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ORIGINAL ARTICLE

Understanding the Determinants of Aspirations in Rural Tanzania: Does Financial Literacy Matter?

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Abstract

Aspirations have recently received increased attention in the analysis of poverty and its dynamics. The argument is that aspirations provide reference points for individuals' forward-looking decisions and behaviours. Understanding of what determines aspirations is vitally important to design development interventions that can raise aspirations. In this paper, we analyse whether financial literacy is associated with individuals' aspirations. Using data from more than 2000 Tanzanian households, we find a robust positive correlation between financial literacy and aspirations. Our results are robust to using alternative financial literacy measure, controlling for extensive covariates and non-cognitive traits, and sensitivity analyses to omitted variables. Overall, our findings suggest that aspirations could be influenced to improve poor individuals' future investments and forward-looking behaviour.

Keywords Aspiration · Financial literacy · Poverty · Non-cognitive trait · Tanzania

JEL Classification C26 · C83 · D91 · G53 · O12

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Résumé
Les aspirations personnelles ont récemment fait l'objet d'une attention accrue dans l'analyse de la pauvreté et de la dynamique qui l'entoure. L'argument est que les aspirations fournissent des points de référence pour les décisions et les comportements prospectifs des individus. Comprendre ce qui détermine les aspirations personnelles est d'une importance vitale pour concevoir des interventions de développement susceptibles de susciter des aspirations. Dans cet article, nous analysons si l'alphabétisation financière est associée aux aspirations des individus. En utilisant les données de plus de 2 000 ménages tanzaniens, nous trouvons une corrélation positive robuste entre l'alphabétisation financière et les aspirations. Nos résultats sont robustes quant à l'utilisation d'autres mesures d l'alphabétisation financière, quant au contrôle des co-variables étendues et des traits non cognitifs, et quant aux analyses de sensibilité pour les variables omises. Dans l'ensemble, nos résultats suggèrent que les aspirations personnelles pourraient être influencées pour améliorer les investissements futurs et le comportement prospectif des individus vivant dans la pauvreté.

Introduction

Globally, an estimated 828 million people were undernourished in 2021, with the majority living in the developing countries (FAO et al. 2022). Africa accounts for more than one-third (278 million) of the global number of undernourished people in 2021. Specifically, sub-Saharan Africa has the world's highest prevalence of undernourishment that was projected to be 23.2% during the same year (FAO et al. 2022). Tanzania remains a country with disproportionately high levels of poverty, food insecurity and malnutrition in the region. The most recent assessment of poverty dynamics in Tanzania based on the 2017–2018 Household Budget Survey (HBS) shows that the incidence of basic needs poverty was about 26.4% in 2018, registering a slight decrease from 28.2% in the 2011–2012 HBS (Swinkels 2019; Aikaeli et al. 2021). An estimated 49% of Tanzanians were reported to live on less than the international extreme poverty line of US$ PPP 1.9 per day in 2018. Poverty rates are especially acute in rural areas, where over 80% of the country's poor reside (Aikaeli et al. 2021). According to the 2017–2018 HBS, the incidence of basic needs poverty is much higher in rural areas (31.3%) than in urban areas (15.8%). Similarly, food poverty is higher in rural areas (9.7%) than in urban areas (4.4%).

Tackling persistent poverty in the developing world has remained high in the global development agenda (e.g. Barrett and Carter 2013; FAO et al. 2022). What mechanisms cause and sustain chronic poverty is still an active research area. A recent literature has emphasized the importance of internal constraints[1] and behavioural biases in helping understand the psychological aspects of poverty and prosperity (e.g. Bertrand et al. 2004; Lybbert and Wydick 2018; Kremer et al. 2019). In line with this, a growing theoretical and empirical literature has examined the role of aspirations in explaining poverty and its dynamics. Aspirations predict a host of forward-looking decisions and outcomes in various domains, including education

[1] Alternative designations for internal constraints commonly found in the literature include personal traits, non-cognitive skills, psychological factors or soft skills.

outcomes (Page et al. 2007; Beaman et al. 2012; Serneels and Dercon 2021), household food security (Mekonnen and Gerber 2017), and agricultural inputs and investments (Kosec and Khan 2016; Mekonnen and Gerber 2016; Mausch et al. 2018), as well as political and community engagement behaviours (Kosec and Mo 2017). Relatedly, a new strand of research has called for the importance of accounting for farm households' aspirations in agricultural research and development interventions (Mausch et al. 2021; Nandi and Nedumaran 2021).

Accordingly, understanding aspirations of the rural poor and their determinants is vitally important to gain insights into what can potentially boost aspirations and to design development interventions that can make individuals aspire to improve their outcomes and invest in their futures (Kosec and Khan 2016). Particularly, measures and interventions that help individuals make better decisions, reduce behavioural biases and misperceptions, relax information constraints and improve exposure to new environments can have a role to increase their aspiration levels (Bernard et al. 2014; Lybbert and Wydick 2018). In this paper, we analyse whether individuals' financial literacy is associated with higher levels of aspirations. Greater financial literacy is expected to enhance individuals' ability to understand opportunities and risks and acquire, process and effectively use information in making economic decisions (Lusardi and Mitchell 2014).

Aspirations are preferences about forward-looking goals or targets and a desire to achieve them, implying the intention to invest and exert effort towards reaching the targets (Locke and Latham 2002; Bernard et al. 2014). The power of aspirations to influence actions, effort, and outcomes is grounded in the premise that aspirations serve as endogenous reference points for future-oriented behaviours and outcomes. The poor are believed to have low aspirations, perhaps because of limited exposure and selective mental models that magnify restrictive features of their environments (Appadurai 2004; Ray 2006; Dalton et al. 2016; Kosec et al. 2018; Kremer et al. 2019). In turn, low aspirations limit effort and investments to set ambitious goals and to proactively seek to achieve them to bring about a more prosperous future, such that low aspirations and poverty reinforce a self-sustaining trap (Ray 2006; Dalton et al. 2016; Genicot and Ray 2017). Banerjee and Duflo (2011) and Macours and Vakis (2014) show that low aspirations lead to low investments and contribute to sustained poverty. In response, several studies have examined a host of development interventions that aim to raise individuals' aspirations in various contexts (Beaman et al. 2012; Chiapa et al. 2012; Bernard et al. 2014; Golan and You 2021). Results from these studies are generally consistent with the idea that greater exposure to new standards of behaviour and outside world plays a critical role in driving aspirations among poor people.

This study contributes to this small but rapidly growing literature by analysing the association of financial literacy levels with aspirations of poor individuals in rural Tanzania. Financial literacy entails not only the knowledge and understanding of financial concepts and risks but also the skills, motivation and confidence to aptly use such knowledge and understanding to make informed decisions about wealth accumulation, investments and consumption (Lusardi 2019; OECD 2019). As such, financial literacy has the potential to induce changes in individuals' aspirations. Theoretically, we can envisage several potential mechanisms through which

financial literacy can affect aspirations. Financial literacy can improve individuals' capacity to aspire through increasing their self-efficacy and agency, relieving them from aspiration failure fatalism—a deep belief that one's destiny is preordained and beyond one's control (Ray 2006). It may empower individuals to update their subjective probabilities of realizations of outcomes and their beliefs about the likelihood of their actions in determining aspired outcomes. Financial literacy can also reduce cognitive biases by affecting people's expectations, perceptions of possibilities for their own lives and orientation to the future. It may help people analyse their situation and get out of survival mode, helping them escape psychological stresses and negative affective states of chronic poverty (Mani et al. 2013; Haushofer and Fehr 2014). We further formalize these mechanisms and relate them to the literature in section "Linking Aspirations and Financial Literacy".

We use a large and rich dataset collected from rural households in Tanzania. We measure aspirations using four dimensions relevant for poor individuals: income, wealth, social status and children's education attainment. We generate an aspirations index based on a standardized weighted average of aspirations over these four dimensions. Similarly, financial literacy is assessed using a relatively simple set of questions measuring basic understanding about concepts of numeracy, interest compounding, inflation and risk diversification. Our results show that financial literacy is positively and significantly associated with individuals' aspirations. Our results are robust to controlling for extensive individual, household and community covariates and several sensitivity analyses, including using alternative financial literacy measure, controlling for other non-cognitive traits and district fixed effects, and employing individual dimensions of aspirations. Importantly, our results are less likely to be affected by omitted variable bias, as confirmed by the sensitivity analysis to omitted variables due to Imbens (2003).

