Bridging the Gap between Formal and Informal Finance

Determinants of saving in India

by

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Financial inclusion, defined as access and usage of formal financial services, has several positive micro and macro-level socio-economic implications. Due to decades of vigorous policies aiming at lowering barriers to formal finance, 80 percent of Indians now own a bank account. However, there is a significant gap between account take up and usage. One reason for low usage rate is persistent informal saving. The purpose of this thesis is to shed more light on what affects propensity to save formally and informally via different saving vehicles, namely bank accounts, gold, social networks and self-help groups (SHGs). By using a series of multivariate logistic regression models, this thesis analysed a comprehensive and recent household dataset from India. The main findings are: 1) women and men are as likely to save, but they have different saving preferences, 2) social networks play an important role in sustaining informal finance, 3) financial literacy does not have a statistically significant impact on savings, and 4) some financial inclusion policies have a negative effect on propensity to save formally. Since different saving vehicles carry multiple purposes, it might be difficult to fully substitute informal saving. For instance, the risk sharing and the social capital function of saving via social networks or the cultural dimensions of women owning gold cannot directly be substituted by formal finance. Our recommendation is to shift the focus to demand-side financial inclusion policies with special focus on women and economically vulnerable groups.

Keywords: financial inclusion, propensity to save, informal finance, development, gender

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1 Introduction

For years, financial inclusion has been one of the key development agendas for governments, NGOs and international development organizations. Technological development, i.e. emergence of smart phones, growing telephone networks and new fintech products have accelerated the debate around financial inclusion. Microcredit has been dominating financial inclusion research and policymaking. However, microcredit has also received negative attention among academics (Duflo et al., 2013) and media. The pessimism towards microcredit has turned the attention to saving and how to lower the barriers to save formally. Many governments, including the Indian government, have done a great deal in order to increase access to formal bank accounts. Despite the positive developments in increasing outreach, a persistent gap remains between take up and active usage of the bank accounts. Several studies are researching the effects of a cost interventions to account take up and usage (Dupas et al., 2012; Prina, 2015) and others are investigating the cultural, cognitive and socio-economic reasons leading to under-saving and informal saving (Karlan et al. 2014; Goedecke et al., 2017 Fernandez et al., 2014). However, there is a research gap for a country-level empiric research on determinants of saving behaviour. Where randomized control trials (RCTs) and other experiments (Dupas et al., 2012; Prina, 2015; Duflo et al., 2013) are providing us valuable understanding of effects of a policy intervention, the results lack external validity as they cannot be generalized for a whole country. Furthermore, most of the studies are limiting the population of the study to e.g. rural poor. The population of this study is all individuals who are currently saving and have a possibility to use an account.

The aim of this thesis is to shed light on informal saving and provide policy suggestions that can increase financial inclusion. The purpose of this thesis is to investigate why people continue to save via informal vehicles even though they have access to bank accounts. By using a comprehensive and recent household data set, the thesis was testing several hypotheses on savings, namely how gender, receiving of remittances, belonging to a financial inclusion program 'PMJDY' and financial literacy effects likelihood to save formally and informally. The intent was to separately examine what increases the likelihood to save via different saving vehicles: i.e. bank account, self-help group (SHG), gold or social networks. A better understanding of the reasons to continue saving informally regardless of access to affordable banking services will provide valuable information for policymakers and financial providers to develop better and more suitable policies and financial products.

1.1 Background

1.1.1 Financial inclusion

Financial inclusion has gained both positive and negative attention among researchers and policymakers for few decades now. It is argued that providing poor with formal facilities to save, receive credit, make transfers and take up insurances formally can have significant

positive micro and macro-level implications: financial inclusion can empower woman (Doess et al. 2017; Ashraf et al., 2010) increase entrepreneurship (Dupas and Robinson, 2013a), cushion financial shocks and increase productive investments (Deaton, 1990; Prina, 2015; Dupas and Robinson, 2013b). It can also reduce income inequality (Beck, Demirguc-Kunt and Levine, 2004), enhance economic growth (Lenka and Sharma, 2017) and lower household debt in long-term (Kast and Pomeranz, 2014). Hence, it is no surprise that international development organizations like the World Bank or the UN, and local governments are promoting financial inclusion programs around the developing and emerging world.

However, not everyone is as optimistic about financial inclusion. Especially microcredit is criticized by many researchers and public media. It is proven unable to meet the promised socio-economic goals (Duflo et al., 2013). Ear-marked subsidized microcredit programs have found to be benefitting the well-off and well-connected instead of the poor (Sinha, 2000; Tsai, 2013). Furthermore, there are concerns about privacy and risk of fraud related to mobile money (The Economist, 2020) and debt burden resulting from recklessly lending microfinance institutes (MFIs), which has been linked to other socio-economic problems, such as the infamous wave of debt related suicides among poor farmers in central India (BBC, 2010)

The unrealized socio-economic outcomes and fear of over-indebtedness of the poor has shifted the attention from microcredit to 'microsavings'. The poor do save, but are often using informal saving vehicles, which tend to be costlier, less safe and not as functional as formal savings accounts (Karlan et al., 2014). The macroeconomic implications of savings are undeniable. Economic theory includes savings/capital accumulation and investments as the key variables in economic growth (Solow, 1956). Therefore, if savings are accumulated as gold instead of liquidity in banks, many of the potential productive investments may end up being unrealized. The micro-level implications on the other hand are similar to those attributed to microcredit. After all, savings is the other side of the same coin: intertemporal consumption. Increased formal savings are found to decrease poverty (Burgess and Pande, 2005), increase investment for entrepreneurs (Prina, 2015; Dupas and Robinson, 2013a), enhance resilience to economic shocks and improve overall financial situation (Deaton, 1990; Prina, 2015; Dupas and Robinson, 2013b) and lower household debt (Kast and Pomeranz, 2014)

1.1.2   Financial inclusion in India

When it comes to bank accounts, India represents a curious case with high take up rate but low usage. Where the account ownership was as high as 80 % in 2017, only 40 % of the account owners withdrawal or deposited money from their account; account ownership in India is highest among South Asian countries, but active account usage is lagging behind (Table 1.1. & table 1.2.) On the contrary, in a country like Pakistan, the share of accounts remains low, <20 %, but nearly 70 % of the accounts are being used (Figure 1.1. & table 1.2.). What keeps the gap so large in India? Essentially, the gap is an indication of a market failure: low usage is explained by high demand for informal finance and high take up rate is explained by aggressive supply-side financial inclusion policies. India has a long history with financial inclusion policies and fight against informal finance. The Indian Integrated Rural Development Programme (IRDP) has been extending subsidized rural credit through the banking sector since 1978 (Tsai, 2013) and state-led rural bank expansion from 1977 to 1990

was targeting the unbanked population with credit and saving accounts (Burgess and Pande, 2005). In 2016, the infamous demonetization, a policy introduced by the Modi government, invalidated majority of Indian cash overnight and forced Indians to open bank accounts, as the only way to convert old money into new bill was through banks. The demonetization has been nominated as the main cause for high banking penetration in India (Schueth and Moler, 2017) (See also table 1.2.). The consequent bank account take up was aided by another initiative, the Pradhan Mantri Jan Dhan Jodjna (PMJDY), which aims to extend access to financial services to all Indians (Ministry of Finance, Gov. India, 2018).
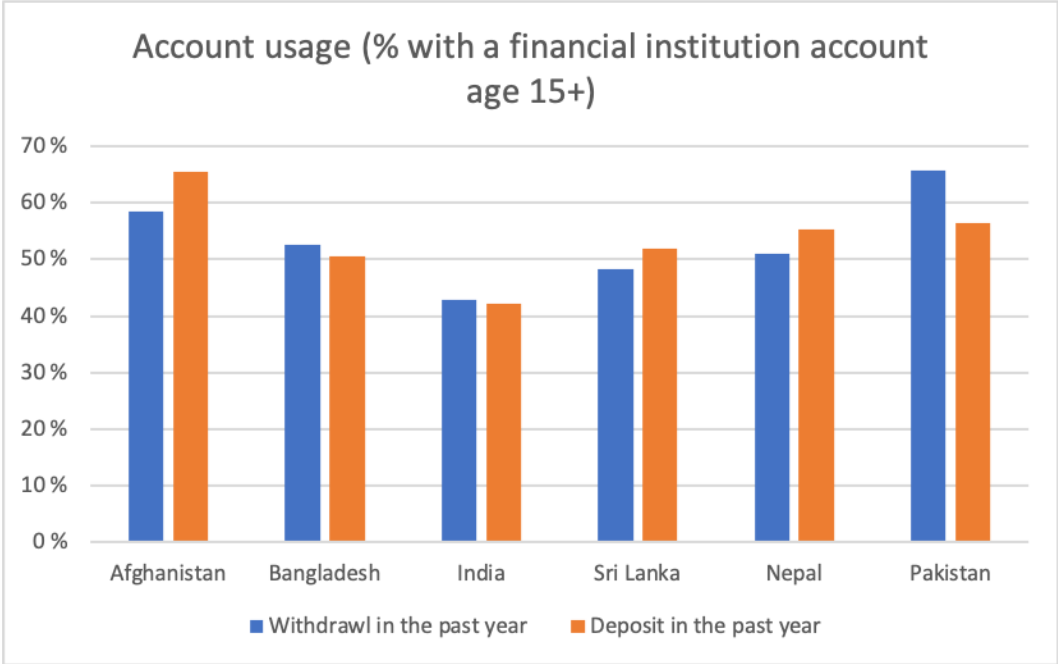
Figure 1.1 Account usage. 2017, South Asia, Author's calculations (Demirgüc-Kunt et al., 2018)
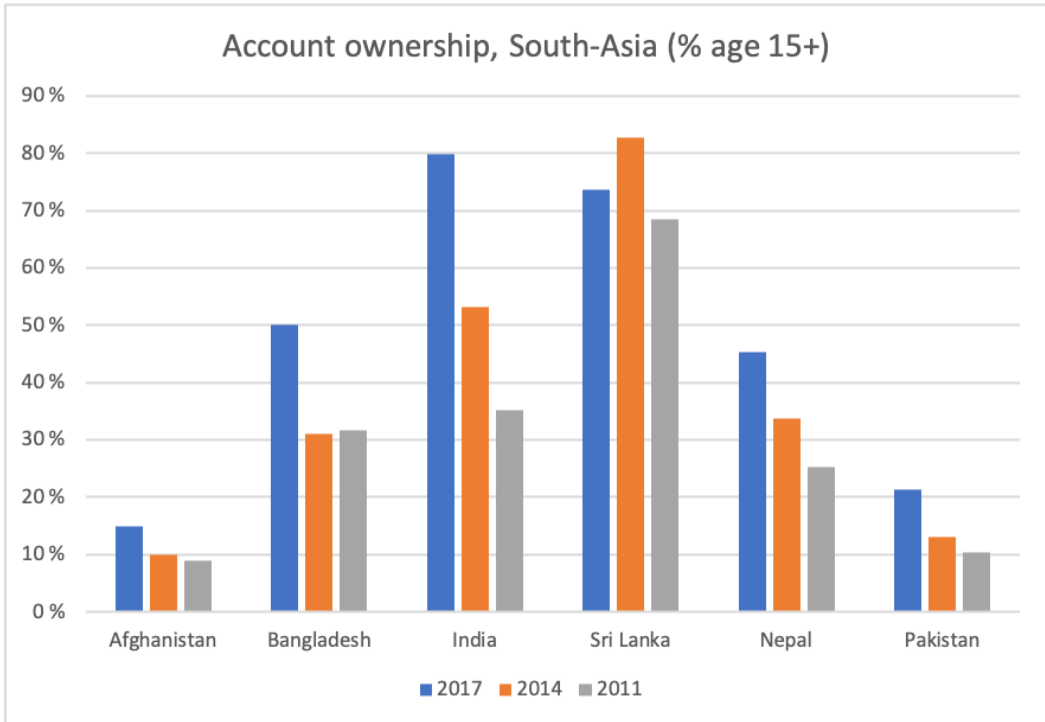
Figure 1.2 Account ownership, South Asia, Author's calculations (Demirgüc-Kunt, 2018)

As shown above, India is following a strong supply-side strategy in financial inclusion. Investigating the structure of informal savings can shed more light on low adoption of formal saving. Different saving vehicles include a series of formal alternatives from regular bank accounts and mobile money accounts to different low-cost, no-frills accounts like post office bank accounts and payments bank accounts. The take up rate on mobile money, post bank and payment bank in India is still very low. Therefore, they are omitted from our investigation. Within non-bank financial institutions (NBFIs), self-help groups (SHG) and cooperatives (coop), which are usually administered by a combination of NGOs and financial institutes, are extending non-collateral loans to members who are obliged to save small amounts to common pot (Tsai, 2013). Informal saving vehicles include cash, social networks, gold, property and land and agricultural inputs. The informal saving vehicles serve multiple economic, social and cultural purposes, which means that they cannot be perfectly substituted by formal savings (Goedecke et al., 2017; Tsai, 2013).

