing money at a personal mobile money account, which can be used to keep savings, but mainly to make transactions and send money to family and friends (Suri, 2017).

There are numerous barriers that hinder people from saving, such as behavioral biases, high costs or lack of access to financial services (Karlan et al., 2014). A common strategy to overcome some of the barriers to saving is to form savings groups. A savings group generally consist of 10-30 individuals coming together and agreeing on the amount and frequency of saving. Then, e.g. once a month, one of the group members receives the whole pot and the cycle is continued until every participant has received the pot once (Brown et al., 2015). Some groups have accumulating pots from where members can borrow with interest and the participants receive interest at the

end of a cycle. However, due to the risk of theft the groups can generally not accumulate funds for too long periods at a time. Participation in savings groups gives a commitment and a social pressure to contribute, which can be important to overcome the behavioral biases preventing people from saving as much as they would like to (Banerjee & Mullainathan, 2010).

Many studies have been made on the effects of savings groups on general economic outcomes, such as Karlan et al. (2017) and Steinert et al. (2018). It has been shown that apart from the possibility to save, participation in groups can be empowering, increase financial literacy and give access to a network providing knowledge and safety (Karlan et al., 2017). However, Flynn and Sumberg (2018) argue that even if the savings groups may have positive impacts on the individuals, they are not a game changer and claim that the positive effects of savings groups have probably been overestimated.

We are curious whether strong communities, i.e. high levels of social capital, can encourage saving in any form, not only in savings groups. Therefor, in this thesis, we study the relationship between social capital and saving. We also study the possibility that cognitive skills affect this relationship. This has not been done previously in a joint manner. The role of social capital for economic decision making has been investigated in multiple papers, but in a different setting than ours. Also, the social capital approach has arguably been underrepresented in the previous research on saving behavior. We will pursue our objective by trying to answer the following questions:

i. What is the general connection between social capital and saving?

ii. Is the connection between social capital and saving different for different types of saving?

iii. Is the relationship different depending on the individual's level of skill?

There is a significant amount of previous literature studying the factors that influence savings behavior. However, most of it is rather old and thus there is a need for an update of knowledge, especially in the light of the Fintech revolution. The economic environment in the developing countries has drastically changed during the 21st century. The World Bank (2020) projects that by the end of 2020 the number of unbanked adults globally has dropped from 2000 million adults in 2014 to under 400 million.

Some of the main factors that influence savings behavior, except income of course, are identified as personal time preferences, cognitive ability, financial literacy, culture and social capital (Karlan et al., 2014). We study the relationship between social capital and savings. Social capital can affect savings through two channels. Firstly through empowerment and the spread of information, which may encourage saving (Newman et al., 2014). Secondly through the

culture of sharing among family and friends, which may discourage saving. Whenever someone has excess resources they are expected to share them, which makes it difficult to accumulate wealth in order to make investments for the future (Di Falco & Bulte, 2011). There is also empirical evidence that people in a strong kin network feel confident that they will get help when lacking resources, which lowers the incentives to save (Xu & Wang, 2015). To our knowledge, there are no previous studies looking at the importance of local social networks in relation to saving in general, or comparing different types of saving, which is what we aim to do. Other literature typically study a certain type of saving or another aspect of social capital (Di Falco & Bulte, 2011; Newman et al., 2014; Okello Candiya Bongomin et al., 2018).

Skills, such as literacy or numeracy, are fundamental for the understanding of economic reasoning and decision-making that maximises long term welfare (Amu & Amu, 2012; Baidoo et al., 2018; Lusardi et al., 2011; Lusardi & Mitchell, 2011). Cognitive abilities has been found to be connected to time preferences, as cognitively stronger individuals shows to be more patient (Burks et al., 2009). Higher cognitive skills can also lower the cost of decision-making, and thus reduce impulsive decisions (Burks et al., 2009). Most literature uses either educational attainment or years of schooling as an indicator for human capital, but by using literacy and numeracy we are able to observe the actual skills that an individual possess. Arguably education gives a much wider set of skills than just reading or calculus, but the educational attainment rarely gives an exact view of the individual's cognitive capabilities (Ritchie et al., 2015). Based on this evidence it is clear that cognitive skills may be an important factor savings. Therefor it seems relevant to understand how social capital's correlation with savings can vary depending on cognitive skills.

In our study we will use the Tanzanian FinScope data, provided by the Financial Sector Deepening Trust. This data gives us the possibility to investigate social capital and saving, but also provides unique information on respondents literacy and numeracy skills. It is generally agreed that cognitive skills are important for economic decision making (Burks et al., 2009). Both cognitive skills and social capital can impact the cost of decision-making (Coleman, 1988; Shugan, 1980) and we therefore want to seize the opportunity to study the effect of social capital on savings in relation to cognitive skills.

2 Literature

In this section we will first outline previous literature on social capital and its connection to economic outcomes and decision-making. We will then go through existing research on cognitive skills and discuss how it connects to both economic decision-making and economic performance. We link these findings to our own research and use it to build a hypothesis of the relationship between social capital and saving.

2.1 Social Capital and Network Theory

Economic theory adopted the ideas about social capital rather late and its importance for economic outcome has been debated (Nagatsu, 2015). Social capital has been defined in many ways, and one common definition is made by Coleman (1988), who specifies social capital as a variety of productive entities which make it possible achieving certain outcomes that would be impossible without it. According to Coleman, social capital differs from other forms of capital by its structure. Social capital is intangible and not possessed only by a single individual, but it lies in the relations between people. Social capital can according to Coleman (1988) also be viewed as a network constituted by the different "debts", or favours, people in a network have to each other that may be called in when needed. Putnam (1992) makes a slightly different definition and claims that social capital can be understood as the social network of trust that lubricates production. The trust in a social network can be very important in order to overcome the challenges of collective action (Putnam, 1992).

Social capital also provides an efficient and cheap way to obtain information that otherwise had been costly to get (Coleman, 1988; Gine et al., 2013). For instance, if a person who is not interested in technology is going to buy a phone, she will most probably ask her technically skilled friends for advice on which phone that best suits her needs. This saves a lot time or simply increases the probability of making a good decision. However, if she has no technically skilled friends she would stand a larger cost in obtaining the information or just make a worse purchase.

Social networks can be considered as a form of social capital, and is in the focus of this paper. In theory on social capital as well as behavioral economics, peoples behavior is expected be influenced by what other people do (Ahern et al., 2014; Bertrand et al., 2000; Mugerman et al., 2014). An example applied to our case is that people are assumed to be more likely to save when more people in their community save, and vice versa. This would be an effect on economic behavior depending on the quality of the network, i.e. how many others are saving. This effect is assumed to be reinforced by the density, or tightness of the network. Thus, social capital

defined as social networks can be described by two dimensions, the density and the quality of the network (Bertrand et al., 2000; Fukuyama, 2000; Newman et al., 2014). The density is the social strength of the network, containing trust and frequency of contact and speed of information sharing. The quality of a network is the type of information and norms that are spread within the network. In our case a high quality network spreads information and norms promoting saving and knowledge about financial opportunities. The network effect is the effect of the combination of density and quality of the network.

2.2 Social Capital and Saving

The relationship between social capital and saving has been studied from various angles before, but there is no consensus on the overall effect of social capital on saving. The determinants of savings are diverse, and different components or definitions of social capital can impact the savings decision in different ways.

The connection between social networks and economic behavior has been highlighted in a number of studies (Bertrand et al., 2000; Newman et al., 2014; Okello Candiya Bongomin et al., 2018; Tabellini, 2010). For example, Newman et al. (2014) have studied how the participation in a Women's Union in rural Vietnam can affect the uptake of formal saving practices. The authors look at indicators for both the quality and density of the network, finding that quality plays an important role. Newman et al. (2014) also identify both social norms and information as ways through which a community can affect individuals' choices. Similar results have been found in research by Okello Candiya Bongomin et al. (2018), who found a connection between social networks and mobile money adaptation, and by Bertrand et al. (2000), who also use a quality density approach when estimating network effects on welfare use.

Savings groups are also an important example of how social capital can impact economic behavior. A savings group is an informal institution that builds on the relations and trust between people (Irving, 2005). An initial level of social capital is crucial for the formation of a savings group, but the groups themselves may also build up social capital through growing trust, networking and empowerment (Musinguzi, 2016). The foundation of savings groups is thus trust, reciprocity, debt and duty, and also the sharing of information and knowledge (Irving, 2005; Musinguzi, 2016), which are some of the main compounds of social capital according to the definitions above. Savings groups has been proven important for saving in developing contexts, and is an important alternative to, as well as a compliment to, formal saving (Irving, 2005; Musinguzi, 2016).

Formal saving, such as saving through a bank or a mobile money account, has arguably a

weaker connection to social capital than savings groups, which by definition give rise to social interactions. Therefore formal saving might provide less help for people to overcome their present bias and lower the cost of the saving decision (Karlan et al., 2014). Gurbuz Cuneo (2019) finds that saving with mobile money and in savings groups are complimentary, and not substitutes, suggesting that people see different benefits from using formal and informal savings methods, and that the savings group is offering something different than formal saving. Several authors come back to the fact that social capital is generated within the savings groups and people see a value in this (Gurbuz Cuneo, 2019; Irving, 2005; Musinguzi, 2016). This suggests that social capital may have a different relationship with different types of saving, which is what we want to investigate.

The social network may also in itself affect economic behavior. In a strong network people can feel confident that they will get financial support whenever they are in need, and this might lower the incentives to save for both unexpected expenses and consumption smoothing. This is the so-called "kin insurance" argument (Di Falco & Bulte, 2011). For example, Xu and Wang (2015) have studied the connection between people's general trust in their networks and attitudes toward thrift. They argue that social capital, defined as social networks, can function as a substitute to a formal social insurance, and that individuals who have a perception of higher social capital do not value thrift as much. Kimball and Shumway (2009) also argue that people who think that their children will take care of them financially when they get old, have a lower propensity to save than people who do not trust in their children's financial support.