This paper potentially contributes to two strands of literature. First, it is related to the small but growing literature on the correlates and malleability of aspirations (Beaman et al. 2012; Chiapa et al. 2012; Bernard et al. 2014; Kosec and Khan 2016). This paper is particularly closest to Sutter et al. (2020) who study the effect of financial literacy on risk and time preferences and find that financial literacy makes subjects more patient, less present-biased, and slightly more risk-averse. Second, our paper provides insights into potential mechanisms for the well-established impact of financial literacy on a wide range of behavioural and economic outcomes (e.g. Hastings et al. 2013; Lusardi and Mitchell 2014; Martínez and Puentes 2018; Chilemba and Ragasa 2020). Our results suggest that improving individuals' aspirations may constitute a relevant channel through which financial literacy influences behavioural and economic outcomes.

The remainder of this paper proceeds as follows. Section "Linking Aspirations and Financial Literacy" provides an overview of potential theoretical mechanisms linking financial literacy to aspirations. Section "Data and Empirical Strategy" describes our data and empirical strategy. Section "Results and Discussion" presents the main results along with selected sensitive analyses. Section "Conclusion and Discussions" concludes.

Linking Aspirations and Financial Literacy

Two views are observed in the economics literature on the stability of non-cognitive skills and preferences. Standard classical theories assume that non-cognitive skills are reasonably stable over time (Stigler and Becker 1977; Heineck and Anger 2010), an assumption that facilitates empirical identification. In line with this view, earlier studies considered aspirations as exogenous and relatively stable, and used lagged variations to explain growth outcomes (e.g. Fuchs and Landsberg 1973; Schloss 1975). However, recent studies have argued otherwise that personality traits evolve over time in response to life experiences and changes in circumstances (e.g. Boyce et al. 2013; Melesse and Cechi 2017; Heckman et al. 2019; Stillman and Velamuri 2020). Overall, the current consensus seems that non-cognitive skills continue to develop and change over time. In line with this perspective, Lybbert and Wydick (2018) set out a theoretical framework for understanding possible determinants of and scenarios of changes in aspirations.

Here, our goal is on understanding the association between individuals' aspirations and their financial literacy levels. We can theoretically envisage several potential mechanisms that can link financial literacy and aspirations. One possibility is that financial literacy can improve individuals' self-efficacy and agency. Appadurai (2004) and Ray (2006) argue that poor people lack the capacity to aspire by forming mental models that neglect relevant information and circumvent some options, leading to aspirations failure. Especially, poor people suffer from low self-efficacy, i.e. falsely low perception of their ability to complete specific tasks and achieve goals (Dalton et al. 2016). Financial literacy can empower individuals to make informed decisions through improving their skills for comparing, extrapolating and evaluating information and economic options (Lusardi and Mitchell 2014; OECD 2019). A related point is that costs of acquiring, processing and interpreting information are more likely to be lower for the financially literate.

Financial literacy may also help individuals to update their subjective probabilities of realizations of outcomes and their beliefs about the likelihood of their actions in determining aspired outcomes. Expectations (i.e. subjective probabilities of realizations of future outcomes) and beliefs (i.e. stances of individuals about the link between actions and outcomes) can influence individuals' aspirations. Relatedly, prospect theory argues that people overestimate the occurrence of low probability events and underestimate the probability of higher probability events (Kahnemann and Tversky 1979). Such inconsistent choices may actually come at substantial costs in terms of aspirations and foregoing investment opportunities (Hey 2005). Financial literacy may affect people's expectations, perceptions of possibilities for their own lives and orientation to the future. Empirical evidence shows that people with improved levels of financial literacy are more likely to have long-term financial attitudes, plan ahead and engage in saving behaviours (Bruhn et al. 2016).

The interaction between poverty and aspirations can provide another plausible channel connecting financial literacy to aspirations. Recent experimental and behavioural studies argue that poverty imposes substantial psychological stresses and negative affective states that lead to short-sighted and low-aspired decision-making at

the expense of forward-looking goals (Mani et al. 2013; Haushofer and Fehr 2014). Gaining financial literacy may help people analyse their situation and get out of survival mode. There is ample empirical evidence showing that financial literacy is also associated with higher returns on investments and greater wealth accumulation and income growth (Hastings et al. 2013; Lusardi and Mitchell 2014). Supporting this argument, there is tentative evidence that asset and cash transfers to poor people fostered positive psychological changes that appeared to induce higher aspirations (Banerjee et al. 2011; Macours and Vakis 2014).

Finally, recent studies demonstrate strong complementarity between economic preferences and psychological personality traits (Becker et al. 2012; Jagelka 2020), which may provide an indirect channel linking financial literacy to aspirations. Sutter et al. (2020) find that financial literacy makes subjects more patient and less present-biased. These results suggest that financial literacy may influence aspirations through its implications for optimal economic choices. Overall, it is reasonable to hypothesize that financially literate individuals are more likely to have increased aspiration levels.

Data and Empirical Strategy

Data

Our analysis relies on data collected in Tanzania in October and December 2019 by the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT), as part of the project Accelerated Varietal Improvement and Seed Delivery of Legumes and Cereals in Africa (AVISA). The survey covers four ecological zones: Central, Southern highland, Coastal and Lake zones. These zones were selected because they are key sorghum growing dryland agro-ecologies in the country. The main climatic feature for most of these agro-ecologies is the long dry spell from May to October, followed by a period of rainfall from November to February. Thus, our sample is representative of sorghum growing drylands. Multistage sampling design was employed to come up with a total sample size of 2026 households. First, 20 districts were randomly selected across all zones. Next, a simple random sampling was used to select 39 wards and 82 villages for the survey. The final stage involves random selection of households from villages proportional to their populations using sampling frames generated with the help of local extension agents and administrative officers.

Table 1 provides detailed summary statistics for respondents. The first row in the variables list shows aspirations. Following Bernard and Taffesse (2012) and Bernard et al. (2014), we measure aspirations across four dimensions: income, wealth, social status and children's educational attainment. While there can potentially be many dimensions in which an individual could aspire, we argue that these dimensions are among the central aspects of what the rural poor could aspire to achieve. Income and asset wealth are key in determining individuals' economic welfare and livelihoods. Children's education is an important investment for the poor, where future-looking behaviour plays a central role. Social status is the relative rank that an individual

Table 1 Summary statistics of the study sample ($N = 2026$)

Variables	Description of variables	Mean	Stan. dev	Min	Max
Aspirations index	Aspirations index based on normalized wealth, income, child education and social status (outcome variable)	0.840	22.614	−81.091	197.175
Financial literacy score	Measure of financial literacy based on knowledge of numeracy, interest compounding, inflation and risk diversification (treatment variable)	3.026	1.890	0	7
Covariates					
Male	Respondent is male = 1, 0 = otherwise	0.578	0.494	0	1
Age	Age of the household head in years	46.52	13.56	15.00	95.00
Household size	Number of people living in a household	4.143	1.632	1	20
Education	Number of completed years of schooling	6.156	3.013	0	17
Per capita income	Household income divided by the household size (TSh.)	655,883	7,278,373	0	2.89e+08
Farming	Main occupation of household head is farming = 1, 0 = otherwise	0.877	0.328	0	1
Land	Total land owned in acres	7.382	11.806	0	34
TLU	Livestock owned in tropical livestock unit	7.368	28.736	0	811
Group membership	Member of a farmer-based organization = 1, 0 = otherwise	0.267	0.443	0	1
Extension services	Received extension services = 1, 0 = otherwise	0.450	0.498	0	1
Household asset index	Asset index measuring the value of assets owned by a household	13.817	60.035	−0.14	1360.30
Village market	Village market is available in the community = 1, 0 = otherwise	0.620	0.485	0	1
Formal credit	Access credit from formal financial institution = 1, 0 = otherwise	0.063	0.242	0	1
Parent's education level	Respondent father's years of schooling	3.299	3.350	0	20
Bank account ownership	Holder of bank account = 1, 0 = otherwise	0.254	0.435	0	1
Locus of control	Standardized locus of control	−0.001	0.991	−2.82	3.08
Time preference	Rate of time preference	21.556	52.473	0.25	599
Risk preference	Risk preference based on certainty equivalence	286.37	41.99	250	399.79
Zone dummies					
Central zone	Respondent is from Central = 1, 0 = otherwise	0.464	0.499	0	1

Table 1 (continued)

Variables	Description of variables	Mean	Stan. dev	Min	Max
Southern highland zone	Respondent is from Southern highland = 1, 0 = otherwise	0.111	0.314	0	1
Coastal zone	Respondent is from Coastal = 1, 0 = otherwise	0.055	0.229	0	1
Lake zone (reference group)	Respondent is from Lake zone = 1, 0 = otherwise	0.369	0.483	0	1

Source Tanzania household survey

holds in a society, with attendant rights, duties, and honour or prestige. Social status dictates individuals' ability to access resources and opportunities and is a major factor in determining the way people influence other societal members' conduct. That is why poverty is sometimes considered as an outcome of how a society is structured. That is, poverty is not a personal choice, but a reflection of societal structure in a hierarchal society. Further, these dimensions are empirically justified, and this approach of measuring aspirations has been used by several other papers with some adaptations (e.g. Beaman et al. 2012; Kosec and Khan 2016; Kosec and Mo 2017; Kosec et al. 2018).