Figure 1.3. displays saving behaviour among Indian adults. Cash is by far the most popular way to save in India, almost 30 % of adult population save by accumulating cash. Saving via bank account is the second most popular way (over 20 %). Each informal channel alone represents a relatively small share, but the total value of savings is likely to differ. The different channels are not mutually exclusive, and each bar represent only the share of people saving via certain vehicle, not the total value of savings. Evidence from rural context in South India is suggesting that gold and rotating saving and credit associations (ROSCAs) are the most common ways to save if measured by value (Goedecke et al., 2017).
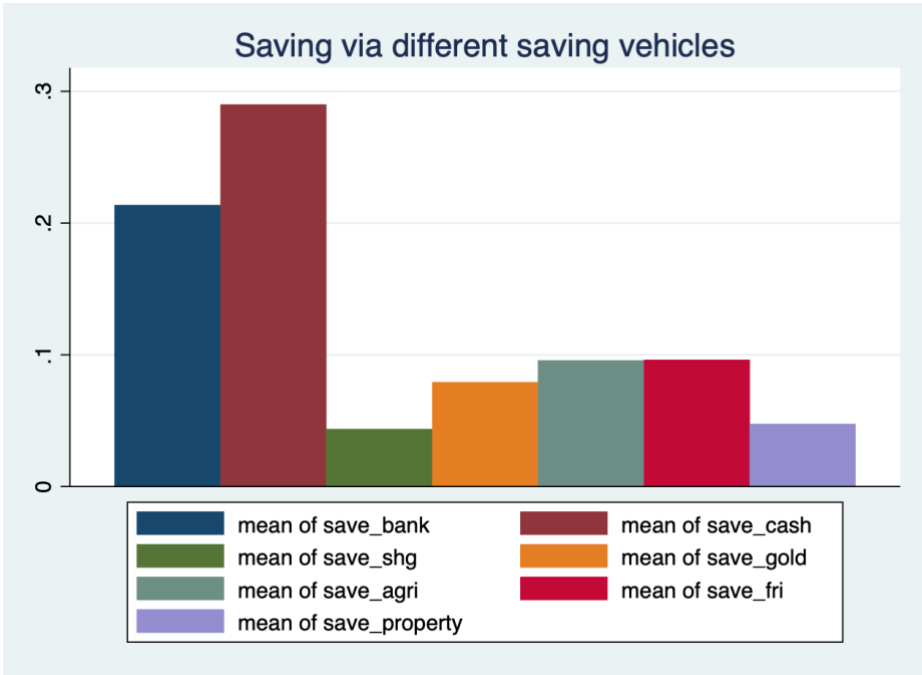
Figure 1.3 Weighted average of Indian adults' (>=15) saving decisions via different saving vehicles: bank accounts, SHGs/coops, agricultural inputs, land and property, cash, gold and social networks. (InterMedia, 2018)

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1.2   Research approach

Savings are gaining more and more attention within research on financial inclusion. From the perspective of policy suggestions, 'microsavings' have the power to overcome some of the shortcomings of microcredit, namely over-indebtedness of households. The current research on saving behaviour in developing and emerging countries can be divided to two main groups: some are researching the effects of cost interventions to account take up and usage (Dupas et al. 2012; Prina, 2015; Cole et al., 2011; Brune et al., 2014) while others are investigating cultural, cognitive and socio-economic reasons for under-saving or informal saving (Karlan et al., 2014; Goedecke et al., 2017; Fernandez, 2014). However, there is a research gap for a country-level empiric research on determinants of saving behaviour. Moreover, a comparison of propensity to save via different vehicles is quite novel. Goedecke et al. (2017) are researching a similar phenomenon, but their study is limited to a small population in rural South India and the results cannot be generalized for the entire Indian population. Generalizability is an issue with the RCTs as well. Such studies can provide us valuable and deep understanding of effects of a policy intervention, but due to the localized nature of the experiments, the results cannot be generalized to a whole country.

1.2.1   Aim and purpose

The aim of this thesis is to bridge the aforementioned research gap by investigating the determinants of formal and informal saving in India and to provide more information for policymakers and financial service providers about informal saving. The thesis was answering the question: why informal finance remains persistent in India? The purpose of this thesis was to tests four hypotheses: how 1) gender, 2) receiving household remittances, 3) financial literacy and 4) membership in governments financial inclusion program effect the likelihood to save via formal and informal channels while controlling for educational, socio-economic, cultural/ethnic, demographic and household composition variables. By running separate logistic regressions, the thesis was investigating what influences the likelihood to save via different saving vehicles: i.e. bank accounts, self-help groups (SHG), gold or social networks. To conduct the analysis, the thesis was using a comprehensive and recent household dataset provided by InterMedia's Financial Inclusion Insights (FII). The results were analysed though a theoretical framework, which is suggesting that various social, cultural and cognitive demand-level constraints, and multiple purposes of informal saving vehicles are hindering the adoption of formal finance regardless of extensive efforts in lowering the barriers to formal finance. A better understanding of the reasons to continue saving informally regardless of access to affordable banking services will provide valuable information for policymakers and financial institutes that can help in increasing financial inclusion creating better suiting financial products.

1.2.2 Delimitations

This research was delimited to investigating cross-sectional, largely binary data from 2018. Due to the binary nature of the outcome variables, i.e. decision to save or not save, the study could not measure the total value of savings. In other words, even if saving on cash is the most common way to save, it might not be so when measured by the total monetary value. Moreover, the thesis was investigating only the determinants of saving via bank account, gold, SHGs and social network. The other saving vehicles were omitted from the research due to lack of theory and unsatisfactory specification tests and goodness-of-fit of the models. Also, the population of the study was restricted to Indian adults that are currently saving and own an account. The investigation left out the fully financially excluded individuals, as the purpose of the study was to understand why informal saving is persistent among the people who have the opportunity to save formally.

1.2.3 Outline of the thesis

This thesis is structured as follows. Chapter 2 discusses previous literature and presents the theoretical framework. Chapter 3 presents the research design, data, variables and the model. Chapter 4 is showing the results and discusses the policy implications and reference to literature. Chapter 5 concludes.

2 Literature/Theoretical Review

2.1 Literature Review

This section is presenting some of the current debates on informal and formal saving and the theoretical framework used in the thesis. A substantial body of literature is suggesting that policy interventions aiming at lowering barriers to formal saving tend to increase account take up but leave active usage lagging behind. For many–this thesis included–this evidence is a motivation to investigate persistence of informal finance. The reasons restricting widespread adopting of formal finance can be roughly divided to two categories: supply-side constraints and demand-side constraints. Supply-side constraints include formal barriers for saving, e.g. high costs, low access and stringent regulation. Demand-side constraints include informal barriers, e.g. social and cultural norms, cognitive skills and biases and lack of trust to financial institutes. Often academia and practitioners have diverging opinions on how to bridge the gap between formal and informal finance, e.g. financial literacy is often cited as one of the main constraints by policymakers and service providers, but experiments and data is not finding evidence to support the relationship.

2.1.1 What explains low levels of formal saving?

Persistence of informal saving in developing and emerging economies is a topic that interests researchers across the fields from development economics to political economy, institutional economics, behavioural economics and even anthropology. Each field has their contributions. Development economics is focusing on RCTs that are investigating effects of policy interventions to take up and usage of accounts (Dupas and Robinson, 2013a; Dupas and Robinson, 2012; Prina, 2015, Cole et al., 2011; Brune et al., 2014), political economy is investigating persistence of informal finance through the lenses of corruption and inefficiencies in the finance institutions and markets (Tsai, 2013; Sinha, 2000), institutional economics is providing an useful analytical concept 'informal institutions' for cultural and social explanations (North, 1990; Edoardo, 2013; Malaki, 2005), behavioural economics is investigating the relationship between different behavioural biases and saving behaviour (DellaVigna, 2009) and finally, there is a body of research that arguments for and against of financial literacy being a significant variable affecting saving decisions (Fernandez et al., 2014; Xu and Zia, 2012; Banerjee, 1992). None of the explanations are sufficient on their own, but they are complementary. This thesis argues that all of the perspectives provide some insight to persistence of informal finance. Moreover, country specific preconditions should be considered as well: if the account ownership rate is already high–as it is in India–, the focus should be on what keeps the informal channels attractive as a complementary way of saving.

Roughly, the literature on undersaving and persistence of informal saving can be divided to two complementary categories: some are investigating supply-side constraints while others demand-side constraints. The supply-side constraints include different cost and regulatory

barriers and lack of infrastructure, i.e. outreach of bank branches and internet networks. The demand-side constraints are related to imperfect information and informal institutions; e.g. social institutions, cultural norms and behavioural biases. The table 2.1. summarizes the main constraints given in the literature.

Table 2.1. Summary of supply and demand-side constraints for saving. (Karlan et al., 2014; Dupas and Robinson, 2013; Prina, 2013; Cole et al., 2011; Burgess and Pande, 2005; Dupas et al., 2012; Jentzsch, 2009; Fernandez et al., 2014; Xu and Zia, 2012; Banerjee, 1992; Calvet et al., 2007; Field et al., 2012; Goedecke et al., 2017; Brune et al., 2013; DellaVigna, 2009; EMCompass, 2017; Schaner, 2018).

Supply-side constraints	Demand-side constraints
Pecuniary costs: • account opening costs, • minimum balance, • withdrawal fees	Lack of trust: • fear of embezzlement, • unreliable service
Non-pecuniary costs: • transportation, • opportunity costs, • lack of ATMs and bank branches	Lack of information: • financial literacy, • "low knowledge traps" and herd behaviour, • awareness and attitudes
Regulatory barriers: • lack of documents, • stringent due diligence, • know-your-customer (KYC) rules	Social constrains: • inter-household bargaining: social claimants, risk sharing, social capital, e.g. remittances, saving by lending to friends and family, • intra-household bargaining: females might have less agency
Technological barriers and weak infrastructure • Internet and phone networks	Behavioural biases: • lack of self-control • present bias, • commitment devices
Financial incentives • cash transfers • high interest rate	Social institutions and cultural norms: • social class and caste • religion

2.1.2 Supply-side constraints on saving

Opening and using a bank account typically includes different expenses: pecuniary expenses and non-pecuniary expenses. Opening fees, transaction and withdrawal fees and requirements for minimum balances are constraining adoption and usage of bank accounts. Furthermore, especially in remote areas, the costs (time and money) for reaching the nearest bank branch or an ATM can be substantial. Other supply-side barriers include various regulatory barriers. Many banks require official documents and stringent due diligences, so called know your

customer (KYC) rules, which can exclude many poor from the system due to insufficient documents (Jentzsch, 2009).

Several studies have researched the effects of lowering cost and regulatory barriers to saving in various developing countries. The experiments typically include a policy intervention, where a subsidized, or in other ways more easily accessible bank accounts are offered to a treatment group in order to test how take up rate and account usage evolve and if there are any other socio-economic outcomes related. In most of the cases the take up rate is high, but the usage remains low (Dupas and Robinson 2013a; Dupas et al., 2012; Brune et al., 2014; Cole et al., 2011). As an exception, an experiment among rural women in Nepal found both very high rate of take up and high usage (Prina, 2015). It would be fascinating to understand why the results in Nepal were so optimistic, but the study fails to provide a sufficient mechanism to explain what made the treatment group so keen on adopting the accounts. When it comes to non-pecuniary costs, one seminal work was investigating the 1977-1990 rural bank branch expansion in India and found a significant expansion of both formal credit and savings due to increased bank branch penetration (Burgess and Pande, 2005). Moreover, they found a strong positive relationship between increased formal savings and poverty reduction.

The low usage rate seems to imply that there are other reasons for undersaving or informal saving besides cost and regulatory barriers. In many ways, a similar pattern can be seen on aggregate level in the data from India: the take up of accounts is high, but the usage remains low (see chapter 1.1.2). Some of the aforementioned RCTs were also investigating the reasons behind low usage. In an experiment conducted in rural western Kenya, a survey of the participants revealed that the main reasons limiting the usage of the subsidized accounts were lack of trust, unreliable services and expensive withdrawal fees (Dupas et al., 2012). Another landmark experiment conducted in rural Kenya provided valuable insight to how an occupation and gender can affect the outcome of the experiment: access to saving accounts were allocated to two different occupational groups. The participants in the first group were predominantly male and in the second one predominantly female. The study found a significant increase in females' total amount of savings by no effect on males' savings. High levels of usage among females are likely to be signal of significant saving constraints that women encounter outside the policy intervention (Dupas and Robinson, 2013a).

Financial incentives might be one way to nudge people to save formally. High interest rate or modest cash transfers may increase likelihood to save via bank account. One experiment in Kenya found that subsidized accounts with fixed-period high interest rate had a strong positive impact on long-term income and assets. The growth was mainly due to increased entrepreneurial activity, which was enabled by improved possibilities to save. However, the study did not find a relationship between cash transfers and savings and income (Schaner, 2018). The results seem very optimistic, but it might be problematic to implement such policies in country-level. As participants in an experiment, the people were likely to be more informed about their opportunities. As discussed earlier, India has been implementing the PMJDY programme since 2014. PMJDY aims at providing low cost bank accounts to non-banked Indians and the accounts include certain incentives such as interest rate on savings, accidental insurance, pension and possibility to receive cash transfers related to other welfare programs (Government of India, 2018). This thesis tested if belonging to PMJDY or receiving cash transfers from government increased likelihood to save through bank accounts and the results were inverse: both variables decreased the likelihood to save formally and increased likelihood to save via gold.