The social norm of sharing within the extended family network, which is a strong cultural trait in many developing countries, can also make it difficult to save, since excess resources are expected to be shared (Di Falco & Bulte, 2011). These mechanisms are important as an informal system of social security, but can also be considered as a poverty trap, where the social norms provide a setting where it is more rational to share than to save, and investments remain thus low (Di Falco & Bulte, 2011). The sharing norm can also impact the incentives for people to make an effort to increase their income, since the benefits of the effort are expected to be shared (Di Falco & Bulte, 2011). This has been described as the family tax hypothesis and it produces a classical equity efficiency dilemma (Di Falco & Bulte, 2011).

According to the empirical evidence of previous literature, social capital plays an important role in individuals savings behavior. The prior research lays the foundation for our hypothesis of social capital affecting people's present biased behavior. These effects may be both positive and negative and the main mechanisms behind them are believed to be social norms of sharing or saving, the spread of information and commitment. These mechanisms will be discussed in

the theoretical model section.

2.3 Cognitive Abilities and Saving

Variation in knowledge and skills is an important explanation for the differences in people's economic behavior (Amu & Amu, 2012; Baidoo et al., 2018; Lusardi et al., 2011; Lusardi & Mitchell, 2011). We want to study if the relationship between social capital and savings behavior is different for people with different cognitive abilities.

Cognitive abilities can be defined in various ways. Some researchers define it as an individual's basic abilities in abstract logic and problem solving (Ones et al., 2010; Wilhelm & Engle, 2004). Others see cognitive abilities as a concept of mental complexity or efficiency of the brains neural processes (Osmon & Jackson, 2002). The different definitions always mirror the researcher's own viewpoints, even though ultimately everyone agrees that cognitive abilities link strongly to intelligence (Sternberg, 1997).

The origins of cognitive abilities are not completely sure and therefore there is a severe threat of reverse causality when researching the connection between cognitive abilities and economic behavior. Some researchers suggest that it is the genetics of a person that explain her cognitive abilities (Haworth et al., 2009; Oskarsson et al., 2015; Plomin & Spinath, 2002). On the other hand, a fair share of the existing literature (Blums et al., 2017; Larson et al., 2015; Yates et al., 2003) stresses the importance of other factors, such as the living environment or the socioeconomic status. Similarly, poverty is known to be affecting cognitive abilities negatively and the effects are long lasting (Dean et al., 2017; Guo, 1998; Lupien et al., 2001; Mani et al., 2013). It is widely accepted that the people in poverty may make irrational decisions not because they have lower cognitive abilities to start with, but because the poverty itself is harmful to cognition.

Cognitive abilities caused by genetic variation has been found to be a critical origin of economic reasoning and thereby savings behavior as well (Ballinger et al., 2011; Benjamin et al., 2013; Burks et al., 2009; Cronqvist & Siegel, 2015; Frederick, 2005). In a twin study, Cronqvist and Siegel (2015) find that even though the living environment affects saving behavior, genetic variation can largely explain the differences in savings behavior. Cognitive abilities seem to be connected to patience, and thereby saving. Burks et al. (2009) argue that cognitive abilities are closely connected to both patience and saving, but also general economic performance. Similar results have been found by multiple authors (Ballinger et al., 2011; Benjamin et al., 2013; Frederick, 2005).

To be able to make good financial decisions, it is important to have knowledge of the exist-

ing financial possibilities. Financial literacy has been defined as the abilities to make informed choices and to take effective decisions regarding consumption and management of money (Marcolin & Abraham, 2006; Noctor et al., 1992). During the last couple of decades there has been rising awareness of the need for increasing the financial literacy among the poor (The World Bank, 2020). Sub-Saharan Africa has seen an extensive modernization and formalization of the financial system in the last decade, but people need to have the required understanding and skills to make use of the possibilities that comes with it. Baidoo et al. (2018) argue that people with higher financial literacy understand better the relevance and importance of saving and Lusardi and Mitchell (2007) assert that financially illiterate individuals fail to make economic plans and therefore do not save. Jappelli and Padula (2013) present empirical evidence of individual's math skills, i.e. cognitive skills, having a strong positive connection to financial literacy.

In the light of the knowledge about social capital and economic decision-making, we want to investigate whether social capital may compensate for low skills. Meaning that it could help people increase their chances of saving even though they are unlikely to save due to their cognitive preposition. Based on the literature, our hypothesis is that social capital and skills are functioning as substitutes, in a sense that higher social capital can compensate for the lack of cognitive skills and therefore help low-skilled individuals to save. There may also be situations where they instead act as compliments to the savings decision, when both high skills and a strong social network are required.

3 Theoretical model

When discussing savings behavior, a commonly used model is the Hyperbolic Discounting model by Laibson (1997). The model can be used to capture and predict the mechanisms of undersaving, i.e. people saving less then they would actually like to (Basu, 2011; Cao & Werning, 2018; Laibson, 1996; Zhang, 2013).

Hyperbolic Discounting (HD) is a development of the standard utility maximization model including a behavioral dimension. The HD model includes a behavioral bias, as people are assumed to have inconsistent time preferences and overestimate their utility drawn from present consumption in relation to future consumption. The model thus includes both a normal time discounting parameter (δ) and a present bias parameter (β). As discussed earlier, poor people are generally more exposed to behavioral biases than rich people due to their circumstances (Banerjee & Mullainathan, 2010). This model captures the present bias as well as the individuals exogenous time preferences.

The intertemporal utility maximization problem consists of an intertemporal utility function and a budget constraint. The utility function is defined in equation 1.

$$U = u(c_0) + \beta \sum_{t=1}^{N} \delta^t (u(c_t)). \tag{1}$$

N is an individual's expected remaining lifespan and c_t is the consumption in time period t. People are assumed to be present biased, i.e. $0 < \beta < 1$, and discounting their future utility according to $0 < \delta < 1$. The time discount rate is considered as an exogenous parameter and purely preference based (Andreoni et al., 2019; Mischel et al., 1988). δ should be included in the function in order to make rational savings decisions. The bias on the other hand is a behavioral kink preventing people from making the rational decisions that would lead to a maximized intertemporal utility. As the individuals optimize the utility function (1) including the present-bias coefficient β, they save less than they would like to. Both β and δ will affect the individual's trade-off between consumption and saving.

The individual's utility function (1) will be maximized subject to the budget constraint defined in equation 2.

$$a_0 + E[\sum_{t=1}^{N} \frac{y_t}{(1+r)^t}] = \sum_{t=1}^{N} \frac{c_t}{(1+r)^t}. \tag{2}$$

Here y_t is the income in time period t. In order to smooth consumption people may save or

dissave/borrow. In a developing country context where people often lack collateral, and access to formal financial services, there can be reasons to assume returns to savings being lower than the cost of borrowing (Ghosh et al., 2000). Yet, for simplicity, the rate of return, r, is assumed to be a constant through time and equal for both borrowing and saving. This is a commonly used assumption in the existing literature (Dean et al., 2017; Schmidt-Hebbel et al., 1992). Furthermore, the individuals are assumed to not leave an inheritance but consume all of their income, and they might possess some initial wealth a_0.

Economic decision-making always comes with a cognitive cost, and arguably this cost is smaller the more knowledge, experience and cognitive ability a person has (Shugan, 1980; Westbrook et al., 2013). The cognitive cost of decision-making comes from considering different alternatives, which consumes mental resources (Shugan, 1980).

Question i.

In order to answer our first question, whether a general connection between social capital and saving exists, we will extend the hyperbolic discounting model presented above by specifying β as a function of social capital.

Looking at equation 1, β can be affected by an infinite amount of factors. For example, the decision-making process can be impacted if a person is hungry, scrutinized, or if the decision maker can easily assess or access information about possible outcomes of a decision (Dasgupta & Maskin, 2005; Frederick et al., 2002; Loewenstein, 2000, 1996). One can think of β as a function of many circumstantial aspects that will add a transaction cost to the saving decision, and thus make the refrain of consumption in the present relatively less costly, cognitively or socially. We will consider β a function of social capital. We assume that social capital only affect the present bias. However, we acknowledge the possibility that also time preferences can be affected by social aspects, and we will add robustness checks to handle this.

The previous literature suggest that social capital can affect the savings decision through multiple channels, some of them being a more qualitative nature and others revolving around the density, or tightness of the network. The main channels identified as qualitative are social norms of saving, the spread of information increasing financial literacy and prospects of improved future income or living conditions. Whereas trust, commitment and kin insurance mechanisms are considered to be connected to the density of the network. The density of the network is expected to reinforce the effects of the qualitative aspects.

By defining social capital by the two dimensions of a social network, density (d) and quality (q), we can then define β as a function of those variables. This is stated formally in equation 3.

$$\beta(d, q) \in (0, 1] \tag{3}$$

The total effect of social capital on the bias will depend on the combination of density and the quality of the network. A high density low quality network may even have adverse effects on savings. It can for example promote spontaneous spending or non-thrift norms and it can also spread distrust in financial institutions which will make people hesitate to put their money there (Fukuyama, 2000; Iyer & Puri, 2012). A high quality network may on the other hand spread trust, financial knowledge, and norms promoting sound saving behavior (Grootaert, 1999). Social capital can also provide help with overcoming self control problems, for example through savings groups participation, where social commitment and social collateral are important aspects (Karlan et al., 2014). Hence, we hypothesize that a high quality dense network will be positively connected to saving and thus indicating a smaller bias. A low quality and dense network would then be negatively associated with saving.

$$\frac{\partial \beta}{\partial q} > 0 \tag{4}$$

Equation 4 states that β will always depend positively on the quality of the network. However, when it comes to density, the relationship will depend on the quality. In a high quality network, β will have a positive connection to density, and in a low quality network, the relationship is expected to be negative. The relationship can be described as if beta is depending negatively on d alone, but positively on the interaction between d and q. Equations 5 and 6 formalize this connection.

$$\frac{\partial \beta}{\partial d} < 0 \tag{5}$$

$$\frac{\partial \beta^2}{\partial d \partial q} > 0 \tag{6}$$

Thus, the overall effect of social capital on savings on the utility maximization side will depend on the combination of quality and density of the social network.