For each of the four dimensions, respondents were asked the level they would like to achieve on specific dimensions. Table 5 in the Appendix contains the exact wordings of the questions. Annual income, measured in Tanzanian shilling (TSh), captures cash income from all activities. Wealth includes durable wealth (including housing, vehicles, furniture and other valuable durables). Education was measured in years of schooling respondents sought their eldest child to achieve. Social status was measured as the percentage of community members who would ask for the respondent's advice at times of important decisions.

We generate an aspirations index by aggregating the four dimensions. For this purpose, respondents were given forty beans to allocate to each of the four dimensions according to the relative importance of each dimension to them. Bernard and Taffesse (2012) used this approach of generating weights. We generate weights based on the allocations to each dimension, allowing us to account for individual heterogeneity across the dimensions. We use these weights to estimate a standardized aspirations index using the following expression: $A_i = \sum_{k=1}^{4} \left(\frac{a_i^k - \mu_i^k}{\sigma_i^k} \right) w_i^k$, where A_i is the aspiration index for individual i, a_i^k is individual i's aspiration for dimension k, w_i^k is the weight that individual i assigned to dimension k, and μ_i^k and σ_i^k measure, respectively, the mean and standard deviation of dimension k. An individual's aspiration levels are likely to be affected by a process of social comparison with others in her social environment or reference groups (Festinger 1954; Kosec and Khan 2016; Kosec and Mo 2017). As such, we standardize based upon the mean and standard deviation within a community and use mean and standard deviations of dimensions relative to the district to account for social comparisons in aspirations. If the district average aspiration level represents what is possible to achieve within the district, then our measure of aspirations captures the distance between what is possible and what an individual aspires to achieve on each dimension. Individuals with an aspiration level for a specific outcome above (below) their district's average have a positive (negative) value on the normalized outcome. The overall mean of the aspiration index for the sample is about 0.84.

Table 6 in the Appendix reports non-standardized aspirations, i.e. as recorded in the survey. Mean aspirations are relatively high. Income aspirations are four times current household income levels, which are TSh. 2,344,028 (about US$ 1022 at exchange rates at the time of the survey, 1US$ = TSh. 2292.9). Durable wealth is valued at around TSh. 951,896 (US$415). Wealth aspirations are even higher, up to 319 times current wealth levels. In terms of education, mean aspirations are 15 years of school attendance, i.e. respondents aspire their children to be university graduates.

This is quite an improvement, given that the year of schooling for respondents is averaged at six, i.e. primary school complete (Table 1). Related to our measure of social status, about 36% of respondents reported that they were currently consulted for important decisions in their community, and they would like to offer their advice at times of important decisions to as much as 64% of their fellow community members.

Next is our key explanatory variable: financial literacy. Financial literacy is measured using a relatively parsimonious set of seven questions assessing basic concepts of numeracy, interest compounding, inflation and risk diversification, which are building blocks to most peoples' day-to-day financial decision-making. While the questions are adapted from standard financial literacy measurements used in surveys (Lusardi and Mitchell 2014), we modify them to reflect local context (e.g. currency) and value spectrum to enhance understanding. The precise wordings of the questions are given in the Appendix (Table 7). The answers were scored as correct or incorrect, and the correct responses were summed to generate a financial literacy score, ranging from 0 to 7.

Expectedly, the level of financial literacy is considerably low. The average financial literacy score is about 3 (Table 1). Table 7 in the Appendix also provides the distribution of correct answers across individual questions. Relatively, respondents have better numeric literacy, with the share of correct answers ranging from 41% for "what is 10% of 400?" to 75% for "what is 35 + 82?" Generally, knowledge of interest compounding, inflation and risk diversification is low. Only about 30% could answer the simple 2% interest calculation. The scores for inflation and risk diversification, with both about 20% of respondents answering correctly, are even lower. Strikingly, only 1% could answer all seven questions correctly, while only about 24% could answer at least five questions correctly.

Moreover, Table 1 contains detailed information on a range of other household characteristics. The majority (57%) of the households are headed by males. The average respondent is about 47 years old and a primary school completed. Farming is the main occupation for about 88% of the households, implying that agriculture constitutes the main stay for sample households. The average household works on about seven acres of cultivable land with a livestock herd of seven tropical livestock units (TLU).[2] The average per capita income from all income sources for the sampled households was about TSh. 655,883 (about US$286). Parent's education level is proxied by the education levels of fathers of respondents. Fathers of respondents had, on average, more than three years of completed schooling.

As to institutional factors, about 62% of the households reported that there is a village market in their communities. Only 6% households accessed credit from formal lending institutions. About 25% of respondents had a bank account. Close to 27% of the respondents are members of a farmer-based organization, such as farmer producer organizations and marketing cooperatives. About 45% of the farming

[2] Tropical livestock unit is a unit used to quantify a wide range of various livestock species to a single figure to get the total amount of livestock owned by a household. A tropical livestock unit applicable for SSA is employed.

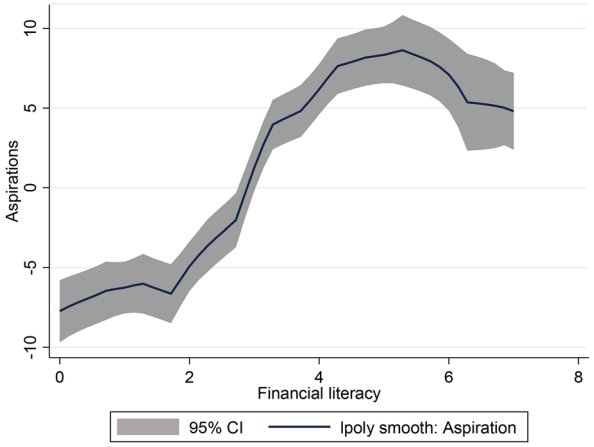

Fig. 1 Relationships between financial literacy and aspirations. Local polynomial regressions; Shaded areas refer to 95% confidence intervals

households are visited at least once by an extension officer in the survey year. Agricultural extension officers are trained agricultural professionals who are responsible for the last mile delivery of agricultural information and extension services to smallholder farmers. They act as intermediaries between agricultural research and smallholder farmers, helping farmers understand and use agricultural and market information and encouraging them to adopt improved agricultural technologies to improve productivity and production of the sector.

We control for individuals' locus of control, time and risk preferences to account for potential confounds, since studies show existence of considerable complementarity between economic preferences and personal traits (Becker et al. 2012; Kosec and Khan 2016; Jagelka 2020). Locus of control—measure of farmers' sense of control—was elicited using contextually appropriate items that are commonly employed to elicit external and internal locus of control in the literature (e.g. Cobb-Clark et al. 2014). Individuals' time preferences were measured through hypothetical intertemporal choices involving trade-offs in which individuals had to choose between earlier but smaller rewards and later but higher rewards. A higher discounting rate implies that an individual is more inclined to present consumption and considered to have a lower rate of time preference. Risk preference was measured using certainty equivalence (CE) based on data generated from hypothetical risk decisions—the higher the CE, the more risk-seeking an individual is.

Finally, most of the respondents are from Central and Lake zones. This is because these agro-ecological zones consist of major sorghum growing regions, including Dodoma, Singida, Shinyanga, Tabora, and Mara, that accounted together for more than 70% of total sorghum production in the country (ROT 2017; Miriti et al. 2022).

To get a glimpse of the data, a non-parametric analysis is carried out to look at the unconditional correlations between financial literacy and aspirations using local polynomial regression. Figure 1 reveals a positive association between financial literacy and aspirations. Below, we further examine and formalize this relationship, accounting for potential confounding factors and district fixed effects.

