Household Saving Behavior in Rural Ethiopia: Challenges and Policy Options[1]

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Abstract

Despite remarkable progress in increasing domestic saving over the last two decades, it has been unable to keep pace with investment rates. Hence, it is crucial to identify and implement feasible policies to mobilize more domestic savings to reduce the financial gap. To this end, dependable empirical evidence is imperative. This study aims to identify the major drivers of saving in general, and in-cash and in-kind savings in particular among rural households. We rely on both primary (panel data sets, key informant interviews, and focus group discussions) and secondary (data collected from Micro Finance Institutions (MFIs) and the National Bank of Ethiopia) sources. Descriptive and econometric approaches were employed to analyze the data and answer the research questions posed. The results show that about 75% and 77% of surveyed households saved in formal or informal financial institutions in 2014 and 2022, respectively. Nominal savings per household have increased in the past decade, but most of the improvement has come from in-kind savings which are destined for informal mechanisms. As a result, the main source of finance for rural households, MFIs, faced difficulty meeting the loan demands with their own savings. The rise in inflation, especially in recent years, forced households to reduce cash savings and hold assets. Our econometric analysis shows that ensuring access to formal financial services, financial knowledge, and building trust in formal financial institutions (FFIs) and their services significantly increases cash saving. Therefore, improving access to FFIs and diversifying financial products will improve the rate of savings and therefore, the rate of investment in Ethiopia. The results also show that building trust in the services and products of formal financial institutions (FFIs) can help bring in-kind savings and informal cash savings to formal cash deposits in financial institutions.

Key words: Rural households, savings, Investment, financial institutions
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1. Introduction

Savings mobilization is critical for individual and societal welfare (Karlan et al., 2018). For individuals, some of the benefits embedded in savings include hedging against unforeseen circumstances (Chowa, 2006; Karlan et al., 2014; Lugilde, 2018; Demirguc-Kunt et al., 2018), building of assets, tapping investment opportunities (Tekie and Wolday, 2014; Demirguc-Kunt et al., 2018), provision for retirement (Demirguc-Kunt et al, 2018; Lugilde, 2018), purchasing or improving dwellings, to enjoy a sense of independence and the power to do things (Ashraf et al., 2010; Asare et al., 2018), and debt settlements (Rehman et al., 2011; Zwane et al., 2016).

At the macroeconomic level, saving rates strongly predict future economic growth (Karlan et al., 2018). Hence, to reap the aforementioned benefits of savings, there have been strong efforts in place by governments to encourage domestic saving mobilizations.

In Ethiopia, the savings rate was 14.1% in the year 2008/2009, and it has been increasing at an average rate of 7.2% per annum over the last 10 years to reach 24.3% in 2018/19 (NBE, 2020). The contribution of new saving products such as the GERD bond, house savings, and pension contribution was significant to realize the progress (MoFED, 2015; FDRE PSRC, 2018). However, there are still valid reasons to drive domestic resource mobilization beyond its past achievements. First, in recent years, there have been efforts by the government to increase the private sector's role in the national economy beyond its low contribution in the past. This requires mobilizing more private savings since public savings are often used for public investments (UNCTAD, 2007). Second, despite the past effort to improve agricultural output and productivity, the country still faces a large yield gap (Bachewe et al., 2019; Amare et al., 2019; Cepheus R and A, 2021). One of the major explanations for this gap is the low technological adoption rate and intensity of use among smallholder farmers due to financial constraints. For instance, only 30% to 40% of Ethiopian smallholders apply fertilizer, and the application rate is only 37 to 40 kg per hectare, which is far below the recommended rate (Amare et al., 2016).

Smallholder farmers who produce nearly 90% of the country's agricultural production are resource-poor, which limits their investment in productivity-enhancing inputs (Bachewe et al., 2019; Spielman et al., 2013; Belissa et al., 2019). The financial service provision to the agricultural sector is limited in terms of access,

quantity, and quality of financial products (CIMMYT, 2015; Desalegn and Yemataw, 2017; National Bank of Ethiopia, 2019). Most financial institutions are concentrated in urban areas, and only a few serve nearly 80% of the country's rural population, which results in low financial inclusion. Demirguc-Kunt et al. (2018) found that only 35% of those aged 15 years and above have accounts in formal financial institutions (FFIs) in Ethiopia, and the majority of those who do not have accounts in FFIs mentioned that absence of these institutions in their vicinity as a major barrier. That is far less than in neighboring east African countries like Kenya, Uganda, and Tanzania, where 80% in Kenya and nearly 50% in Uganda and Tanzania have accounts in FFIs.

In terms of product quality, gaps exist for all major product categories, including credit, savings, insurance, and payments for all major actors in the agricultural sector, including farmers, traders, and manufacturers. In terms of product quantity, the supply of rural finance is far short of the demand, which is partly driven by rural households' poor saving culture in formal financial institutions (Mirach and Hailu, 2014; FDRE PSI, 2018; Demirguc-Kunt et al., 2018; Negeri, 2018; Addis et al., 2019), since they opt to save in kind or cash under the mattress and informal institutions such as 'Iqqub' (Demirguc-Kunt et al., 2018). Saving in kind and cash saved in informal in institutions may not be channeled to entrepreneurs (deficit units in the financial system with feasible business or project ideas), and as a result, such types of savings are mostly less efficient compared to saving in cash and in formal financial institutions (UNCTAD, 2007). To this end, this study was initiated to answer two specific research questions, namely: (i) Why is saving culture low among rural households in Ethiopia? And (ii) what can be done to help farm households save more in cash and in formal financial institutions than they do in kind and through informal methods?

2. Literature Review

2.1. Definition and Institutions of Saving

Household saving is the action of putting aside part of one's current income in order to consume or invest it later on (Gardiol, 2004). This saving can be practiced in kind, such as cattle, grain, jewelry, and so forth, or cash (money). The money saved can be kept as savings deposit in the formal sector (banks, insurance companies, and so forth.), semiformal sector (microfinance institutions, saving and

credit co-operatives, and so forth.), and informal sectors such as "Iqqub"[5], "Iddir"[6] or save at home (Fenta et al., 2017).

2.2. Theories of Saving

The amount of savings is calculated as a residual between disposable income and total current consumption. Hence, saving theory is basically consumption theory, and the determinants of saving should be the same as those of consumption (Lugilde, 2018). Accordingly, we have discussed below the standard consumption theories as theories of saving.

A. Life cycle hypothesis (LCH)

This hypothesis states that individuals choose to maximize utility derived from life time resources by allocating them optimally between current and future consumption (Modigliani, 1986). According to this hypothesis, saving is future consumption, and positive saving is motivated by the smoothening of consumption across time as households rationally expect a decline in their income patterns. To this end, individuals borrow in their early ages to acquire education, skills, etc.; save in their middle (working ages) to use it in their old ages (Modglani, 1986). The conclusion is that in addition to household income, the age of the individual also determines saving behavior. Furthermore, it implies that households with a high dependency ratio will have less probability or amount to save as the income will be used either to educate the dependents (in their early years) or for consumption (in their later years).

B. Permanent income hypothesis (PIH)

The PIH enables us to differentiate the components of permanent and transitory income, which in turn helps identify determinants of household saving. *Permanent income* is defined in terms of the long-term income expectations over a planned period and with a constant rate of consumption maintained over the lifetime given the present level of wealth. On the other hand, *transitory income* is the

[5] According to Aredo (1993) Iqqub is a savings association where each member agrees to pay periodically a small sum
into a common pool so that each, in rotation, can receive one large sum and

[6] Iddir is a sort of insurance programme run by a community or a group to meet emergency situations.

difference between actual or current income and permanent income. According to PIH, permanent income determines consumption, and households practice of saving if current income is above permanent income. In this hypothesis, individuals are assumed to not consume from transitory income, so the marginal propensity to save from this income is nearly one (Modglani, 1986).