The saving decision will not only be depended on time preferences, but also on present and expected future income, $E[y_t]$. Income will vary over time and in order to smooth consumption people will save or borrow depending on their current income, in accordance with equation 2. The variation in income depends on the livelihood of the household as well as exogenous shocks,

such as natural catastrophes, illness or general economic trends. These income shocks can also be positive. We assume that people with a more dense social network stand a greater chance to get economic help from other community members when facing a negative income shock. Similarly, people with more social capital are assumed to, in a larger extent, use their savings to help others within the community if a negative shock occurs. These social dynamics decrease the variation in y_t and thus both the incentives and possibilities to save can be negatively affected (Di Falco & Bulte, 2011; Xu & Wang, 2015). This would add an extra dimension to the relationship between density of the social network and saving, where density also correlates negatively to saving through its effect on the budget constraint.

The model contains both a negative and a positive relationship between social capital and saving. The aggregate sign of the relationship will be decided by the dominating side. Our hypothesis is that the quality of the network will have a generally positive correlation to savings through its relationship to β explained above. The density of the network alone will be negatively correlated to saving through its relationship to β for the low quality networks and its connection to $E[y_t]$. The interaction of density and quality is expected to be positively correlated to saving. Therefore the aggregate relationship between social capital and saving is expected to be negative for low quality networks and positive for high quality networks.

> First hypothesis: Quality has a positive connection to saving, density has a negative connection to saving and their interaction has a positive connection to saving.

Question ii.

To further understand the connection between social capital and saving, we look at different types of saving separately.

Previous literature (Flynn & Sumberg, 2018; Karlan et al., 2014) suggests that saving in savings groups have a different social nature than formal saving. Being part of a savings group comes with a social commitment and group belonging, whereas saving formally or at home, does not have to involve social interactions almost at all. Savings groups are in themselves a form of social capital, and a place where social capital is regenerated, meaning that social capital is inseparable from participating in savings groups (Gurbuz Cuneo, 2019; Irving, 2005; Musinguzi, 2016). The formal ways of saving, mainly through mobile money or regular bank accounts, can on the other hand be argued to have a less social nature. Formal saving does not require strong interpersonal relationships to many people, only a connection between the individual and the formal financial institution (Musinguzi, 2016). Thus it would be easy to assume that the connection between social capital and saving with savings groups is different from the connection

between social capital and saving through a savings account or with mobile money.

The most common way of saving informally in our data is just keeping cash at home. Saving under the mattress is presumably also a less social type of saving than saving in savings groups. There are also next to none thresholds regarding information and knowledge on how to start saving at home. One can even think that access to more information and trust would lead to people saving less at home and more at financial institutions.

We are thus interested in whether social capital has a different relationship to savings depending on what type of saving is examined. Based on the reasoning above, our hypothesis is that social capital has a stronger relationship with saving in savings groups than with other types of saving. Mathematically the hypothesis is defined as

$$\frac{\partial\, save\_SG}{\partial sc} > \frac{\partial\, \text{save\_other}}{\partial sc} \tag{7}$$

Where *save_SG* stands for the probability of saving in a savings group and *save_other* is the probability of saving in another way, such as in formal financial institutions or at home. *sc* stands for social capital, that is a combination of density and quality of the network.

> Second hypothesis: Social capital is more strongly connected to saving in savings groups than other types of saving.

Question iii.

In order to answer our third question we will further develop our model by including cognitive skills.

We believe that cognitive skills will have a positive relationship to saving, since previous literature has showed that high skilled individuals are more likely to both have a higher degree of financial literacy and be more patient, both in the sense of discounting the future less, but also in the sense of making more rational decisions in the present (Burks et al., 2009). The mere seeking of financial information also seems to be positively correlated to cognitive skills (Burks et al., 2009; Meier & Sprenger, 2013). These findings suggest that high skilled individuals will have an ability to find information and make good economic decisions independent of their network, even though the network can still have a positive impact on savings for these individuals. On the other hand, low skilled individuals may benefit more from having an access to a high quality network where information and knowledge is shared, and where they can get economic advice from higher skilled individuals. We believe that both social capital and cognitive skills can lower the cost of making rational economic decisions.

In accordance with Burks et al. (2009), we assume that skills impact both β and δ. However, we are interested in the present bias and will thus only discuss the effects of skills on β. The cognitive skills will impact β partly through the fact that cognitively stronger individuals need to use less cognitive resources to evaluate different alternatives and make rational decisions. Higher skilled individuals are also more likely to posses important financial information. Therefore, the high skilled individuals have a lower transaction costs in making the saving decision. This transaction cost can also be affected by a good network, i.e. high social capital, where people can turn to their network for advice and information. Social networks and cognitive skills may hence work as substitutes to decrease the cost of the saving decision.

This means that the connection between social capital and saving could be dependent on cognitive skills. We believe that a low skilled individual benefits more from increased social capital than an individual with higher skills. Therefore, an increase in social capital is assumed to affect β more when the level of skill is lower.

We define β as a function of social capital and skill, $\beta(sc, skill) \in (0:1]$. If the two are substitutes, the cross derivative is going to be negative, as in equation 10. We here assume that the overall relationship between social capital and saving is positive, as stated in equations 8 and 9. This would mean that the relative impact of an increase in social capital is smaller if skills are higher.

$$\frac{\partial \beta}{\partial sc} > 0 \tag{8}$$

$$\frac{\partial \beta}{\partial skill} > 0 \tag{9}$$

$$\frac{\partial \beta^2}{\partial sc \, \partial skill} < 0 \tag{10}$$

Our model predicts that low skilled individuals will benefit relatively more from social capital than a high skilled individuals when it comes to saving. Social capital can thereby compensate for a lack of skills, and social networks can help people to save although they do not have a very powerful set of skills.

It is reasonable to believe that just as social capital, skills might correlate to different types of saving differently. Therefore, the interaction of skills and social capital might have a varying relationship to saving for different types of saving. In the context of savings groups, the idea of substitution between skill and social capital is reasonable. A high skilled person may save just as much regardless of participating in a group or not, but a low skilled person's saving may be dependent on the group and the benefits it provides.

When we instead think about saving at a bank account, the barriers can be much higher. Both a high degree of cognitive skills and a strong high quality social network might be required to take the step of opening a bank account (Karlan et al., 2014). Having only a high level of social capital may not be enough, some level of skill can also be required. In this setting, skills and social capital may act as compliments rather than substitutes. Therefore, our hypothesis is that skills and social capital act as compliments when formal saving is examined. For these cases the second derivative in equation 10 would be positive. If social capital and skills are found to be complements, a possible explanation could also be that the high skilled individuals can utilize their network more efficiently due to their higher cognitive abilities.

Third hypothesis: The relationship between social capital and saving is in general weaker for high skilled individuals. Aside from formal saving, where social capital and skills are reinforcing each other and the connection between social capital and saving is stronger for high skilled individuals.

4 Data

This paper relies on the FinScope data set provided by the Tanzanian Financial Sector Deepening Trust (FSDT). FSDT is an organization working towards better financial inclusion in Tanzania. FinScope is a national survey gathering a large set of data on households' financial conditions. It primarily includes information on the financial services that households use and have access to. The survey is conducted every three years and in our analysis we use the 2017 data, which is the latest available. The survey does not have a panel structure and the questions asked vary slightly between years. Earlier waves of FinScope do not comprise all of the key variables that we need for our research, such as calculus skills and social network assessment and therefore preceding years are not included in our sample.

In addition to the FinScope data, FSDT also provides more specific data on financial access in Tanzania. We use FSDT's regional Financial Access data to measure the average access to formal financial services such as banks or mobile money agent. The region level data includes the share of population living within 5km of a bank branch, mobile money agent or other financial access point. We use the financial access data to control for the accessibility of formal financial services. This data was gathered in 2013-2014, and we can expect more financial access points to exist in 2017.

To control for the economic development of the geographical areas, we use geocoded nighttime light data that is collected by the US Air Force Weather Agency and provided by NOAA's National Geophysical Data Center. Geocoding and data publishing is a work of Goodman et al. We use the 2017 mean of observed nighttime light, which is measured by the Visible Infrared Imaging Radiometer Suite (VIIRS). The light is measured on a ward level and linked to each respondent based on the ward that they are living in. Nighttime light has been found to be a rather good proxy for economic activity (Doll et al., 2006; Mellander et al., 2015).

The FinScope data from FSDT has been previously used in several studies. Mori (2019) uses the data for evaluating determinants of savings behavior in Tanzania. She finds that gender, marital status, education and financial literacy are important factors explaining savings. Lotto (2020b) bases his research of financial literacy determinants on the FinScope data. He notices that there is a large gender gap in financial literacy amongst Tanzanians. Men, younger people and educated high income earners are more likely to have stronger financial knowledge. In his further studies, Lotto (2020a) investigates the link between financial literacy and household's investment choices. Again, he uses the FinScope data set to estimate the relationship. The main finding of the study is that the more financially literate a household becomes, the more likely it is to move from informal groups to formal saving (Lotto, 2020a). In addition to the

work of Lotto and Mori, multiple other authors have been using FSDT's FinScope data. For example, Kibona (2020) study the pension uptake in Tanzania and (Ndanshau & Njau, 2021) use the data to examine the demand side determinants of financial inclusion.

The FinScope data set from 2017 includes 9459 respondents, all from different households, and therefore gives us a large enough sample to do a statistically credible analysis. However, the sample is not nationally representative without weighting the observations, since the survey has consciously over-sampled some regions. Oversampling was done in five regions to get more information for purposes of district level analysis. For simplicity weights are not used in our estimations, but since we control for district fixed effects, as will be discussed further below, our results should not be biased due to the skewed sampling distribution. Definitions of our variables of interest and control variables are shown in table 1.

Table 1: Variables

Variables of interest	
Dependent	
Saver	1 if the respondent has saved or put money aside in the past 12 months, otherwise 0.
Explanatory	
Quality	Mean of *Saver* among respondents in the same ward, excluding the household i.
Density	The strength of the community network the respondent is part of.
$Numeracy$	Number of calculus questions answered correctly.
Literacy	Combined results in reading and writing questions in both Swahili and English.
Skill	The arithmetic average of numeracy and literacy.
Control variables	
Age	Age of the respondent.
*Age*2	Age of the respondent squared.
$Female$	1 if household head is female, otherwise 0.
Educ	Education level of the respondent.
NTL	The average measured nighttime light by ward in 2017.
$PPIScore$	The Poverty Probability Index of the household.
N_adults	Number of adults over 16 years old in the household.
$FinAccess$	% of the region's population living within 5km from a financial access point.
$Farmers$	1 if the household's main income source is farming activities, otherwise 0.