Empirical Strategy

Our goal is to estimate the correlation of financial literacy with aspirations of farm households. The empirical specification is as follows:

$$A_i = \beta_0 + \beta_1 F_i + \beta_2 X_i + \varepsilon_i \quad (1)$$

where A_i is the aspiration index for individual i, F_i is the financial literacy score for individual i, X_i is a vector of covariates, and ε_i is the random error term of the model. β_s are the parameters to be estimated. Specifically, β_1 is the parameter of interest. As we hypothesize that financial literacy improves aspirations, we expect β_1 to be positive. Given that the aspiration index is continuous, we estimate ordinary least squares (OLS) regressions.

A potential concern in our analysis is that financial literacy may be endogenous due to potential reverse causality, omitted variables and measurement errors. Our analysis has sought to generate compelling evidence by minimizing many potential sources of concerns about endogeneity. First, we use a uniquely detailed dataset that allows us to control for a rich set of individual, household, and community level variables and, therefore, can exclude a large number of potential sources of endogeneity biases. Individual characteristics include age, education and gender of the household head, while household characteristics cover household size and assets, such as livestock and land ownership. Included community level factors are access to markets, extension and credit. Second, Zone dummies are included in all regressions to account for agro-ecological and contextual characteristics. Third, district fixed effects are included to capture observed and unobserved characteristics beyond controlled covariates. Lastly, we report robust standard errors that account for heteroskedasticity, autocorrelation and the presence of outliers.

Despite these measures, we acknowledge that we cannot control for all potential concerns about endogeneity, and making neat causality remains a challenge with (non-experimental) cross-section data. Given the cross-sectional nature of the data, it is virtually impossible to control for every possible individual-specific factor that might be correlated with both aspirations and financial literacy. Thus, although we did our best to control for as many potential confounding factors as possible, omitted variable bias could be a real problem, and it may be plausible that those who aspire more are willing to invest more resource and time to become more financially literate. One potential way to address this issue is to use the sensitivity analysis proposed by Imbens (2003). The results of the analysis are presented in section "Sensitivity Analyses" and show that any omitted variable would have to be much more important than our existing control variables to invalidate our results. This gives us confidence that our main result that financial literacy improves aspirations is unlikely to have been driven by omitted variable bias. Overall, we argue that our results remain informative, even in the absence of definitive causality.

Results and Discussion

Main Results

We proceed in steps to estimate the correlation between financial literacy and aspirations conditional on several individual, household and community characteristics. Table 2 provides the regression results. We start by estimating a specification (column 1) that does not include regional dummies and district fixed effects. The results show that financial literacy is positively and significantly correlated with farm households' aspirations ($p < 0.01$). In the relatively simple model (column 1), a unit improvement in financial literacy score leads on average to 1.83 weighted standard deviation increases in aspirations, all else constant. In columns 2 and 3, we go on to including regional dummies and district fixed effects. We can see that the successive inclusion of additional explanatory variables leaves the estimate for financial literacy significant at 1% level. Importantly, the coefficients on financial literacy remain robust across the various specifications. Hence, financial literacy has a robust positive relationship with farm households' aspirations.

Table 2 also shows other individual and household characteristics are correlated with aspirations. Male respondents are more likely to have higher aspirations than their female counterparts, indicating lower economic opportunities for women that could limit their potential achievements. Household size and farming as main occupation have a significant relationship with aspirations. As expected, aspirations are higher for relatively more-educated respondents. This could suggest that education reduces cognitive biases that increase aspirations. Education could also open opportunities. Aspirations are increasing with household asset. Respondents whose parents were relatively educated have higher aspirations. Taken together, this may indicate an intergenerational transmission of aspirations. Individuals with more assets and parent's education level than others in their district may possess better resources and forward-looking outlook, increasing aspirations. In addition, having more resources can enable more stability and greater security, which empowers people to be more forward-looking.

Similarly, bank account ownership is strongly associated with higher aspirations. Perhaps, this is because bank account ownership offers individuals to become financially savvier through more experience with banking processes and different bank products, and interactions with formal financial institutions. For instance, microcredit loans in rural areas of Africa are often provided in a group-lending scheme, with account opening, information provision and networking as packages of loan extensions. Social interaction is a useful source of learning in various domains of life due to its role in diffusing knowledge. In low-income countries where physical presence is key to access services, holding a bank account at banks and microcredit institutions is likely to increase individuals' interactions with these institutions.

Respondents who have access to extension services are more likely to have higher aspirations, perhaps suggesting networking, information sharing, training and investment opportunities that may drive forward-looking behaviour. In

Table 2 Financial literacy robustly correlates with individuals' aspirations

Variables	Dependent variable: aspirations (OLS)		
	(1)	(2)	(3)
Financial literacy	1.833***	1.845***	1.919***
	(0.324)	(0.323)	(0.328)
Male	1.333*	1.305*	1.188*
	(0.993)	(0.994)	(1.009)
Age	− 0.010	− 0.006	− 0.005
	(0.039)	(0.039)	(0.038)
Household size	0.649**	0.603*	0.589*
	(0.311)	(0.318)	(0.317)
Education	0.187**	0.194**	0.205*
	(0.209)	(0.208)	(0.209)
Log per capita income	− 0.060	− 0.063	− 0.063
	(0.076)	(0.076)	(0.079)
Farming	2.444**	2.712**	2.971**
	(1.137)	(1.158)	(1.188)
Land	0.114	0.114	0.111
	(0.072)	(0.072)	(0.073)
TLU	0.021	0.019	0.020
	(0.014)	(0.014)	(0.014)
Parent's education level	0.289*	0.307*	0.296*
	(0.164)	(0.165)	(0.166)
Bank account ownership	7.535***	7.654***	7.787***
	(1.440)	(1.441)	(1.460)
Group membership	0.546	0.956	1.162
	(1.116)	(1.102)	(1.113)
Extension services	3.197***	3.059***	3.155***
	(0.960)	(0.999)	(1.026)
Household asset index	0.029*	0.029*	0.029*
	(0.019)	(0.020)	(0.020)
Village market	1.986**	2.215**	2.691**
	(0.980)	(1.016)	(1.161)
Formal credit	− 1.157	− 1.167	− 1.082
	(2.267)	(2.261)	(2.290)
Locus of control	1.874***	1.894***	1.924***
	(0.484)	(0.488)	(0.503)
Time preference	0.044***	0.044***	0.044***
	(0.015)	(0.015)	(0.015)
Risk preference	− 0.016*	− 0.015	− 0.014
	(0.010)	(0.010)	(0.010)
Central zone		− 1.911*	− 3.995*
		(1.039)	(2.045)
Southern zone		− 1.760	− 2.843
		(1.569)	(2.310)
Coastal zone		− 3.777	− 4.830*
		(2.381)	(2.477)
District fixed effects	No	No	Yes

Table 2 (continued)

Variables	Dependent variable: aspirations (OLS)		
	(1)	(2)	(3)
Constant	− 13.924*** (4.079)	− 13.433*** (4.123)	− 14.007*** (4.361)
F-statistic of the model Prob. > *F*	15.28 0.000	13.70 0.000	8.97 0.000
R^2	0.150	0.152	0.155
Number of observations	2026	2026	2026

Robust standard errors in parentheses

Statistical significance denoted at ***$p < 0.01$, **$p < 0.05$, *$p < 0.1$

communities where village markets exist, individuals are more likely to have greater aspirations. Locus of control and risk preferences are important predictors of aspirations in ways that are intuitive: individuals who are likely to have greater control on life events and more willing to take risk are more likely to have high aspirations. This suggests that greater internal locus of control and risk taking provide pathways to individuals to aspire and achieve their goals through hard work and taking risk therein. This evidence tentatively suggests that interventions that support individuals how they could control and change their livelihood status and promote taking reasonable risk (entrepreneurship) may increase individuals' aspirations. The coefficients of the zone dummies are interpreted in relation to the omitted Lake zone dummy. Compared to Lake zone, individuals coming from Central and Coastal zones have lower aspiration levels. This makes sense as Central and Coastal zone consists of many of the regions that are relatively poorest and have the least level of human development in Tanzania (Economic and Social Research Foundation et al. 2015). Finally, controlling for zonal dummies and district fixed effects can effectively account for various observed and unobserved community level characteristics beyond the controlled for covariates.