2.1.3 Demand-side constraints on saving

The modest improvements in usage of accounts highlight the need to understand what is constraining the consumers. The six main demand-side constraints include financial literacy, inter-household bargaining, intra-household bargaining, social institutions, behavioural biases and lack of trust. Often the reasons behind saving decisions are related to informal institutions, i.e. social constraints and cultural norms. The constraints can be conscious or subconscious or related to social norms within a family or between families. These norms can explain for instance why women and men save differently, or why people belonging to different religions may have different preferences on saving. Some of the reasons are cognitive, like low financial literacy or behavioural biases. Behavioural biases are related to e.g. time and risk preferences and are somewhat difficult measure (DellaVigna, 2007). The behavioural biases were omitted from this research since they are mainly explaining reasons to not save at all rather than reasons to save informally. The other demand-side constraints can be difficult to operationalize as well. For instance, there is no universally acceptable measure for financial literacy, and it is open to debate what is should measure.
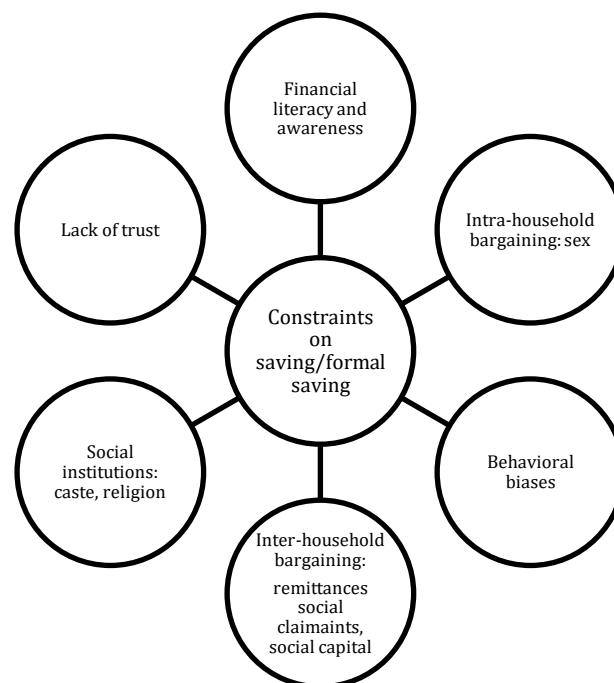
Figure 2.1 Demand-side savings constraints (Dupas et al., 2012; Fernandez et al., 2013; Xu and Zia, 2012; Banerjee, 1992; Calvet et al., 2007; Field et al., 2012; Goedecke et al., 2017; Brune et al., 2013; DellaVigna, 2009)

2.1.4 Financial literacy

The relationship between financial literacy and saving has received much attention in the literature. Intuitively, lower levels of financial literacy and lack of knowledge and awareness can lead people do suboptimal financial decisions, e.g. undersaving or saving via informal channels. Informal channels are costlier, less safe and lack functionality (Karlan et al., 2014). Many policy programmes (including PMJDY in India) are naming increasing financial literacy as one of their objectives. Moreover, reports targeted at financial providers and NGOs

(e.g. EMCompass, 2017; McKinsey Global Institute, 2016; FICCI, 2015) are arguing that low level of financial literacy is one of the key obstacles for financial inclusion. However, the scientific evidence seems to point out to a different direction. A thorough meta-analysis of 201 prior studies finds on average a very weak relationship between financial literacy and financial behaviour; the positive relationship found in few correlational studies were discovered to be result of an omitted variable bias as controlling for psychological traits made the effect shrink significantly (Fernandez et al., 2014). Another systematic literature review arrives at more mixed conclusions: several experiments testing for the effects of financial education on saving behaviour in developing countries found no significant change in the participants behaviour. However, several correctional studies find a relationship between account take up and financial literacy and some experiments found a positive effect from increasing awareness of available banking services (Xu and Zia, 2012).

Financial literacy is difficult to measure. In non-experimental studies, a commonly used measure is a three questions survey measuring respondents' knowledge on interest rates, inflation and risk diversification in stock market (Lusardi and Mitchell, 2011). However, one should ask if it is meaningful to consider the knowhow on stock markets while investigating basic saving decisions people make in developing or emerging countries? The generally used 3-question score can be unnecessarily difficult if a significant share of the people have not even finished the basic education. Hence, this thesis decided to use a different measure for financial literacy, a composite score based on questions that are testing simple mathematic and financial skills (see chapter 3).

2.1.5 Informal institutions: social norms and inter and intra-household bargaining

A much-cited work in institutional economics coined the terms formal and informal institutions in order to explain how humans organize and govern their economic and social worlds (North, 1990). Formal institutions are a set of rules, regulations and conduct governed by laws and contracts. Informal institutions on the other hand, are extensions, elaborations and modifications of the formal rules and they are governed by social norms, taboos and other unwritten rules. Informal institutions can explain much of the resistance formal finance is facing. For instance, there are different cultural norms and social institutions that are guiding how financial decisions are made between and within families and how different socio-economical class may effect on how people save. Even though literature on social norms and finance is abundant (Goedecke et al., 2017; Karlan et al., 2014; Doess et al., 2017), North's seminal work is rarely cited in this context (Eduardo, 2013; Malaki, 2005).

Caste system in India is an example of informal institution. It is illegal to segregate people based on their caste, but the informal cultural and social norms continue to impact the economic and social opportunities people in different castes or social classes face. Goedecke et al. (2017) researched social institutions and cultural norms impact on informal saving in rural South India. They concluded that regardless of rigorous supply-side financial inclusion programmes, informal saving vehicles such as gold, rotating saving and credit associations (ROSCAs, similar to SHGs) and lending to friends and family remain the most popular way to save. They found that informal saving persists because social institutions, such as socio-economic class, i.e. 'caste', determines how people save. Furthermore, different saving vehicles carry multiple purposes: gold has cultural significance in rituals and matrimony and

it the most attractive for Dalits (the lowest caste) due to caste-related restrictions on buying different assets.

Informal institutions can affect saving through intra-household and inter-household bargaining (Karlan et al., 2014). Intra-household bargaining refers to the different levels of financial decision making between men and women within families. This misbalance has led to a gender gap in financial inclusion, which is well documented around the world (Demirgüc-Kunt et al., 2018). Studies have found that women in India tend to use more informal finance instead of formal finance (Ghosh, 2017). Interestingly, evidence from Kenya is pointing out to a different direction, when given an account, women were more likely to start saving than men (Dupas and Robinson, 2013a). Another study found that difficulties in intra-household bargaining can lead to a higher share of women saving through informal or semiformal saving clubs like ROSCAs (Besley et al., 1993). The same mechanism might affect on why women save more on gold or other informal vehicles. Remarkably, women's bargaining power within family seem to be not related to household's income, but to woman's personal assets (Doess et al., 2017; Ashraf et al., 2010). Bridging the gender gap between formal and informal finance is shown to have several positive impacts for women empowerment and equality (Dupas and Robinson, 2013a; Ashraf et al., 2010; Does et al., 2017).

Intra-household bargaining, i.e. bargaining between families, is theorized to affect saving behaviour. Intra-household bargaining has multiple motivations. On the other hand, it is a way to share risk, and on the other hand, it can cumulate social wealth for the families that are lending to others (Goedecke et al., 2017; Karlan et al., 2014). It can cause undersaving through two channels: firstly, social claimants are seen as a 'tax' on savings, when the better-off families or individuals have a social pressure to channel their savings through social network instead of bank accounts (Platteau, 2000), and secondly, well-functioning social finance network can reduce incentives for precautionary saving (Karlan et al., 2014).

Household remittances, i.e. transfers between families and individuals, are an example of intra-household bargaining. In a county like India, work related immigration, both within and outside the country, is very common. The remittances sent to family members in the home village/city may enhance and harden inter-household financial networks. Hence, remittances can effect financial inclusion and formal savings in two opposite ways. Firstly, remitting between individuals and families cements the pre-existing social norms and decrease formal finance (Karlan et al., 2017; Platteau, 2000) and secondly, remittances received through formal channels can pave the way for adoption of formal finance by introducing and incentivising the usage of formal financial services for the recipients and by improving the financial service infrastructure (Misati et al., 2019; Filippo et al., 2014).

2.2   Theoretical Framework

This thesis investigated on what affects peoples' decisions to save formally and informally via different saving vehicles, namely bank account, gold, social networks and SHGs/coops. As can be seen from the data, people across socio-economic stratum do save (InterMedia, 2018). The question is how they save. Increased savings, especially formal savings, are shown to have multiple positive micro and macro-level socio-economic implications (Dupas and

Robinson, 2013a; Burgess and Pande, 2005; Doess et al., 2017). Moreover, microsavings have the ability to overcome the shortcomings of microcredit, namely over-indebtedness (Kats and Pomeranz, 2014). Hence, bridging the gap between formal and informal finance has been on the policy agenda for many governments, NGOs and international organizations.

According to economic theory, households have two main reasons to save: precautionary saving and investment saving. The previous is aiming to smoothing consumption and cushioning from economic shocks and the latter is seeking to maximizing future income. However, in countries where informal finance still plays a key role, saving behaviour seems to be somewhat more complex phenomenon. To understand what keeps people saving through informal channels, we need to assess two interrelated things: 1) what constraints people from saving via bank accounts and 2) what purposes other saving vehicles carry i.e. can they be substitutes for bank accounts. This thesis is building on a body of literature that is identifying various saving constraints and theories on multiple purposes of different saving vehicles. As the saving vehicles are not perfect substitutes, it might be a rocky road to shift the savings from informal sector to formal sector. This chapter describes the theoretical framework used in the thesis.

2.2.1   Drivers for formal and informal saving

As discussed in length in chapter 2.1, the main reasons causing undersaving and informal saving can be divided to supply and demand-side constraints. Undersaving is defined as a level of saving that would realize if there were no market frictions, e.g. transaction costs, regulatory barriers or imperfect information. Similar reason that lead to undersaving may lead to informal saving. Supply-side constraints include formal barriers such as high costs, lack of access, stringent regulation and lack of documents. Demand-side constraints are constraints yielding from informal institutions e.g. cultural and social norms, cognitive skills and biases and lack of trust. Various constraints can be targeted through policies and better financial products developed based on deep knowledge of customers, their needs and constraints. This thesis investigates how four variables are affecting likelihood to save through different channels, namely 1) incentivising to save (PMJDY programme and received government transfers), 2) inter-household bargaining (gender), 3) intra-household bargaining (received remittances) and 4) financial literacy. Incentivising is expected to increase likelihood to save formally and decrease likelihood to save informally, women are expected to be more likely to save though informal channels and less likely to save on a bank account, remittances are expected to have two opposite effects on saving; firstly, remittances may increase the likelihood to save on a bank account, but simultaneously, remittances are expected to increase saving via social networks. The mechanisms are presented in detail in chapter 2.1.

2.2.2   Different informal saving vehicles serve different purposes

Much of the microsavings literature is focusing on undersaving or assuming that the undersaving and informal saving are caused by same reasons, mainly high barriers to formal finance (Allen et al., 2016; Demirgüg-Kunt et al., 2013). Evidently, increasing access to bank accounts plays a significant role in financial inclusion. However, as we can see from low account usage rate in India, supply-side barriers are not a sufficient explanation for persistent informal saving. A small but increasing amount of literature in development economics is

starting to pay closer attention on the alternative forms of saving and is arguing that different saving vehicles are not perfect substitutes but carry different purposes (Tsai, 2013; Goedecke et al., 2017). For instance, gold may carry several cultural and social purposes besides precautionary saving and saving via social networks play an important role in cementing social relationships (Goedecke et al., 2017). The low bank account usage rate witnessed in India (see chapter 1.2) and in several experiments carried out in various developing countries (Dupas and Robinson 2012, Cole et al. 2011, Brune et al., 2014) is a clear indication of demand-related reasons that are affecting people's saving decisions. Increased access to bank accounts does not necessarily translate to increased usage. This chapter is presenting literature on different informal saving vehicles, namely gold, social networks and SHGs, and the multiple purposes they may carry. As the saving vehicles are not perfect substitutes, it might be difficult to steer savings from informal sector to formal sector.

India is culturally and socioeconomically fragmented country. Different religions and different socio-economical classes, i.e. *castes* or *jatis,* are creating and conserving social norms and codes of conduct which are determining how people should save and organize their finance. A seminal work in institutional economics by North (1990) is arguing that informal institutions, i.e. various internally imposed codes of conduct, such as norms, taboos, customs and other unwritten rules are affecting how people organize their economic and social lives. Just like formal, i.e. legal institutions, informal institutions are used to reduce uncertainty. However, in some cases, the formal and informal institutions may steer people to opposite actions, as seems to be the case with financial inclusion. On the other hand, formal institutions such as policies, the central bank, and various financial inclusion schemes are encouraging people to use formal finance, which undoubtedly has several benefits; but informal institutions, such as social norms, seem to be encouraging people to save via social networks.

Gold has a large financial, cultural and social significance for Indian people. It is widely used as a way to save money. In a case of an economic shock, the gold, usually in form of jewellery, can be pawned, making is a relatively liquid asset. However, gold has other purposes than putting aside money for the rainy days. Goedecke et al. (2017) list four non-financial purposes for saving in gold that are particular for India: sign of social status, medium of exchange between families during rituals, a special role in matrimony and dowries, i.e. *mangalsutra* and way to aim at social mobilization. Social mobilization through accumulating gold happens because people belonging to lower castes, i.e. social class, have socially enforced restrictions on accumulating other assets and participating in formal finance. Furthermore, age, sex and socio-economic class may have impact on demand for gold.