We have defined social capital in terms of two variables, which are *Density* and *Quality*. Both can be quite difficult to identify, and previous scholars such as Bertrand et al. (2000)

and Newman et al. (2014) have struggled with finding the right measure. Since *Density* is supposed to reflect the trust, and tightness, or frequency of interactions within a community, we have chosen to identify *Density* based on questions about the respondent's community. In the FinScope survey people are asked whether they expect to receive help from the community if in need, if people in the community have a strong sense of involvement and if people feel they can rely on each other. Based on the answers, we create an index taking values between zero and five. This index will thus capture some very important features which describe the density of the network. Exact details of the construction of the variable can be found in Appendix 1. The quality of a social network is defined by the norms, skills and information spread within the network. Therefor the share of people saving money within the respondents geographical area can be identified as a quality measure, similar to Bertrand et al. (2000) and Newman et al. (2014). *Quality* is thus defined as the share of respondents reporting that they have saved in the past 12 moths, living in the same ward as the respondent in question. The variable *Skill* is defined as the mean of the two variables, *Literacy* and *Numeracy*, which are summarizing the answers to survey questions testing literacy and numeracy. The value of *Literacy* is based on the number of correct answers the respondent gave when asked to read and write, in Kiswahili and English. *Numeracy* is defined as the number of correct answers given to four calculus questions. We have standardized the two variables to range between 0 and 2. Exact questions and calculations are stated in Appendix 1.

We also use a number of control variables including age and age squared, gender, educational attainment, nighttime light in the respondent's ward, Poverty Probability Index, number of adults in the household, access to formal financial services and being a farmer. We also include dummy variables for each of the 171 districts, which is done to control for district specific effects. For example, there may exist local cultural variation or NGOs acting on a local level promoting saving. Table 2 includes the mean value, standard deviation as well as the minimum and maximum value for each variable.

The average respondent can be characterized by a few key variables. The mean of *Saver* is 0.46, meaning that 46% of the respondents have saved in the past 12 months. The average respondent is a 38 year old female, who has completed primary education. The average household consists of two adults and has a Poverty Probability Index (PPI) of 35.

The PPI score is used as a wealth and income indicator and the score corresponds to a table value indicating the probability of the household living below a certain poverty line. A PPI score of 35 indicates that the household has a 47% probability to live below the poverty line, i.e. living on less than 1.90$ per person a day, and a 85% probability to live on less than 3.10$

per person a day. The score is calculated based on a number of survey questions about the living standards of the household. The survey includes questions such as which material the respondent's home's roof is made of and how many of the respondent's children are in school. The Poverty Probability Index is used as a proxy variable for income, as the FinScope survey does not include data on income. Another control that is used for economic development and possibilities is the nighttime light data.

The specification of the dependent variable *Saver* is altered when we look specifically at different types of saving. Table 2 shows the mean value and standard deviation for each type of saving that will be analysed. *Saver_SG* counts those who save in a savings group, *Saver_formal* counts respondents saving formally, i.e. in a bank account, mobile money, through other less common financial assets or pension funds. *Saver_home* counts people who save money at home. Respondents may use multiple ways of saving and the categories are therefore overlapping.

Table 2: Summary Statistics

	mean	median	sd	min	max
Saver	.459	0	.498	0	1
Density	3.90	4	1.16	0	5
Quality	.459	.44	.220	0	1
Skill	.978	1	.694	0	2
Numeracy	1.03	1	.812	0	2
Literacy	.928	1	.725	0	2
Age	38.2	35	16.2	16	100
Female	.565	1	.495	0	1
Educ	3.05	3	1.55	1	7
NTL	1.58	.52	3.4	.32	41
PPI Score	35.2	31	15.8	2	79
N_adults	2.32	2	1.22	1	12
Farmers	.438	0	.496	0	1
Observations	9300				
Save_SG	.082	0	.274	0	1
Save_formal	.189	0	.391	0	1
Save_home	.213	0	.409	0	1
Observations	9409				

Figure 1 shows that saving is on average more likely to occur when the respondent has a higher skills. For graphical reasons, we have defined the threshold for being high skilled here as having *skill* equal to or higher than 1.5. It also seems that having a more dense social network is correlated to a higher likelihood of being a saver.

Figure 2 presents the share of respondents that have a bank account, participate in a savings group or use mobile money. Only 11% of the respondents are banked, 16% are participating in a savings group and more than a half of the sample, 55 %, is using mobile money. Mobile money is thus by far the most common financial service used.

There are many ways to save and the most common ones are presented in figure 3. Both figure 2 and 3 have overlapping participation, such that the same person can be counted both for using mobile money and saving in a savings group, for example. The difference between the staples in figure 2 and 3 captures the fact that a person can have a service, but has not necessarily used it for saving in the past 12 months. The most common types of saving are keeping cash at home and saving with mobile money. Saving through buying assets is defined as having purchased some type of physical asset for purposes of saving. Family/Friend means that the respondent keeps her saved money with a friend or a family member.

Figure 1: Saving, social capital and skills

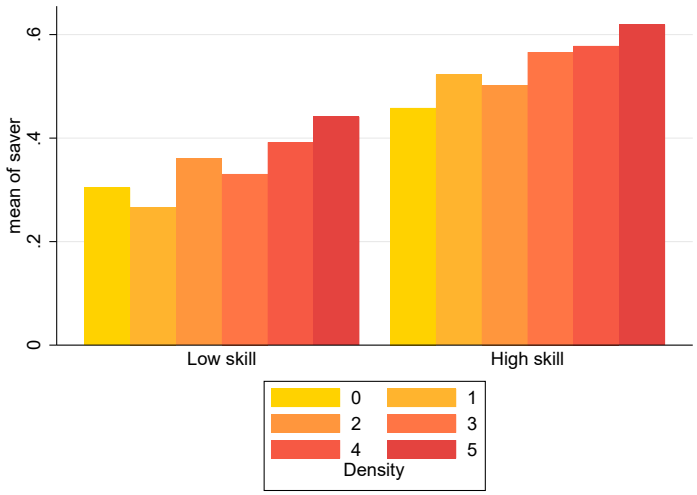


Figure 2: Bank account, mobile money and savings groups

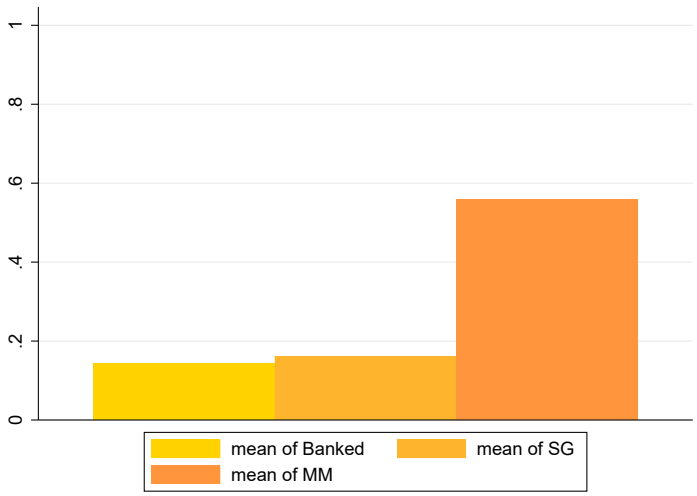
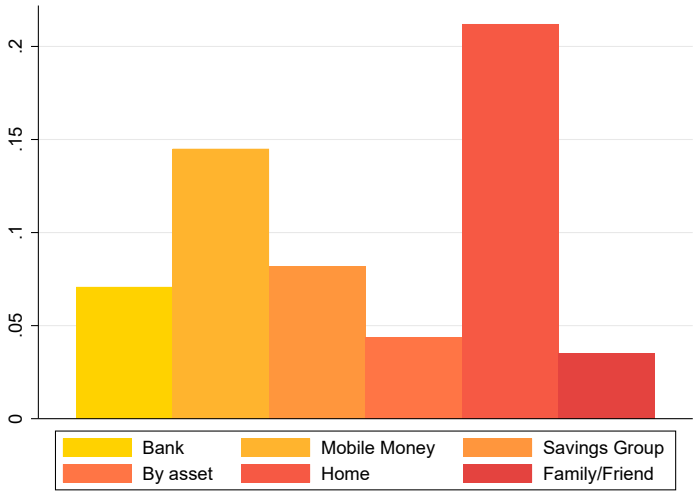


Figure 3: The most common types of saving



5 Empirical Approach

Question i.

In order to test the connection between social capital and saving, we estimate a linear probability model (LPM). Our dependent variable, *saver*, is a dummy variable indicating if a person has saved in the past 12 months. Social capital is defined as a combination of two variables, *Density* and *Quality*, which have been presented previously.

We start by estimating a simple model where *saver* is a linear combination of the two social capital variables and a set of control variables, X. The model is stated in equation 11 and is called Model 1. X includes the set of control variables presented in the data section above as well as district dummies. Throughout our empirical estimation, we cluster standard errors by ward. This decision is made because the residuals are likely to correlate with the individual's place of residence. There are 956 wards represented in our sample, with on average 10 observations per ward.

$$saver_i = \alpha + \gamma_0\, density_i + \gamma_1\, quality_i + \beta\, X_i \tag{11}$$

We expect both γ_0 and γ_1 to be positive. However, there is a reason to believe that the density of a network have a different relationship with saving depending on the quality of the network. As Newman et al. (2014) suggest, a low quality but dense network may affect savings negatively. Therefore we define a second model where we include an interaction term between *density* and *quality*. We call this Model 2 and it is defined in equation 12.

$$saver_i = \alpha + \gamma_0\, density_i + \gamma_1\, quality_i + \gamma_2\, (density \times quality_i) + \beta\, X_i \tag{12}$$

According to our hypothesis, γ_2 will be positive and γ_0 will have a negative sign. This can be interpreted as the density of the community having a negative connection to saving if the quality of the network is low. Correspondingly, the relationship is assumed to be positive if the quality is high.