Generally, the traditional theoretical models discussed above assume that saving behavior by individuals is mainly driven by the desire to balance current versus anticipated consumption (Steinert et al., 2018; Lugilde, 2018) and they are supported by many empirical analyses in rich countries and are robust to varying assumptions (Karlan and Morduch, 2010). However, many empirical works showed that these models are less applicable to Africa and to more collectivist societies (Aron, 2007; Karlan and Morduch, 2010; Steinert et al., 2018). In case of extended families, there is an obligation to care the elderly inter-generationally rather than by the individual which weakens the relationship between age and savings. Morduch and Armendariz (2005) further discussed that the models are designed to describe the behavior of nuclear families. As a result, they poorly predict savings in complex and multigenerational households. In support to this, Demirguc-Kunt et al. (2018) used global FINDEX data base and found that nearly half of adults in high-income economies to have saved for old age, whereas in developing economies, only 16 percent did it for old ages. Furthermore, the above models assume the supply side factors (that is, access/service of financial institutions, and so forth) as given in less developing countries (for example, no constraint in credit access, and so forth) and this poorly captures the reality on the ground because a large proportion of the population especially in rural Africa are out of the outreach of FFIs and their services (UNCTAD, 2020). Therefore, it is vivid from these discussions that a comprehensive analysis of saving and its determinants at micro level has to address a range of factors such as institutional characteristics, difference in cultures, societal factors, and risk behavior.

C. Empirical literature review

Few researches are conducted in Africa, even though the merits of domestic savings deserve more attention and should have been one of the dominant focuses of researchers.

A study on saving behavior among households of teachers, entrepreneurs, and small holder farmers in rural parts of Nakuru, Kenya showed that household

saving is significantly determined by income of the household (positively), type of occupation (businessmen save more than teachers and farmers), credit access (negatively), and age of the household (negatively) (Kibet et al., 2009).

Household saving behavior in Ghana was studied by Anang et al. (2009) using a probit model, and they found that demographic variables such as age, sex, and marital status were significant determinants. Contrary to most other findings, household income and education status of respondents weren't significant determinants of saving among Ghanaian households.

Touhami *et al.* (2009) employed microeconometrics to investigate the determinants of households' saving in Morocco, and they found that income and saving had strong and positive relationship. Moreover, family size is a significant determinant of household savings only in urban areas, and it is negatively related to saving. Moreover, they found that there is a lack of access to formal financial institutions in rural areas.

Zwane et al. (2016) employed panel data estimation models to identify the determinants of household saving in South Africa. The result of their study revealed that household saving in South Africa is strongly driven by income, age structure, educational achievement, and employment status. Their result about the impact of age on saving is positive, and they noted that their finding validates the life cycle hypothesis. As far as educational achievement is concerned, educated households have higher savings than illiterate ones. Moreover, family size significantly and negatively affects household savings in South Africa. Interestingly, as mentioned above, this paper used panel data, which allows accounting for unobserved differences across households, and the 2SLS estimation technique to overcome the endogenity problem that arises due to simultaneity between income and saving. More specifically, although a rise in an individual's income might increase savings, higher savings may also result in increased income growth. Estimating such causality would result in a potential endogenity bias, leaving the estimates of both the fixed effect and the random effect biased and inconsistent. They used the lagged value of income as IV while estimating 2SLS. However, variables of the model in this study are more about household attributes and achievements such as income, education, age, and location of the household, and no attempt is made by the researchers to analyze the potential impacts of access, trust, and so forth of financial institutions on household savings in their case study.

A number of research works have been conducted with the objective of identifying the determinants of household saving in Ethiopia. The following table summarizes empirical works carried out on determinants of household saving in Ethiopia. The table presents the case studies, type of data used, methods employed, and major findings. This helps to compare and contrast past efforts easily and also to draw major line of findings.

Table 1: Summary of empirical research works on determinants of household saving in Ethiopia

Author/s & year of publication	Area/case study	Data Type	Method Used	Main Findings (significant variables with the associated impact on saving)			
				Economic Variables/ wealth indicators	Social variables	Financial Institutions	Risk
Addis et al (2019)	South West Amhara	cross section	Ordered probit	Land size (+), Expected income (+), Remittance (-), aid (-), festive expenditure(-)	Education level (+), membership of community based health insurance (+)	Access to FIs (+), Credit access (-)	
Teman & Feleke (2018)	Wolaita and Dawuro Zone, SNNPR (rural HHs)	cross section	Tobit Model	HH income (+), Amount of land holdings (+), Unemployed family member (-)	Age(-)	Distance to FIs(-)	
Teshome et al (2013)	East Hararghe zone-Rural HHs	cross section	Tobit model	Livestock holding in Tlu (+ve), Income(+)	sex (+ve for female), education level (+), contact to extension workers (+)	Access to credit service (+)	
Fenta et al (2017)	Zonal cities of Amhara regional state	Cross section	Logistic Regression	Employment Status (+), Asset from parents(+) & House ownership (+) for owners and renters compared to those who live in Kebele Houses)	Education level (+)		

Mirach & Hailu (2014)	North Gonder Zone-both rural and urban HHs	cross section	Tobit model	Income (+)	age(+), Sex of the head (Higher saving for male headed HHs), Marital status (-ve for those married HHs)	Type of financial institutions used (more saving for those who use formal financial institutions)
Negeri (2018)	Sinana Woreda, Oromia Region	cross section	Probit Regression	Income (+), expenditure (+),	Education status (+), access to extension service (+)	Distance to Fis (-)
Ayenew (2014)	Arba Minch Town	cross section	logistic Regression	HH income (+), ownership of urban agriculture (+)	Family size (-)	Credit access (-)
Yonas & Gebrekirstos (2016)	Dire Dawa City	Cross section	Probit	HH income(+)	Marriage (+), Age (+)	- -
FDRE PSRC (2018)	Urban & rural	Panel	Probit	HH income (+), Productivity level of woredas (+)	Age(-), Family size (+), Education level (+)	Access to MFI in km (+)
Asare et al (2018)	Rural	Cross sectional	Two part model-probit for participation	Land size(+) Bad production season at t-1 (-)	Access to extension(+)	

			and OLS for intensity/amount equation		Market information(+)	
Zeleke & Endris, 2019	Urban & Rural	Cross sectional	Logistic regression	Income(+) Main occupation-not being a farmer(+)	Age of HH head(+) Family size (+) Education (+)	Knowledge of interest rate (+)
Saliya, A. Y. (2018)	Urban (Mekelle City)	Cross sectional	Logistic regression	Income(+) Additional earner in a HH(-)	Female headed HHs(+) Age of HH head(-) Dependency ratio(-)	Prior saving experience(+)
Gonosa et al (2020)	Rural (North Bench district)	Cross sectional	Logistic regression	Number of livestock (+)	Age of HH head(-) Extension service(+) Education level(+)	Access to credit (+) Transaction cost of saving in FFIs (+)
Amha & Tekie (2014)	Rural & Urban	Cross sectional	Heckman selection model	Income(+)	Number of dependents within HH(-) Number of members currently in school (+) Mean age of members of the HH(+) Male headed HHs(+)	

As noted from the above review of empirical works abounding in Ethiopia, saving increases with increases in most wealth indicators (that is, income, land, and livestock ownerships), education level, and access to extension services. However, the impacts of access to FFIs and their services on gender, marital status, and the age of the household head are not conclusive. In our study, we tried to get more evidence on the determinants of savings in Ethiopia by bringing additional variables into the analysis, such as knowledge and trust in financial institutions and their services.