Saving via social networks is another widely used way of putting aside money for the future. Comparing to formal saving, lending out money to friends and relatives increases risks and lowers liquidity of the assets. The fact that people keep on saving informally regardless of the risks indicates that there must be another purpose to private lending that would draft the risk and liquidity problem. Finance via social networks is found to enhance pre-existing social relationships, e.g. a landowner lending to their labourers as way of gaining loyalty or inter-caste money lending and borrowing or people within same caste lending to each other (Goedecke et al., 2017). The causation can be expected to go both ways: finance customs strengthen the social ties and the social ties keeps the finance customs persistent. This is an example of informal institutions organizing economic lives. Saving through social networks is seen also as a way of accumulating "social wealth"; the better-off families may be expected to lend to families and individuals that are in the need of help (Goedecke et al. 2017; Karlan et al., 2014). Social claimants are theorized as being a "tax" on savings (Platteau, 2000).

Self-help groups (SHGs) and cooperatives are non-bank financial institutions (NBFIs), which are usually a hybrid between a bank and an NGO. Functionally they are similar to rotating savings and credit associations (ROSCAs), which are widely used e.g. in Africa. However, most of the SHGs in India have an official licence to work in finance (Tsai, 2013). The purpose of a SHGs is to reach the otherwise financially excluded, e.g. people with less money, women and rural individuals and accumulate savings and share small amounts of credit between the members of the SHG. They also disseminate awareness and knowhow on financial matters. Several studies from Africa have found that women are more likely to participate in ROSCAs and SHGs due to intra-household bargaining difficulties (Besley et al., 1993; Hertzberg, 2012).

The figure 2.2 presents a map of different saving vehicles and the main theoretical constraints on saving and formal finance. Interpreting saving constraints while realizing the multiple purposes of different saving vehicles can explain why informal finance remains persistent. According to different supply and demand-side constraints, individuals may be early adopters or laggards in using formal finance
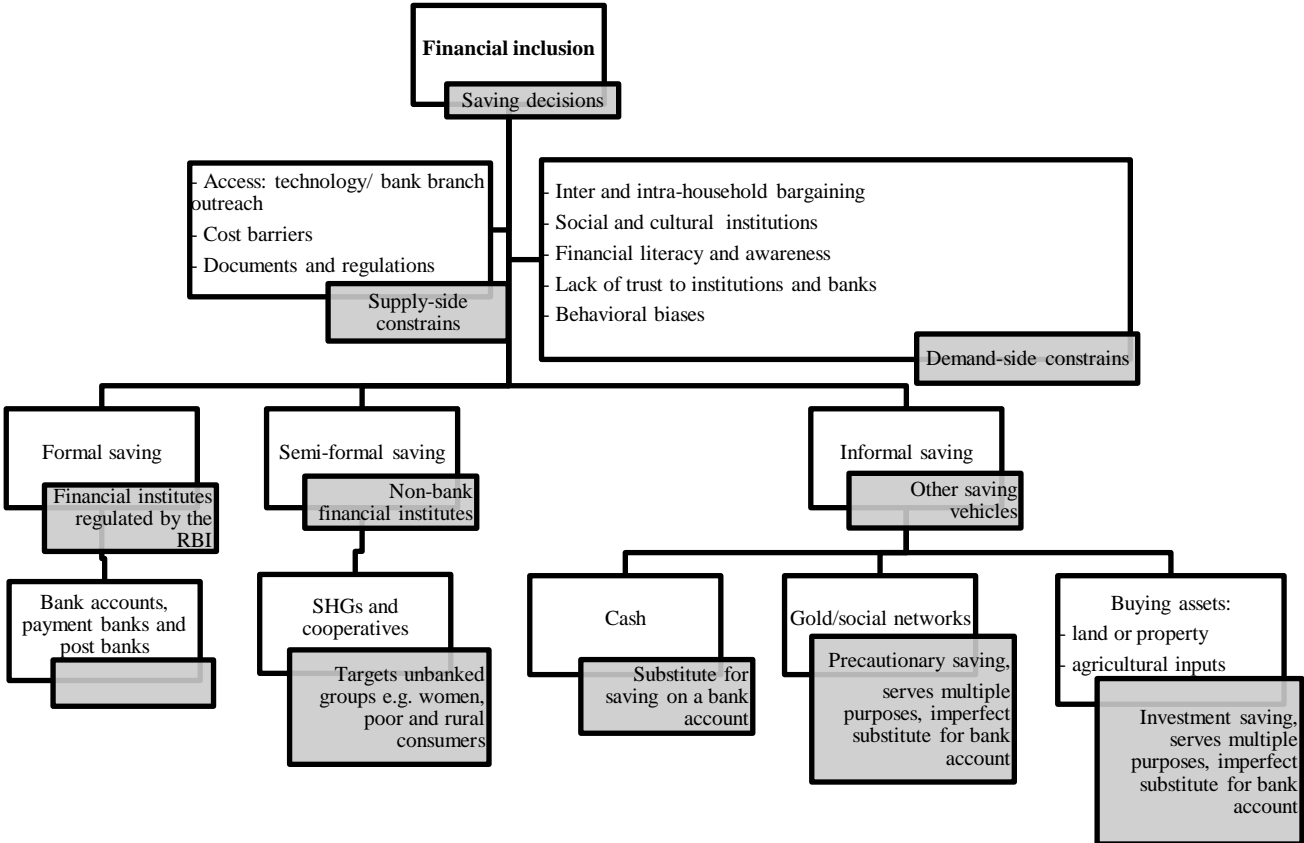
Figure 2.2 Map of different saving vehicles and theoretical constraints on financial inclusion.

2.3   Chapter summary

Literature on financial inclusion and undersaving has long concentrated on supply-side constraints; high operating costs, regulatory barriers, technological deficiencies and lack of documentation. Lowering barriers to access is paramount, but it is not a sufficient mean for reaching full financial inclusion. Evidence from India and several RCT from various emerging and developing countries is showing that increased access to bank accounts does not necessarily translate into usage. For that reason, the focus has shifted from supply-side constraints to demand-side constraints. The literature has identified several demand-side constraints; lack of trust, low levels of financial literacy, intra-household bargaining (i.e. gender gap), inter-household bargaining (i.e. finance through social networks), behavioural biases and social institutions. However, to fully understand the why informal finance persists, one should also assess on the multiple purposes different informal saving vehicles carry. The literature has point out that both gold and social networks carry multiple social and cultural purposes and hence, cannot substitute formal finance perfectly. This thesis uses a theoretical framework that aims to understand informal saving through the various constraints and the multiple purposes of different saving vehicles.

3   Methodology

This section is describing the chosen research approach, research question, hypotheses, data and variables and the model used for the analysis. The thesis was using a quantitative research design for investigating why informal saving is persistent in India. It used a cross-sectional household data set from India collected by InterMedia's Financial Inclusion Insights (FII). The population of the study was restricted to adults that save currently and have a bank account. The econometric model used for the analysis was a logistic regression, which is measuring likelihood for an event to occur. It was specified variable by variable and several tests were conducted for overall model evaluation, individual predictors and goodness-of-fit statistics. The dependent variables were saving to bank, gold, SHG and social networks. The main predictor variables included gender, belonging to PMJDY programme, receiving transfers, financial literacy score and receiving remittances. The control variables included individual characteristics, family context, structural opportunities and geographical context.

3.1   Research Approach and Design

The aim of this research is to shed light on persistence of informal saving. This thesis conducted a quantitative research design to investigate what are the determinants of formal and informal saving in India. It analysed a recent cross-sectional dataset from India which was collected in 2018. A series of logistic regressions were run in order to investigate the relationship between saving behaviour and the predictors. Each regression model took a different dependent variable denoting likelihood to save though various channels: i.e. a bank account, gold, self-help group or cooperative or social networks. A set of cognitive, socio-economical, cultural and demographic predictors were used to specify the model. The motivation to use a quantitative research approach is to make generalizable statements about the population (Creswell, 2014).

The hypotheses were deduced from previous studies and theories on savings constraints in developing and emerging economies' context. After the set of hypotheses were deduced, they were tested by using multivariate logistic regressions to analyse cross-sectional household data: one regression for each outcome variable. The analysis was conducted by comparing the different models and the odd ratios of the predictors. The population of the study was restricted to Indian adults ($>= 15$ years) that are currently saving and own a bank account. The population means used in the figures are calculated by using sampling weights, which make the sample representative of the whole Indian adult population. The weights were not used in logistic regressions, as the regressions can be fitted without them (Trivedi and Cameron, pp.105-106).

To answer the research question: 'what are the determinants of formal and informal saving?', the following hypotheses were formulated:

- Financial literacy: measured by a financial literacy score

    H_0 Higher levels of financial literacy have no effect on likelihood to save on bank account among Indian adult population that are currently saving

    H_1 Higher levels of financial literacy have a positive effect on likelihood to save on bank account among Indian adult population that are currently saving

    H_0 Higher levels of financial literacy have no effect on likelihood to save via SHGs, social networks and gold among Indian adult population that are currently saving and own a bank account

    H_1 Higher levels of financial literacy have a negative effect on likelihood to save via SHGs, social networks and gold among Indian adult population that are currently saving and own a bank account

- Intra-family bargaining: sex

    H_0 Sex does not have effect on likelihood to save via SHGs, social networks and gold among Indian adult population that are currently saving and own a bank account

    H_1 Women are more likely to save via SHGs, social networks and gold among Indian adult population that are currently saving and own a bank account

    H_0 Sex does not have effect on likelihood to save formally, social networks and gold among Indian adult population that are currently saving and own a bank account

    H_1 Women are less likely to save formally, social networks and gold among Indian adult population that are currently saving and own a bank account

- Policy interventions: Pradhan Mantri Jan Dhan Yodjna scheme

    H_0 Belonging to the PMJDY program has no effect on likelihood to save on a bank account among Indian adult population that are currently saving

    H_1 Belonging to the PMYDY program has a positive effect on likelihood to save on a bank account among Indian adult population that are currently saving

- Inter-family bargaining: remittances

    H_0 Remittances have no effect on likelihood to save on a bank account among Indian adult population that are currently saving

    H_1 Remittances have a positive effect on likelihood to save on a bank account among Indian adult population that are currently saving

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H_0 Remittances have no effect on likelihood to save informally among Indian adult population that are currently saving and own a bank account

H_1 Remittances have a negative effect on likelihood to save informally among Indian adult population that are currently saving and own a bank account

3.2   Data and variables

The dataset used in the analysis was collected by Financial Inclusion Insights (FII) which is a program run by InterMedia and Kantar and it is funded by Bill and Melinda Gates foundation. Since 2013, they have been conducting annual surveys about financial inclusion in eight African and Asian countries, including India. The data used for this thesis comes from wave 6 and it was collected in 2018 in India. The cross-sectional data consists of household surveys handling topics on demand-side financial inclusion such as saving, credit, access to banking and mobile money. It includes also socio-economic and cognitive measures and it had calculated a poverty measure based on Grameen Foundation's Progress Out of Poverty Index (PPI). The data for wave 6 includes nearly 50 000 observations from around India and it includes sampling weights that make the data representative for the whole adult ($>=$ 15 years old) population. It was using random sampling technique. Surveys were carried out face-to-face by an interviewee, which is likely to increase the internal consistency of the answers. The FII provides a rare household level, demand-side dataset on financial inclusion. Other much cited data sources, such as the World Bank's Global Findex database or the FinMark trust's FinScope survey, provide far less detailed information on individual level financial behaviour. A shortcoming in FII's data is that it is largely discrete, which unfortunately makes it is impossible to compare the total value of savings or the impact of income. Moreover, the dataset provides an excellent number of variables, but the lengthiness of the questionnaire is likely to decrease internal consistency as respondents may grow tired of replying. The data set included also variables measuring propensity to save via cash, agricultural inputs and property and land. Unfortunately, due to lack of theory and poor model fit, those dependent variables were omitted for the analysis. Saving via mobile money, payments bank and post bank were also omitted because they are still very rare in India (only 0.24 % of Indians have saved via mobile money).

Table 3.1. Dependent variables used in the empirical analysis.

VARIABLE NAME	DESCRIPTION	RESTRICTION	TYPE
SAVE TO A BANK ACCOUNT	"Have you ever saved money using a bank account?" 1 = yes, 0 = no	"Are you saving currently?" = 1 "yes"; "Do you have a bank account" = 1 "yes"	Dichotomous
SAVE GOLD	"Have you ever saved money by buying gold?" 1 = yes, 0 = no	"Are you saving currently?" = 1 "yes"; "Do you have a bank account" = 1 "yes"	Dichotomous

SAVE SOCIAL NETWORKS	"Have you ever saved money by keeping it with people you trust, such as family, friends, neighbours, shopkeeper, money guards or saving collectors?" 1= yes, 0 = no	"Are you saving currently?" = 1 "yes"; "Do you have a bank account" = 1 "yes"	Dichotomous
SAVE SHG/COOP	"Have you ever saved money using a self-help group or cooperative?" 1 = yes, 0 = no	"Are you saving currently?" = 1 "yes"; "Do you have a bank account" = 1 "yes"	Dichotomous

Table 3.2. Independent variables used in the empirical analysis.