Question ii.

To see how the connection between social capital and different types of saving looks like, we re-estimate Model 1 and 2 with alternative versions of the dependent variable *saver*. We use three different specifications, saving in savings group ($save\_SG$), saving formally ($save\_formal$) and saving at home ($save\_home$). All of these variables are described in detail in the data section.

By looking at different types of saving separately, we can see whether the connection between social capital and saving is different for different types of saving.

We expect to find a weaker link between social capital and formal saving, as well as saving at home, and a stronger connection between social capital and savings groups.

Question iii.

In order to investigate if the connection between social capital and saving varies for different levels of skill, we extend Model 1 and 2 with a skill variable. *Skill* is a continuous variable based on math and literacy performance, as explained in the data section above. The extended models are presented in equations 13 and 14. They are called Model 3 and 4.

$$saver_i = \alpha + \gamma_0\, density_i + \gamma_1\, quality_i + \gamma_2\, skill_i + \beta\, X_i \tag{13}$$

$$saver_i = \alpha + \gamma_0\, density_i + \gamma_1\, quality_i + \gamma_2\, skill_i + \gamma_3\,(density_i \times skill_i) + \gamma_4\,(quality_i \times skill_i) + \beta\, X_i \tag{14}$$

We expect *skill* to have an overall positive correlation with saving. However, to be able to capture if skill can work as a substitute to social capital, as we hypothesize, we add interaction terms between *density* and *skill* as well as between *quality* and *skill* to Model 3. This is defined in equation 14 and called Model 4. The interaction terms capture our hypothesises of social capital having a stronger connection to savings if the respondent has a low level of skill. If an interaction effect is found estimating model 1 and 2, this hypothesis can be tested for a triple interaction model. A regression with a triple interaction term between *density*, *quality* and *skill* is included in Appendix.

We estimate Model 3 and 4 for the three alternative dependent variables, $save\_SG$, $save\_formal$ and $save\_home$. In accordance with our theoretical model, we believe that the signs of γ_3 and γ_4 will be different depending on the type of saving. For formal saving, we expect γ_3 and/or γ_4 to be positive and thus indicate *skill* and social capital being compliments.

Robustness of the results

Based on our data and econometric method we are not be able to claim causality when discussing our results, mainly because of the concerns about endogeneity. Cross-sectional data does not give the opportunity to control for unobservable variables, which makes causality impossible to claim. With a OLS analysis, it is neither possible to determine the direction of the connections,

thus we cannot say if it is skills affecting savings or savings affecting skills and the results should only be considered as correlations. However, we can use evidence from previous studies supporting causal relationships to motivate possible causality in our results.

We may have omitted variable bias affecting the estimation of the empirical models and making the estimates biased. There are for example individual characteristics which we cannot observe, such as ambition, attitude towards thrift and income. There are also locally determined circumstances that we cannot observe. These omitted factors could affect both the density or the quality of the local social network and the likelihood of saving. The inclusion of control variables and district level dummies is limiting the possible bias. Nevertheless, there is still a number of factors being left out of the analysis, that may drive omitted variable bias.

We can estimate the this possible threat of coefficient stability, due to omitted variable bias, with an Oster Bound approach created by Oster (2019). The principle of Oster bounds is to look at the same regression both with and without control variables and then see how the fit of the model changes. Thereby, it is possible to tell how much variation there is left for the unobservable variables to explain. We calculate the Oster Bounds for both *density* and *quality* in Model 1 and 2. They are calculated with the standard assumption $\delta = 1$, meaning that our unobserved and observed variables are equally related to saving. Due to this assumption, we can compress the boundaries into a single number reflecting the robustness of our results. The β values tell us how much the density and quality coefficients would change if the unobservables would explain the savings behavior as much as the observable variables do. According to Oster (2019), one can reject the hypothesis of serious omitted variable bias, if the interval between *beta* and the estimated coefficient does not include zero.

We have defined social capital as a combination of two variables, density and quality of the local social network. The measure of density is based on a set of questions in the FinScope survey, and our research builds on the assumption that we can identify the network's density based on the answers to these questions. The questions asked can however capture other things than only the density of the network, such as qualitative aspects. This may bias the estimates which would then lead to wrong interpretations of the results. Since we are including quality in the model as well, we do not consider this a very large problem, but when it comes to estimating the interaction effect of quality and density it may cause problems. Presumably we are going to underestimate the interaction effect, since the density variable is not only measuring density but also quality to some degree.

Regarding the quality variable, it may suffer from endogeneity bias and the reflection problem. As the quality variable is locally defined, we cannot distinguish if the individuals behavior

is similar because they copy each other or if it is because they are facing similar local circumstances. By controlling for local effects through the district level dummies, we can get a hint on the magnitude of this problem, but the local fixed effects may as well be reflecting the local network effects. To further explore this issue we employ a multilevel model.

In the OLS approach we have chosen to control for local fixed effects by including district level dummies. An alternative approach to modelling hierarchical data is to use a multilevel mixed effects model. The difference between including districts as a level in a multilevel model and including them as fixed effects in an LPM model is that the group effect is estimated simultaneously with the independent variables in the LPM model, whereas in the multilevel model the fixed effects part is estimated before the variance components part. A multilevel model does not eliminate the reflection problem with the quality variable, but it is going to work as a robustness check, telling us something about the sign and magnitude of the problem

There might also be district level differences that impacting the the size of the effect of our predictors. Especially *density* may have a different relationship to saving in different places, due to local factors. In some regions savings groups might be a source of social capital and the density of the social network can then be closely connected to saving behavior. In some other region people might have a strong sense of community but this does not have to be directly connected to savings behavior. For example, differences in local cultural practices and differences in local NGO activity could be variables that would impact this relationship on a local level.

We thus undertake a multilevel analysis and develop a three level linear mixed-effects model and use it to estimate a version of Model 1, stated in equations 15 - 18. We add a regional level assuming that the individuals, i, are clustered in districts, j , which are then clustered in regions, k. In this model we allow for random intercepts at the district level and at the regional level, and allow for the coefficient for density γ_1 to vary between districts.

$$saver_{ijk} = \gamma_{0jk} + \gamma_{1j}\, density_{ijk} + \gamma_2\, quality_{ijk} + \beta\, X_{ijk} + e_{ijk} \tag{15}$$

$$\gamma_{0jk} = \gamma_{0k} + u_{0j} \tag{16}$$

$$\gamma_{0k} = \gamma_0 + u_{0k} \tag{17}$$

$$\gamma_{1j} = \gamma_1 + u_{ij} \tag{18}$$

Regardless of the possible threats for the robustness of our results, it can be argued that the research setting is interesting and relevant. Even if the relationship between social capital and saving is not found causal, identifying the connection helps designing public policies that aim to boost savings.

6 Results & Discussion

In this section we highlight and discuss our empirical estimations. We start by going through the main findings and connecting them to our hypothesises. We then discuss the possible explanations and interpretations of the results in relation to the theory and previous literature.

Question i.

In the first question we try to answer whether there is a general connection between social capital an saving. The regression outputs for Model 1 and 2 are presented in Table 3, with *saver* as the dependent variable. The first column shows the regression without control variables, which are added in the second column. In the third column district dummies are added and in the fourth column an interaction term between the two parts of social capital is also added.

Looking at the results from Model 1 when all controls are included, we find that *density* has a statistically significant positive connection to the likelihood of an individual having saved during the past 12 months. This suggests that density of the social network has a positive relationship to saving in general, and the negative effects of a dense network are thus outweighed by the positive. However, the connection between *quality* and *saver* is somewhat ambiguous. The first two columns of Table 3 show a statistically significant positive link between *quality* and saving with coefficients for density of 0.039 and 0.031, and for quality 0.469 and 0.402. When adding district dummies, we lose the statistical significance of *quality* and the coefficient drops drastically to 0.061. This is probably due to the reflection problem discussed earlier in the empirical approach section.

Table 3 shows no statistical significance for the interaction term between *density* and *quality*. Our hypothesis was that the interaction effect would be positive and that *density* would have a negative relationship to saving in low quality networks. We find no evidence supporting this hypothesis.

As a robustness check for Model 1 and 2 we run the same regressions but using a probit model and the results can be found in Appendix in Table 6. The probit model provides consistent results regarding both sign and statistical significance of all coefficients. Since the results are consistent with the LPM approach, we stick with the LPM throughout our analysis.

To further test the robustness, we estimate Oster Bounds for Model 1 and 2. The estimated bias adjustments for the coefficients for *density* and *quality* are reported as Beta1 and Beta2 in Table 3. The reported values tell the size of the bias if the unobserved characteristics would explain all of the variation in our dependent variable, i.e. saving. Beta1 coefficients for *density*, -0.194 for Model 1 and -25.33 for Model 2, tell the possible change in the estimates. We can

see that Model 1 is more robust than Model 2. In both cases, the possible bias for *density* is notably smaller than the possible bias of *quality*.

We also report the Oster Bound estimates for relative degree of selection, which are given by Delta1 and Delta2 in Table 3. The reported values tell how much of the variation in *saver* that would have to be explained by the unobservables in relation to the observable variables, in order for them to drive the estimated coefficients down to zero. Reported Delta1 values for *density* are 0 for Model 1 and 0.011 for Model 2. Same values for *quality* are 0.013 and -0.001 respectively. Based on the Oster Bound estimates we can tell that both Model 1 and Model 2 would suffer from large omitted variable bias if a large share of the variation is explained by the unobservables.