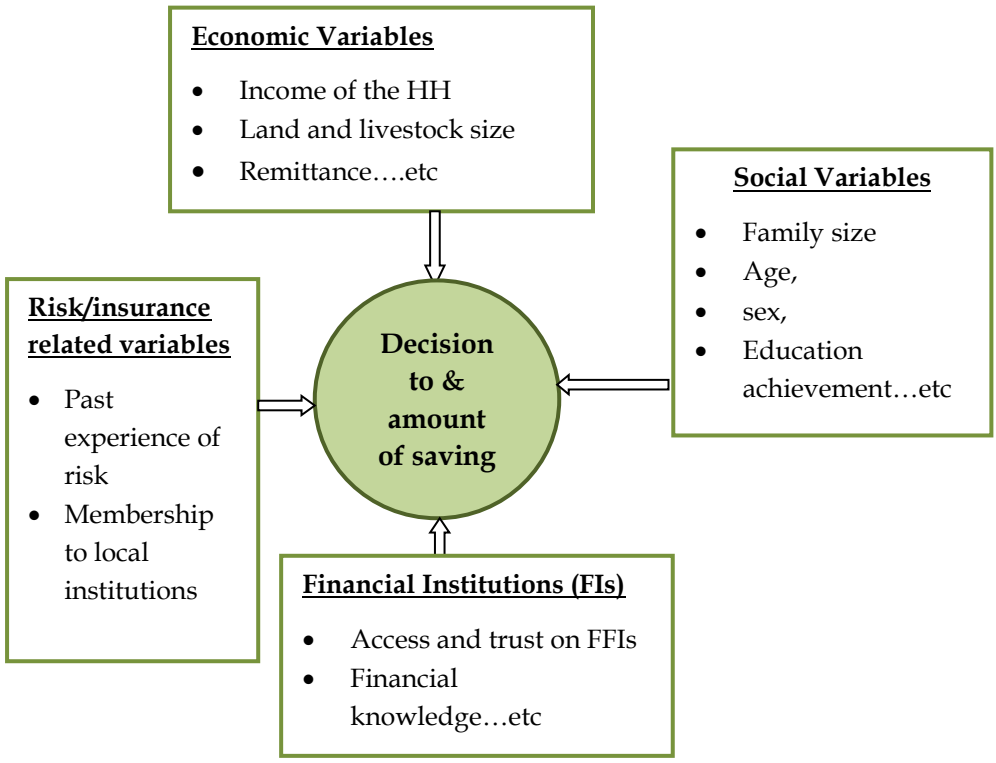
Moreover, almost all micro-level studies in Ethiopia rely on cross-sectional data, but our research work used three rounds of panel data. The use of panel data helps in getting more realistic and robust estimations since it accounts for some of the problems of cross-sectional data such as endogeniety bias and unobserved heterogeneity in a cross-sectional unit (Wooldridge, 2010).

In sum, it is our belief that this study contributes to the existing literature on household saving in Ethiopia in the following ways: ***first,*** in contrast to abundant works in Ethiopia that used cross-sectional data, this study uses a panel data set, which, as mentioned above, gives more robust and accurate coefficient estimates by controlling household heterogeneity in cross-sectional data. ***Second***, in addition to the panel household data, we have conducted FGDs, KIIs, and gathered and analyzed secondary data related to the topic, which provides an in-depth analysis of our research problems in contrast to previous papers that mainly rely on either of the data sources. ***Third***, we attempted to address the determinants of cash and in-kind savings separately since prior efforts, especially factors that affect the latter, are almost nonexistent in Ethiopia. Doing so helps to identify and target those factors that could potentially decrease in-kind savings and boost cash savings in FFIs.

3. Conceptual Framework

On the basis of the theoretical and empirical literature reviewed above, we have developed the following diagrammatic illustration that guides our analysis of the determinants of saving behavior and the amount of savings by rural households in Ethiopia.

Figure 1: Conceptual framework of determinants of rural household savings



Source: Own sketch based on theoretical and empirical reviews on household savings

4. Methodology

4.1. Data types, sources, and sampling method

We mainly rely on three waves of households' panel data to get information regarding the demand and supply side determinants of saving at the household level. The first round survey was conducted in 2014 by the Association of Ethiopian Micro Finance Intuitions (AEMFI). In the second round, the same households were contacted in 2018 by the then-FDRE Policy Studies and Research Center (PSRC) in collaboration with AAU's Department of Economics. The third round was collected by the EEA in 2022, and in each round, 302[16] rural households (that is, a total of 906) are taken. Data was collected from four regions (Amhara, Oromia, SNNPR, and

[16] Actually, the surveys in 2014 and 2018 have covered 1500 & 3005 rural households respectively including those contacted in 2022 by our recent survey.

Afar), and we tried to include households from different agro-ecologies and main livelihoods such as crop and livestock sub-sectors.

Table 2: Sample weights

Region	Percentage	Sample size
Oromia	28.67	87
Amhara	28.67	87
SNNPR	28.33	85
Afar	14.33	43
Total	**100**	**302**

Moreover, we have conducted 8 focus group discussions (2 FGDS in each region) and KIIs with selected community leaders, rural money lenders, and other relevant stakeholders to identify the institutional constraints that hamper savings mobilizations from rural households. Furthermore, we collected secondary data from the National Bank of Ethiopia and the Association of Ethiopian Microfinance Institutions (AEMFI) about the saving trends of commercial banks and microfinance institutions, respectively.

4.2. Methods: Empirics and model specification

According to the random utility model, farmers as rational agents decide to save only if their utilities increase compared to the decision not to save (Cameron and Trividi, 2005). Let $Y_1 \& Y_0$ be utilities expected by farmers from decision to save and not to save, respectively. If $Y_1 > Y_0$, households decide to save, and they don't save when $Y_1 \leq Y_0$.

However, we can't directly observe the utilities, only their decisions, which take a binary value (that is, 1 if the farmer saves and 0 otherwise).

$ss = 1\ if Y_1 > Y_0,$ in terms of probabilities this can be further written as

$P(ss = 1/X) = P(Y_1 > Y_0)$

Hence, our dependent variable is a binary outcome that takes a value of 1 if the household decides to save, in cash or kind and 0 otherwise. The potential models

for consideration are the pool of non-linear panel data models (that is, random/fixed effect probit and logit models). Wooldridge (2010) claimed that the popular model for binary outcomes with panel data is the unobserved effects probit model.

Following Wooldridge (2010) and Cameron and Trivedi (2009), let us start from the latent variable model, which is specified as follows:

$$y_{it}^{*} = x_{it}\beta + \gamma + \bar{x}_{\iota}\delta + c_i + e_{it}$$
$$y_{it} = 1 \; if \; y_{it}^{*} > 0$$
$$y_{it} = 0 \; if \; y_{it}^{*} \leq 0$$
$$e_{it} \mid x_{it}, \; c_i \sim Normal(0, \delta_c^2) \qquad \textbf{(2)}$$

Where

$\boldsymbol{x_{it}}$ contains both time variant and invariant explanatory variables including time dummy, c_i is unobserved random variable and $\boldsymbol{e_{it}}$ is error term. δ_c^2 is the conditional variance of c_i in the first equation and it is assumed that it doesn't depend on x_i.

On the other hand, the amount of saving ($E[y_{it}]$) can be expressed as follows:

$E [y_{it}| y_i \text{ if observable}] = E [y_{it}| z^{*}_i>0]$

$= E [X_{it}\beta + \varepsilon_{it} | z^{*}_i>0]$

$= E [X_{it}\beta + \varepsilon_{it} | w_i\gamma + u_i>0]$

$= E [X_{it}\beta + \varepsilon_{it} | u_i>-w_i\gamma]$

$= X_{it}\beta + E [\varepsilon_{it} | u_i>-w_i\gamma]$

However, $E [\varepsilon_{it} | u_i>-w_i\gamma] = \rho\sigma_e^2\lambda_i(\alpha_u)$

Thus, $E [y_{it}| y_i \text{ if observable}] = X_{it}\beta + \rho\sigma_e^2\lambda_i(\alpha_u)$ where $\lambda_i(\alpha_u) = \varphi (w_i\gamma/ \sigma_u)/\Phi (w_i\gamma/ \sigma_u)$

Hence, $E [y_{it}| y_i \text{ if observable}] = X_{it}\beta + \rho\sigma_e^2 \quad \varphi (w_i\gamma/ \sigma_u)/\Phi (w_i\gamma/ \sigma_u)$.