Unfortunately, per capita income enters not significantly in the aspirations model, which merits some discussion. Aspirations and financial literacy are anticipated to independently associate with income. As a first order concern, while it is highly likely that income is also partly endogenous, one would argue that the income effect on aspirations, and the endogeneity of income, might be more important than the independent relationship between financial literacy and aspirations if the simultaneity issue is addressed properly in our model. To attenuate this concern, we estimate our aspirations model excluding the financial literacy variable. However, per capita income does not still enter significantly in the model (column (1) of Table 8 in the Appendix). An alternative concern can be that it is the distribution of income that would matter instead of average income. We examine this hypothesis by generating an income dummy (one for higher than median income) and per capita income still does not correlate significantly with aspirations, both when financial literacy is included [column (2)] and excluded [column (3)] in Table 8. Another potential explanation for the lack of significant

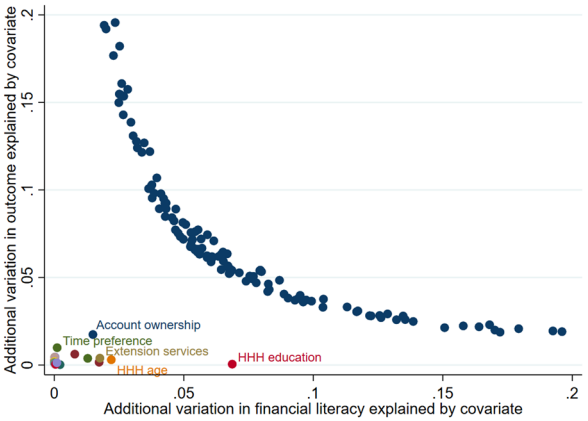

Fig. 2 Sensitivity of estimated effect to omitted variable bias. Level of partial correlation required for an omitted covariate to substantially bias results on the estimated effects of financial literacy on aspirations. *HHH* household head. Although legends are provided for only five controls with larger partial correlations, the figure depicts partial correlations for the full set of controls used in Table 2

correlation between aspirations and per capita income could be that income is poorly measured. Despite all the careful efforts taken in data collection, it is hard to correctly measure income in the rural African context, partly because recalls in typical rural surveys are usually imprecise and income is not stable. With these reservations, we argue that the strong association between financial literacy and aspirations is independent to the correlation between financial literacy and income (see also section "Sensitivity Analyses").

Sensitivity Analyses

We now present selected sensitivity analyses to assess the robustness of our findings. First, it is well known that omitted variables could bias our estimation of the relationship of financial literacy with aspirations if the omitted variables are significantly correlated with both the outcome (aspiration) and the explanatory variable (financial literacy). In this regard, Imbens (2003) proposes a sensitivity analysis that helps us examine whether our results are appreciably affected by omitted variable bias by estimating the degree of correlation a missing variable should have with both the outcome and explanatory variables to substantially change the estimated coefficient of correlation. A similar test is performed by, among others, Gottlieb and Kosec (2019).

To implement this procedure, we take all relevant covariates included in Table 2 and consider the correlation between financial literacy and unobserved covariates that are also correlated with aspirations. By generating pseudo-observables over 200 iterations, Fig. 2 shows a series of points representing the combination of R^2 values that would lead to a reduction of the size of the correlation coefficient by half. On the vertical axis, we plot the marginal increase in R^2 that results when an unobserved covariate is added to a regression of the aspirations index on our full set of controls included in Table 2. The horizontal axis plots the marginal increase in R^2 from adding the covariate to a regression of financial literacy on our full set of controls.

Table 3 Alternative measure of financial literacy

	Dependent variable: aspirations	
Financial literacy	2.278***	2.363***
	(0.513)	(0.519)
Controls[a]	Yes	Yes
Zone dummies	Yes	Yes
District fixed effects	No	Yes
Constant	− 13.088***	− 13.423***
	(4.151)	(4.395)
F-statistic of the model	12.28	8.01
Prob. > *F*	0.000	0.000
R^2	0.144	0.146
Number of observations	2026	2026

[a]All control variables (listed in Table 1) are included but coefficients omitted to preserve space

Robust standard errors in parentheses; Statistical significance denoted at ***$p < 0.01$, **$p < 0.05$, *$p < 0.1$

From the figure, we can see that a low correlation between financial literacy and an omitted variable would only be problematic if the correlation between the same omitted variable and our aspiration index was very high. To illustrate this finding made by a hypothetical omitted covariate, we also plot the partial correlations for our full set of controls with both financial literacy and aspirations. The results show that none of the controls even approaches the threshold that reduces our estimated coefficient on financial literacy by half. Therefore, an omitted variable would have to be much more impactful than our existing controls to invalidate our results. This essentially supports our causal interpretation of the results.

Second, we generate and use an alternative measure of financial literacy. There is no consensus on which unique set of questions should be used in evaluating financial literacy. The three big questions consistently used in different studies are the questions related to compound interest rate, inflation and risk diversification (Lusardi and Mitchell 2014). However, in a recent study, Carpena and Zia (2020) broadened the definition of measurement of financial literacy to include numeracy skills, among other dimensions, by arguing that numeracy literacy is useful in financial decision-making for comparing various options to choose the best one. Following this, our scale of financial literacy consists of individuals' understanding on four financial concepts: compound interest rate, inflation, risk diversification and numeracy. The numeracy component is represented by four questions related to summation, difference, multiplication and ratios, while the remaining three are represented by one question each. One concern is that numeracy may be over represented in the measurement of our financial literacy. To address this concern, we generate a single numeracy measure by recoding the numeracy questions into a dummy taking one for respondents who correctly answered at least three questions and zero otherwise. We then construct a more conservative financial literacy score ranging from zero to four, weighing all the four domains in a relatively similar way. Corresponding results (Table 3) show that our findings remain robust to this alternative measure of

Table 4 Impacts of financial literacy on the four dimensions of the aspirations index

Dependent variable: domains of aspirations	Income	Wealth	Children's education	Social status
Financial literacy	0.003 (0.156)	0.180** (0.163)	1.384*** (0.145)	0.352*** (0.106)
Controls[a]	Yes	Yes	Yes	Yes
Zone dummies	Yes	Yes	Yes	Yes
District fixed effects	Yes	Yes	Yes	Yes
Constant	− 2.889 (1.935)	− 4. 143** (2.999)	− 5.120** (2.051)	− 1.854 (1.794)
F-statistic of the model Prob. > *F*	2.42 0.000	2.90 0.000	8.07 0.000	5.48 0.000
R^2	0.032	0.101	0.125	0.081
Number of observations	2026	2026	2026	2026

Standard errors in parentheses; Statistical significance denoted at ***$p < 0.01$, **$p < 0.05$, *$p < 0.1$

[a]All control variables (listed in Table 1) are included but coefficients omitted to preserve space

financial literacy ($p < 0.01$), indicating that they are not driven by the over representation of the numeracy literacy.

Finally, we generate a single measure of aspiration levels by taking a weighted average of the multiple dimensions in our core analysis. Here, we assess whether financial literacy affects all dimensions of aspirations captured in our index or a subset of the components. Note that the aspiration index captures desired levels that one would like to achieve in four dimensions: income, wealth, child education and social status. We present results for each of these four outcomes of farm household aspirations in Table 4. We transform income and wealth by taking their logarithmic values to address the skewedness of the distributions of these variables. The results show that financial literacy is positively and significantly correlated with wealth ($p < 0.05$), children education ($p < 0.01$) and social status aspirations ($p < 0.01$). The strong and robust correlation of financial literacy, particularly with children's education, highlights that improving aspirations can be intergenerational, since many of the parents' future-oriented decisions are about investments in their children's education.

Unfortunately, financial literacy is not significantly correlated with income aspirations of individuals. Two observations may be relevant here. First, perception of strongly limited income-earning opportunities may constrain poor individuals to aspire high, even when they are financial literate. While income aspirations capture income from all sources, the major prospect for rural households comes from agricultural income. With highly subsistence-orientation and increasingly dwindling land ownership, smallholder agricultural income-earning capacity may be limited. As the poor do not see a possibility that their income can feasibly be much higher, they do not aspire to take actions to improve it and can consequently be stuck in a

poverty trap. This may translate into an intergenerational transmission of poverty, where households with limited income-earning opportunities may perceive that it will be difficult to aspire more income and to escape poverty. Supporting this perspective, respondents placed, on average, 22% of the bean tokens (i.e. weights) on income, ranking it as the third important dimension of aspirations. As related to the other three dimensions, 34% of bean tokens were placed on child education, 26% on wealth, and 18% on social status. Second, the lack of significant association between financial literacy and income aspirations may also suggest strong cultural and social barriers to aspire high income in the Tanzanian society. For example, forced sharing norms within one's kinship networks discourage individuals from income aspirations and more saving in Africa (di Falco and Bulte 2011). Thus, improving income aspirations through social and psychological interventions may need to be complemented by changes in individuals' perceptions and mindsets towards smallholder agriculture and opportunities presented by the sector.