Table 3: Model 1 and 2 Regression Results

	Model 1 Saver	Model 1 Saver	Model 1 Saver	Model 2 Saver
Density	0.039***	0.031***	0.026***	0.015
	(0.004)	(0.004)	(0.005)	(0.010)
Quality	0.469***	0.402***	0.061	-0.032
	(0.024)	(0.026)	(0.038)	(0.085)
Density × Quality				0.024
				(0.020)
Age		0.012***	0.012***	0.012***
		(0.002)	(0.002)	(0.002)
Age2 ÷ 100		-0.014***	-0.014***	-0.014***
		(0.002)	(0.002)	(0.002)
Female		-0.062***	-0.056***	-0.059***
		(0.010)	(0.011)	(0.011)
Educ		0.032***	0.037***	0.037***
		(0.004)	(0.004)	(0.004)
NTL ÷ 100		-0.428***	-0.103	-0.099
		(0.113)	(0.225)	(0.226)
PPIScore ÷ 100		0.456***	0.595***	0.596***
		(0.041)	(0.046)	(0.046)
N_adults		-0.038***	-0.042***	-0.042***
		(0.004)	(0.005)	(0.005)
FinAccess ÷ 100		0.039	-0.574*	-0.569*
		(0.026)	(0.285)	(0.283)
Farmers		0.076***	0.067***	0.067***
		(0.010)	(0.011)	(0.011)
District dummies	No	No	Yes	Yes
Constant	0.093***	-0.233***	-0.098	-0.058
	(0.019)	(0.041)	(0.085)	(0.091)
Beta1 Density			-0.194	-25.33
Beta2 Quality			-6.806	-110.9
Delta1 Density			0	0.011
Delta2 Quality			0.013	-0.001
N	9409	9300	9300	9300
adj. R^2	0.053	0.108	0.132	0.132

Standard errors are clustered by ward and given in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Question ii.

In our second question we look whether the connection between social capital and saving is different for different types of saving. Our hypothesis is that social capital has a positive connection to saving in general and a stronger connection to savings groups than to other types of saving.

Table 4 shows the estimates for Model 1 and 2 with the alternative dependent variables. The

first two columns show the results already presented in the Table 3. The third and fourth column have saving through savings group participation as the dependent variable. Saving formally is the dependent variable in the fifth and sixth column. Lastly, the seventh and eight column have saving at home as the dependent variable. We cannot tell whether the estimates are statistically different from each other, but the differences in sizes of the coefficients can give us indications of the relationships between social capital and different types of saving.

The results in Table 4 suggest that *density* is mainly important when it comes to saving in savings groups. Thus, the general positive relationship between *density* and *saver*, with a coefficient of 0.026, can to a large extent be explained by the strong connection between *density* and *save_SG*, where we estimate a coefficient of 0.017. Saving at home also has a positive and statistically significant relationship with *density*, with a coefficient of 0.08, when estimating Model 1. These findings support our hypothesis that the connection between social capital and saving in savings groups should be stronger than other types of saving. It seems that social capital is not highly important for saving in general. Just as previously, *quality* is not statistically significantly connected to saving in any of the specifications.

When looking at Model 2 in Table 4, just like before, we find no statistically significant interaction effect between the two parts of social capital. Therefore, we find no evidence supporting our hypothesis of quality and density being complements and having an interactive connection on the likelihood of saving.

As discussed when presenting the empirical approach, the quality variable may suffer from a reflection problem, meaning that the local fixed effects cannot be separated from the effects of the quality of the local network. As a robustness control we estimate a multilevel model where region and district is added as levels with random intercepts. We also take the opportunity to test if *density* can have a different relationship with saving depending on the geographical region. We do this by allowing the coefficient for *density* to vary between districts in the multilevel model. The results for saving in general show a large and significant coefficient for *quality* of 0.217, in contrast to the LPM model which give a small and non statistically significant coefficient of 0.061. The full results can be found in Appendix. Our interpretation is that the district dummies in the LPM are capturing some of the effect of quality. This means that the true coefficient for quality should exist somewhere in between the ones obtained in the LPM and multilevel model. There are some regional differences in the estimated relationship between *density* and *saver*. The relationship is generally positive but may also be negative in some cases, indicating that density could have an overall both negative and positive connection to saving, depending on the properties of the social network. For local networks with few savers and a strong kin insurance

culture, it is feasible to think that density has an overall negative connection to saving. And in communities with savings groups, higher human capital, and a lot of savers it is likely that the relationship between density and saving is positive. To be able to make stronger conclusions on this issue this should be addressed in future research.

Table 4: Model 1 and 2 Regression Results

Model	(1) Saver	(2) Saver	(1) Save_SG	(2) Save_SG	(1) Save_formal	(2) Save_formal	(1) Save_home	(2) Save_home
Density	0.026***	0.015	0.017***	0.013**	0.005	-0.002	0.008*	0.003
	(0.005)	(0.010)	(0.002)	(0.005)	(0.003)	(0.007)	(0.004)	(0.008)
Quality	0.061	-0.032	0.027	-0.008	0.045	-0.019	0.004	-0.042
	(0.038)	(0.085)	(0.017)	(0.045)	(0.024)	(0.059)	(0.028)	(0.073)
Density × Quality		0.024		0.009		0.017		0.012
		(0.020)		(0.011)		(0.015)		(0.017)
Age	0.012***	0.012***	0.009***	0.009***	0.007***	0.007***	0.000	0.000
	(0.002)	(0.002)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Age2 ÷ 100	-0.014***	-0.014***	-0.009***	-0.009***	-0.008***	-0.008***	-0.001	-0.001
	(0.002)	(0.002)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Female	-0.060***	-0.059***	0.055***	0.055***	-0.079***	-0.079***	0.003	0.003
	(0.011)	(0.011)	(0.006)	(0.006)	(0.008)	(0.008)	(0.009)	(0.009)
Educ	0.037***	0.037***	0.008***	0.008***	0.057***	0.057***	-0.012***	-0.012***
	(0.004)	(0.004)	(0.002)	(0.002)	(0.003)	(0.003)	(0.003)	(0.003)
NTL ÷ 100	-0.103	-0.099	-0.302	-0.301	-0.050	-0.047	0.314	0.316
	(0.225)	(0.226)	(0.166)	(0.166)	(0.219)	(0.220)	(0.177)	(0.177)
PPIScore ÷ 100	0.595***	0.596***	0.127***	0.127***	0.654***	0.655***	0.069	0.070
	(0.046)	(0.046)	(0.028)	(0.028)	(0.040)	(0.040)	(0.038)	(0.038)
N_adults	-0.042***	-0.042***	-0.006*	-0.006*	-0.045***	-0.045***	-0.013**	-0.013**
	(0.005)	(0.005)	(0.003)	(0.003)	(0.004)	(0.004)	(0.004)	(0.004)
FinAccess ÷ 100	-0.574*	-0.569*	0.238	0.240	-0.266	-0.262	-0.541*	-0.538*
	(0.285)	(0.283)	(0.207)	(0.206)	(0.157)	(0.157)	(0.228)	(0.228)
Farmers	0.067***	0.067***	0.002	0.002	-0.029***	-0.029***	0.053***	0.053***
	(0.011)	(0.011)	(0.006)	(0.006)	(0.008)	(0.008)	(0.010)	(0.010)
District dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Constant	-0.098	-0.058	-0.372***	-0.357***	-0.220***	-0.192**	0.282***	0.302***
	(0.080)	(0.091)	(0.050)	(0.051)	(0.061)	(0.064)	(0.067)	(0.073)
N	9300	9300	9300	9300	9300	9300	9300	9300
adj. R^2	0.132	0.132	0.060	0.060	0.227	0.227	0.059	0.058

Standard errors are clustered by ward and given in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Question iii.

The third question of ours is whether the relationship between social capital and saving is depending on the cognitive skills of an individual.

In Table 5, the variable *skill* is added to regressions and the primary focus is on the possible interaction between social capital and *skill*. We find as expected, a statistically significant positive link between skill and saving. Skills have a larger coefficient when estimating formal saving than informal, which suggest that literacy and numeracy are more important factors for saving formally, i.e. saving through a bank or a mobile money account.

Our hypothesis was that the interaction between *skill* and the social capital variables would be negative. If this was the case, skills and social capital could work as substitutes when it comes to saving. Looking at the estimated coefficients for the interaction terms in Table 5, we find no statistically significant negative relationships that would support this hypothesis.

As Table 5 shows, formal saving is positively associated with the combination of skill and *quality*. The interaction coefficient is positive and strongly statistically significant in Model 4 for formal saving. This suggests that skills and social capital are functioning as compliments rather than substitutes in the case of formal saving.

Table 5: Model 3 and 4 Regression Results

Model	(3) Saver	(4) Saver	(3) Save_SG	(4) Save_SG	(3) Save_Formal	(4) Save_Formal	(3) Save_home	(4) Save_home
Density	0.024*** (0.005)	0.033*** (0.007)	0.016*** (0.002)	0.013*** (0.003)	0.003 (0.003)	0.004 (0.004)	0.008* (0.004)	0.015* (0.006)
Quality	0.065 (0.038)	0.029 (0.050)	0.029 (0.017)	0.006 (0.022)	0.048* (0.024)	-0.080** (0.030)	0.005 (0.030)	0.051 (0.040)
Skill	0.078*** (0.01)	0.102*** (0.029)	0.050*** (0.006)	0.026 (0.015)	0.071*** (0.009)	0.013 (0.022)	0.010 (0.009)	0.062* (0.025)
Density × Skill		-0.011 (0.006)		0.003 (0.003)		-0.001 (0.005)		-0.008 (0.005)
Quality × Skill		0.036 (0.035)		0.024 (0.018)		0.132*** (0.028)		-0.048 (0.028)
Age	0.011*** (0.002)	0.011*** (0.002)	0.008*** (0.001)	0.008*** (0.001)	0.006*** (0.001)	0.006*** (0.001)	-0.000 (0.001)	-0.000 (0.001)
Age2 ÷ 100	-0.013*** (0.002)	-0.013*** (0.002)	-0.009*** (0.001)	-0.009*** (0.001)	-0.007*** (0.001)	-0.007*** (0.001)	-0.001 (0.001)	-0.001 (0.001)
Female	-0.044*** (0.010)	-0.044*** (0.010)	0.065*** (0.006)	0.065*** (0.006)	-0.065*** (0.009)	-0.065*** (0.009)	0.005 (0.009)	0.005 (0.009)
Educ	0.017*** (0.005)	0.017*** (0.005)	-0.005 (0.003)	-0.005 (0.003)	0.040*** (0.004)	0.038*** (0.004)	-0.014*** (0.004)	-0.014*** (0.004)
NTL ÷ 100	-0.070 (0.229)	-0.078 (0.225)	-0.281 (0.163)	-0.278 (0.162)	-0.020 (0.222)	-0.018 (0.214)	0.318 (0.177)	0.311 (0.179)
PPIScore ÷ 100	0.542*** (0.047)	0.539*** (0.047)	0.092*** (0.028)	0.092*** (0.028)	0.605*** (0.040)	0.603*** (0.040)	0.063 (0.039)	0.062 (0.039)
N_adults	-0.041*** (0.005)	-0.041*** (0.005)	-0.005* (0.003)	-0.005* (0.003)	-0.044*** (0.004)	-0.043*** (0.004)	-0.013** (0.004)	-0.013** (0.004)
FinAccess ÷ 100	-0.669* (0.278)	-0.672* (0.283)	0.177 (0.200)	0.189 (0.199)	-0.352* (0.155)	-0.311 (0.167)	-0.553* (0.227)	-0.578* (0.225)
Farmers	0.066*** (0.011)	0.066*** (0.011)	0.001 (0.006)	0.001 (0.006)	-0.03*** (0.008)	-0.031*** (0.008)	0.053*** (0.010)	0.053*** (0.010)
District dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Constant	-0.044 (0.082)	-0.068 (0.086)	-0.338*** (0.050)	-0.319*** (0.051)	-0.171** (0.057)	-0.134* (0.061)	0.289*** (0.068)	0.249*** (0.069)
N	9300	9300	9300	9300	9300	9300	9300	9300
adj. R^2	0.137	0.137	0.067	0.067	0.234	0.236	0.059	0.059