In this model: φ is the normal density function and Φ is the normal distribution function.

On the other hand, $\lambda_i(\alpha_u)$ is the Inverse Mills Ratio which is estimated in the first stage regression and inserted in the second stage tobit model as an explanatory variable.

4.3. Variables of the model and expected signs

Based on the theoretical and empirical literature reviewed in the previous sections, here below we have presented the variables included in our model with their description, measurement, and expected signs.

Table 3: Variables of the model and expected signs

Variables	Description and Measurement	Expected sign	
		Probability of saving	Amount of saving
Log of household income	Continuous variable and it is the log of total income of the HH for the last 1 year measured in *ETB*	+	+
Family size	Continuous variable and it counts all the members of a HH that permanently lives in the house	+/-	+/-
Distance to the nearest formal financial institution	It is continuous variable and measures in KM the distance between residence of a HH and the nearest financial institution (it is a measure of access to FIs)	-	-
trust on FFIs	It is qualitative measurement (no trust, low, medium and high trust)- we have assigned 0 for those who responded no/low trust and 1 for those who replied medium and high trust on FFIs	+	+
Sex of the HH head	It is dummy variable and has values for Male headed HH = 1 & Female headed HH=0	+/-	+/-
Age of the HH head	It is a continuous variable and it measures age of HH head in years	-	-
Participation in off-farm activities	It is dummy variable and has values equal to 1 if the household Participated in income generating off-farm activities, and 0 otherwise	+	+

Variables	Description and Measurement	Expected sign	
		Probability of saving	Amount of saving
Receipt of remittance by the HHs	It is dummy variable and has values for HHs who received remittance in the last 12 months = 1, if not= 0	-/+	-/+
Financial knowledge of the HHs	It is dummy variable and has values for HHs who have basic financial knowledge about saving products = 1, if not =0	+	+
Land size	It is continuous variable and measures land in ha	+	+
Number of livestock	It is continuous variable and counts the number of livestock a HH owns	+	+
Membership to local institutions	It is dummy variable and has values equal to 1 for those HHs who are members of local saving institutions, and 0 otherwise.	-	-
Agro-ecology	Dega, Woyna Dega, Kola & Desert	+/-	+/-

5. Results and Discussions

5.1. Descriptive analysis

I. Rural saving practice: the bigger picture

As depicted in Table 4 below, MFI's savings has grown on average by 32.53% per annum for a decade. More importantly, the share of voluntary saving has continuously increased to reach 84.71% in 2019. The growth in total savings was higher than the growth in the number of active borrowers, which improved savings per borrower significantly. However, this remarkable growth in saving per borrower was far below the growth of loans per borrower. As a result, the capacity of MFIs to meet loan demand from savings has decreased over time especially in recent years. The growth of the overall financial gap of MFIs is also evident in the last decade, as the difference between total loans and total savings has been growing continuously except in 2014.

Table 4: Ethiopian MFIs Saving Trend, Saving & loan per Borrower (in Million birr)

Year	Compulsory Saving-in million ETB (A)	Voluntary Saving-million ETB(B)	Total Saving-million ETB –C	No of Active Borrowers (D)	Voluntary / Total Saving (%)	Growth of T. Saving (%)	Saving per Borrowers (ETB)-E=C/D	Loan per Borrowers (ETB)-F	Gap per borrower=F-E	growth of gap per client
2010	817.13	1,738.60	2,555.73	2.33	68.03	-	*1,098.81*	2,453.39	1,354.58	-
2011	931.25	2,764.77	3,696.02	2.48	74.80	44.62	*1,489.84*	2,882.96	1,393.11	2.84
2012	1,407.29	4,067.06	5,474.35	2.64	74.29	48.11	*2,075.48*	3,635.71	1,560.22	12.00
2013	2,164.47	5,853.83	8,018.31	3.15	73.01	46.47	*2,545.70*	4,117.37	1,571.67	0.73
2014	2,934.57	8,584.04	11,518.61	3.37	74.52	43.65	*3,422.10*	4,672.81	1,250.71	(20.42)
2015	3,165.79	11,699.09	14,864.88	3.81	78.70	29.05	*3,904.45*	5,374.17	1,469.71	17.51
2016	3,384.16	13,600.69	16,984.85	3.86	80.08	14.26	*4,397.34*	5,867.59	1,470.25	0.04
2017	4,622.97	20,563.27	25,186.25	4.82	81.64	48.29	*5,226.97*	7,166.67	1,939.70	31.93
1018	5,234.12	23,730.05	28,964.16	5.11	81.93	15.00	*5,672.91*	8,491.62	2,818.71	45.32
2019	6,014.12	33,330.10	39,344.22	5.00	84.71	35.84	*7,869.74*	11,001.80	3,132.06	11.12
Average	**3,067.59**	**12,593.15**	**15,660.74**	**3.66**	**77.17**	**32.53**	***3,770.33***	**5,566.41**	**1,796.07**	**10.11**

Source: Association of Ethiopian Microfinance institutions (AEMFIs) & own computation.

II. Rural savings in the study area

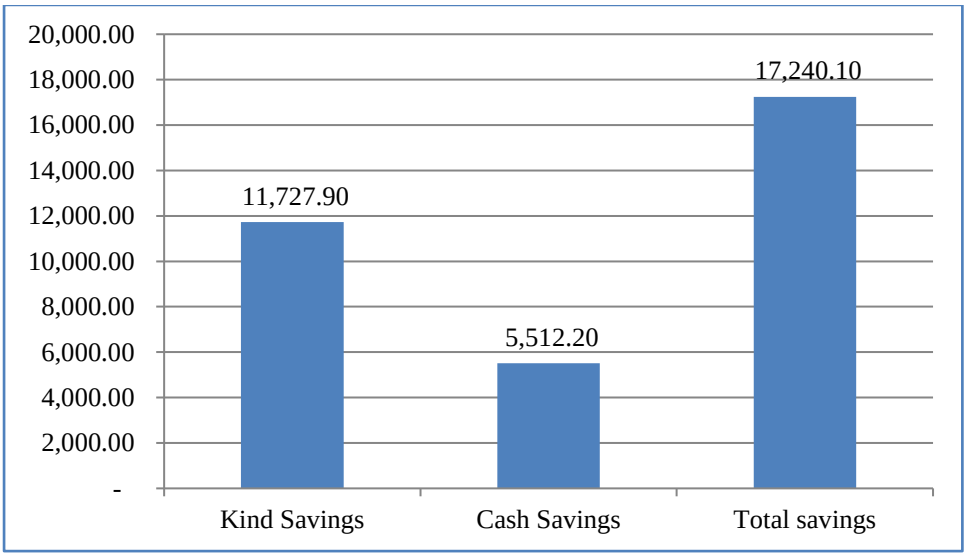
The majority of the households in the study area (72.6%) save their resources either in kind or in cash. For those who saved, the average value of in-kind saving amounted to Birr 11,728 while the cash saving was almost half of that amount (ETB 5,512). The total average savings was, therefore, Birr 17,240 (Figure 2).