Conclusion and Discussions

Breaking the poverty cycle in poor countries requires not only the availability of opportunities but also the will to take advantage of these opportunities. Recent work in psychology and behavioural economics has argued that poor people suffer from internal constraints and behavioural biases that play a significant role in hindering profitable investments. Following this, aspirations have received increased attention in theoretical and empirical studies of poverty and its dynamics. The central argument is that aspirations are reference points for decisions about future-oriented behaviour and outcomes. In other words, aspirations provide individuals the blueprint to set ambitious goals and seek to proactively invest to achieve them. Whether policy can have a role in influencing aspirations of poor people, and thereby their forward-looking economic decisions, largely depends on our understanding of what determines aspirations (Kosec and Khan 2016).

In this paper, we provide compelling evidence linking individuals' financial literacy levels to their aspirations using data from a relatively large and representative sample that allow us to control for a wide range of individual, household and community level variables. We find robust evidence that financial literacy is strongly and positively associated with aspirations. A disaggregated analysis of the domains of aspirations reveals that financial literacy has a positive and significant effect on aspirations in wealth, children education and social status. Nevertheless, while we provide evidence of a consistent positive relationship between financial literacy and aspirations, we caution the reader that we cannot establish a definite causal relationship between them. Making neat causality based on (non-experimental) cross-section data remains a challenge. Although we did our best to control for as many potential confounding factors as possible, included regional dummies and county fixed effects, we cannot rule out the possibility that individuals' levels of financial literacy and their aspirations might be

endogenously determined. Particularly, omitted variable bias could remain a real challenge. For example, those who aspire more could be willing to invest more resource and time to become more financially literate. To allay this concern, we run the sensitivity analysis to omitted variables due to Imbens (2003) and the analysis shows that our results are less likely to be driven by omitted variable bias.

Our results are important from a policy perspective. Financial literacy has the strongest correlation with aspirations in children's education. In addition, individuals place the highest importance on aspirations in education. High education aspirations in poor communities may support public investment in expanding education coverage. For example, high aspiration people can respond favourably for programmes that encourage school attendance in these communities. Overall, the penetration of financial institutions and services into rural areas not only improve the poor's access to finance and credit but can also be a relevant mechanism to raise their aspirations. This can happen in two potential ways. First, penetration of financial institutions and services into rural areas can positively contribute to increase financial literacy through product-related information, the introduction of new products and services, more experience with banking processes, and improving interactions with formal financial institutions. Second, penetration of financial institutions and services into rural areas can open economic opportunities that can help raise the aspiration levels of rural communities. Our finding that aspirations are increasing with bank account ownership provides tentative support to this hypothesis.

We also identify several individual and household characteristics predicting aspiration levels, highlighting factors that must be encouraged for a progressively aspiring rural communities in Tanzania. Factors, such as education levels, bank account ownership and land ownership, can be influenced by targeted policy. Similarly, non-cognitive factors, such as locus of control and risk-taking behaviours of individuals, can be appropriately influenced (e.g. by training programmes) as pathways to help individuals aspire and reach their goals. For example, exposure to successful role models (succeeded through personal efforts) could help create that a feeling that outcomes in life is determined by one's own actions and ultimately boost aspirations. In line with this argument, financial literacy can have a multiplier effect, as it also makes subjects more patient and less present-biased (Sutter et al. 2020). Overall, our findings suggest that policy and other interventions can have a role to encourage poor individuals to aspire to improve their lives. Given the link between individuals' aspirations and their future-oriented behaviour and outcomes, understanding what improves aspirations will be crucial for improving the economic outcomes of the poor and ultimately for poverty reduction.

Alternatively, it is crucial to note that increased aspirations are not always an unalloyed good. As much as low aspirations have remained detrimental to development in poor countries, unduly increased aspiration levels in communities may not always lead to positive outcomes. There could be conditions that shape the value of higher individual aspirations. For example, increased aspirations can lead to larger aspiration gaps that can foment greater political discontent (Healy et al. 2017). The argument is that when people become more aware of the potential for improved living standards with expanded opportunities, their aspirations may increase faster than actual living standards to create unrealized aspirations and hence political discontents. Likewise, large aspiration gaps can lead to greater risk tolerance that can

in turn produce undesirable outcomes. Evidently, Mo (2018) illustrated that excessively high aspirations can induce individuals to engage in more risk-seeking behaviour to pursue the prospect of economic opportunities, as in human trafficking, putting themselves at greater vulnerability to exploitation.

Finally, a few avenues may be attractive for future research. First, building more rigorous evidence (e.g. using randomized control trials and other credible approaches) is needed to support strong causal inference and generalization of our findings. Second, our measurement of aspirations considers four domains relevant to the poor: income, wealth, children's education and social status. Yet, it may be informative from a policy perspective to embrace aspirations in other domains relevant for development, including health, security, technology adoption and nutrition. Domain-specific measurement of aspirations is needed and remains an important area for further research both theoretically and empirically. Third, our data are not well equipped to allow us to make clear inference about specific mechanisms to explain our findings. We only speculate about plausible channels for linking financial literacy to aspirations. Future research may benefit from empirically examining competing channels.

Financial literacy is one of the growing lists of specialized literacy types. The present work opens a more general research question on how different types of literacy may impact aspirations of individuals. More broadly, individuals' aspirations are determined by their social circle, life experiences, personality, awareness, perceptions, reasoning and judgement, all of which shape how they perceive their futures (Appadurai 2004; Ray 2006; Kosec and Khan 2016). Different literacy types can influence aspirations of individuals, as much as they affect (some of) these various correlates of aspirations. Evidently, there is evidence on the importance of basic literacy skills, such as reading, writing, and numeracy in increasing career aspirations of pupils (Parsons and Bynner 2008). There are also other specific types of literacy, such as political literacy (O'Toole and Jones 2003), ICT literacy (Siddiq et al. 2017), climate literacy (Azevedo and Marques 2017) and mental health literacy (Pavarini et al. 2022), which have been proven useful in enabling individuals to achieve their personal goals and participate in activities that are important to their community and beyond.

We can illustrate this making a case related to climate change literacy, which could highlight more explanations on the mechanism of influence of literacy on aspirations of individuals. Smallholder farmers' misconceptions on the causes of climate change in Africa range from anger of gods due to people's negligence of cultural norms and practices to witchcraft practices and unrelated natural causes (Cobbinah and Anane 2016; Kaganzi et al. 2021). Such climate change perceptions ultimately influence the actions and adaptation choices of smallholder farmers and their willingness to bear risks. Fortunately, it has been shown that climate change literacy reduces misperceptions and related cognitive biases that can increase aspirations in precautionary investments and adaptation strategies (Azevedo and Marques 2017; Shwom et al. 2017).

Appendix

See Tables 5, 6, 7 and 8.

Table 5 Aspirations questions and weight generation

A1. Aspiration questions	
Income	Annual income is the amount of cash income that your household earn from all agricultural and non-agricultural activities i. What is the level of annual income (TSh) that you have at present? ii. What is the level of annual income (TSh) that you would like to achieve?
Wealth	Wealth includes monetary value of durable consumer goods including housing, vehicles, furniture, cell phone, and other valuable durables, but not productive assets, like land and livestock i. What is the approximate value of the wealth (TSh) you have at present? ii. What is the level of wealth (TSh) that you would like to achieve?
Children education	Education level indicates the number of years of schooling in a formal education i. What is your current level of education in terms of years of schooling? ii. What is the education level in terms of years of schooling that you would like your eldest child to achieve?
Social status	Social status indicates percentage of your fellow community members who would ask you for their advice at times of important decisions i. What is the level of social status you have at present? ii. What is the level of social status that you would like to achieve?