Standard errors are clustered by ward and given in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Mechanisms

When connecting the empirical results to our theoretical model, we have assumed the relations between social capital and saving to be mainly results of differences in the present bias. The correlations between skills and saving are however, expected to be a result of differences in both

time preferences and present bias. Based on the empirical estimation presented above we cannot conclude whether the relationships between social capital, skills and savings are explained by differences in time preferences or by differences in the present bias. Previous literature propose that time preferences can be assumed to be exogenous to social capital, but cognitive abilities affecting both time preferences and present bias (Beckmann & Mare, 2017; Benjamin et al., 2013; Burks et al., 2009; Frederick et al., 2002; Galiani et al., 2020).

To be able to tell anything about the distinction between the connection to time preferences and present bias, i.e. δ and β, we identify a proxy variable for time preferences, *patience*. This variable will be added as a control to model 3. Our measure is not perfect, but if *patience* is positively correlated with saving, it is interpreted as capturing some degree of time preferences. The direction of the possible change in coefficients for the variables of interest tells us if they are connected to time preferences, and how. In the FinScope survey, the respondents are asked how they are planning to meet their needs when they are old and cannot work. We define people as impatient, if they have not though about how to support themselves when they get old, or if they do not have a plan. 76% of the respondents are classified as patient. Webster and Jackson (1997) argue that individuals with low patience also have a lower ability to make plans for the future.

If the changes are small when *patience* is added as a control it will be hard to interpret the impact of time preferences on our results. Therefore we also estimate Model 3 with *patience* as the dependent variable. This approach gives us a possibility to evaluate how our variables of interest are connected to time preferences.

The regression outputs can be found in Appendix in Table 9. When adding *patience* to Model 3 we find *patience* having a positive and statistically significant relationship to saving. However, the coefficients of the other independent variables do not drastically change when *patience* is added to the model. When looking directly on the relationship between patience and the social capital variables, we find that the social capital variables do not have a great explanatory power for patience. Density has a positive and statistically significant, but extremely small coefficient. Quality is not statistically significant. We can therefore argue that neither the density nor the quality of the social network are affecting personal time preferences, i.e. *delta* in our theoretical model. Therefore, if people are hyperbolic discounters, it can be argued that the observed correlations between saving and social capital are a result of a decreased present bias.

However, skills seem to have a stronger and a more statistically significant connection to patience, with an estimated coefficient 0.038. This finding is in line with previous literature, as cognitive abilities have been found to be affecting time preferences (Benjamin et al., 2013;

Burks et al., 2009; Frederick et al., 2002). The findings presented earlier regarding the relationship between skills and saving might thus be explained by skills being connected to both time preferences and present bias. The link found between social capital and patience may on the other hand be explained by differences in the present bias.

Discussion

Generally the connection between social capital, defined as local social networks, and the likelihood of saving money is found to be rather weak, and few of our hypothesises are supported by the econometric analysis. In this section, we interpret the results in the light of our theoretical model and previous literature.

We find no evidence of the effect of density depending on the quality of the network, and thus no evidence for our hypothesis that density and quality would be operating as compliments. This is slightly surprising when connecting it to earlier literature, such as Bertrand et al. (2000) and Newman et al. (2014), who find the combination of quality and density being important for economic behavior. A possible explanation is that our measure of density also captures some qualitative aspects. When adding density and quality individually to the regression, we see that the coefficient for density diminishes when quality is added. The two variables have a correlation coefficient of 0.056. This indicates that our definition of density is not perfectly separable from the quality of the network, which is not surprising. Nevertheless, it is possible that dense social networks have a dominating positive connection to savings behavior. To fully understand this relationship, further research is needed, preferably with panel data.

The density of the local social network is found to be positively associated with saving when examining saving in general. However, most of this relationship can be explained by the strong link between saving in savings groups and the density of the network. The strong relationship between saving in savings groups and network density could in turn be explained by the inseparability of social capital and savings groups, thus, this connection is to be considered as endogenous. The lack of connection to formal saving and the very weak connection to saving at home, respectively, could be explained by them being less social forms of saving and not depending on people's co-operation and social interaction like savings groups. This finding is in line with our hypothesis that social capital will be stronger connected to more social types of saving.

The magnitude of the connection between quality of the social network and saving remains unclear, but it is most likely a positive relation. The liner probability model's results are conflicting with the result of the multilevel model, showing either a very small and non-significant

connection or a very large and highly significant relationship. There seem to be variation in saving which is explained by some unobservables connected to local properties, which we cannot control for. To better understand this relationship, further research is needed. When looking at the differences in coefficients for the different types of saving, in both in the LPM model and the multilevel model, it appears that quality is strongest connected to formal saving. Yet, this can be only an extension of the problems with the quality variable. Wealthier people are more likely to save formally and live in the same districts as other high income earners. This phenomenon is then reflected in the quality coefficient.

Connecting to the previous literature, there are ambiguous arguments for the effects social capital has on saving, which is probably due to the complexity of social capital (Di Falco & Bulte, 2011; Kimball & Shumway, 2009; Newman et al., 2014; Okello Candiya Bongomin et al., 2018; Xu & Wang, 2015). We find no evidence of a negative relationship between dense social networks and saving behavior, as some scholars have (Di Falco & Bulte, 2011; Xu & Wang, 2015). Based on our results we argue that the positive effects of a strong network on saving are dominating in the studied context. This could look different in another country and context.

The connection between social capital and saving is not found to be depending on cognitive skills. Thus, no evidence is found supporting the hypothesis of skills and social capital being substitutes in the saving decision. Nevertheless, looking only at formal saving, we find that the the interaction of quality and skill is positively correlated with the likelihood of being a saver. Skill and quality seem to be compliments when it comes to formal saving. We believe this is due to the fact that saving formally poses a higher threshold, and requires more resources to get started with (Banerjee & Duflo, 2011; Karlan et al., 2014). The threshold to enter the formal financial system is something that is already addressed in policy in Tanzania, and these results shows the importance of continuing the work of lowering the barriers to formal saving. One policy implication to draw from our results is to continue focusing on improving literacy and numeracy among the population to improve their prospects of participating in the formal financial system.

Based on our results, it is yet impossible to say whether the difference in savings comes from differences in personal time preferences or differences in present bias. By adding a proxy variable for patience, we find evidence suggesting that social capital is not predominantly connected to time preferences, which suggests that social capital is instead connected to the present bias. Whereas skills can be connected to both time preferences and present bias. Assuming that people are hyperbolic discounters, the correlations found for formal saving and saving at home, can be argued to be a product of decreased present bias. The relationship between the interaction

of skills and quality and formal saving could be the result of an effect on both time preferences and social capital.

The results above are merely based on cross sectional data which makes causal claims difficult and all results discussed here should be interpreted with this in mind. As discussed throughout the paper, there are endogeneity problems and a possible omitted variable bias, which make interpretation more difficult. Further research is needed to establish causal relationships. However, the study of correlations can provide insightful information that can help to build better future research and hopefully better financial opportunities for the people in Sub-Saharan Africa.

7 Conclusion

This thesis aims to evaluate the relationship between social capital and savings behavior. Based on our quantitative econometric analysis, it can be concluded that social capital is positively associated with saving. We analyze two parts of social capital, the density and the quality of the local social network. Density is found to be positively connected to saving, while the relationship between quality and saving remains unclear but presumably positive. The results show that the density of the local social network is mainly linked to saving in savings groups, weakly linked to saving at home, and not linked to formal types of saving. It is also found that the quality of the social network and skills are acting as complements when it comes to formal saving. Thus, a combination of high skills and a high quality network is linked to a substantially higher probability of saving formally.

Our rather weak results show that social capital is hard to study in a general fashion and more precise methods would be needed for stronger claims. The main conclusion of the study is that social capital is generally not strongly correlated with saving, and other factors such as skills, income and livelihood are arguably much more important predictors. Social capital is yet closely connected to saving in savings groups, which remains an important saving method in Tanzania and many other developing countries. There does not seem to be a spillover effect to other types of saving. Social capital's connection to savings groups still is something that should be acknowledged, as it can have other social and economic benefits beyond the scope of this study.

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A Appendix

A.1 Variable Construction

One of our main variables of interest is the density of an individual's social network. The variable ranges from 0 to 5 and is based on the five questions in section E12 in the FinScope 2017 survey. People are asked on which of the following statements they agree with. The statements are:

E12.1 You have people in the community that you can turn to for help if you need to.

E12.2 You would rather turn to strangers than people in the community if you need financial help.

E12.3 People in your community have a strong sense of involvement in the community.

E12.4 People in your community rely on each other for support.

E12.5 There is a strong tendency in your community where you live to form groups.

The density of the respondent's social network is then a arithmetic sum of number of the statements agreed with. With exception of the second question, *You would rather turn to strangers than people in the community if you need financial help*, which higher the density score by one if disagreed with.