Table 5: Saving status/practice

Saving Status	Freq.	Percent
Practice saving	658	72.63
Don't practice saving	248	27.37
Total	906	100

Source: own computation based on panel data

Figure 2: Average saving per HH



Source: Own computation based on panel data

The nominal value of saving of the sampled households has been increasing over the years. The average savings amounted to be Birr 6,725 in 2014, grew to 9,968 in 2018, and reached Birr 35,027.5 in 2022, where the average growth rate was about 20.6%. In real terms, assuming a 25% annual inflation rate, the growth of savings was about 11.9%, which was nearly half of the growth in nominal saving. On the other hand, saving in kind was growing faster than saving in cash, reflecting

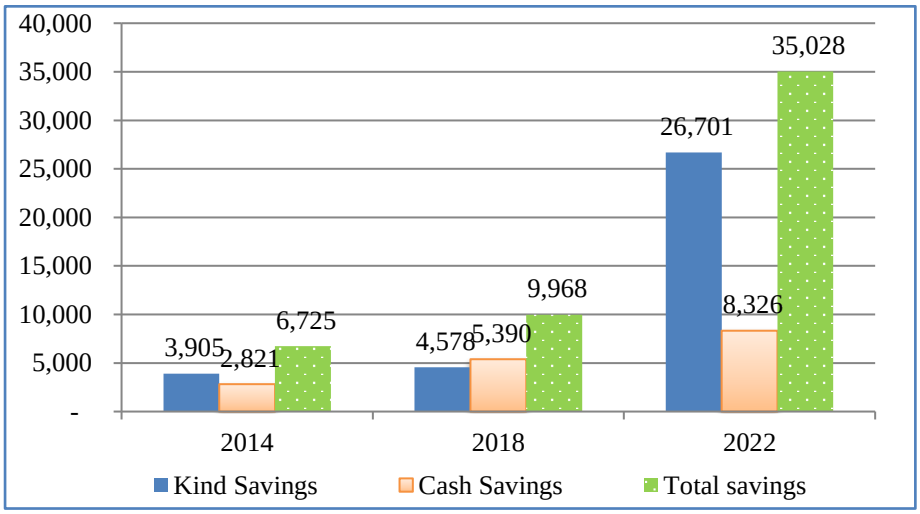
households' response to the country's growing inflation rate over the years. As a complement to this, in 2022, 35% of those who practice saving said that the previous years' inflation forced them to reduce their savings in cash and resort to in-kind saving, where these figures were 21.6% and 16% in 2018 and 2014, respectively.

Table 6: Nominal vs. real saving over the years

Year	Nominal saving value	Nominal saving value (ln)	Real saving value	real saving value (ln)
2014	6,725	8.814	6,725	8.814
2018	9,967.7	9.207	6,645.133	8.802
2022	35,027.5	10.464	17,513.75	9.771
Growth rate		**20.63%**		**11.96%**

Source: Own computation based on panel data

Figure 3: Cash and in-kind savings over time (mean values)

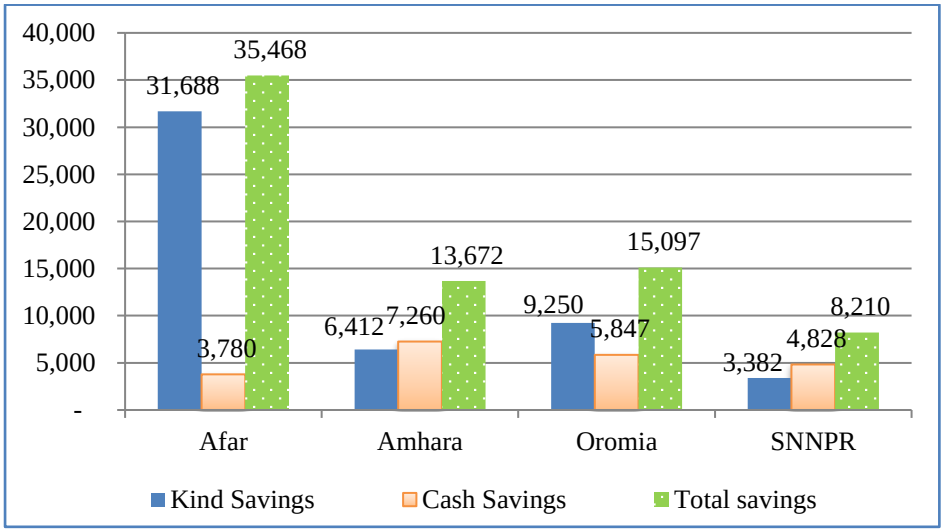


Source: Own computation based on panel data

Those households who saved in kind mentioned that their main motives to save in this form are the expectation of higher returns (62.5%) and protecting their wealth from inflation (15%), whereas cash saving decisions by rural households are mainly driven by safety issues (49.5%) and a high demand for liquidity (47.3%).

Regional savings (that is, both cash and kind savings) seem alike across regions (Fig. 4) with the exception of Afar, where there is a substantially huge amount of kind savings. This may be due to low access to formal financial institutions in the region, which forces households to save more in-kind, and an appreciation of prices for values stored in-kind following a wave of inflation in the country.

Figure 4: Cash and in-kind savings across sample regions

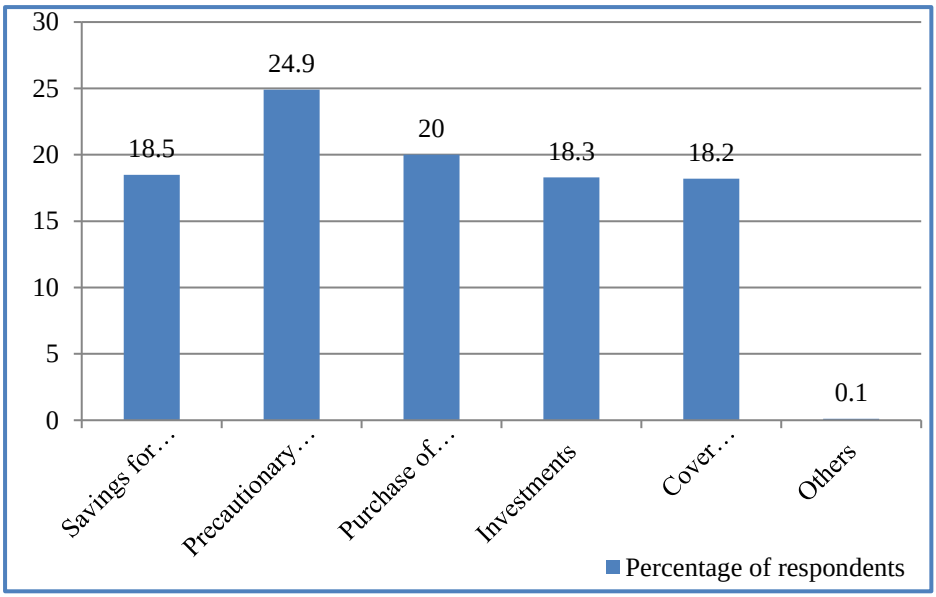


Source: Own computation based on panel data

III. Motives for savings (aggregate-both in kind and cash)

Respondents were asked about what is the most motivating factor for practicing savings in cash and/or kind. Nearly 25% of the respondents replied that the precautionary motive is the main driving force for savings. More specifically, rural households mainly practice saving so that it can be used for mitigating any shocks, if encountered. This is in line with the findings of Saliya (2018) and Gonosa et al. (2020), who noticed that saving is mainly driven by households' desire to overcome unexpected shocks in the cases of Mekelle city (Tigray) and Bench Majji zone (SNNPR), respectively.

Figure 5: Motives for saving (aggregate)



Source: Own computation based on panel data

Furthermore, as shown in the above graph, quite a significant portion of households practice saving to purchase household durables and assets (20%), to smoothen consumption in older ages (18.5%), to invest in profitable businesses (18.3%), and to cover education expenditures (18.2%).

These results have important implications on the role of efficient insurance schemes such as modern health, crop, livestock, and so forth, because a fair uptake of these kinds of products helps to cope with shocks at reduced cost and, in turn, boost, a capital available for investment.

IV. Institutions of rural savings

As far as the institutions for rural saving are concerned, in 2022, 22.6% of savers were using only formal financial institutions, 27.8%, were using informal institutions, and the remaining 49.6% were using both formal and informal financial institutions. Accordingly, we observed that rural households diversify their savings institutions more in recent periods, since only 21.66% of the savers practiced saving in both institutions in 2014 (Table 7).