A2. Weight generation for aspiration dimensions			
Which of these four dimensions are the most important for you? Suppose that you have 40 beans, how would you distribute the beans to each dimension according to their importance			
Income	Wealth	Children Education	Social Status

Table 6 Non-standardized aspirations: level you'd like to achieve

Domain of aspiration	Mean (Sand. Dev.)	Min	Max
Income (TSh.)	8,647,103 (6.76e+07)	20,000	2.00e+09
Wealth level (TSh.)	3.04e+08 (1.11e+10)	10,000	5.00e+11
Children's education (Years)	15.041 (4.069)	0.000	25.000
Social status (%)	64.221 (29.061)	0.000	100.000
N	2026		

Table 7 Financial literacy questions and percentage of respondents answering correctly

S. No.	Questions	Correct answers (%)
1	Suppose you save TSh.100 in an account at a guaranteed interest rate of 2% a month. If you don't make any further saving into this account and you don't withdraw any money. How much would be in the account at the end of four months? [more than TSh.102; exactly TSH. 102; less than TSh. 102; Do not know]	30.95
2	If you have TSh.100 in an account for which the guaranteed interest rate is 1% per year, and if the price of goods rises by 2% per year, will you be able to buy more, less, or as much as today with your deposit account balance after one year? [More; As much as today; Less; Do not know]	20.24
3	It is less likely that you will lose all your money if you save it in more than one place [Right; False; Do not know]	20.24
4	What is 35 + 82?	75.12
5	If you have four friends and would like to give each of your friends TSh. 8, how much TSh. do you need?	60.96
6	What is 10% of 400?	41.07
7	Suppose you want to buy a small bag of groundnut that costs TSh. 437 and you only have one TSh.1000 note. How much change will you get?	54.00

Table 8 Income not significantly correlates with aspirations even when financial literacy is excluded

Variables	Dependent variable: aspirations (OLS)		
	(1)	(2)	(3)
Financial literacy	–	1.918***	–
		(0.328)	
Male	2.020**	1.176	2.007**
	(0.991)	(1.009)	(0.992)
Age	−0.012	−0.005	−0.012
	(0.039)	(0.038)	(0.039)
Household size	0.607*	0.596*	0.614*
	(0.321)	(0.318)	(0.322)
Education	0.557***	0.205	0.556***
	(0.186)	(0.209)	(0.186)
Log per capita income	−0.064	–	–
	(0.080)		
Per capita income (dummy)	–	−1.077	−1.110
		(0.967)	(0.980)
Farming	3.276***	2.977**	3.282***
	(1.203)	(1.188)	(1.203)
Land	0.117	0.110	0.117
	(0.075)	(0.073)	(0.075)
TLU	0.019	0.020	0.019
	(0.013)	(0.014)	(0.013)
Group membership	1.589	1.178	1.606
	(1.118)	(1.113)	(1.117)
Extension services	4.142***	3.175***	4.162***
	(1.002)	(1.026)	(1.003)
Household asset index	0.030	0.029	0.030
	(0.020)	(0.020)	(0.020)
Village market	2.538**	2.705**	2.552**
	(1.171)	(1.160)	(1.170)
Formal credit	−0.777	−1.065	−0.758
	(2.283)	(2.285)	(2.278)
Parent's education level	0.459***	0.300*	0.462***
	(0.163)	(0.166)	(0.163)
Bank account ownership	8.830***	7.819***	8.864***
	(1.475)	(1.458)	(1.473)
Locus of control	2.274***	1.919***	2.268***
	(0.516)	(0.504)	(0.517)
Time preference	0.047***	0.044***	0.047***
	(0.015)	(0.016)	(0.015)
Risk preference	−0.012	−0.014	−0.012
	(0.010)	(0.010)	(0.010)
Central zone	−3.642*	−3.970*	−3.616*
	(2.068)	(2.044)	(2.067)
Southern zone	−2.962	−2.787	−2.903
	(2.287)	(2.314)	(2.290)
Coastal zone	−4.139*	−4.817*	−4.125*
	(2.492)	(2.474)	(2.489)

Table 8 (continued)

Variables	Dependent variable: aspirations (OLS)		
	(1)	(2)	(3)
District fixed effects	Yes	Yes	Yes
Constant	− 12.779*** (4.427)	− 13.926*** (4.359)	− 12.696*** (4.425)
F-statistic of the model	6.81	8.94	6.80
Prob. > F	0.000	0.000	0.000
R^2	0.138	0.155	0.138
Number of observations	2026	2026	2026

Robust standard errors in parentheses; Statistical significance denoted at ***$p < 0.01$, **$p < 0.05$, *$p < 0.1$

Declarations

Conflict of interest On behalf of all authors, the corresponding author states that there is no conflict of interest.

References

Aikaeli, J., D. Garcés-Urzainqui, and K. Mdadila. 2021. Understanding poverty dynamics and vulnerability in Tanzania: 2012–2018. *Review of Development Economics* 25: 1869–1894.

Appadurai, A. 2004. The capacity to aspire: Culture and the terms of recognition. *Culture and Public Action* 59: 62–63.

Azevedo, J., and M. Marques. 2017. Climate literacy: A systematic review and model integration. *International Journal of Global Warming* 12 (3/4): 414–430.

Banerjee, A.V., and E. Duflo. 2011. *Poor economics: A radical rethinking of the way to fight global poverty*. New York: Public Affairs.

Banerjee, A.V., E. Duflo, R. Chattopadhyay, and J. Shapiro. 2011. *Targeting the hardcore poor: An impact assessment*. Mimeo: CGAP.

Barrett, C.B., and M.R. Carter. 2013. The economics of poverty traps and persistent poverty: Empirical and policy implications. *Journal of Development Studies* 49 (7): 976–990.

Beaman, L., E. Duflo, R. Pande, and P. Topalova. 2012. Female leadership raises aspirations and educational attainment for girls: A policy experiment in India. *Science* 335 (6068): 582–586.

Becker, A., T. Deckers, T. Dohmen, A. Falk, and F. Kosse. 2012. The relationship between economic preferences and psychological personality measures. *Annual Review of Economics* 4: 453–478.

Bernard, T., S. Dercon, K. Orkin, and A.S. Taffesse. 2014. *The future in mind: Aspirations and forward-looking behavior in rural Ethiopia*, 25. Oxford: Centre for the Study of African Economies.

Bernard, T., and A.S. Taffesse. 2012. *Measuring aspirations: Discussion and example from Ethiopia, IFPRI Discussion Paper, 01190*. Washington, DC: International Food Policy Research Institute.

Bertrand, M., S. Mullainathan, and E. Shafir. 2004. A behavioral economics view of poverty. *American Economic Review* 94 (2): 419–423.
Boyce, C.J., A.M. Wood, and N. Powdthavee. 2013. Is personality fixed? Personality changes as much as variable economic factors and more strongly predicts changes to life satisfaction. *Social Indicators Research* 111 (1): 287–305.
Bruhn, M., L. de Souza Leão, A. Legovini, R. Marchetti, and B. Zia. 2016. The impact of high school financial education: Evidence from a large-scale evaluation in Brazil. *American Economic Journal: Applied Economics* 8 (4): 256–295.
Carpena, F., and B. Zia. 2020. The causal mechanism of financial education: Evidence from mediation analysis. *Journal of Economic Behavior & Organization* 177: 143–184.
Chiapa, C., J.L. Garrido, and S. Prina. 2012. The effect of social programs and exposure to professionals on the educational aspirations of the poor. *Economics of Education Review* 31 (5): 778–798.
Chilemba, J., and C. Ragasa. 2020. The impact on farmer incomes of a nationwide scaling up of the farmer business school program: Lessons and insights from Central Malawi. *European Journal of Development Research* 32: 906–938.
Cobb-Clark, D.A., S.C. Kassenboehmer, and S. Schurer. 2014. Healthy habits: The connection between diet, exercise, and locus of control. *Journal of Economic Behavior & Organization* 98: 1–28.
Cobbinah, P.B., and G.K. Anane. 2016. Climate change adaptation in rural Ghana: Indigenous perceptions and strategies. *Climate and Development* 8 (2): 169–178.
Dalton, P.S., S. Ghosal, and A. Mani. 2016. Poverty and aspirations failure. *Economic Journal* 126 (590): 165–188.
di Falco, S., and E. Bulte. 2011. A dark side of social capital? Kinship, consumption, and savings. *Journal of Development Studies* 47 (8): 1128–1151.
Economic and Social Research Foundation, United Nations Development Programme (UNDP), and Government of the United Republic of Tanzania. 2015. Tanzania Human Development Report 2014: Economic Transformation for Human Development. Dar es Salaam, Tanzania. https://hdr.undp.org/system/files/documents/thdr2014-mainpdf.pdf
FAO, IFAD, UNICEF, WFP and WHO. 2022. The state of food security and nutrition in the world 2020. Transforming food systems for affordable healthy diets. Rome, FAO.
Festinger, L. 1954. A theory of social comparison processes. *Human Relations* 7: 117–140.
Fuchs, C.J., and H.A. Landsberger. 1973. "Revolution of rising expectations" or "Traditional life ways"? A Study of income aspirations in a developing country. *Economic Development and Cultural Change* 21 (2): 212–226.
Genicot, G., and D. Ray. 2017. Aspirations and inequality. *Econometrica* 85 (2): 489–519.
Golan, J., and J. You. 2021. Raising aspirations of boys and girls through role models: Evidence from a field experiment. *Journal of Development Studies* 57 (6): 949–979.
Gottlieb, J., and K. Kosec. 2019. The countervailing effects of competition on public goods provision: When bargaining inefficiencies lead to bad outcomes. *American Political Science Review* 113 (1): 88–107.
Hastings, J.S., B.C. Madrian, and W.L. Skimmyhorn. 2013. Financial literacy, financial education and economic outcomes. *Annual Review of Economics* 5: 347–373.
Haushofer, J., and E. Fehr. 2014. On the psychology of poverty. *Science* 344 (6186): 862–867.
Healy, A., K. Kosec, and C.H. Mo. 2017. Economic development, mobility, and political discontent: An experimental test of Tocqueville's thesis in Pakistan. *American Political Science Review* 11 (3): 605–621.
Heckman, J.J., T. Jagelka, and T. Kautz. 2019. Some contributions of economics to the study of personality. IZA Discussion Paper Series No. 12753.
Heineck, G., and S. Anger. 2010. The returns to cognitive abilities and personality traits in Germany. *Labour Economics* 17: 535–546.
Hey, J. 2005. Why we should not be silent about noise. *Experimental Economics* 8 (4): 325–345.
Imbens, G.W. 2003. Sensitivity to exogeneity assumptions in program evaluation. *American Economic Review* 93 (2): 126–132.
Jagelka, T. 2020. Are economists' preferences psychologists' personality traits? A structural approach. IZA Discussion Paper Series No. 13303.
Kaganzi, K.R., A. Cuni-Sanchez, F. Mcharazo, E.H. Martin, R.A. Marchant, and J.P.R. Thorn. 2021. Local perceptions of climate change and adaptation responses from Two Mountain Regions in Tanzania. *Land* 10: 999. https://doi.org/10.3390/land10100999.