VARIABLE NAME	DESCRIPTION	TYPE
WOMAN	1 for woman, 0 for men	dichotomous
PMJDY	1 for belonging the program and, 0 for not belonging	dichotomous
TRANSFERS	1 for receiving government transfers, 0 for not receiving	dichotomous
LOG OF FINANCIAL LITERACY SCORE	Financial literacy score is a composite score build on 10 questions related to numeracy and finance and the score was based on correct answers. (1-10) Log is used because the distribution of scores is slightly skewed to right.	continuous
REMITTANCES DOMESTIC	1 for receiving remittances from within India, 0 for not receiving	dichotomous
REMITTANCES FOREIGN	1 for receiving remittances from abroad, 0 for not receiving	dichotomous
PPI SCORE + PPI_SCORE2	Grameen Foundation's Progress Out of Poverty Index (0-100)	continuous
RURAL	1 for rural, 0 for urban	dichotomous
AREA	1 central, 2 east, 3 north, 4 north 5 east, 6 south and 7 west	categorical
RELIGION	1 Christian, 2 Muslim, 3 Sikh, 4 Hindu, 5 Buddhist	categorical
FARM OWNER	1 yes, 0 no	dichotomous
AGE + AGE2	Age of respondent 15-101	continuous
MARRIED	1 single, 2 married, 3 widowed	categorical
HOUSEHOLD SIZE	1-8	continuous
ENTREPRENEUR	1 yes, 0 no	dichotomous
AGRICULTURE	1 income from agriculture work, 0 no	dichotomous
JOB	33 different jobs	categorical

Besides the main independent variables: PMJDY and transfers, gender, financial literacy and remittances, the thesis used several control variables in the model specification. It controlled for individual characteristics, family context, structural opportunities and geography. Individual characteristics were age, job and religion. According to the life-cycle hypothesis of savings, young are less likely to save than old. Religion may impose various gendered roles, norms and codes of conduct related to finance. Job was controlled, because it works as a proxy for caste system, since various castes/jatis are determining what kind jobs people are doing. The model was also controlling for family context, such as marital status and family size. Bigger families and married couples are expected to have more income and therefore more savings. Structural opportunity variables included a measure for poverty (PPI score), land ownership, education and work status. People with higher education, land ownership and income are expected to be more likely to save through formal channels, because they are better informed about their options, bank accounts may be more easily accessible, and they may have more opportunities to save. Geography variables included six different geographical areas: north, south, east, west, central and north-eastern India and rural and urban living. India is a big country with significant economic and social differences across the areas. Moreover, rural living is expected to have a negative impact on saving formally, because the number of economic opportunities and access to banks is lower in rural environments.

The data was inspected for missing values, outliers and skewness. The missing values were flagged and omitted from the analysis. Some of the variables were transformed to improve the model fit and then tested with Wald's test to make the final decision about including the transformed variables or not (see appendix). Wald's test is used to test for individual coefficients of variables (Cameron and Trivedi, 2009, p. 453). Financial literacy score was given a logarithmic transformation to fix a slight skewness and Wald's test validated the inclusion of log FL score. The predictor variables were also tested for multicollinearity by running an additional regression analysis by using one of the continuous variables, fl_score, as the dependent variable and then performing the variance inflator factor test (VIF). The results showed no problems with multicollinearity (VIF < 3, excluding the transformed variables age2 and PPI2) (see appendix).

Table 3.3. Descriptive statistics of dependent variables

	Mean	Sd	Min	Max	Observations when saves currently and owns a bank account
Save bank	0.57	0.49	0.00	1.00	15036.00
Save SHG or coop	0.64	0.48	0.00	1.00	2678.00
Save friends or family	0.20	0.40	0.00	1.00	15287.00
Save gold	0.19	0.39	0.00	1.00	15287.00
Save property	0.12	0.32	0.00	1.00	15287.00
Save cash	0.61	0.47	0.00	1.00	15287.00

Table 3.4. Descriptive statistics of independent variables

	Mean	Sd	Min	Max	Obs. in the restricted sample (individuals who own an account and who are currently saving)	Total obs.
Log of FL score	1.88	0.38	0.00	2.30	13777.00	47284.00
Woman	0.50	0.50	0.00	1.00	13877.00	48027.00
Rural	0.67	0.47	0.00	1.00	13877.00	48027.00
PPI score	48.77	20.52	0.00	100.00	13877.00	48027.00
PMJDY	0.26	0.44	0.00	1.00	13877.00	38102.00
Transfers	0.16	0.37	0.00	1.00	13877.00	48027.00
Remittances India	0.17	0.38	0.00	1.00	13877.00	48027.00
Remittances foreign	0.03	0.18	0.00	1.00	13877.00	48027.00
Entrepreneur	0.08	0.27	0.00	1.00	13877.00	48027.00
Farm owner	0.50	0.50	0.00	1.00	13877.00	48027.00
Agriculture	0.30	0.46	0.00	1.00	13877.00	48027.00
Area	3.56	1.58	1.00	6.00	13877.00	48027.00
Religion	3.73	0.74	1.00	6.00	13877.00	48027.00
Education	4.70	2.84	1.00	11.00	13877.00	48027.00
Work status	4.81	2.63	1.00	10.00	13877.00	48027.00
Age	38.65	14.82	15.00	101.00	13877.00	48027.00
Married	1.36	0.73	1.00	4.00	13877.00	48027.00
Family size	4.24	1.72	1.00	8.00	13877.00	48027.00
Age2	1713.27	1310.73	225.00	10201.00	13877.00	48027.00
Ppi_score2	2799.19	2075.14	0.00	10000.00	13877.00	48027.00

3.3   Data Analysis

The model used in the analysis was derived from Goedecke et al. (2017), who were investigating informal saving in South India. In their research, they run a series of regression analyses determining the propensity to save formally and informally, i.e. to banks, gold, ROSCAs or by lending to friends and family. As explanatory variables they were using various cultural, socio-economical and household composition related variables. The model used in this thesis differs from the aforementioned by the nature of the dependent variable. In Goedecke et al. (2017), the dependent variable is continuous instead of binary. As the dataset used for this thesis contained only binary information about saving decisions, the most suitable model for the analysis was a logistic regression (Kennedy, 2008).

Logistic model takes a categorical variable as the dependent variable, the coefficients are estimated by the maximum likelihood estimator (MLE) and the error term ε_i is logistically distributed (Cameron and Trivedi, 2009, pp. 446-447). The null hypothesis states that the βs are equal to 0 (Peng, 2002). The thesis was using the odds ratio interpretation, which is exploiting the exponentiated coefficients. The odds ratio is telling us the likelihood of an event to occur as per unit increase in the predictor variable; dummies are comparing the likelihood to the reference category (Peng, 2002). For example, the odds ratio 3 for a dummy variable 'woman' is interpreted so that women are three times more likely to do the event denoted by the dependent variable, e.g. save in a bank. The odds ratio interpretation was chosen instead of marginal effects/latent variable interpretation because our model includes several categorical variables. Interpretation of coefficients and their marginal effects is equivocal for discrete variables because they are estimated by setting x to its mean, which for a dichotomous variable is non-sensical (Caudill and Jackson, 1989). Binary outcome model yields an equation where the dependent variable can be interpreted as log odds, i.e. the likelihood for an event to occur:

$$ln \left(\frac{\frac{P(y=1)}{P(y=1)}}{1-P(y=1)} \right)_i = \alpha + \beta x_i + \delta w_i \qquad (1)$$

where x and w are the explanatory variables, α is the intercept and β and δ are the regression coefficients and the probability of event y is:

$$P(y=1) = \frac{\exp(\alpha + \beta_i x_i + \delta_i x_i')}{1+\exp\left(\alpha + \beta_i x_i + \delta_i x_i\right)} \qquad (2)$$

(Peng, 2002).

The logistic models used in this thesis are 3-7:

$$savebank_i = \alpha_i + \beta_i financial\ literacy_i + \beta_i Remittances_i + \beta_i sex_i + \beta_i PMJDY_i + \beta_i transfers_i + \beta_i \varphi_i + \varepsilon_i \qquad (3)$$

$$saveshg_i = \alpha_i + \beta_i financial\ literacy_i + \beta_i Remittances_i + \beta_i sex_i + \beta_i PMJDY_i + \beta_i transfers_i + \beta_i \varphi_i + \varepsilon_i \qquad (4)$$

$$savegold_i = \alpha_i + \beta_i financial\ literacy_i + \beta_i Remittances_i + \beta_i sex_i + \beta_i PMJDY_i + \beta_i transfers_i + \beta_i \varphi_i + \varepsilon_i \qquad (5)$$

$$savefriends_i = \alpha_i + \beta_i financial\ literacy_i + \beta_i Remittances_i + \beta_i Sex_i + \beta_i PMJDY_i + \beta_i transfers_i + \beta_i \varphi_i + \varepsilon_i \qquad (6)$$

where *financial literacy* is the financial literacy score, *remittances* denotes if the person receives remittances from 1) India or 2) abroad, *sex* is a dummy, *PMJDY* and *transfer* are dummies denoting if the person i is belonging PMJDY program or receiving any government transfers, φ_i is a set of control variables and ε_i is the error term. I must be noted that the dependent variables are not mutually exclusive: one person might save in more than one way.

3.4   Validity and Reliability

Several tests were used to evaluate the overall model fit and the model specification as recommended for logistic regression (Cameron and Trivedi, 2009; Peng, 2002; Kennedy, 2008). For specification of the model, Wald's test was run to determine the inclusion of transformed variables age2 and PPI_score2 and if to include log_fl_score of fl_score. For goodness of fit, Hosmer-Lemeshow (HL) and pseudo R2 were used. The pseudo R2s are on the low side, but the HL tests for each model were not indicating specification errors. Additionally, a postestimation for the percentage of correctly classified observations was calculated for each model, indicating acceptable levels. See appendix A. for detailed information. Unfortunately, one of the key dependent variables, 'saving in cash', was left out of the analysis due to poor model fit. Saving in cash is the most popular form of saving according to the data.

What comes to external validity of the data, the dependent variables seem to be in line with Findex (Demirguc-Kunt et. al., 2018).

3.5   Chapter Summary

This thesis used a quantitative research design to investigate the relationship between formal and informal saving and various demand and supply-side variables. Four different binary dependent variables were used in logistic regressions: save on a bank account, save in SHG, save by buying gold and save by lending to social networks. We tested for four things: how incentivising impacts likelihood to save (belonging to PMJDY + receiving transfers), how intra-household bargaining effects likelihood to save (gender), how financial literacy effects likelihood to save and how inter-household bargaining (receiving remittances) impacts likelihood to save. The control variables included individual characteristics, household composition, geographical variables and structural opportunity variables.

The data used was a representative household data set from 2018, India and it was provided by InterMedia's Financial Inclusion Insights programme. The sampling method was random and the data set included sampling weights, that were used in the graphs presenting population means.

4   Analysis and Discussion

This section is presenting the results and the discussion of the results. The analysis was looking at the determinants of saving via formal and informal channels. The main variables were incentivising to save (PMJDY membership + government transfers), inter-household bargaining (gender), intra-household bargaining (remittances) and financial literacy. The main findings are supporting the theory and previous literature.

4.1   Results

The multivariate binary outcome logistic model was fitted to the data in order to test hypotheses regarding the relationship between different saving vehicles (bank account, gold, social networks and SHG/coop) and various saving contains. The results with the odds ratios are displayed in the table 4.1.

4.1.1   Financial literacy

The relationship between financial literacy and saving behaviour is strongly debated among researchers and policy makers. Intuitively, lower levels of financial literacy make people do sub-optimal saving decisions and vice versa: high levels of financial literacy allow people to make well informed decisions, which should increase saving via formal channels. Evidence from experiments and correlational studies show that financial literacy does not have a significant effect on saving decisions, as long as the econometric model is correctly specified (Fernandez et al., 2014; Xu and Zia, 2012). However, financial literacy is constantly mentioned in policy programmes and financial institutes reports as one the main obstacles for financial inclusion (e.g. EMCompass, 2017; McKinsey Global Institute, 2016; FICCI, 2015; Gov India, Ministry of Finance, 2018).

Our analysis supports the academic view. Variable financial literacy score was found statistically insignificant in all of our models when controlling for education. When education was omitted, the relationship between financial literacy and saving was statistically significant for bank and gold and had a positive (>1 odds ration) effect on likelihood to save as per every unit increase in FL score. However, omitting education from the equation would bias the results.