Table 7: Institutions for rural saving

Institutions for saving	Percentage of savers-2014	Percentage of savers-2022
Formal	39.69%	22.6
Informal	38.65%	27.8
Both	21.66%	49.6

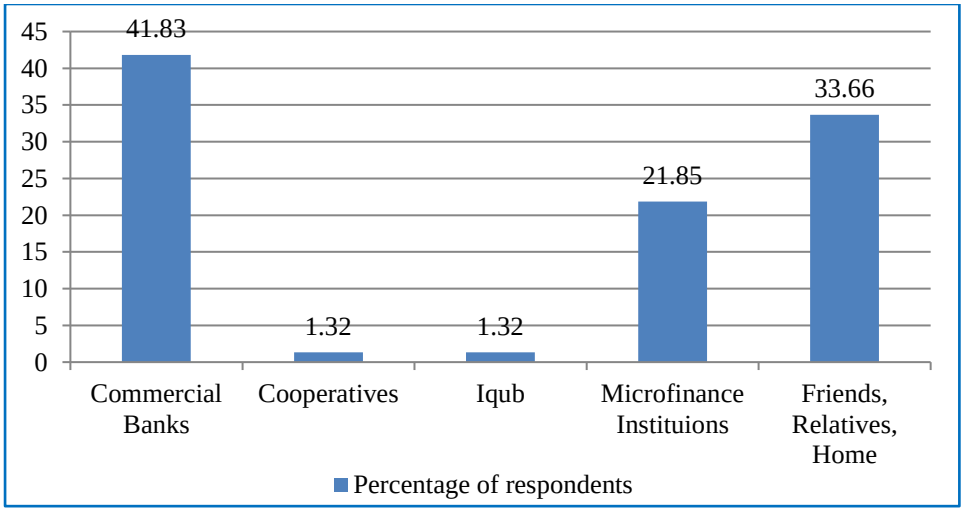
Source: Own computation

In 2022, among those respondents who used to save in informal institutions, 65% and 33.1% of them replied that proximity and ease of access are, respectively, the main drivers for saving in informal institutions. Safety (78%), ease of access (13.9%), and the motive to get other services such as loans (4.3%) are the other factors behind visiting FFIs for deposits.

V. Trust on various saving institutions

The level of trust a household has placed in various saving institutions is expected to determine where wealth is stored. We empirically assess the types of saving institutions in which rural households put their maximum trust to keep their savings.

Figure 6: Trust on various saving institutions



If rural households have the resources to save, 41.8% of them opt to deposit money in commercial banks. However, still large percentages of rural households,

33.7%, have the maximum faith in their home, friends, and/or relatives to keep their wealth. The microfinance institutions, which are more committed to providing formal financial services for rural households, stood third with 21.9% of respondents as their first choice.

Moreover, we tried to observe the dynamism, if any, in terms of shifts in trust in depository institutions across time among rural households. Accordingly, as shown in the following table, banks, friends, relatives, and deposits under the mattress have gained more trust in recent periods by rural households, and all these shifts happen at the expense of loss of trust in microfinance institutions[17].

Table 8: Trust on various saving institutions across time

Institutions	2012		2022	
	Number of respondents	percentage	Number of respondents	percentage
Commercial Banks	97	32.1	159	52.6
Cooperatives	4	1.3	3	1.0
Iqqub	3	1.0	6	2.0
Microfinance Institutions	133	44.0	23	7.6
Friends, Relatives, Home	65	21.5	111	36.8
Total	**302**	**100**	**302**	**100**

Source: Own computation based on panel data sets in 2012 & 2022

It requires further assessment why there is deteriorating trust in MFIs, though these institutions are still believed by governments, especially in low income countries where they are highly crucial to efficiently delivering formal financial services to rural households.

VI. Knowledge about saving products of FFIs

The financial knowledge of respondents about saving products was assessed along with the main sources of information for their knowledge. The products were a

[17] It should be noted that the current institutions households deposited their wealth may not be a direct replica of trust on saving institutions because what trusted most may not be accessible to rural households.

savings account, compulsory and voluntary saving, children's savings account, and interest on own savings. Among all products, awareness about saving accounts is the best (56.6%), followed by interest from saving (38.7%). The main sources of information are friends, relatives, neighbors, CBs, and MFIs (Table 9).

Table 9: Sources of financial knowledge

Types of Financial Products	Financial knowledge			Main source of information
	I knew it before (%)	I heard about it (%)	I don't know about it (%)	
Saving account	56.6	25.8	17.5	Friends, relatives, neighbors & CBs, MFIs
Compulsory & voluntary saving	29.5	20.9	49.7	Friends, relatives, neighbors & MFIs
Children saving account	25.5	20.2	54.3	Friends, relatives, neighbors & Radio
Interest from saving	38.7	21.5	39.7	Friends, relatives, neighbors & CBs, MFIs

Source: Own computation based on panel data sets

Furthermore, we observed that in 2012, approximately 52% of respondents had basic knowledge about the meaning, types, and benefits of saving accounts in formal financial institutions. This figure has steadily risen for 10 years to reach 61.6% in 2022.

Table 10: Knowledge of Saving Accounts across time

Description	2012		2022	
	Number of respondents	Percentage	Number of respondents	Percentage
I knew it before	157	52.0	186	61.6
I heard about it	77	25.5	78	25.8
I don't know about it	68	22.5	38	12.6
Total	**302**	**100**	**302**	**100**

Source: Own computation based on panel data sets in 2012 & 2022

We further noticed that there is no significant difference in the source of information across the two aforementioned periods.

5.3. Econometrics results and discussion

a. Determinants of household saving

To understand the determinants of saving behavior of farm households in the study area, initially we run a correlated random effects Probit model using surveys from 2014, 2018 and 2022. However, we found that the coefficients of the average values of the continuous variables, which are added to the model to control for unobserved heterogeneity, are not jointly different from zero. As a result, we estimated random effects probit after excluding these variables. Moreover, we run random effects tobit regression to identify the major determinants of the amount of savings by rural households.

The inverse mills ratio, which is obtained from the participation equation and regressed with other variables in the intensity equation, is statistically insignificant (see Appendix B for details), and hence we run our tobit model excluding the inverse mills ratio. The result is presented in Table 11 below.

Table 11: Econometric estimation of determinants of probability and amount of saving by rural households - (APE)

Explanatory variables	Probability of saving-Random effects regression (probit)		Amount of saving(ln)-Random effects Tobit regression	
	Coefficient	*Delta-method Std. Err.*	*Coefficient*	*Delta-method std. Err*
Family size within a HH	0.01*	0.006	0.117	0.073
Sex of the HH head	0.003	0.041	0.394	0.550
Age of the HH head	0	0.006	0.068	0.083
Square of age of HH head	0	0	-0.001	0.001
Participation in off-farm activity	0.019	0.038	-0.247	0.473
Receipt of remittance	-0.127***	0.045	-2.095***	0.612
Household income(ln)	0.024***	0.005	0.429***	0.067
Basic financial knowledge of HH head	0.13***	0.032	1.804***	0.421
Trust on formal financial institutions (FFIs)	0.015	0.031	-0.212	0.406
Distance measured in KM from FFIs	-0.006**	0.002	-0.073**	0.033
Number of livestock	0.001	0.001	0.022**	0.010
Amount of land size measured in Ha.	0.025	0.016	0.404**	0.188
Membership to local saving institutions	0.003	0.041	0.580	0.489
Ecology_n				
Desert	-0.162***	0.059	-2.063***	0.756
Kola	-0.021	0.052	-0.742	0.692
Woyina dega	-0.009	0.048	-0.730	0.631
Number of obs.		906		906
Uncensored		-		658
Left censored		-		248
Right censored		-		0
LR/Wald chi2(16)		96.7		119.01
Prob> chi2		0		0

****, ** & * shows statistical significance at 1%, 5% & 10% respectively*

A key factor that is found to have a significant effect on households' decisions to save is ***household income.*** A one percent increase in a household's income increases the probability of saving by 2.4%. The result is in line with the findings of Teshome et al. (2013), Mirach and Hailu (2014), Fenta et al. (2017), and Temam and Feleke (2018). Furthermore, for those households that decide to save, a 1% increase in rural income is associated with a 0.43% increase in savings, other things being equal.