Both numeracy and literacy are constructed on a similar basis and are based on the FinScope survey's section K. The skill variable is just an arithmetic average of numeracy and literacy. Literacy can take on the values $0, 1, 2$, based on whether the respondent could read a text and write an answer in Kiswahili, English, or in both. The literacy value is the number of languages that the respondent could both read and write.

Numeracy is ranged between 0 and 2 and can take values 0, 0.5, 1, 1.5 and 2. The respondents were asked four calculus questions and the numeracy value is the number of questions answered correctly. The amount of correct answers is divided by two by to match the scale of the literacy variable. The questions asked in the K2 section of FinScope are

K2.1 A person spent TSH 13,000 to buy food one day but only TSH 8,000 the next day. How much did they spend to buy food over the two days?

K2.2 A person has TSH 50,000 in cash and spends TSH 13,000 on food and TSH 8,000 on clothing. How much money do they have remaining?

K2.3 20 people each won a prize of TSH 35,000. What was the total amount of money received by the 20 people?

K2.4 A prize of TSH 180,000 is shared equally between six people. How much will each person receive?

A.2 Tables

Table 6: Robustness check with Probit

	Model 1	Probit 1	Model 1	Probit 1	Model 2	Probit 2
Density	0.039***	0.102***	0.026***	0.074***	0.015	0.049
	(0.004)	(0.012)	(0.005)	(0.013)	(0.01)	(0.031)
Quality	0.469***	1.227***	0.061	0.173	-0.032	-0.033
	(0.024)	(0.068)	(0.038)	(0.106)	(0.085)	(0.259)
Density × Quality					0.024	0.053
					(0.02)	(0.061)
Age			0.012***	0.037***	0.012***	0.037***
			(0.002)	(0.005)	(0.002)	(0.005)
Age2 ÷ 100			-0.014***	-0.044***	-0.014***	-0.044***
			(0.002)	(0.005)	(0.002)	(0.005)
Female			-0.06***	-0.169***	-0.059***	-0.168***
			(0.011)	(0.030)	(0.011)	(0.030)
Educ			0.037***	0.105***	0.037***	0.105***
			(0.004)	(0.012)	(0.004)	(0.012)
NTL ÷ 100			-0.103	-0.274	-0.099	-0.267
			(0.225)	(0.622)	(0.226)	(0.624)
PPIScore ÷ 100			0.595***	1.700***	0.596***	1.700***
			(0.046)	(0.135)	(0.046)	(0.135)
N_adults			-0.042***	-0.119***	-0.042***	-0.119***
			(0.005)	(0.014)	(0.005)	(0.014)
FinAccess ÷ 100			-0.574*	-1.950	-0.569*	-1.940
			(0.285)	(1.030)	(0.283)	(1.03)
Farmers			0.067***	0.191***	0.067***	0.191***
			(0.011)	(0.032)	(0.011)	(0.032)
District dummies	No	No	Yes	Yes	Yes	Yes
Constant	0.093***	-1.070***	-0.098	-1.698***	-0.058	-1.607***
	(0.019)	(0.056)	(0.085)	(0.283)	(0.091)	(0.305)
N	9409	9409	9300	9300	9300	9300
adj. R^2	0.053		0.132		0.132	

Standard errors are clustered by ward and given in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 7: Mixed-Effects Model

	Saver	Save_SG	Save_formal	Save_home
Density	0.027***	0.020***	0.005	0.008
	(0.007)	(0.003)	(0.003)	(0.005)
Quality	0.217***	0.056***	0.097***	0.079*
	(0.041)	(0.014)	(0.021)	(0.037)
Age	0.012***	0.009***	0.007***	0.000
	(0.002)	(0.001)	(0.001)	(0.002)
Age2 ÷ 100	-0.014***	-0.009***	-0.008***	-0.002
	(0.002)	(0.001)	(0.001)	(0.002)
Female	-0.060***	0.055***	-0.081***	0.003
	(0.010)	(0.007)	(0.009)	(0.008)
Educ	0.035***	0.008**	0.056***	-0.012**
	(0.004)	(0.003)	(0.003)	(0.004)
NTL ÷ 100	-0.278**	-0.322*	0.128	0.181
	(0.094)	(0.164)	(0.293)	(0.170)
PPIScore ÷ 100	0.529***	0.114***	0.675***	0.025
	(0.042)	(0.030)	(0.044)	(0.042)
N_adults	-0.040***	-0.006*	-0.047***	-0.011**
	(0.004)	(0.003)	(0.004)	(0.004)
FinAccess ÷ 100	0.066	0.026	-0.010	-0.036
	(0.101)	(0.033)	(0.070)	(0.046)
Farmers	0.070***	0.004	-0.033***	0.054***
	(0.016)	(0.006)	(0.009)	(0.013)
Constant	-0.192***	-0.286***	-0.251***	0.196***
	(0.050)	(0.030)	(0.036)	(0.045)
Region: SD(Constant)	0.077	0.022	0.045	0.049
	(0.012)	(0.006)	(0.010)	(0.014)
District: SD(Constant)	0.155	0.038	0.040	0.076
	(0.028)	(0.011)	(0.036)	(0.038)
District: SD(Density)	0.038	0.018	0.009	0.022
	(0.008)	(0.003)	(0.011)	(0.009)
N	9300	9300	9300	9300

Standard errors are clustered by ward and given in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 8: Model 3 and 5 Regression Results with triple interaction

	Saver	Saver	Save_SG	Save_SG	Save_formal	Save_formal	Save_home	Save_home
Density	0.024***	0.025	0.016***	0.004	0.003	0.003	0.008*	0.009
	(0.005)	(0.015)	(0.002)	(0.006)	(0.003)	(0.008)	(0.004)	(0.013)
Quality	0.065	-0.045	0.029	-0.069	0.048*	-0.086	0.005	-0.005
	(0.038)	(0.126)	(0.017)	(0.052)	(0.024)	(0.064)	(0.028)	(0.109)
Skill	0.078***	0.112	0.050***	0.00	0.071***	0.025	0.010	0.070
	(0.010)	(0.06)	(0.006)	(0.025)	(0.009)	(0.043)	(0.009)	(0.050)
Density × Quality		0.020		0.020		0.002		0.015
		(0.031)		(0.014)		(0.017)		(0.027)
Density × Skill		-0.010		0.010		-0.004		-0.009
		(0.014)		(0.006)		(0.011)		(0.011)
Quality × Skill		0.019		0.081		0.109		-0.060
		(0.112)		(0.052)		(0.086)		(0.088)
Density × Quality × Skill		0.003		-0.015		0.006		0.002
		(0.028)		(0.013)		(0.022)		(0.022)
Age	0.011***	0.011***	0.008***	0.008***	0.006***	0.006***	-0.000	-0.000
	(0.002)	(0.002)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Age2 ÷ 100	-0.013***	-0.013***	-0.009***	-0.009***	-0.007***	-0.007***	-0.001	-0.001
	(0.002)	(0.002)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Female	-0.044***	-0.044***	0.065***	0.065***	-0.065***	-0.065***	0.005	0.005
	(0.010)	(0.010)	(0.006)	(0.006)	(0.008)	(0.008)	(0.009)	(0.009)
Educ	0.017***	0.017***	-0.005	-0.005	0.039***	0.038***	-0.014***	-0.014***
	(0.005)	(0.005)	(0.003)	(0.003)	(0.004)	(0.004)	(0.004)	(0.004)
NTL ÷ 100	-0.070	-0.074	-0.281	-0.280	-0.020	-0.016	0.318	0.314
	(0.229)	(0.226)	(0.163)	(0.163)	(0.222)	(0.214)	(0.177)	(0.179)
PPIScore ÷ 100	0.542***	0.540***	0.092***	0.092***	0.605***	0.603***	0.063	0.063
	(0.047)	(0.047)	(0.028)	(0.028)	(0.040)	(0.040)	(0.039)	(0.039)
N_adults	-0.041***	-0.041***	-0.005*	-0.005*	-0.044***	-0.043***	-0.013**	-0.013**
	(0.005)	(0.005)	(0.003)	(0.003)	(0.004)	(0.004)	(0.004)	(0.004)
FinAccess ÷ 100	-0.669*	-0.669*	0.177	0.195	-0.352*	-0.312	-0.553*	-0.576*
	(0.278)	(0.280)	(0.200)	(0.197)	(0.155)	(0.168)	(0.227)	(0.225)
Farmers	0.066***	0.066***	0.002	0.001	-0.030***	-0.031***	0.053***	0.053***
	(0.011)	(0.011)	(0.006)	(0.006)	(0.008)	(0.008)	(0.010)	(0.010)
District Dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Constant	-0.044	-0.038	-0.338***	-0.288***	-0.171**	-0.132*	0.289***	0.272***
	(0.082)	(0.099)	(0.050)	(0.053)	(0.057)	(0.065)	(0.068)	(0.081)
N	9300	9300	9300	9300	9300	9300	9300	9300
adj. R^2	0.137	0.137	0.067	0.067	0.234	0.236	0.059	0.059

Standard errors are clustered by ward and given in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 9: Patience

	Saver	Patient
Density	0.023***	0.009*
	(0.005)	(0.004)
Quality	0.064	0.015
	(0.040)	(0.029)
Skill	0.075***	0.038***
	(0.011)	(0.010)
Patient	0.068***	
	(0.014)	
Age	0.024***	0.011***
	(0.003)	(0.003)
Age2 ÷ 100	-0.031***	-0.010*
	(0.004)	(0.004)
Female	-0.046***	-0.060***
	(0.012)	(0.010)
Educ	0.016**	0.010*
	(0.005)	(0.005)
NTL ÷ 100	0.091	-0.256
	(0.263)	(0.213)
PPIScore ÷ 100	0.529***	0.143***
	(0.051)	(0.042)
N_adults	-0.039***	-0.003
	(0.005)	(0.005)
FinAccess ÷ 100	-0.607	1.360***
	(0.332)	(0.334)
Farmers	0.058***	0.060***
	(0.012)	(0.011)
District Dummies	Yes	Yes
Constant	-0.302**	-0.098
	(0.094)	(0.117)
N	7816	7816
adj. R^2	0.135	0.108

Standard errors are clustered by ward and given in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$