4.1.2   Inter-household bargaining

The theory indicates that women are less likely to save formally and more likely to save informally due to intra-household bargaining, i.e. within families, women have less agency on

her financial decisions (Doess et al., 2017; Ghosh, 2017; Besley et al., 1993). The analysis is supporting the theory. With 0.01 significance level, women are less likely than men to save on a bank account while controlling for socio-economic, educational and geographical variables. The odds for women saving to an account are 0.8 to men. With same significance level women were 1.5 times more likely to save by buying gold and almost 4 times more likely to save via SHG or cooperative. The likelihood to save via lending to social networks was statistically insignificant.
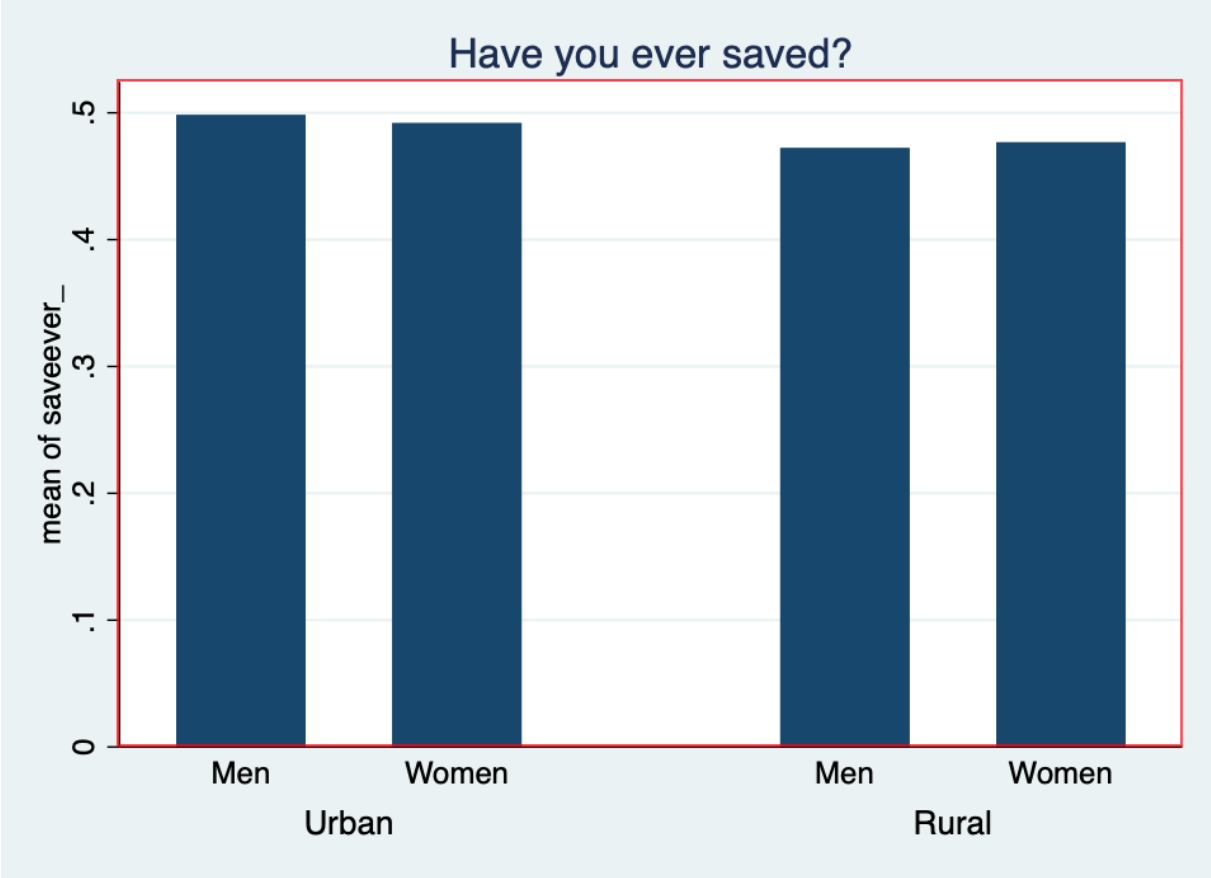
Figure 4.1Men and women have similar propensity to save.

Bargaining between families is theorized to impact saving through two mechanisms: firstly, the risk-sharing function of social networks is lowering the need for precautionary savings (Karlan et al., 2014) and social claimants may work as a 'tax' on savings (Platteau, 2000). Remittances, are a form of inter-household bargaining and they are theorized to have two opposite effects on savings: on the other hand remittances received via formal channels can pave the way for adopting formal finance as the money received on an account can introduce formal financial services for the potential customer (Mirati et al., 2019; Filippo et al., 2014) and on the other hand, receiving remittances may cement financial social networks and therefore increase saving via friends and family instead of formal channels (Goedecke et al., 2017).

The results are supporting the theory. What is interesting, is that remittances received from within India, had very opposite impact on saving than remittances received from abroad. With 0.01 level of significance, individuals receiving remittances from India are less likely to save

on a bank account and more likely to save via gold and social networks than individuals who do not receive remittances. The odds are also significant, 0.67 for saving on a bank, 1.59 for gold and 1.94 for social networks. On the other hand, the individual who receive remittances from abroad are more likely to save formally, but the effect is drafted by increased likelihood to save via social networks. With 0.01 level of significance, they are 1.99 times as likely to save on an account and 1.49 times more likely to save through networks. The impact of both type of remittances is strong.

4.1.4 Policy interventions

India has been implementing a strong supply-side strategy on financial inclusion for decades now (see chapter 1). The main vehicle for increasing the number of bank accounts and financial inclusion since 2014 has been the PMJDY scheme. The scheme is also distributing transfers from various social welfare programs. Transfers to bank accounts are a way to nudge people to start using the account (Kast and Pomeranz, 2014). The analysis revealed that such policies have an inverse effect to saving. People who belong to PMJDY program seem to be less likely to save to an account and more likely to save via informal channels, namely gold and friends and family. For individuals belong to the PMJDY program, the odds of saving to a bank account are 0.89, to gold 1.15 and friends 1.1. The statistical significance for saving via friends and family is less clear ($p<0.1$), but gold and bank account are statistically significant in 0.05 level. The effect of transfers is also inverse from what was expected. The individuals receiving transfers from the government are 1.22 times as likely to save via gold that the individuals who are not receiving transfers. The results from gold were significant at 0.01 level, for the other saving vehicles, there was no statistically significant relationship.

4.1.5 Gold

Goedecke et al. (2017) researched gold's the cultural and social implications in India. They found that besides its saving function, it carries multiple other purposes as well; it is a sign of social status, a medium of exchange between families during rituals, it has a special role in matrimony and dowries, i.e. *mangalsutra* and it can aim at social mobilization. As our method is purely quantitative, we could not arrive at such conclusions, but the data did reveal a statistically significant strong relationship between religion and gold. As Christianity was the reference category, it showed that all other religions were approximately twice as likely to save by buying gold. With 0.01 level of significance, the odds for saving in gold were 1.87 for Muslims, 2.59 for Sikhs, 2.02 for Hindus and 2.77 for Buddhists. The strong impact of religion indicates that there are cultural and social norms and codes of conduct that steer financial decisions.

4.1.6 Notes

There is considerable variation between geographical areas. For instance, individuals in central India are significantly more likely to save via gold and less likely to save via bank accounts and SHGs. People in North East India on the other hand are much more likely to save on a bank account and SHGs than any other states.

Saving across the geographical areas
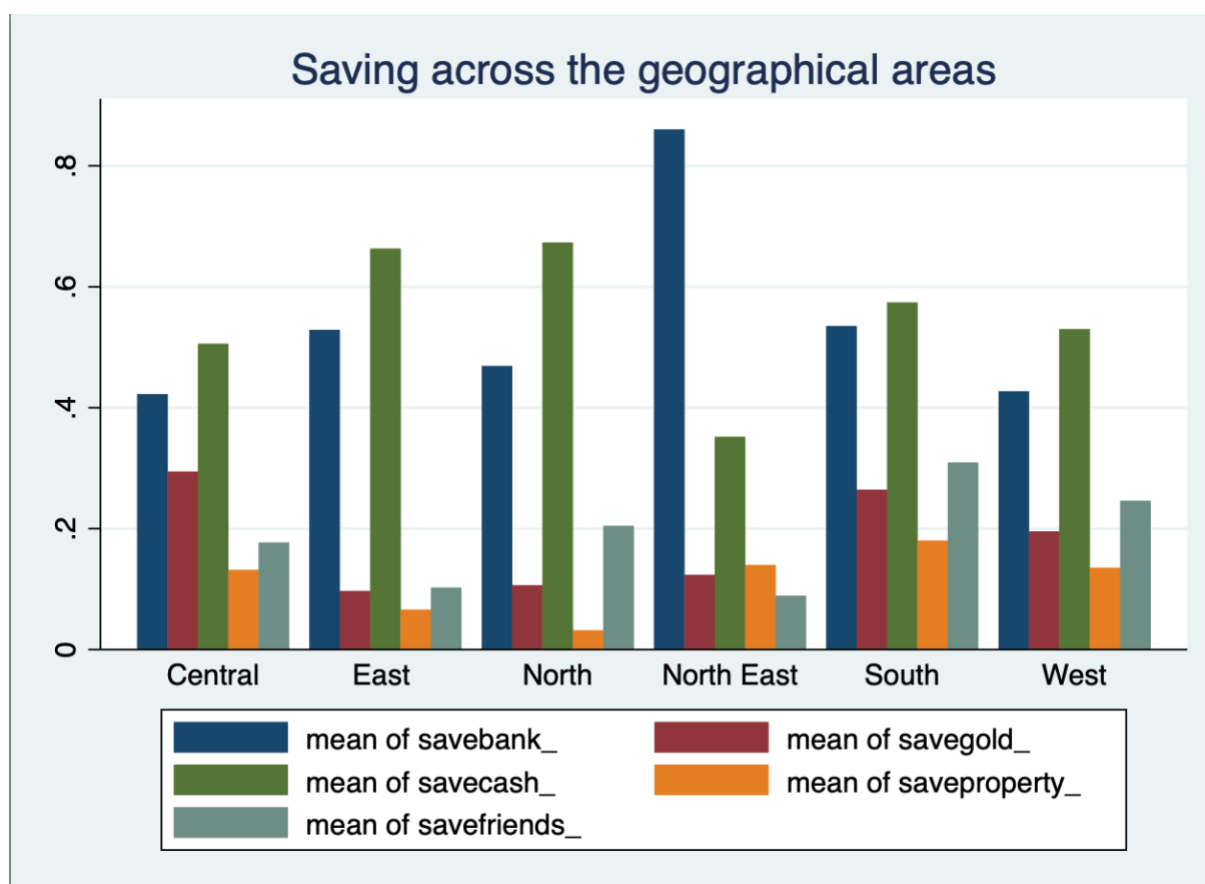
Table 4.1. Results from logistic regression for models 1, 2, 3 and 4

VARIABLES	(1) Save bank	(2) Save gold	(3) Save friends or family	(4) Save cooperative
Log FL score	1.048	1.102	1.113	1.027
	(.0569)	(0.0779)	(0.0739)	(0.139)
Woman	0.757***	1.549***	1.043	3.883***
	(0.0407)	(0.109)	(0.0668)	(0.591)
Rural	0.778***	0.790***	1.098	1.406***
	(0.0376)	(0.0455)	(0.0636)	(0.185)
PPI score	1.025***	1.040***	1.001	1.007*
	(0.00413)	(0.00603)	(0.00152)	(0.00375)
PMJDY	0.899**	1.145**	1.104*	0.840*
	(0.0380)	(0.0621)	(0.0561)	(0.0883)
Transfers	1.086	1.220***	1.010	0.866
	(0.0547)	(0.0741)	(0.0603)	(0.104)

Remittances, India	0.687***	1.589***	1.944***	0.784**
	(0.0338)	(0.0937)	(0.105)	(0.0946)
Remittances, foreign	1.989***	1.090	1.488***	0.771
	(0.221)	(0.135)	(0.173)	(0.176)
Area (central)				
East India	1.521***	0.261***	0.567***	19.02***
	(0.129)	(0.0257)	(0.0628)	(8.211)
North India	1.193**	0.281***	1.390***	4.611***
	(0.101)	(0.0273)	(0.147)	(2.116)
North East India	7.464***	0.266***	0.421***	11.60***
	(1.100)	(0.0391)	(0.0761)	(5.664)
South India	1.289***	0.776***	2.016***	18.51***
	(0.113)	(0.0720)	(0.215)	(8.011)
West India	0.713***	0.417***	1.632***	12.98***
	(0.0640)	(0.0410)	(0.178)	(5.922)
Religion (Christianity)				
Islam	1.140	1.865***	1.934***	1.842*
	(0.176)	(0.346)	(0.394)	(0.608)
Sikhism	1.002	2.585***	1.056	2.787
	(0.208)	(0.652)	(0.302)	(1.917)
Hinduism	1.108	2.023***	1.907***	1.538*
	(0.158)	(0.337)	(0.361)	(0.402)
Buddhism	1.500	2.765***	1.214	1.680
	(0.412)	(0.833)	(0.422)	(0.928)
+ other control variables				
Constant	0.262***	0.0160***	0.0777***	0.0297***
	(0.0792)	(0.00616)	(0.0240)	(0.0215)
Observations	13,785	13,766	13,772	2,380
Pseudo R-squared	0.0915	0.122	0.0730	0.155

N	13785	13766	13772	2380
ll	-8517	-5890	-6393	-1311

<div align="center">

Odds ratios, standard error in parentheses
*** p<0.01, ** p<0.05, * p<0.1
Control variables not shown in the table: education, work status, age, marital status, family size, job, entrepreneur, agriculture. See appendix F for full model.