Households' ***awareness of formal financial services, especially savings products increased with*** the recent boom in the number of branches of financial institutions across regions in recent years, which increased access to financial services and played a huge role in increasing household awareness. Our regression results also show that, compared to those households who do not have knowledge about financial services, the probability of saving increases by about 13 percent for those who have better knowledge about financial services, and positive impacts are observed on the amount of savings. However, we found that about 50 percent of the households in our study area still have no idea about compulsory and voluntary saving products, indicating the need to work more on raising awareness about different saving products.

From the results, the reader can also note that ***distance*** matters. As households go farther and farther away from formal financial institutions, the transaction cost to save also increases, which is more likely to reduce the probability of saving. Moreover, those households whose residence is far away from such institutions are less aware of the services of formal financial institutions (FFIs), and as a result, they have a relatively lower commitment to save. The regression result also shows that the probability of saving declines by 0.6 percent as distance from formal financial institutions increases by one more kilometer, and this result is significant at 5%. This result is consistent with previous findings by Negeri (2018) and Addis et al. (2019). In relation to distance to FFIs and amount of savings concerned, depending on households' decisions to save, the amount of savings by rural households reduces by 1.8% for each additional kilometer from the nearest FFIs.

Based on the nature, frequency, and behavior of the households', ***receipt of remittance*** affects the probability of saving either positively or negatively. In our case, a receiver of remittance is estimated to reduce the probability of saving by 12.7% compared to those who didn't receive it, and this result is statistically

significant at 1%. This may be due to two reasons. First, the remittances are sent occasionally, mostly for emergency purposes, to be spent right away and may not be saved. Second, even though it was sent on a constant basis, households may develop dependency, which reduces the probability and their amount of saving because the receiver usually becomes more or less certain about the next remittance cycle to smooth out their consumption or cope with emergencies. This result is consistent with the findings of Addis et al. (2019).

In addition to the aforementioned variables, the amount of savings by rural households is positively and significantly affected by land size and the number of livestock. More specifically, each additional acre of land and pound of livestock increases the probability of saving by 2.5% and 0.1%, respectively. Moreover, for those rural households that decide to save, the amount of saving increases by 40.4% and 2.2% in response in a one unit increase in land size and livestock. These positive outcomes are a priori expected because both land and livestock holdings are measures of wealth among rural households, and many empirical evidences support the notion that saving rises with wealth. Studies by Asare et al. (2018), Temam and Feleke (2018), and Addis et al. (2019) found that in the country, a larger land area is correlated with more savings. In other studies, Teshome et al. (2013) and Gonosa et al. (2020) showed that savings are higher for households that own more livestock.

b. Determinants of saving in cash and in-kind

Below, we have presented discussions on the results of regression on the determinants of cash (mostly in the formal financial institutions) and savings in kind. As illustrated in the above table, household income, participation in off-farm activities, trust in formal financial institutions, and agro-ecology (that is, desert) affect both cash and in-kind savings significantly. In addition to these variables, saving in kind is significantly affected by family size, knowledge about financial services, distance from formal financial institutions, and the number of livestock and land holdings. The following discussion is based on these findings.

An increase in household income tends to increase the probability and amount of cash and in-kind savings, with a more pronounced impact on the latter. More specifically, a 1% rise in household income results in an increase in the probability of cash and in-kind savings of 1.2% and 3.4%, respectively. This difference in magnitude can be explained by the vivid shift from cash to in-kind

savings following the rising inflation of recent periods. As evidence to this, we asked the respondents a hypothetical question about the use of additional income if their current income doubled, and 57.4% of the respondents replied that they would keep it in the form of in-kind savings, whereas 24.18% preferred to deposit the additional income in MFIs, with the remaining eye on boosting their current consumption level.

Table 12: Average marginal effect of cash and kind savings after probit regression

	Probability of saving in cash		Probability of saving in kind	
	Coefficients	**Delta-method Std. Err.**	**Coefficients**	**Delta-method Std. Err.**
Family size within a HH	0.007	0.006	0.012*	0.006
Sex of the HH head	0.046	0.046	0.031	0.047
Age of the HH head	0.003	0.007	0	0.007
Square of age of HH head	0	0	0	0
Participation in off-farm activity	0.077*	0.041	-0.084**	0.04
Receipt of remittance	-0.072	0.051	-0.082	0.051
Household income(ln)	0.012**	0.005	0.034***	0.006
Basic financial knowledge of HH head	0.056	0.036	0.212***	0.034
Trust on formal financial institutions (FFIs)	0.072**	0.034	-0.059*	0.035
Distance measured in KM from FFIs	-0.004	0.003	-0.007***	0.003
Number of livestock	0	0.001	0.002**	0.001
Amount of land size measured in Ha.	0.004	0.016	0.038**	0.016
Membership to local saving institutions	0.011	0.043	0.012	0.041
Ecology_n				
Desert	-0.28**	0.065	-0.21***	0.063
Kola	-0.013	0.059	-0.102*	0.059
Woyina dega	-0.024	0.054	-0.194***	0.054
Number of obs	906		906	
LR chi2(16)	100.48		137.68	
Prob> chi2	0		0	

****, ** & * shows statistical significance at 1%, 5% & 10% respectively*

Participation in off-farm activities increases the probability of saving cash by 7.7%, whereas the impact of the same on the probability of saving in-kind is negative (that is, participation in off-farm activities reduces the probability of in-kind saving by 8.7%). A possible reason for this may be that petty trade is the main form of rural households' off-farm participation, which forces traders to deposit their income mainly in cash to replenish their stock of goods or services quite often.

We expect a higher tendency to save in cash or mainly in formal financial institutions by those households that trust the services of FFIs. On the contrary, low trust or an absence of trust will force households to make in-kind savings. Consistent with this, we found that rural households with medium and high in trust have FFIs have 7.2% higher probability of saving cash compared to those households with low and no trust. Furthermore, better trust in FFIs results in a reduction of in-kind savings by 5.6%. This result signals that increasing outreach and financial awareness alone will not result in the intended change in households' decisions to save. But more work is required in building trust between smallholder farmers and the service providers.

In addition to the above socio-economic factors, in-kind saving is also affected by financial knowledge, distance to FFIs, and the number of livestock and land holdings.

Many households in rural areas are engaged in animal husbandry and farming. The household's income from such activities is determined by the size of its livestock and land holding, respectively. These most important determinants of households' farm income can also have a consequence on a household's decision to save. Income from such activities is usually collected in kind, so if households decide to save, the probability of saving in kind will be high. Teshome (2013) shows the significant and positive relationship between the size of livestock and households' decisions to save and the amount of saving. Our regression results also accord with such findings, and we found that when the size of livestock increases by one, the probability of a household's decision to save in kind increases by about 0.2 percent. When a household's land holding increases by one hectare, the likelihood of the household deciding to save in-kind increases by 3.8 percent. Even though the results of livestock and land holdings are consistent with theory, the impacts of financial knowledge and distance to FFIs on kind savings are at odds with prior expectations. More specifically, knowledge of the services of FFIs increases the probability of in-kind savings by 21.2%. This may be due to the fact that stocks of financial knowledge

help rural households not only save but also save in the form of those portfolios with higher returns (that is, save in kind).

We conducted focus group discussions (FGDs) with selected rural households and key informant interviews (KIIs) with managers and senior financial sector experts to assess the existing institutional challenges to mobilize cash savings in formal financial institutions. Accordingly, participants reported that this effort is limited by several supply-and demand-side institutional challenges. On the supply side, inadequate all-weather roads and a lack of internet services in rural areas hinder MFIs and banks from expanding their outreach. Moreover, in some areas, the existing financial products do not fit the demand from the respective farmers. On the demand side, limited financial knowledge about the services and products of formal financial institutions (FFIs), a high cost to reach the nearest FFIs, poor trust in the services and workings of FFIs, and the availability of local and informal financial service providers such as Iqqub, moneylenders, 'Tsewa Mahber', and so forth, have negatively impacted the opportunity to exploit the services of formal financial institutions.