Kahnemann, D., and A. Tversky. 1979. Prospect theory: An analysis of decision under risk. *Econometrica* 47: 263–291.

Kosec, K., K. Akramov, B. Mirkasimov, and J. Song. 2018. Aspirations and Women's Empowerment: Evidence from Kyrgyzstan. IFPRI Discussion Paper 01786. Washington, DC: International Food Policy Research Institute.

Kosec, K., and H. Khan. 2016. Understanding the aspirations of the rural poor. In *Agriculture and the rural economy in Pakistan: Issues, outlooks, and policy priorities*, ed. D.J. Spielman, S.J. Malik, P. Dorosh, and N. Ahmad, 433–474. Philadelphia, PA: University of Pennsylvania Press.

Kosec, K., and C.H. Mo. 2017. Aspirations and the role of social protection: Evidence from a natural disaster in rural Pakistan. *World Development* 97: 49–66.

Kremer, M., G. Rao, and F. Schilbach. 2019. Behavioral development economics. In *Handbook of Behavioral Economics*, vol. 2, 345–458. North-Holland: Elsevier B.V.

Locke, E., and G. Latham. 2002. Building a practically useful theory of goal setting and task motivation: A 35-year Odyssey. *American Psychologist* 57 (9): 705–717.

Lusardi, A. 2019. Financial literacy and the need for financial education: Evidence and implications. *Swiss Journal of Economics and Statistics* 155: 1.

Lusardi, A., and O.S. Mitchell. 2014. The economic importance of financial literacy: Theory and evidence. *Journal of Economic Literature* 52 (1): 5–44.

Lybbert, T.J., and B. Wydick. 2018. Poverty, aspirations, and the economics of hope. *Economic Development and Cultural Change* 66 (4): 709–753.

Macours, K., and R. Vakis. 2014. Changing households' investment behavior through social interactions with local leaders: Evidence from a randomized transfer program. *Economic Journal* 124 (576): 607–633.

Mani, A., S. Mullainathan, E. Shafir, and J. Zhao. 2013. Poverty impedes cognitive function. *Science* 341 (6149): 976–980.

Martínez, A.C., and E. Puentes. 2018. Micro-entrepreneurship debt level and access to credit: Short-term impacts of a financial literacy program. *European Journal of Development Research* 30: 613–629.

Mausch, K., D. Harris, E. Heather, E. Jones, J. Yim, and M. Hauser. 2018. Households' aspirations for rural development through agriculture. *Outlook on Agriculture* 47 (2): 108–115.

Mausch, K., D. Harris, and J. Revilla Diez. 2021. Rural aspirations—Reflections for development planning, design, and localized effects. *European Journal of Development Research* 33: 795–808.

Mekonnen, D. A. and N. Gerber. 2016. The effect of aspirations on agricultural innovations in rural Ethiopia. ZEF–Discussion Papers on Development Policy No. 214, Center for Development Research, Bonn.

Mekonnen, D.A., and N. Gerber. 2017. Aspirations and food security in rural Ethiopia. *Food Security* 9: 371–385.

Melesse, M.B., and F. Cecchi. 2017. Does market experience attenuate risk aversion? Evidence from landed farm households in Ethiopia. *World Development* 98: 447–466.

Miriti, P., M.D. Regassa, C.O. Ojiewo, and M.B. Melesse. 2022. Farmers' preferences and willingness to pay for traits of sorghum varieties: Informing product development and breeding programs in Tanzania. *Journal of Crop Improvement* 37: 1–20.

Mo, C.H. 2018. The effects of perceived relative deprivation on risk: An aspiration-based model of human trafficking vulnerability. *Political Behavior* 40 (1): 247–277.

Nandi, R., and S. Nedumaran. 2021. Understanding the aspirations of farming communities in developing countries: A systematic review of the literature. *European Journal of Development Research* 33: 809–832.

OECD. 2019. *PISA 2021 financial literacy analytical and assessment framework*. Paris: PISA, OECD Publishing.

O'Toole, T., D. Marsh, and S. Jones. 2003. Political literacy cuts both ways: The politics of non-participation among young people. *Political Quarterly* 74 (3): 349–360.

Page, L., L.L. Garboua, and C. Montmarquette. 2007. Aspiration levels and educational choices: An experimental study. *Economics of Education Review* 26: 748–758.

Parsons, S., and J. Bynner. 2008. Illuminating Disadvantage: Profiling the experiences of adults with Entry level literacy or numeracy over the lifecourse. National Research and Development Centre for adult literacy and numeracy, Institute of Education, University of London, London.

Pavarini, G., C. Booysen, T. Jain, J. Lai, K. Manku, A. Foster-Estwick, I. Singh, et al. 2022. Agents of change for mental health: A survey of young people's aspirations for participation across five

low-and middle-income countries. *Journal of Adolescent Health*. https://doi.org/10.1016/j.jadohealth.2021.10.037.

Ray, D. 2006. Aspirations, poverty and economic change. In *Understanding poverty*, ed. A. Banerjee, R. Benabou, and D. Mookherjee, 409–422. Oxford: Oxford University Press.

ROT. 2017. The 2016/17 annual agriculture sample survey. The United Republic of Tanzania.

Schloss, H. 1975. Revolution of rising expectations and aspiration. *Indian Economic Journal* 22 (4): 299–332.

Serneels, P., and S. Dercon. 2021. Aspirations, poverty, and education. Evidence from India. *Journal of Development Studies* 57 (1): 163–183.

Shwom, R., C. Isenhour, R.C. Jordan, A.M. McCright, and J.M. Robinson. 2017. Integrating the social sciences to enhance climate literacy. *Frontiers in Ecology and the Environment* 15: 377–384.

Siddiq, F., P. Gochyyev, and M. Wilson. 2017. Learning in digital networks–ICT literacy: A novel assessment of students' 21st century skills. *Computers & Education* 109: 11–37.

Stigler, G., and G. Becker. 1977. De Gustibus Non Est Disputandum. *American Economic Review* 67 (2): 76–90.

Stillman, S. and M. Velamuri. 2020. Are personality traits really fixed and does it matter? IZA Discussion Paper Series No. 13342.

Sutter, M., M. Weyland, A. Untertrifaller, and M. Froitzheim. (2020). Financial literacy, risk and time preferences: Results from a randomized educational intervention. IZA Discussion Paper Series No. 13566.

Swinkels, R.A. 2019. Tanzania - Mainland Poverty Assessment 2019: Executive Summary (English). Washington, D.C.: World Bank Group