</div>

4.2 Discussion

Financial inclusion is receiving a lot of positive and negative attention in development context. Savings are playing a key role in many macroeconomic outcomes from economic growth to equality and poverty reduction. People in all socio-economic classes save, but often informally. This can mitigate many of the macro and micro-level positive outcomes. This thesis investigated the determinants of formal and informal saving. Identifying the characteristics of the people who safe informally helps to design better financial inclusion policies and financial products. The main findings in this study are: 1) men and women are as likely to save, but have different saving preferences due to intra-household bargaining issues 2) social networks impact on how people save 3) some of financial inclusion policies have had a reverse impact on formal saving 4) financial literacy does not have statistically significant effect on saving.

According theory, typical constraints for adopting formal finance include supply and demand-side constraints (see chapter 2.1.). Various financial inclusion programmes implemented in the last years, e.g. PMJDY, Aadhaar and introduction of various no-frills accounts have lowered the supply-side constraints in India. This makes cost and regulatory barriers less and less of an obstacle for widespread financial inclusion. However, the financial inclusion policies have not managed to address many of the demand-side problems. This has led to a significant gap between account take up and usage. The gap is a signal of a market failure, where demand for accounts is smaller than supply. The low demand is due to persistent informal finance. Even when people have adopted the usage of formal finance, the traditional saving vehicles; namely cash, gold, social network, property and other assets continue to coexist. Clearly, the saving vehicles are not perfect substitutes and many of the informal assets serve other purposes besides saving.

Our analysis is revealing that there are significant demographic, socio-economical and regional differences in saving behaviour. For instance, women and men have the same propensity to save, but they have different saving preferences: men save more via bank accounts and women more through gold and SHGs. The observation is supporting theory and previous literature. Ghosh (2017) came to similar conclusions while researching access and usage of formal and informal finance among Indian households. Several other papers have found that women are less likely to save via formal channels due to inter-household bargaining, i.e. they have less agency over financial matter within households (Doss et al., 2017: Karlan et al., 2014).

As shown in our theoretical framework, different saving vehicles have multiple purposes. Gold is a good example; in India, it is a sign of social status, a medium of exchange between

families during rituals, it has a special role in matrimony and dowries, i.e. *mangalsutra* and it can aim at social mobilization (Goedecke et al., 2017). Our results are supporting this view. Women and people belonging to other religions than Christianity were more likely to save through gold. That highlights the fact that there are cultural and social implications for gold. However, an in-depth qualitative analysis on cultural and social dimensions is out of scope for this study.

Social networks are playing an important role in finance. They work as a way to share risk (Karlan et al., 2014), accumulate social capital (Goedecke et al., 2017) and pressure to help other families in need (Karlan et al., 2014). These social norms are often referred as inter-household bargaining. Remittances are an example of financial behaviour via social networks. Remittances are found to have two opposite effects on financial inclusion and saving: firstly, remittances received through formal channels are paving the way for formal savings (Mirati et al., 2019; Filippo et al., 2014) and secondly, the social norms may increase saving through friends and family (Goedecke, 2017). Our results are supporting this view. The data shows that people who receive remittances from abroad are more likely to save on a bank account, but the also though social networks. The results for individuals who receive remittances from within India are slightly different: the likelihood to save through social networks increases, but the likelihood to save formally decreases. It might be that formal remittance channels are more common among international transfers than domestic transfers. This would explain the increased formal savings among the recipients of international remittances. The positive effect of foreign remittances to formal saving was strong.

The results show that financial inclusion policies are having a reverse effect on saving. The Indian financial inclusion policies include nudging or incentivising to use bank accounts by giving transfers to these accounts. The data revealed that the policies had a reverse effect on formal saving. The individuals who belong to PMJDY program were less likely to save to a bank account and more likely to save via gold or friends and family. The impact of transfers was statistically less significant, but it did have a positive effect on likelihood to save via gold. Field experiment in Kenya had found that a subsidy in a form of increased interest rate had a strong positive effect on assets and savings, but cash transfers did not have the same effect (Kast and Pomeranz, 2014). The PMJDY accounts include several incentives for saving including accidental insurance, interest on savings and a pension plan (Gov. India, 2018). Hence, it is surprising that the adoption among the PMJDY participants is so low. The results might also imply of slow adoption, since PMJDY is particularly targeting those who are financially excluded. Even though the adoption of bank account usage is lagging behind, it beneficial to have the supply of accounts in condition. However, more work needs to be done to increase the attractiveness of saving via formal channels.

Our analysis validates the notion that financial literacy does not have statistically significant effect on saving. The literature on financial literacy is divided. The financial institutions and policymakers are emphasizing the importance of financial skills are knowledge. However, most of the experiments and correlational studies are finding financial literacy to be insignificant (Fernandez et al., 2013; Xu and Zia, 2012). The evidence from our data is pointing at the same direction.

The policy implications of this study are to continue to assess and target the demand-side constraints on formal saving. As mentioned earlier, some of the saving vehicles such as gold and social networks have multiple purposes and they are not perfect substitutes to each other. The risk sharing function of social networks or the cultural and social dimensions of owning

gold e.g. in form of wedding jewellery might be difficult to change. However, a deeper understanding of women's saving behaviour and consequent support could help women to gain more agency over the households' saving decisions. What comes to financial literacy programmes, the objectives and performance should be carefully considered, since there is little evidence proving their usefulness. The free flow of remittances should also be encouraged by lowering regulatory and cost barriers for formal transfers.

For further research, a panel data analysis of determinants of saving could help to shed light on how much the usage is lagging behind from take up or if there is any change in usage since the account extensions started to happen. Moreover, information on the people who are the early adopters and the laggards would give us more comprehensive picture on how the financial inclusion policies are proceeding in India. Also, a qualitative study on women's saving would give us a better understanding on reasons behind financial exclusion which could then be confirmed via new, improved household survey.

5 Conclusion

This thesis investigated formal and informal saving in India. Financial inclusion– especially savings–have several significant positive socio-economic implications. Increased savings can enhance economic growth, alleviate poverty and decrease inequality. The individual level implications are noteworthy as well; formal savings can empower women, increase productive investments and entrepreneurship and decrease household debt. India has done a great deal in increasing financial inclusion. 80% of the adults now own a bank account and almost 100% possess the necessary documentation. Saving through formal finance is incentivised in several ways.

However, our results show that lowering barriers to formal finance through increased access, lower costs and various incentives is not a sufficient mean to reach full financial inclusion. There is a significant gap between account take up and usage. Even though access to formal bank accounts is an integral step, more focus should be placed on demand-side constraints. Our results show that Indian financial inclusion program, PMJDY, has had unfortunate results so far. The individuals belonging to the programme are saving less on bank accounts than others not belonging to PMJDY. That is regardless of the multiple incentives embedded in the programme, like accidental insurance, pension plan and interest rate on savings.

Informal saving seems to persist for several complementary reasons; other relating to various saving constraints and others to the fact that many informal saving vehicles carry multiple purposes besides saving money. Bank accounts are not a perfect substitute to gold and social networks, which both have several social and cultural implications. For instance, gold has an important cultural meaning in form of dowries and wedding jewellery, *mangalsutra*, and saving by lending it to other people have several social implications, e.g. gaining social wealth and risk sharing. Our results show that women and individuals belonging to other religions are significantly more likely to save in gold. Moreover, intra-household bargaining is constraining women from saving formally. Women's low financial agency within families is pushing them to save via informal channels like gold, and semiformal channels like self-help groups and cooperatives. Also, pre-existing social norms, or inter-household bargaining, is enhancing the social financial networks: we found that individuals who receive household remittances are more likely to save via social networks. This is an indiacation of reciprocity and risk sharing between families. However, remittances received from abroad have a positive effect on formal saving. As international remittance transfer services tend to be formal, they may pave the way for adoption of other formal financial services.

Our policy suggestions are to shift focus from supply-side constraints to demand-side constraints. The barriers to formal finance in India are relatively low, but the usage is lagging behind. We argue that understanding the multiple purposes different informal saving vehicles carry, can help policymakers and financial institutions to develop better suiting financial services. However, some of the purposes may be difficult to substitute. For instance, the

cultural and social importance gold may be difficult to replace with bank accounts. Similarly, the social networks are likely to remain due to their risk sharing function.

A timeseries analysis of formal and informal saving could provide deeper understanding of the change that is happening due to the rigorous supply-side policies.

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Appendix A

This appendix presents the goodness of fit tests, specification tests and correctly predicted values. The pseudo r2s are in low side in all of the models, but Homer-Lemeshow test for goodness of fit is ok (p-value > 0.05) for all models except for save social networks. Linktest is used for detecting specification errors and all models passed the test (_hat p-value < 0.05 & _hatsq p-value > 0.05). We tested also if the transformed variables age2 and ppi_score2 improved the model, with bank and gold models they improved the fit (p-value < 0.05). In the other two models the transformed variables were omitted. Correctly predicted values were good for gold and social networks and ok for bank and cooperative. Various tests are analysed in more detail in the methods section. The actual tests are enclosed in appendix b.

SPECIFICATION AND MODEL FIT	PSEUDO R2	WALD TEST	LINKTEST	CORRECTLY PREDICTED VALUES	GOODNESS OF FIT: HOSMER-LEMESHOW
SAVE BANK OBS. 13,785	*0.0915 **1716.21	*21.52 ** 0.001	_hat: **0.000 _hatsq **0.968	65.19%	* 4.59 ** 0.8000
SAVE COOPERATIVE OBS. 2,380	*481.44 **0.1552	**0.0688 Trans-formed variables were left out	_hat: **0.000 _hatsq **0.136	73.03%	* 9.57 ** 0.2967
SAVE GOLD OBS. 13,766	**0.1221	*28.11 ** 0.000	_hat: **0.000 _hatsq **0.457	81.88%	* 6.19 ** 0.6261
SAVE SOCIAL NETWORKS OBS. 13,772	0.0730	** 0.0765 Trans-formed variables were left out	_hat: **0.000 _hatsq **0.497	80.48%	* 16.47 ** 0.0361

*Chi2, ** P-value, ***

Appendix B

Tests for model 1.

```
. test $list

 ( 1)   [savebank_]age2 = 0
 ( 2)   [savebank_]ppi_score2 = 0
 ( 3)   [savebank_]log_fl_score = 0

         chi2(  3) =   21.52
       Prob > chi2 =    0.0001

. *0.0000




. estat gof, group(10)

Logistic model for savebank_, goodness-of-fit test

   (Table collapsed on quantiles of estimated probabilities)

        number of observations =     13785
              number of groups =        10
     Hosmer-Lemeshow chi2(8) =      4.59
               Prob > chi2 =    0.8000
```

. estat classification

Logistic model for savebank_

| Classified | ——— True ——— | | Total |
	D	~D	
+	6139	2934	9073
−	1865	2847	4712
Total	8004	5781	13785

Classified + if predicted Pr(D) >= .5
True D defined as savebank_ != 0

Sensitivity	Pr(+| D)	76.70%
Specificity	Pr(−|~D)	49.25%
Positive predictive value	Pr(D| +)	67.66%
Negative predictive value	Pr(~D| −)	60.42%
False + rate for true ~D	Pr(+|~D)	50.75%
False − rate for true D	Pr(−| D)	23.30%
False + rate for classified +	Pr(~D| +)	32.34%
False − rate for classified −	Pr(D| −)	39.58%
Correctly classified		65.19%

Appendix C

Tests for model 2.

```
. test $list

 ( 1)  [savegold_]age2 = 0
 ( 2)  [savegold_]ppi_score2 = 0
 ( 3)  [savegold_]log_fl_score = 0

        chi2(  3) =    28.11
      Prob > chi2 =     0.0000

. *0.0000
```

```
. estat gof, group(10)

Logistic model for savegold_, goodness-of-fit test

  (Table collapsed on quantiles of estimated probabilities)

      number of observations =      13766
            number of groups =         10
    Hosmer-Lemeshow chi2(8) =       6.19
              Prob > chi2 =      0.6261
```

```
. estat classification
```

Logistic model for savegold_

Classified	True		Total
	D	~D	
+	312	181	493
−	2314	10959	13273
Total	2626	11140	13766

```
Classified + if predicted Pr(D) >= .5
True D defined as savegold_ != 0
```

Sensitivity	Pr(+| D)	11.88%
Specificity	Pr(−|~D)	98.38%
Positive predictive value	Pr(D| +)	63.29%
Negative predictive value	Pr(~D| −)	82.57%
False + rate for true ~D	Pr(+|~D)	1.62%
False − rate for true D	Pr(−| D)	88.12%
False + rate for classified +	Pr(~D| +)	36.71%
False − rate for classified −	Pr(D| −)	17.43%
Correctly classified		81.88%

```
. linktest

Iteration 0:   log likelihood = −6708.4866
Iteration 1:   log likelihood = −5978.6812
Iteration 2:   log likelihood = −5892.0601
Iteration 3:   log likelihood = −5889.5316
Iteration 4:   log likelihood = −5889.5235
Iteration 5:   log likelihood = −5889.5235
```

Logistic regression		Number of obs	=	13,766
		LR chi2(2)	=	1637.93
		Prob > chi2	=	0.0000
Log likelihood = −5889.5235		Pseudo R2	=	0.1221

savegold_	Coef.	Std. Err.	z	P>|z|	[95% Conf. Interval]	
_hat	1.048445	.0707644	14.82	0.000	.9097492	1.18714
_hatsq	.0181267	.0243517	0.74	0.457	−.0296018	.0658552
_cons	.0190049	.0481411	0.39	0.693	−.07535	.1133598