6. Conclusions and Recommendations

Results of the current study show that nominal savings per household have increased in the past decade. However, most of the improvements have come from in-kind savings, which are destined for informal mechanisms. As a result, the major source of finance for rural households (MFIs) has faced difficulty meeting loan demand with mobilized savings. The rise in inflation, especially in recent years, forced households to reduce cash savings (whose real returns are mostly negative) and hold assets whose prices rise with inflation. This calls for the implementation of both fiscal and monetary policies that can reduce inflation. Moreover, lowering prices increases real income for a given nominal income and hence boosts saving, as our finding signals a strong correlation of income with savings.

Furthermore, based on the results of our study, one can suggest that it is possible to channel more savings to formal financial institutions by enhancing access, knowledge, awareness, and trust in these institutions. The results suggest that building trust in the services of FFIs is more crucial, since increasing awareness and outreach alone will not result in the intended outcome of higher savings.

Ensuring access to savings services in rural settings is costly since saving mobilization in such settings requires physical presence in a wider geographic area, which involves higher administrative costs as households residing in a given village save smaller amounts. Hence, innovative approaches such as agent banking, postal banking, and so forth may be potential and feasible options as they can help mobilize savings at a lower cost by avoiding the costly physical presence of FFIs in each village.

Financial education, such as the basic skills of managing expenditure and revenue, knowledge of the services of financial institutions, and so forth, increases the probability of saving among rural households. The role of the government in creating and enhancing financial knowledge is irreplaceable by any of the other actors, such as commercial banks or microfinance institutions. This is because once this knowledge is created, it will be a public good and hence may not compensate those FIs that invested in it. The skills that should be rendered include, among others, income-expenditure management, services and benefits of saving in formal and semi-formal institutions, and so forth.

Directly or indirectly, ensuring access to financial education for rural households improves ***trust*** in these institutions and their services. Moreover, building trust would be more successful if efficient and trustworthy channels of disseminating financial information were identified and targeted.

Last but not least, formal financial institutions should keep an eye on cash deposits by informal financial institutions as a potential resource that can be brought to their accounts through awareness creation and the provision of convenient services to rural households.

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Appendix A: Random effect probit estimation of probability of saving

Variables	**Coefficient**	**Std. err.**	**z**	**P>z**
Family size within a HH	0.016	0.023	0.69	0.49
Sex headed HH	-0.02	0.14	-0.14	0.889
Age of the HH head	-0.003	0.021	-0.15	0.882
Square of age of HH head	0	0	-0.29	0.77
Participation in off-farm activity	0.034	0.129	0.26	0.793
Receipt of remittance	-0.428	0.152	-2.82	0.005
Household income(ln)	0.077	0.019	4.05	0
Basic financial knowledge of HH head	0.478	0.111	4.31	0
Trust on formal financial institutions (FFIs)	0.07	0.103	0.68	0.496
Distance measured in KM from FFIs	-0.005	0.011	-0.5	0.615
Number of livestock	0.003	0.004	0.79	0.428
Amount of land size measured in Ha.	0.015	0.065	0.22	0.824
Membership to local saving institutions	-0.012	0.138	-0.09	0.93
Ecology_n				
Desert	-0.412	0.212	-1.95	0.052
Kola	0.07	0.197	0.36	0.721
Woyina dega	0.04	0.177	0.23	0.819
Avlny	0.007	0.039	0.18	0.855
Avfmsize	0.041	0.044	0.93	0.353
Avdisffi	-0.035	0.019	-1.9	0.057
Avlivestock	-0.001	0.005	-0.18	0.853
Avland	0.187	0.112	1.67	0.094
_cons	-0.242	0.646	-0.38	0.707
/lnsig2u	-15.14	21.225		
sigma_u	0.001	0.005		
Rho	0	0		

test avfmsize avlny avdisffi avlivestock avland

(1) [savdum]avfmsize = 0

(2) [savdum]avlny = 0

(3) [savdum]avdisffi = 0

(4) [savdum]avlivestock = 0

(5) [savdum]avland = 0

chi2(5) = 7.74

Prob > chi2 = 0.1714

Appendix B: Random effects Tobit regression with inverse mills ratio

Variables	Coefficient	Std. err.	z	P>z
Family size within a HH	0.0109	0.1056	0.1	0.918
Sex of the HH head	0.3622	0.5508	0.66	0.511
Age of the HH head	0.0567	0.0835	0.68	0.497
Square of age of HH head	-0.0004	0.0009	-0.49	0.625
Participation in off-farm activity	-0.4296	0.4910	-0.87	0.382
Receipt of remittance	-0.5329	1.2841	-0.41	0.678
Household income(ln)	0.1009	0.2460	0.41	0.682
Basic financial knowledge of HH head	0.2504	1.1997	0.21	0.835
Trust on formal financial institutions (FFIs)	-0.4077	0.4297	-0.95	0.343
Distance measured in KM from FFIs	0.0009	0.0630	0.01	0.988
Number of livestock	0.0121	0.0120	1.01	0.311
Amount of land size measured in Ha.	0.1336	0.2712	0.49	0.622
Membership to local saving institutions	0.4978	0.4925	1.01	0.312
Ecology_n				
Desert	-0.2138	1.5353	-0.14	0.889
Kola	-0.5964	0.6993	-0.85	0.394
Woyina dega	-0.7013	0.6312	-1.11	0.267
Mills	-7.9097	5.7254	-1.38	0.167
_cons	6.6592	5.4711	1.22	0.224

```
Random-effects probit regression                Number of obs     =        906
Group variable: unique_id2                      Number of groups  =        302

Random effects u_i ~ Gaussian                   Obs per group:
                                                              min =          3
                                                              avg =        3.0
                                                              max =          3

Integration method: mvaghermite                 Integration pts.  =         12

                                                Wald chi2(16)     =      88.94
Log likelihood = -483.62165                     Prob > chi2       =     0.0000
```

savdum	Coefficient	Std. err.	z	P>|z|	[95% conf.	interval]
family_size	.0331543	.0195195	1.70	0.089	-.0051032	.0714117
sexdum	.0103116	.1372619	0.08	0.940	-.2587168	.27934
age	.0018791	.0209209	0.09	0.928	-.0391252	.0428833
age_sq	-.0001084	.000204	-0.53	0.595	-.0005082	.0002914
offfarmdum	.0599347	.1261774	0.48	0.635	-.1873684	.3072378
remit_dum	-.4236067	.1504366	-2.82	0.005	-.718457	-.1287564
lny	.0815509	.0161496	5.05	0.000	.0498984	.1132035
knowlefs_dum	.4234927	.1074938	3.94	0.000	.2128087	.6341768
trustfi_dum	.054686	.1020211	0.54	0.592	-.1452716	.2546436
distance_ffi	-.0188183	.0083087	-2.26	0.024	-.035103	-.0025337
numlivestock	.0025509	.0023459	1.09	0.277	-.002047	.0071488
landsize	.0810267	.0526982	1.54	0.124	-.0222599	.1843133
localmeb_dum	.0176289	.1339933	0.13	0.895	-.2449931	.280251
ecology_n						
Desert	-.5104869	.1956804	-2.61	0.009	-.8940134	-.1269604
Kola	-.0718386	.1869463	-0.38	0.701	-.4382466	.2945693
Woyina dega	-.0279187	.1724023	-0.16	0.871	-.365821	.3099837
_cons	-.1646149	.5738667	-0.29	0.774	-1.289373	.9601431
/lnsig2u	-13.8721	26.12362			-65.07344	37.32925
sigma_u	.0009721	.0126974			7.40e-15	1.28e+08
rho	9.45e-07	.0000247			5.48e-29	1

```
LR test of rho=0: chibar2(01) = 4.1e-05                 Prob >= chibar2 = 0.497
```