Appendix D

Tests for model 3.

```
. estat gof, group(10)
```

Logistic model for savefriends_, goodness-of-fit test

```
   (Table collapsed on quantiles of estimated probabilities)

          number of observations =      13772
                number of groups =         10
       Hosmer-Lemeshow chi2(8) =      16.47
                   Prob > chi2 =       0.0361
```

```
. estat classification
```

Logistic model for savefriends_

Classified	——— True ———		Total
	D	~D	
+	155	85	240
−	2603	10929	13532
Total	2758	11014	13772

```
Classified + if predicted Pr(D) >= .5
True D defined as savefriends_ != 0
```

Sensitivity	Pr(+| D)	5.62%
Specificity	Pr(−|~D)	99.23%
Positive predictive value	Pr(D| +)	64.58%
Negative predictive value	Pr(~D| −)	80.76%
False + rate for true ~D	Pr(+|~D)	0.77%
False − rate for true D	Pr(−| D)	94.38%
False + rate for classified +	Pr(~D| +)	35.42%
False − rate for classified −	Pr(D| −)	19.24%
Correctly classified		80.48%

```
. linktest

Iteration 0:   log likelihood = -6896.5299
Iteration 1:   log likelihood = -6433.5633
Iteration 2:   log likelihood = -6393.4264
Iteration 3:   log likelihood = -6392.9692
Iteration 4:   log likelihood = -6392.9689

Logistic regression                            Number of obs   =     13,772
                                               LR chi2(2)      =    1007.12
                                               Prob > chi2     =     0.0000
Log likelihood = -6392.9689                    Pseudo R2       =     0.0730
```

savefriends_	Coef.	Std. Err.	z	P>|z|	[95% Conf. Interval]	
_hat	1.063548	.0995162	10.69	0.000	.8684995	1.258596
_hatsq	.0243898	.0358859	0.68	0.497	-.0459454	.094725
_cons	.0306717	.0657201	0.47	0.641	-.0981374	.1594808

Appendix E

Tests for model 4.

```
. estat gof, group(10)
```

Logistic model for saveshg_, goodness-of-fit test

```
   (Table collapsed on quantiles of estimated probabilities)

          number of observations =       2380
                number of groups =         10
          Hosmer-Lemeshow chi2(8) =       9.57
                    Prob > chi2 =       0.2967
```

```
. estat classification
```

Logistic model for saveshg_

```
                  ———— True ————
Classified    |        D            ~D      |      Total

     +        |      1356           467     |       1823
     -        |       175           382     |        557

  Total       |      1531           849     |       2380
```

```
Classified + if predicted Pr(D) >= .5
True D defined as saveshg_ != 0
```

Sensitivity	Pr(+| D)	88.57%
Specificity	Pr(-|~D)	44.99%
Positive predictive value	Pr(D| +)	74.38%
Negative predictive value	Pr(~D| -)	68.58%
False + rate for true ~D	Pr(+|~D)	55.01%
False - rate for true D	Pr(-| D)	11.43%
False + rate for classified +	Pr(~D| +)	25.62%
False - rate for classified -	Pr(D| -)	31.42%
Correctly classified		73.03%

```
. linktest

Iteration 0:   log likelihood = -1550.5919
Iteration 1:   log likelihood = -1311.3463
Iteration 2:   log likelihood = -1309.8728
Iteration 3:   log likelihood = -1309.8724
Iteration 4:   log likelihood = -1309.8724

Logistic regression                          Number of obs   =       2,380
                                             LR chi2(2)      =      481.44
                                             Prob > chi2     =      0.0000
Log likelihood = -1309.8724                  Pseudo R2       =      0.1552
```

saveshg_	Coef.	Std. Err.	z	P>|z|	[95% Conf. Interval]	
_hat	.9826837	.0524507	18.74	0.000	.8798823	1.085485
_hatsq	.0589074	.0395364	1.49	0.136	-.0185825	.1363973
_cons	-.0589583	.0700302	-0.84	0.400	-.196215	.0782984

Appendix F

Full model with control variables included.

VARIABLES	(1) Save bank	(2) Save gold	(3) Save friends	(5) Save cooperative
Log FL score	1.048	1.102	1.113	1.027
	(.0569)	(0.0779)	(0.0739)	(0.139)
Woman	0.757***	1.549***	1.043	3.883***
	(0.0407)	(0.109)	(0.0668)	(0.591)
Rural	0.778***	0.790***	1.098	1.406***
	(0.0376)	(0.0455)	(0.0636)	(0.185)
PPI score	1.025***	1.040***	1.001	1.007*
	(0.00413)	(0.00603)	(0.00152)	(0.00375)
PMJDY	0.899**	1.145**	1.104*	0.840*
	(0.0380)	(0.0621)	(0.0561)	(0.0883)
Subsidy	1.086	1.220***	1.010	0.866
	(0.0547)	(0.0741)	(0.0603)	(0.104)
Remittances, India	0.687***	1.589***	1.944***	0.784**
	(0.0338)	(0.0937)	(0.105)	(0.0946)
Remittances, foreign	1.989***	1.090	1.488***	0.771
	(0.221)	(0.135)	(0.173)	(0.176)
Farm owner	1.192***	1.129**	1.005	1.151
	(0.0540)	(0.0640)	(0.0560)	(0.133)
Area (Central)				
East India	1.521***	0.261***	0.567***	19.02***
	(0.129)	(0.0257)	(0.0628)	(8.211)
North India	1.193**	0.281***	1.390***	4.611***
	(0.101)	(0.0273)	(0.147)	(2.116)
North East India	7.464***	0.266***	0.421***	11.60***
	(1.100)	(0.0391)	(0.0761)	(5.664)
South India	1.289***	0.776***	2.016***	18.51***
	(0.113)	(0.0720)	(0.215)	(8.011)
West India	0.713***	0.417***	1.632***	12.98***
	(0.0640)	(0.0410)	(0.178)	(5.922)
Religion (Christianity)				
Islam	1.140	1.865***	1.934***	1.842*
	(0.176)	(0.346)	(0.394)	(0.608)
Sikhism	1.002	2.585***	1.056	2.787
	(0.208)	(0.652)	(0.302)	(1.917)
Hinduism	1.108	2.023***	1.907***	1.538*
	(0.158)	(0.337)	(0.361)	(0.402)
Buddhism	1.500	2.765***	1.214	1.680
	(0.412)	(0.833)	(0.422)	(0.928)
Education				
Illiterate, no edu	0.953	1.401**	1.019	0.858
	(0.102)	(0.187)	(0.134)	(0.208)
Literate, formal edu	1.411***	1.364***	1.051	1.372

	(0.123)	(0.153)	(0.113)	(0.326)
Primary	1.186**	1.030	0.997	0.877
	(0.0912)	(0.106)	(0.0932)	(0.173)
Middle	1.351***	1.035	0.890	0.828
	(0.0855)	(0.0891)	(0.0700)	(0.134)
Matriculation	1.556***	1.289***	0.893	0.887
	(0.107)	(0.114)	(0.0744)	(0.162)
Higher secondary	1.749***	1.375***	0.800**	0.528***
	(0.138)	(0.137)	(0.0767)	(0.117)
Non-technical diploma	2.128***	1.299	1.079	1.077
	(0.364)	(0.254)	(0.195)	(0.617)
Technical diploma	2.317***	1.524*	1.079	0.338
	(0.525)	(0.360)	(0.242)	(0.226)
Graduate	2.171***	1.763***	0.842	0.853
	(0.207)	(0.197)	(0.0935)	(0.260)
Post graduate	2.306***	1.734***	0.697*	0.951
	(0.380)	(0.292)	(0.133)	(0.404)
Work status (full-time)				
Part-time, regular salary	0.748***	0.695***	0.804**	1.265
	(0.0649)	(0.0748)	(0.0814)	(0.274)
Occasional work	1.114	0.759**	0.748***	1.668**
	(0.0944)	(0.0854)	(0.0753)	(0.383)
Seasonal work	0.802***	0.709***	1.187*	1.954***
	(0.0651)	(0.0759)	(0.108)	(0.400)
Self-employed	1.037	1.091	0.574***	2.145***
	(0.0806)	(0.0973)	(0.0545)	(0.494)
Not working, looking	0.793	0.450***	1.015	1.183
	(0.131)	(0.0994)	(0.191)	(0.657)
Housewife	0.594***	0.501***	0.745***	1.338
	(0.0580)	(0.0569)	(0.0826)	(0.344)
Student	0.474***	0.315***	1.006	0.976
	(0.0592)	(0.0553)	(0.141)	(0.426)
Retired	1.239	0.763	0.725*	1.723
	(0.203)	(0.131)	(0.135)	(0.851)
Not working, sick	0.613***	0.560***	0.672**	0.744
	(0.0961)	(0.113)	(0.133)	(0.329)
Age	1.028***	1.041***	0.995**	0.988***
	(0.00818)	(0.0109)	(0.00209)	(0.00463)
Marital status (single)				
Married	1.096	0.588***	1.011	0.418***
	(0.0825)	(0.0587)	(0.0846)	(0.108)
Widowed	1.029	0.831*	1.073	0.923
	(0.0863)	(0.0891)	(0.109)	(0.176)
Family size	1.020	1.123***	1.037**	0.950
	(0.0132)	(0.0185)	(0.0162)	(0.0361)
Job (farm owner)				
Farm worker	0.698***	0.527***	1.060	0.626**
	(0.0565)	(0.0541)	(0.0988)	(0.142)
Non-prof health	1.154	0.376***	0.726	0.805
	(0.207)	(0.0893)	(0.168)	(0.355)

Professional health	1.290	0.861	0.811	0.293***
	(0.248)	(0.155)	(0.180)	(0.137)
Clerk	0.954	1.002	1.430*	1.626
	(0.170)	(0.176)	(0.261)	(0.707)
Carpenter	0.893	1.081	1.531**	0.635
	(0.134)	(0.185)	(0.255)	(0.374)
Mechanic	1.016	0.511***	0.923	1.967
	(0.157)	(0.108)	(0.175)	(1.010)
Electrician	0.935	0.511***	1.163	0.145*
	(0.201)	(0.125)	(0.270)	(0.162)
Cleaner/house help	0.983	0.534***	1.144	1.075
	(0.167)	(0.116)	(0.225)	(0.478)
Waiter/cook	0.995	0.536*	1.030	1.081
	(0.259)	(0.177)	(0.317)	(0.571)
Driver	1.043	0.760	0.994	1.858
	(0.159)	(0.131)	(0.170)	(1.078)
Tailor	0.750*	0.461***	1.065	1.354
	(0.127)	(0.102)	(0.219)	(0.592)
Secretary	0.604	0.525	0.857	5.656
	(0.222)	(0.231)	(0.379)	(7.456)
Manager	1.688	1.130	0.948	
	(0.681)	(0.355)	(0.354)	
Security	1.277	1.093	0.836	1.998
	(0.391)	(0.334)	(0.285)	(2.924)
Messenger		-		
Police	1.294	1.288	1.627	
	(0.732)	(0.571)	(0.817)	
Conductor	0.736	0.850	0.665	
	(0.292)	(0.379)	(0.375)	
Factory employee	1.004	0.778	0.976	1.155
	(0.146)	(0.129)	(0.163)	(0.502)
Shop owner	0.598***	0.627***	1.208	1.337
	(0.0963)	(0.0893)	(0.213)	(0.659)
Sales person	0.526***	1.011	1.024	0.936
	(0.118)	(0.249)	(0.278)	(0.733)
Street vendor	0.528**	0.786	1.201	1.607
	(0.133)	(0.235)	(0.380)	(1.486)
Other business owner	0.867	0.664*	1.191	0.935
	(0.174)	(0.142)	(0.278)	(0.480)
Salonist	0.864	0.635	0.969	
	(0.362)	(0.339)	(0.542)	
Landlord	2.350	0.985	1.213	
	(1.839)	(0.552)	(0.803)	
Miner	0.487**	0.364*	0.569	2.365
	(0.160)	(0.223)	(0.307)	(3.219)
Military	0.647	2.003	2.541	1.401
	(0.414)	(1.205)	(1.603)	(2.551)
Occasional worker	0.680***	0.531***	1.014	1.134

	(1)	(2)	(3)	(4)
	(0.0925)	(0.0991)	(0.173)	(0.476)
Supervision	1.380	1.047	1.229	0.312
	(0.333)	(0.218)	(0.271)	(0.244)
Executive, junior	1.899**	1.157	0.595*	2.183
	(0.599)	(0.269)	(0.186)	(1.557)
Executive, middle or senior	0.987	0.720	1.047	
	(0.392)	(0.261)	(0.438)	
age2		1.000***		
		(0.000114)		
ppi_score2		1.000***		
		(5.23e-05)		
1.entrepreneur	1.462***		1.228*	0.669*
	(0.151)		(0.133)	(0.149)
1.agriculture	0.870***		1.417***	1.173
	(0.0412)		(0.0803)	(0.142)
Constant	0.262***	0.0160***	0.0777***	0.0297***
	(0.0792)	(0.00616)	(0.0240)	(0.0215)
Observations	13,785	13,766	13,772	2,380
Pseudo R-squared	0.0915	0.122	0.0730	0.155
N	13785	13766	13772	2380
ll	-8517	-5890	-6393	-1311

seEform in parentheses

*** p<0.01, ** p<0.05, * p<0.1